European Mathematical Society

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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 Mäkelainen

Interview: Sir Ron Dearing

The National Committee of Inquiry into Higher Education: The Dearing Committee

THIS COMMITTEE, under the chairmanship of Sir Ron Dearing, was set up, prior to the recent general election but with the agreement of the political parties, to review higher education in the United Kingdom (UK). Its remit included the making of recommendations into all aspects of higher education including support for students. It was obliged to take account of the increasing participation in higher education by young and mature students, of the standards to be maintained, of the need to maintain international standards in degrees and in research and in the cost- effectiveness of the proposals, bearing in mind the distinctive features of higher education in different parts of the UK; its report was scheduled for Summer 1997. To this end, its first question in a written consultation exercise was "What should be the aims and purposes of higher education over the next twenty years?"

The last major review of UK higher education was by the Robbins Committee in 1963. (It should here be remarked that committees of inquiry in the UK are given formal titles but, by custom, they are referred to by the name of their distinguished chairman - or chair as the case may be). Arising out of the recommendations of the Robbins Committee, many new Universities were created. In the case of the Dearing Committee, many institutions had suddenly been designated as universities; the Dearing Committee has had to anticipate the subsequent future of these and other longer established institutions. The final report of the Committee runs to some 467 A4-size pages together with weighty appendices.

Sir Ron Dearing, as Chairman, was asked a number of questions to which he freely gave answers. The questions and answers are reproduced verbatim below. The utmost gratitude can only be expressed to Sir Ron Dearing for the promptness and fullness of the answers.

The questioning within the UK university scene may be paralleled in similar considerations in other countries. The debate on higher education and its costs is not likely to begin and end in the UK.

Q1 The last major review of United Kingdom higher education was by the Robbins Committee in the 1960s. To what extent was your Committee influenced by the deliberations of the Robbins Committee?

A1 Every member of the Committee had a copy of the Robbins report. The Committee paid particular attention to the Robbins Committee's definition of the purposes of higher education. The Committee felt that those purposes still had much validity although we reformulated them to match the conditions of the modern world.

Q2 Much of the increased demand for higher education is expected to be at the sub-degree level. Is there any estimate of the expected percentage of the relevant age-group in higher education? Within five years, how many students (full-time or part-time) do you envisage there will be in UK higher education?

A2 The Committee was clear that it did not want to set a specific target for participation in higher education. It noted, however, that participation rates of around 45% have already been achieved in Scotland and Northern Ireland and thought it reasonable to assume that a similar participation rate might be achieved across the UK as a whole over the long-term. In Scotland, most of the participation in excess of levels in England is in sub-degree higher education.

Q3 The Committee is obviously concerned about potential students who are disadvantaged in some particular way and who, accordingly, need some special assistance. If it is believed that the present system is failing such people, what active steps should be taken to help them?

A3 The Committee realised that many of the disparities in participation in higher education among different groups in society are the result of factors beyond the influence of higher education. Nonetheless, we felt that higher education had a responsibility to take what steps it could to ensure equity of access. The report recommends a whole range of measures to improve access, including:

- requiring all higher education institutions to have participation policies which are regularly reviewed by the governing body;
- giving priority in the allocation of additional places to those institutions which show a commitment to widening participation;

- improvements to the financial support for disabled students;
- broadening the availability of Access Funds, and doubling the financial provision;
- no payment of tuition fees by part-time students receiving the job seekers allowance.

Q4 A recommendation is that, 'with immediate effect, all institutions of higher education give high priority to developing and implementing learning and teaching strategies which focus on the promotion of students' learning.' It might be thought that any higher education institution would already be carrying out the recommendation. What has prompted the need to make the recommendation?
A4 Higher education institutions do, of course, already give a great deal of time and attention to their teaching activities. Evidence available to the Committee, for example from a seminar on learning which the Committee hosted and from researchers in the field, showed that the adoption of best practice is variable. In particular, we saw a need for the focus in some institutions to shift from teaching to ensuring that students learn as effectively as possible.

Q5 How importantly do you assess the influence of changing and advancing communications and information technology?
A5 As the report makes clear, communications and information technology offer great opportunities but also threats in an increasingly global environment. The key is for the UK to stay at the forefront in exploiting new methods.

Q6 Could you explain the role of the proposed Institute for Learning and Teaching in Higher Education? What is envisaged by the training of higher education teachers?
A6 The Committee envisaged that the proposed Institute for Learning and Teaching in Higher Education would act as a professional body for higher education teachers and also as a source of innovation and advice on good practice. The Committee did not envisage one model for the training of higher education teachers. Individual institutions should have training programmes which match their particular needs, but these should have national recognition so that those who successfully complete them can obtain a qualification which has national validity from the Institute.

Q7 It is suggested that the Institute for Learning and Teaching in Higher Education should develop computer-based materials for undergraduate units or modules. Has the cost of such a project been quantified? Would it be the intention to sell such material?
A7 The Committee did not set out to specify in detail how the Institute should carry out its proposed tasks. This would require consultation within the sector and development in the light of experience.

Q8 It is suggested that a better balance between breadth and depth in programmes should be achieved than at present. In what ways would you like to see the improvement of this balance?
A8 The balance between breadth and depth in higher education programmes has long been the subject of debate. It was an important theme in the Robbins Report. My Committee saw a continuing need for specialist programmes which concentrate on particular areas in depth, but it also believed that students should have more chances to choose broader courses if they so wished. In addition, we felt that all students, whatever their subject of study, should be expected to develop a range of key skills which will serve them well beyond higher education.

Q9 Every student is expected to have a Progress File. How will this be used? Is the idea of a Progress File influenced by American practice?
A9 The idea of a Progress File came from the recent work which Sir Nicholas Goodison carried out in respect of the earlier stages of education. Increasingly, young entrants to higher education will come with a Progress File recording their achievements and experiences at school and college. The Committee considered that they should be encouraged to build on this in higher education.

Q10 The Government, and other bodies, is recommended to endorse immediately the framework for higher education qualifications. Could you explain exactly what is being recommended?
A10 The Committee's report proposes a framework for higher education qualifications with clearly identified levels which is broad enough and flexible enough to encompass academic and vocational qualifications. The framework should help students and employers to understand the available range of qualifications, identify progression routes and assist in the maintenance of standards.

Q11 The role of the Quality Assurance Agency is to be extended and an international member is to join its Board. How will this international member be appointed?
Q12 How will the international members be appointed to the Research Assessment Panels?
A11/12 It will be up to the relevant appointing bodies to decide how international members should be appointed.

Q13 It is proposed that there should be a revolving loan fund of £400 to £500 million, financed by

public and private research sponsors, to support infrastructure in a limited number of top quality research departments. Is this intended to promote 'centres of excellence' in different subject areas?
A13 Those responsible for allocating funds from the revolving loan fund would need to develop policies to guide their decisions. The Committee's view that the funds should be used to support a limited number of top quality departments would almost inevitably mean that funds were focused on "centres of excellence".

Q14 The Committee seems to be very concerned about the responsibilities, and how they are exercised, of the governing body of an institution. Is this concern prompted by one or two instances of improper or inadequate behaviour on the part of some governing bodies?
A14 The Committee was aware of certain specific instances of failings on the part of governing bodies but also knew that others, for example the Nolan Committee and the Committee of University Chairmen, had issued guidance to address these problems. The Committee's concern was that governing bodies and their institutions should be able to respond effectively in an increasingly fast-changing and challenging environment for higher education. Structures which have worked well in the past may not continue to be adequate in the future.

Q15 The Committee devotes a fair amount of attention to the use of the term 'university' and to the growth of degree level qualifications in further education colleges. Is there a feeling that some institutions were unwisely or prematurely granted the title of 'university'?
A15 The Committee was concerned not so much with those institutions already legitimately granted the title of university but with the impact of the criteria which have been set down for further institutions to acquire that title. The effect of numerical criteria is to encourage institutions to focus on achieving a target size. Such criteria do not enable those taking decisions to take account of any wider considerations such as whether additional universities are needed in specific parts of the country.

Q16 Is there not some inconsistency in recommending that funding for teaching should be normally within modest margins and also recommending that, in certain unspecified circumstances, exceptional levels of such funding should be permitted?
A16 The Committee did not suggest that funding for teaching should always be within a narrow margin. There is therefore no inconsistency in suggesting that where exceptions are made, they should be on the basis of a properly justified and accepted case.

Q17 The Committee is recommending that around 25 per cent of the average cost of higher education tuition should be met by an income contingent scheme. This appears to mean that a tuition fee of some £1,000 per annum would have to be met by a student over a three-year period irrespective of the actual degree course or length.
How does the Committee reconcile this recommendation with a previous recommendation to help those who are disadvantaged? Is there no feeling that students may be submerged in debt?
How will tuition costs in the UK compare with tuition costs in other European countries?
A17 The Committee's intention was that students should meet around 25% of the average cost of higher education tuition each year. This would mean, in general, that total contributions would be proportional to the length of the programme studied. The Committee's recommendation would have increased the potential debt burden at graduation of all students regardless of background by £1,000 per year of study but would have retained the means-tested student maintenance grant for students from poorer families to curtail the debt burden they faced on graduation. The Government has adopted a somewhat different approach involving the introduction of tuition fees (albeit not for those from the least well off homes) and replacing maintenance grants by loans, the effect of which is to provide a greater contribution to the cost of higher education than in the Committee's preferred option. The essential point is, however, that it is not students who are expected to contribute to tuition costs for graduates in work. The Committee strongly recommended income contingent payment arrangements so that no-one is asked to pay more than they can afford and the Government has accepted that argument. The contribution costs in the UK would be higher than in many other European countries but much lower than in the US, Japan and more widely in Asia. It is relevant also to look at support for students' living costs which has traditionally been more generous in the UK than in other countries elsewhere in Europe.

Q18 What implications, if any, are there for international, and particularly European, programmes of study and research?
A18 The Committee's report says that the UK should aim to be the world leader in the practice of learning and teaching in higher education. Its recommendations are also designed to improve the research infrastructure. If these objectives are achieved, the UK should be an increasingly attractive partner for international programmes of study and research.

Q19 What aspects of the 'European dimension' did

the Committee consider in its deliberations?
A19 The Committee was very conscious of the "international dimension" in all of its work. It also looked specifically at:
- the position of European Union students if tuition contributions were required (they would be placed on the same footings as UK students which would reduce the extent to which the UK taxpayer currently subsidises students from other EU countries);
- the difficulties faced by UK higher education institutions which win European Union contracts which do not carry infrastructure funding (the report addresses the general problem of infrastructure but does not propose a specific solution to the EU issue);
- the relationship between a UK higher education qualifications framework and arrangements for qualifications elsewhere in Europe (where the report concludes that a framework would assist with the recognition of UK awards in Europe).

Professor D A R Wallace
Vice-President, European Mathematical Society

EUROPEAN MATHEMATICAL SOCIETY

Meeting of the Executive Committee
Capri (Italy) October 10-11, 1997

Main topics of the agenda and decisions

A detailed report will appear in the March Issue of the Newsletter.

SCIENTIFIC ACTIVITIES

Third European Congress of Mathematics (3ECM)
July 10-14, 2000, Barcelona (Spain)

The Scientific Committee is as follows : V. Arnold (Russia), M.F. Atiyah, chair (UK), R. Azencott (France), F. Catanese (Italy), J.I. Diaz (Italy), A. Kupianen (Finland), C. Moeglin (France), J. Sjoestrand (France, Sweden), A. Smith (UK), S. Domokos (Hungary), S. Woronowicz, D. Zagier (Germany).

Diderot Mathematical Forum
On December 19-20, 1997, the Forum on "Mathematics and Environment" will be held in Amsterdam, Madrid and Venice. It will concentrate on problems related to water.

In preparation : "Mathematics as a force of cultural evolution" (June 1998) in Berlin and Florence. "Mathematics and Music" (Autumn 1999) in Lisbonne and Paris.
For information : Mireille Chaleyat-Maurel (e-mail: mcm@ccr.jussieu.fr).

Summer Schools
In 1998, there will be two Summer Schools, one in France (Wavelets and their Applications) and another in Romania (Singularities in Algebraic Geometry).
For information : G. Monegato
(e-mail: monegato@itopoli.bitnet).

Zentralblatt für Mathematics
The President will sign a Memorandum of Understanding between the EMS, Heidelberg Academy of Science, FIZ Karlsruhe and Springer-Verlag.

INFORMATION SERVICES

Server (EMIS)
At the moment there are 27 mirrors operating (one in Japan will be added soon) and there are 22 journals in ElibEMS.

The Newsletter
The new cover will appear in the first issue in 1998. The cover will be in full colour and the paper quality improved. New columns will also be created.

WMY 2000

The EMS member Societies will be asked for details of their plans for the Year 2000.
For information : Mireille Chaleyat-Maurel (e-mail: mcm@ccr.jussieu.fr).

EMS AGENDA

1997

December, 19-20th

Second **Diderot Mathematical Forum (DMF)** on Mathematics and Environment (Amsterdam (Nederlands), Madrid (Spain) and Venice (Italy)) (*Contact*: Mireille Chaleyat-Maurel, mcm@ccr.jussieu.fr)

December, 20th

Meeting of the **DMF Committee** in Venice (Italy)

1998

January, 1st

Deadline for bids for **EMS Lectures 1999** (*Contact*: Tuulikki Mäkeläinen, makelain@cc.helsinki.fi)

February, 15th

Deadline for submission of information or papers for the March issue of the EMS Newsletter (*Contact*: Martin Speller, msp@gcal.ac.uk)

March, 21st-22nd

Executive Committee Meeting in Helsinki (Finland)

May, 15th

Deadline for submission of information or papers for the June issue of the EMS Newsletter (*Contact*: Martin Speller, msp@gcal.ac.uk)

May, 31st

Deadline for submission of proposals for the **1999 EMS Summer Schools** (*Contact*: Giovanni Monegato, monegato@polito.it)

June

DMF "Mathematics as a force of cultural evolution" in Berlin (Germany), Florence (Italy) (*Contact*: Mireille Chaleyat-Maurel, mcm@ccr.jussieu.fr)

June, 20th - July, 10th

EMS Summer School in ORSAY (France) in Applied Mathematics *"Wavelets and their applications"*. Organiser: A. Cohen (University Paris 6, France)

July, 27th - August, 14th

EMS Summer School in CLUJ (Romania) in Pure Mathematics *"Singularities in Geometry"*. Organiser: N.Teleman (Ancona, Italy)

August, 15th

Deadline for submission of information or papers for the September issue of the EMS Newsletter (*Contact*: Martin Speller, msp@gcal.ac.uk)

August 18-27th

EMS booth at the International Congress (ICM98) in Berlin (Germany)
Launching of JEMS (the Journal of EMS) at ICM98

August 28-29th

EMS Council in Berlin (Germany) hosted by the DMV
Election of the President, a Vice-President, the Treasurer, the Secretary, EC members.

November, 15th

Deadline for submission of information or papers for the December issue of the EMS Newsletter (*Contact*: Martin Speller, msp@gcal.ac.uk)

1999

Autumn

DMF "Mathematics and Music" in Lisbon (Portugal), Paris (France) (*Contact*: Mireille Chaleyat-Maurel, mcm@ccr.jussieu.fr)

2000

July 10-14

ECM3 in Barcelona (Spain)

DIDEROT MATHEMATICAL FORUM

A cycle of conferences, called the "Diderot Mathematical Forum", features two conferences a year taking place simultaneously in three European cities exchanging information by telecommunication and addressing in their programmes three different aspects: fundamental mathematics, applications of mathematics and their relation to society (e.g., ethical and epistemological dimensions).

Second Diderot Mathematical Forum

Mathematics and the Environment: Problems Related to Water

Amsterdam, Madrid, Venice

December 19-20, 1997

The second Diderot Mathematical Forum will be held in Amsterdam, Madrid and Venice on the subject of Mathematics and Environment. This meeting is supported by the European Commission (DG XII D).

Contact: **Mireille Chaleyat-Maurel**
e-mail: **mcm@ccr.jussieu.fr**

AMSTERDAM

Organisers: **Pr Michael KEANE** and **Dr Ben SCHOUTEN (CWI)**

Lectures

Friday

Main Speaker: Prof. Dr. Ir. **C.J.van Duijn** (CWI, Delft University of Technology)

Local Speakers: Dr. **J. Verwer** (CWI), Prof. Dr. **R. Cooke** (Delft University of Technology), Dr. **B.H. Gilding** (University of Twente)

Saturday

Main Speaker: Prof.Dr. **R.D. Gill** (CWI, University of Utrecht)

Local Speakers: Dr. **A. Stein** (University of Wageningen), Prof.Dr. **L. de Haan** (University of Rotterdam, not yet confirmed)

Contact: **Ben Schouten** *e-mail*: **bens@cwi.nl**

MADRID

Organiser: **Pr Jesus-Ildefonso DIAZ (Universidad Complutense de Madrid)**

Lectures

A. Bermudez de Castro (Universidad de Santiago de Compostela)
"*Mathematical modelling and optimal control methods in waste water discharges*"

J. Carrera (Universidad Politecnica de Catalunya)
"*Underground water mathematical models*"

E. Custodio (Instituto Tecnólogico Geominero)
"*Title to be annouced*"

T. Estrela (CEDEX, Ministerio de Industria)
"*Title to be annouced*"

A. Hernandez Muñoz (Universidad Politécnica de Madrid)
"*Mathematical approach to the surface water quality*"

R. Llamas (Real Academia de Ciencias de Madrid)
"*Title to be annouced*"

C. Pares (Universidad de Malaga)
"*Numerical simulation of the Alborean sea and the Gibraltar circulation*"

G. Parilla (Instituto Español de Oceanografia)
"*Title to be annouced*"

M. Ruiz de Elvira (Diaro EL PAÍS)
"*Title to be announced*"

J. Samper (Universidad de la Coruña)
"*Geostatistics techniques in water pollution*"

Contact: **Jesus-Ildefonso Diaz**
e-mail: **jidiaz@sunma4.mat.ucm.es**

VENICE

Organiser: **Pr Elio CANESTRELLI (University of Venice)**

Lectures

Speakers: **R. Benzi, V. Casulli, G. Gambolati, A. Marzollo, A. Quarteroni, A. Speranza**

Contact: **Elio Canestrelli** *e-mail*: **canestre@unive.it**

The European Consortium for Mathematics in Industry
and
The ECMI 98 Conference

"Mathematics, as the language of the sciences, has always played an important role in technology, and now is applied also to a variety of problems in commerce and the environment. European industry is increasingly becoming dependent on high technology and the need for mathematical expertise in both research and development can only grow. Too few people recognize that the high technology so celebrated today is essentially a mathematical technology. "

This statement by Edward E. David, recent President of Exxon R & D, is more true now than ever before; and more and more companies recognise that mathematical/computer simulations may replace experiments in their product design to give both reduced costs and flexibility. These simulations leading to the optimisation of the manufacturing process itself, including possible safety and environmental constraints, require mathematical skills if they are to be used effectively. They involve problem identification, a mathematical formulation, and mathematical/numerical analysis to reduce the problem to its simplest form for computation: a procedure called Mathematical Modelling. The presentation of the computer output in a meaningful way for the production engineer also requires both technical and collaborative skills.

These new demands on mathematics have stimulated academic interest in Industrial Mathematics and many mathematical groups world-wide are committed to interaction with industry as part of their research activities. In 1986, ten of these groups in Europe founded ECMI with the intention of offering their collective knowledge and expertise to European Industry. The experience of ECMI members is that similar technical problems are encountered by different companies in different countries. It is also true that the same mathematical expertise may often be used in differing industrial applications. If European industry is to compete in world markets it should take advantage of the competitive edge which may be gained from using European mathematical expertise. No single European country is likely to have sufficient expertise of mathematical knowledge whereas ECMI can provide a comprehensive coverage of mathematical skills and their diverse applications.

The European Community (EC) also recognises this need for the exchange of skills and knowledge between member nations, and has strongly supported ECMI through its COMETT, ERASMUS and HCM programmes. The major objectives of ECMI have been formulated to respond to these European needs of European industry; they may be summarised under three main headings:

A. TO PROMOTE THE USE OF MATHEMATICAL MODELS IN INDUSTRY

Engineers, applied scientists and mathematicians working in industry can greatly benefit from close collaboration with university applied mathematicians with relevant skills and knowledge. This collaboration may also be extended to developing mathematical models for the environment, earth sciences, biology and finance.

B. TO EDUCATE INDUSTRIAL MATHEMATICIANS TO MEET THE GROWING DEMAND FOR SUCH EXPERTS

There is a shortage of industrial mathematicians within European industry and they need updating with the latest mathematical ideas and techniques. Teaching centres in ten European countries are providing short courses for this need, in addition to organising a two-year educational programme on Mathematics for Industry designed to provide new recruits for industry.

C. TO OPERATE ON A EUROPEAN SCALE

Academic resources in Mathematics for Industry are also scarce and distributed across Europe; industrial needs are widely spread. Exchange and interactive programmes are necessary in training, research and industrial collaboration if there is to be an effective transfer of knowledge and skills. The EC is encouraging ECMI to involve relevant groups in Eastern Europe as Associate members.

An ECMI Newsletter is circulated to members and to those interested in becoming members.

ECMI 98 - The 10th Conference on Mathematics in Industry

The conference will take place June 22 - 27, 1998 at the School of Mathematical and Computing Sciences at Chalmers University of Technology and the University of G Fóteborg, in G Fóteborg situated at the beautiful Swedish west coast. The conference will encompass a number of important aspects of industrial mathematics. We hope that the conference will reflect, besides the interests of the ECMI-members at large, some of the strengths of the local industrial relations with ECMI and industrial mathematics. The purpose of the conference is to provide a forum for the presentation of work on the application of mathematics to industrial problems. Such work is carried out by academics working on industry-related problems, by those based in industry who use mathematics to solve problems or in a collaboration between universities and industry. The conference will provide a forum for academics and industrialists to meet and discuss current problems of mutual interest. It should also serve to give advanced students a first-hand impression of the challenges and opportunities for mathematicians in European industry. Industrialists can meet talented students educated in practial applications of mathematics and in a European spirit.

The scientific programme focuses on seven main topics:
Vehicles
Vehicles - Logistics
Materials
Finance
Telecommunications
Pharmaceuticals
Scientific Computing

Each topic is assigned one invited lecture. In addition, contributed lectures, as well as mini-symposia, are scheduled for the half-day following the special session. There will also be a number of invited mini-symposia, including mini-symposia from the ECMI Special Interest Groups.

Some of the invited speakers are:
Schweizer (Berlin)
Traub (Colombia, NY)
Mazullo (Montell)
Langer (Linz)
Leese (Oxford)
Hougaard (Copenhagen)
Fasano (Firenze)
Engqvist (Stockholm)
Laporte (Montreal)
Widman (Djursholm)

Invited mini-symposia topics include: Combustion engines Airline scheduling Smart materials Wood, pulp and paper Molecular dynamics Molecular modelling Elastic liquids Finance Cryptography Reservoir simulation

Special student sessions will be arranged, as well as the contributed mini-symposia.

Acknowledgements: The text for this file is partially taken from from the ECMI brochure, which was edited by Prof. V. Capasso (University of Milan) and Dr. A. Tayler (University of Oxford) in collaboration with various members of the ECMI Board and the ECMI Educational Committee.

Meeting of the Council

Berlin, August 28 and 29, 1998

The Council meets every second year. The next meeting will be held in Berlin, August 28 and 29, 1998, immediately after the International Congress of Mathematicians, in the 'Senatssaal der Humboldt-Universität', Unter den Linden 6, D-10099 Berlin.

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

(a) Full Members

Full 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 1998. As of 1st July 97 there were 44 societies which could designate a maximum of 66 delegates.

(b) Associate Members

There are two associate members, namely the Gesellschaft für Mathematische Forschung and the European Mathematical Trust. Their delegate is elected till 1999.

(c) Institutional Members

There are two institutional members, Institut Non Lineare de Nice and Moldovian Academy of Sciences. Their delegate is elected till 1999.

(d) Individual Members

A person becomes an individual member either through a corporate member, by paying an extra fee, or by direct membership. On November 1, 1997 there were 1745 individual members and, according to our statutes, these members will be represented by 18 delegates. The mandates of 6 of the present 17 delegates end on December 31, 1997, and so elections must be held for their positions. Nomination papers for these elections appear in this issue of the Newsletter. 11 delegates were elected for the term 1996–1999, so they will continue unless they inform the Secretariat to the contrary by 31st December 1997.

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 1998 to the Secretariat of EMS in Helsinki.

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

President	1995–1998	Prof. J.-P. Bourguignon
Vice-Presidents	1995–1998	Prof. D. Wallace
	1997–2000	Prof. A. Pelczar
Secretary	1995–1998	Prof. P. Michor
Treasurer	1991–1998	Prof. A. Lahtinen
Other members	1997–2000	Prof. B. Branner
	1995–1998	Prof. A. Conte
	1997–2000	Prof. R. Jeltsch
	1997–2000	Prof. M. Sanz Sole
	1997–2000	Prof. A. Vershik

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. The President may not serve as President for more than one period, accordingly Professor J.-P. Bourguignon will demit office in December 1998. By Rule 16 of the By-Laws, the incoming President must be elected from among the members of the Council. No such stipulations apply to the other members of the Executive Committee. Professor A. Lahtinen is not eligible for another period.

It would be convenient if potential nominations for office in the Executive Committee, duly signed and seconded, could reach the Secretariat by 27th April 1998. It is strongly recommended that a statement of intention or policy is enclosed with each nomination. If the nomination comes from the floor during the council meeting there must be a written declaration of the willingness of the person to serve or his/her oral statement must be secured by the chair of the Nominating Committee if there is such or by the President. It is recommended that statements of policy of the candidates nominated from the floor should be available.

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 ICM, are advised that their accommodation arrangements can be made through the ICM. For delegates to the Council, who are not attending the ICM, an address for accommodation arrangements will be provided later.

Peter Michor
Secretary of the EMS

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

P.S. Timetable for the Council Meeting

January 31, 1998: Deadline for nominations for delegates of individual members.

February 1998: The ballots for delegates of individual members are sent to individual members.

March Newsletter: Candidates for delegates of individual members are announced. The venue and meeting times of the Council meeting are repeated.

April–May 1998: A letter is sent to each delegate, containing the agenda of the Council meeting.

June Newsletter: The results of the elections for delegates of individual members are announced. The venue, the meeting times, and the agenda of Council meeting are given.

June–July, 1998: Material for the Council meeting is sent to the delegates.

Election of Council Delegates

As announced in the previous issue of the Newsletter, nominations are required for Council delegates representing individual members of the Society. On 1 November 1997 there were 1745 individual members, and this means, by the Statutes, that there should be 18 delegates representing them. During the term ending with this year the delegates representing individual members were:

Term 1994-97:

Castellet, Manuel	Jaiani, George
Kufner, Alois	Langevin, Remi
Michor, Peter W.	Schwarz, Wolfgang

Term 1996–1999:

Anichini, Giuseppe	Bolondi, Giorgio
Branner, Bodil	Deshouillers, Jean-Marc
Habetha, Klaus	Karoubi, Max
Kuusalo, Tapani	Lahtinen, Aatos
Márki, László	Piccinini, Renzo
Puppe, Dieter	

The term of the first mentioned 6 delegates ends now. They are all eligible for re-election.

Nominations are now sought for 7 delegates to serve for the years 1998–2001. Attached to this notice is a nomination form. Completed nomination forms must arrive at the Society's office in Helsinki by 31 January 1998. If there are more nominations than the allowed number of delegates, a postal election will be held; members will receive ballot forms at the end of February 1998 and these must be returned by 10 April 1998.

Nominated delegates must be individual members of the Society and they must be proposed and seconded by individual members. The Society will pay subsistence costs for them to attend the Council meetings, if needed, but is not able to cover travel costs except perhaps in cases of particular hardskip. Candidates for election are invited to submit with their nomination form a short biography (not more than 200 words) together with a Statement of not more than 100 words in support of their candidature. These will be circulated to the members with the ballot forms. A copy of these can be sent as a text file by e-mail to the Secretariat to tuulikki.makelainen@helsinki.fi.

Peter Michor, Secretary

Nomination Form for Council Delegate

NAME: .....

TITLE: .....

ADDRESS: .....

.....

PROPOSER: .....

SECONDER: .....

I certify that I am an individual member of the EMS and that I am willing to stand for election as a delegate of individual members to the Council.

SIGNATURE OF CANDIDATE: .....

DATE: .....

Completed forms should be sent to:

Ms T. Mäkeläinen
EMS Secretariat
Department of Mathematics
P.O. Box 4 (Yliopistonkatu 5)
FIN-00014 University of Helsinki
Finland

to arrive by January 31, 1998.

A photocopy of this form is acceptable.

EULER

European Libraries and Electronic Resources in Mathematical Sciences

EULER (European Libraries and Electronic Resources in Mathematical Sciences) is a project to be co-funded by the European Commission in the Telematics for Libraries sector. The project will start in 1998 and have a duration of 30 months.

The aim of the project is to provide strictly user-oriented, integrated network based access to mathematical publications. One of its uses will be to improve the user interface of the European Mathematical Information Service (EMIS). The EULER service intends to offer a "one-stop shopping site" for users interested in Mathematics. Therefore, an integration of all types of relevant resources is necessary:

- Bibliographic databases
- Library online public access catalogues
- Electronic journals from academic publishers
- Online archives of preprints and grey literature
- Indexes of mathematical Internet resources

and will be made interoperable by using common Dublin Core based Metadata descriptions. A common user interface - the EULER Engine - will assist the user to search for relevant topics in different sources in a single enquiry.

Today, the scientist looking for mathematical information in the Web has to search a huge number of different resources in the world of networked library and other scientific information. For example he/she has to consult

- the bibliographic databases, e.g. MATH (Zentralblatt) and MATHSci containing the relevant publications on the field of mathematics from 1931 until present (for-pay services)
- the OPACs of the important mathematical libraries (free)
- electronic journals online (both subscription and free)
- the preprint servers and technical reports offering grey literature (free)
- software libraries (free)
- guides to the net resources (free)

The number of servers with mathematics-related topics exceeds 3,000 destinations world-wide. Nearly every library has built up an OPAC, most departments have their own Internet servers.

There are many difficulties in searching the Internet:

- there are no actual and general guides about the information resources. The common search machines like AltaVista, Hotbot and so on provide no high quality service for searching (it is only possible to search for specific details of the information in reduced mode)
- the Web is very dynamic, there are many change of the services available
- the different decentralised information resources are only weakly connected (little integration)
- the quality of the information services varies and there is no common standard.

One crucial difficulty for the scientist is that up to now, if he/she has found several relevant articles and books he/she has to leave the Internet and has to consult the catalogues of different libraries, perhaps at his/her university or at some specialised libraries. To get the information about literature is – compared to former times – no longer a big problem. But to get the articles or the books to the desk of the scientist has been up to now a difficult, but for the user an important and common, problem.

The drawbacks of the present situation highlight the demands and user requirements for the development of new services. We need a new high quality information system which integrates the relevant services in the field.

The EULER system will integrate some of the major services in Mathematics. Moreover the system will integrate three different important steps of accessing relevant literature and information:

- searching
- localising of the documents (objects) in the library or on the network
- document delivery by library partners.

The EULER system will be designed as an open, accessible and extensible information system.

Library users and librarians from mathematics in research, education, and industry will actively participate. EULER is an initiative of the European Mathematical Society and especially focuses on real user needs.

Standard, widely used and non-proprietary technologies such as HTTP, Z39.50, and Dublin Core

will be used. Common resource descriptions of document-like objects will enable common access to heterogeneous resources.

EULER will develop the prototype of new electronic information services. Most relevant information of one subject area is integrated (one-stop-shopping). EULER results will be portable to other subject domains.

Users will be enabled to make effective use of the mathematical library-related information resources offered through a single user interface. Time-consuming tasks associated with the use of non-integrated services will be eliminated. The user will be enabled to search for and localise relevant documents. In many cases he/she will be able to retrieve the full text electronically.

Since EULER will combine descriptions of resources (the bibliographical databases) with the full text of documents, free resources with commercial ones and databases with very different structures, retrieval systems and user interfaces, this integration must be built upon common resource descriptions. This glue or intermediate level is accomplished by using descriptions of all resources following the Dublin Core (DC) metadata standard, recently developed and published as an Internet draft.

Technically, the integration of the different resources will be accomplished by producing DC metadata for all resources (by means of conversion, automatic generation or metadata creator software), and collecting it into front-end databases for each individual EULER service. Retrieval and search software, the EULER Engine, will use these metadata databases as sources for a distributed search service. The integration approach will be based on the Z39.50 standard or on HTML-form-based data interchange.

At distributed servers, multilingual EULER service interfaces will be provided as entry points to the EULER Engine, offering browsing, searching, some document delivery and user support (help texts, tutorial etc.). The interface will be based on common user friendly and widely used Web browsers (public domain or commercial).

Main project partners are

- FIZ Karlsruhe (Dept. Math. & Comput. Sci., Berlin) (Coordinator)
- The European Mathematical Society
- Cellule de Coordination Documentaire Nationale pour les Mathimatiques
- NetLab, Lund University Library
- SUB Gvttingen
- Centrum voor Wiskunde en Informatica
- Universit' degli Studi di Firenze

The project is an initiative of the European Mathematical Society. The role of the EMS in the project will be to represent the community of users interested in mathematics from the whole of Europe. The EMS will inaugurate its Electronic Library of Mathematics, distributed through EMS's system of Internet servers, EMIS, http://www.emis.de/. This Electronic Library is today the most comprehensive archive of freely available mathematical electronic journals and conference proceedings. Some improvements of this service can be expected during the project.

Close interaction between the information specialists and the mathematical community is very important. Experiences in other projects - as for example the project 'Specialised information' of the Deutsche Mathematiker-Vereinigung - have clearly shown this need. This interaction has led to many improvements of special information systems, for example the database MATH. Accordingly, a broad discussion with the mathematical community is planned for each phase of the project. The EULER services will be installed at all participating libraries and at the central site of the EMIS system of the European Mathematical Society.

More, constantly updated, information about the EULER project is available from the project's home-page at http://www.emis.de/projects/EULER/.

Michael Jost, November 1997

EUROPEAN NEWS: Country by Country

BELGIUM

An international conference on Advanced Computational Methods in Engineering will be held in Ghent on September 2nd - 4th 1998. It will focus on topics such as adaptive finite element methods, finite differences, domain decomposition techniques and spectral methods and their applications in Solid Mechanics, Heat and Mass Transfer, Environmental Engineering and Fluid Dynamics.

The programme will include some seven invited lectures, mini-symposia on selected topics, contributed papers, a software exhibition and a poster session.

Ghent is the historical and cultural capital of Flanders and is only 55 kilometres from Brussels which is well-served by airline connections with Europe and the world. Accommodation, with a wide range of prices, will be available in nearby hotels and possibly student residences also.

For more details contact Ms Martine BOTTE, Secretary ACOMEN 98, Department of Applied Mechanics, Faculty of Engineering, University of Ghent, Sint-Pietersnieuwstraat 41, B-9000 Ghent, Belgium.

CATALONIA

CENTER DE RECERCA MATEMATICA

List of visitors from January till July 1998

E. Formanek, Pennsylvania, 01.01.98 - 31.01.98 (Algebra)

P. Mattila, Jyväskylä, 01.01.98 - 31.05.98 (Analysis)

A.J. Bishop, Clayton, 04.01.98 - 01.03.98 (Mathematical Education)

N. Balacheff, Grenoble, 11.01.98 - 01.02.98 (Mathematical Education)

N. Presmeg, Florida, 22.01.98 - 07.02.98 (Mathematical Education)

P. Nesher, Jerusalem, 01.02.98 - 15.02.98 (Mathematical Education)

V. Kanovei, Bonn, 05.02.98 - 07.02.98 (Logic)

K. Clements, Callaghan, 08.02.98 - 22.02.98 (Mathematical Education)

B. Parzysz, Metz, 08.02.98 - 22.02.98 (Mathematical Education)

G. de Abreu, Beds, 15.02.98 - 01.03.98 (Mathematical Education)

R. Cantoral, Colonia del Valle, 15.02.98 - 01.03.98 (Mathematical Education)

F. Goffree, Bosch en Duin, 15.02.98 - 15.03.98 (Mathematical Education)

T. Dreyfus, Québec, 17.02.98 - 27.02.98 (Mathematical Education)

E. Silver, Pittsburgh, 17.02.98 - 16.03.98 (Mathematical Education)

P. Hilton, Binghamton, 08.03.98 - 22.03.98 (Mathematical Education)

J. Pedersen, California, 08.03.98 - 22.03.98 (Mathematical Education)

B. Bolt, Exeter, 08.03.98 - 22.03.98 (Mathematical Education)

K. Ruthven, Cambridge, 15.03.98 - 29.03.98 (Mathematical Education)

A. Adem, Madison, 09.04.98 - 15.08.98 (Algebraic Topology)

J.P. Greenlees, Sheffield, 14.04.98 - 04.05.98 (Algebraic Topology)

A. Viruel, Málaga, 14.04.98 - 31.07.98 (Algebraic Topology)

W. Chacholski, Toronto, 14.04.98 - 14.07.98 (Algebraic Topology)

J.A. Crespo, Barcelona, 14.04.98 - 17.07.98 (Algebraic Topology)

J. Moller, Kobenhavn, 15.04.98 - 30.06.98 (Algebraic Topology)

D. Notbohm, Göttingen, 04.05.98 - 10.06.98 (Algebraic Topology)

J. Berrick, Singapore, 07.05.98 - 03.07.98 (Algebraic Topology)

D. Ravenel, Rochester, 10.05.98 - 10.07.98 (Algebraic Topology)

L. Schwartz, Paris, 10.05.98 - 10.06.98 (Algebraic Topology)

F. Cohen, Rochester, 15.05.98 - 15.07.98 (Algebraic Topology)

M. Santos, Granada, 15.05.98 - 15.07.98 (Algebraic Topology)

J. McNeal, Princeton, 15.05.98 - 15.06.98 (Analysis)

W. Dwyer, Notre Dame, 26.05.98 - 03.07.98 (Algebraic Topology)

H.W. Henn, Heidelberg, 27.05.98 - 30.06.98 (Algebraic Topology)

S. Wilson, Baltimore, 01.06.98 - 15.07.98 (Algebraic Topology)

H. Miller, Cambridge, 01.06.98 - 30.06.98 (Algebraic Topology)

O. Cornea, Lille, 03.06.98 - 05.07.98 (Algebraic Topology)

R. Levi, Evanston, 04.06.98 - 22.07.98 (Algebraic Topology)

B. Oliver, Paris, 28.06.98 - 20.07.98 (Algebraic Topology)

P.Kropholler, London, 01.07.98 - 31.07.98 (Algebra)

Activities organised by the "Centre de Recerca Matemàtica":

1) "Intensive winter term on mathematical education (TIEM'98)"

Dates: January 16 to March 30, 1998

Place: Centre de Recerca Matemàtica, Bellaterra

Coordinators: Prof. Alan J. Bishop and Prof. Nuria Gorgorió

Invited professors: Guida de Abreu (Luton University, UK), Nicolas Balacheff (Laboratoire Leibniz IMAG, FR), Alan J. Bishop (Monash University, AU), Brian Bolt (University of Exeter, UK), Ricardo Cantoral (Centro de Investigación y de Estudios Avanzados del IPN, ME), Ken Clements (University of Noewcastle, AU), Tommy Dreyfus (Center for Technological Education, IL), Fred Goffree (Freudenthal Institute, NL), Peter Hilton (SUNY at Binghampton, USA), Pearla Nesher (Ministry od Education and Culture, IL), Bernard Parzysz (Université de Metz, FR), Jean Pedersen (Santa Clara University, USA), Norma Presmeg (Florida State University, USA), Kenneth Ruthven (Cambridge University, UK), Ed Silver (University of Pittsburg, USA).

For further details: e-mail: crm@crm or web http://www.crm.es

2) "Workshop on current trends in research on mathematics education"

Dates: February 19, 20 and 21, 1998

Place: Centre de Recerca Matemàtica, Bellaterra

Coordinators: Prof. Alan J. Bishop and Prof. Núria Gorgorió

For further details: e-mail: crm@crm.es or web http://www.crm.es

3) "The 4th Barcelona Logic Meeting"

Dates: February 5, 6 and 7, 1998

Place: Centre de Recerca Matemàtica, Bellaterra

Scientific and Organising Committee: Joan Bagaria (Universitat de Barcelona), Enrique Casanovas (Universitat de Barcelona), Raimon Elgueta (Universitat Politècnica de Catalunya), Sy Friedman (Massachusetts Institute of Technology), Daniele Mundici (Università di Milano), Bruno Poizat (Université Claude Bernard, Lyon I), Jordi

Rebagliato (Universitat de Barcelona).

Invited professors: Matthias Baaz (Technische Universitat Wien), Jose L. Balcázar (Universitat Politècnica de Catalunya), Andreas Baudisch (Humboldt Universität, Berlin), Gregory Cherlin (University of Rutgers), Viktor A. Gorbunov (Institute of Mathematics, Novosibirsk), Alain Louveau (Université Paris VI), Tomás Recio (Universidad de Santander), Antoni Torrens (Universitat de Barcelona), Hugh Woodin (University of California at Berkeley).

For further details: e-mail: crm@crm.es or web http://www.crm.es

4) "Topology Semester"

Dates: April 14 to July 17, 1998

Place: Centre de Recerca Matemàtica, Bellaterra

Organisers: Prof. J. Aguadé, Prof. C. Broto, Prof. C. Casacuberta (Universitat Autònoma de Barcelona)

List of visitors:

Alejandro Adem (University of Wisconsin-Madison)

(09.04.98 - 15.08.98)

Jon Berrick (National University of Singapore)(07.05.98 - 03.07.98)

Wojciech Chachólsky (The Fields Institute)(14.04.98 - 14.07.98)

Frederic Cohen (University of Rochester)(15.05.98 - 15.07.98)

Octavian Cornea (Université des Sciences et Technologies de Lille)(03.06.98 - 05.07.98)

William Dwyer (University of Notre Dame)(26.05.98 - 03.07.98)

John P.C. Greenlees (University of Sheffield)(14.04.98 - 04.05.98)

Hans-Werner Henn (Universite Strasbourg and Max-Plank Institute in Bonn)(27.05.98 - 30.06.98)

Dikran Karagueuzian (Centre de Recerca Matemàtica)(01.09.97 - 31.07.98)

Peter Kropholler (Queen Mary and Westfield College)(01.07.98 - 31.07.98)

Ran Levi (Northwestern University)(04.06.98 - 22.07.98)

Haynes Miller (MIT)(01.06.98 - 30.06.98)

Jesper Moller (Kobenhavns Universitet)(15.04.98 - 30.06.98)

Dietrich Notbohm (Universität Göttingen)(04.05.98 - 10.06.98)

Bob Oliver (Université Paris XIII)(28.06.98 - 20.07.98)

Douglas Ravenel (University of Rochester)(10.05.98 - 10.07.98)

Marta Santos (Universidad de Granada)(15.05.98 - 15.07.98)

Jérome Scherer (Université de Lausanne)(01.10.97 - 30.09.98)

Lionel Schwartz (Université Paris XIII)(10.05.98 - 10.06.98)

Jeff Smith (Purdue University)(20.11.97 - 31.12.97)

Antonio Viruel (Universidad de Málaga)(14.04.98 - 31.07.98)

Stephen Wilson (The Johns Hopkins University)(01.06.98 - 15.07.98)

For further details: e-mail: crm@crm.es or web http://www.crm.es

5) "Advanced Course on classifying spaces and cohomology of groups"

Dates: May 27 till June 2, 1998

Place: Centre de Recerca Matemàtica, Bellaterra

Speakers: William G. Dwyer (University of Notre Dame, en Indianapolis). "Finite groups, homotopy colimits, and homology decompositions"

Hans-Werner Henn, (Université d'Strasbourg y Max-Plank Institut für Mathematik, Bonn) "Unstable modules over the Steenrod algebra and cohomology of groups"

Organisers: Prof. C. Broto and Prof. C. Casacuberta (Universitat Autònoma de Barcelona)

For further details: e-mail: crm@crm.es or web http://www.crm.es

6) "1998 Barcelona Conference on Algebraic Topology"

Dates: June 4 to 10, 1998

Place: Centre de Recerca Matemàtica, Bellaterra

Organisers: Prof. J. Aguadé, Prof. C. Broto, Prof. C. Casacuberta (Universitat Autònoma de Barcelona)

Speakers: A.K. Bousfield (University of Illinois at Chicago), F.R. Cohen (University of Rochester), W.G. Dwyer (University of Notre Dame), Y. Felix (Université Catholique de Louvain), J.P.Greenlees (University of Sheffield), J.Lannes (Ecole Polytechnique, Paris), W. Luck (Universität Münster), R.Milgram (Stanford University), G. Mislin (ETH Zürich), D.Ravenel (University of Rochester).

For further details: e-mail: crm@crm.es or web http://www.crm.es

CZECH REPUBLIC

SPRING SCHOOL ON FUNCTIONAL ANALYSIS

First Announcement

'What am I if I will not participate ?'

Antoine de Saint-Exup'ery

Following a long-standing tradition, the Faculty of Mathematics and Physics of Charles University, is organising a Spring School on Functional Analysis. The School will be held at Paseky, in a chalet in the Krkonose Mountains, from April 19 - 25, 1998. The programme will consist of a series of lectures on

Recent Trends in Banach Spaces

delivered by

Joram Lindenstrauss
The Hebrew University, Jerusalem, Israel

Gilles Godefroy
Universite Pierre et Marie Curie (Paris 6), France

Jose Orihuela Calatayud
University of Murcia, Spain

Rafael Paya
University of Granada, Spain

Short abstracts of the series of lectures will be available on

http://www.karlin.mff.cuni.cz/katedry/kma/ss

The purpose of this Meeting is to bring together adepts who share a common interest in the field. There will be opportunities for short communications and informal discussions. Graduate students and others beginning their mathematical careers are encouraged to participate.

The conference fee will be 300,- US dollars. A reduced rate of 250,- US dollars will be offered, provided a letter guaranteeing participation reaches the organisers before January 15, 1998. The conference fee includes all local expenses (room and board) and transportation between Prague and Paseky. The fee is the same for accompanying persons.

The organisers may provide financial support to a limited number of students. Applications must be sent before January 15, 1998.

Payment of fees should be made in cash at the registration desk in Paseky, or it may be remitted by a bank transfer to

Komerčníbanka, Praha 1, Václavské nám. 42
account No. 38330-021/0100, v.s. 810

(a copy of the transfer should be presented at the registration desk at Paseky). Unfortunately, cheques cannot be used and will not be accepted. In case of any difficulty you should contact the organisers.

The village of Paseky lies in the slopes of the Krkonose Mountains, in North Bohemia. Accommodation consists of rooms for two or three people. There are excellent facilities and conditions for sporting activities: hiking trips, soccer, mini-golf and sauna. A special bus from Prague to Paseky will leave at 4 p.m. on April, 1998. The bus from Paseky will arrive in Prague on April 25, at 11.30 a. m.

In case of interest please fill out the enclosed preliminary registration form and return it before January 15, 1998.

A final announcement with further details will be mailed in due time. Due to the limited capacity of accommodation facilities the organisers may be forced to decline registration.

We look forward to meeting you in the Czech Republic.

Jaroslav Lukes, Jiri Kottas

Mailing address:

Katedra matematické analýzy

Matematicko-fyzikálnífakulta UK

Sokolovská 83, 186 75 Praha 8

Czech Republic

Phone/Fax: 420 - 2 - 232 3390

E-mail: paseky@karlin.mff.cuni.cz

http://www.karlin.mff.cuni.cz/katedry/kma/ss

Kindly inform colleagues interested in this field !

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Preliminary registration form

Spring School on Functional Analysis, Paseky 1998

Name:

Address:

E-mail:

Fax:

Phone:

I plan on attending the Spring School: Yes No

POLAND

FIFTH CONFERENCE ON PROBABILITY

Czestochowa (Poraj) Poland, 18-22 May 1998

Aim: the aim of the conference is to report on and to discuss recent developments and problems in the field of probability theory and it applications.

Organisers: The conference is organised jointly by the Institute of Mathematics of the Polish Academy of Sciences, the Institute of Mathematics and Computer Science of the Technical University of Czestochowa and the Institute of Mathematics of Warsaw University of Technology.

Information: W Dziubdziela, Insitute of Mathematics and Computer Science, ul. Dabrowskiego 73, 42-200 Czestochowa, POLAND

e-mail probab98@matinf.pcz.czest.pl

UNITED KINGDOM

HYPERBOLIC GEOMETRY

First Announcement

A meeting of the London Mathematical Society will be held at the University of Southampton on Friday, 20 February and Saturday, 21 February 1998. The talks will be on Friday afternoon and Saturday morning.

Speakers are: **Werner Ballmann** (University of Bonn), **Yair Minsky**(SUNY at Stony Brook), **Caroline Series** (University of Warwick), **Brian Bowditch** (University of Southampton), **Alex Lubotsky** (Hebrew University), and **Michael Kapovich** (University of Utah).

Details concerning overnight accommodation and the Friday night banquet will be made available in the second announcement. Further details available from either local organiser:

Graham Niblo (gan@maths.soton.ac.uk) or Jim Anderson (jwa@maths.soton.ac.uk)

Regular mail address is: Faculty of Mathematical Studies, University of Southampton, Southampton SO17 1BJ (tel: 1703 593612; fax: 1703 595147

(http://www.lms.ac.uk/meetings/diary.html).

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LONDON MATHEMATICAL SOCIETY
Burlington House, Piccadilly, London W1V 0NL
Tel: 0171 437 5377; Fax: 0171 439 4629
E-mail: lms@lms.ac.uk; WWW:http://www.lms.ac.uk

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The London Mathematical Society is incorporated under Royal Charter and is a Charity registered with the Charity Commissioners.

CONFERENCE ON COMMUTATIVE ALGEBRA

in Honour of David Rees's 80th Year

Exeter, England, 13 - 16 August 1998

Organisers : P. V. Elmos (Exeter, local organiser), R.Y. Sharp (Sheffield)

Location : Exeter is a city in South West England, about 250 kilometres from London.

Provisional list of invited speakers : Among those who have already accepted invitations to speak are C. Huneke (Purdue), D. Katz (Kansas), D.Kirby (Southampton), L. O'Carroll (Edinburgh), N.V. Trung (Hanoi), G.Valla (Genoa) and J.K. Verma (Bombay).

Scope of the conference : The conference, which is open to all interested mathematicians, is expected to concentrate on recent and current research in aspects of commutative algebra related to the work of David Rees, including reductions and integral closures of ideals, Rees rings and algebras, uniform Artin-Rees Theorems, mixed multiplicities and Hilbert functions. Participants from developed countries will be expected to pay a Registration Fee of $35.

Financial support : The conference is supported financially by a grant from the London Mathematical Society: this will be used to cover part of the costs of attendance by the invited speakers and some graduate students.

Further information : Those interested in further information should send an e-mail message to

`car-meet@maths.ex.ac.uk` or visit the web site `http://www.maths.ex.ac.uk/conf_rees.html`

ELEVENTH INTERNATIONAL CONFERENCE ON DOMAIN DECOMPOSITION METHODS

July 20 - 24, 1998

University of Greenwich - Avery Hill Campus

Avery Hill Road, London SE9, UK

http://dd11.gre.ac.uk/

Email: dd11@gre.ac.uk

First Announcement and Call for Papers

Domain decomposition is an active and interdisciplenary research area that has drawn the attention of researchers working in different fields. The effort during late seventies and earlier eighties was concentrated in the substructuring and block methods for elliptic problems. Research work has now being extended and applied in many branches of computational mathematics and science and engineering. In particular, nonlinear and multiphysics problems related to industries and strategies suitable for parallel and distributed computing and high performance computing are of interest to the participants of this series of international conferences.

This eleventh meeting will take place in the United Kingdom for the first time. Its special focus will be on **Numerical analysis, computational issues, industrial applications and software development for domain decomposition methods.**

The conference will take the format of plenary talks, minisymposia, parallel sessions, selected graduate paper presentations and vendors exhibition. All aspects of DD-based methods are sought, including: numerical analysis of dd methods, fictitious domain methods, block and substructuring methods, multigrid methods, coupling methods for multiphysics, heterogenous dd methods, mortar element methods, dd methods for high-order and spectral discretisations, dd methods for eigenvalue problems, dd methods for nonlinear and time dependent problems, dd methods in computational fluid dynamics, dd methods in structural dynamics and aeroelasticity, dd methods in acoustics and electromagnetics, dd methods in oil field simulations, dd methods in social/financial science, dd methods for inverse problems, dd methods for boundary/panel elements, graph decomposition, mesh partitioning and load balancing issues, strategies for high performance computing, strategies for parallel and distributed computing, software development for dd methods, semi-automatic development tools for dd methods, dd methods for nonlinear industrial/multiphysics problems.

Deadlines Observation:

Please email the following to dd11@gre.ac.uk

- proposal for minisymposia: January 05, 1998.

- abstract (one page of abstract in plain text or Postscript by email): February 28, 1998.

- if you like to exhibit your software and products, voice your need before February 28, 1998.

Local Organising Committee:

Chairman: M Cross (Greenwich)

Vice-Chairman: C - H Lai (Greenwich)

Committee Members: K Chen (Liverpool), A Craig (Durham), P Deuflhard (KZZ, Berlin, Germany), M G Everett (Greenwich), I G Graham (Bath), J Periaux (Dassault, St Clouds, France), K A Pericleous (Greenwich), J E Roberts (INRIA, Rocquencourt, France)

Conference Secretary: Mrs Francoise Barkshire (Greenwich)

Student Participation: Limited funds will be available for graduate students. Please contact the organisers for details.

Students should mention their student status during submission of abstracts with the same deadline as above. Full papers not less than 5 pages should be submitted before May 20, 1998 in order to qualify for Graduate Paper Competition. High quality student papers are being selected for Graduate Paper Competition based on the submission of full papers. Students will have their local expenses waived and will receive a Proceedings free of charge subject to certain conditions. If funding is sufficient, it is possible to waive part of their international travel expenses. Please contact the conference secretary for further details.

Information and Enquiry:

Mrs Francoise Barkshire, School of Computing and Mathematical Sciences, University of Greenwich - Woolwich Campus, Wellington Street, London SE18 6PF, UK

Email: F.Barkshire@gre.ac.uk

Tel: +44 181 331 8706 Fax: +44 181 331 8925

WWW http://dd11.gre.ac.uk/

Preliminary registration:

Potential participants should email their surface mailing addresses to dd11@gre.ac.uk. We will then update you with other conference printed materials.

Problem Corner

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

A Relic from Old Austria-Hungary

The Austrian Mathematical Olympiad – Part I

The Olympic Movement has the motto 'Faster, Higher, Stronger'. It is appropriate to consider this maxim in the light of the work of the large number of national mathematical Olympiad committees. In our societies, life is moving faster, our buildings and structures are getting bigger, higher and more complex, and more and more people are living longer. All this means that there are fresh problems requiring innovative solutions arising from the circumstances in which we find ourselves. But innovative solutions requite rigorous and disciplined thinking. Fortunately, mathematics provides first-class training in developing such thinking. The mathematics committees' activities help develop excellence in mathematics all over the world.

What is particularly pleasing about these ventures is the opportunity they offer to nurture the best of the young national mathematicians and that, through the International Mathematical Olympiad (IMO), they can meet with the most gifted junior staff in mathematics around the globe. This is obviously personally invaluable for the individuals. Like the Olympic Games, just being there and being able to represent his or her own country is an honour in itself.

In most countries, major users of the available native mathematical expertise fully appreciate the vital role that mathematics plays in both the development of indigenous high technology industries and in other areas of professional life. In the future, as our countries confront increasingly competitive international markets, people with high levels of mathematical abilities, and the problem-solving skills that mathematical learning engenders, will become an even greater national asset. It is, however, the case that mathematics does not receive anything like the degree of public and media support which is given to sporting events. As the nineties come to an end and we approach the year 2000, the need of many economies to be more competitive internationally is growing rapidly. So does the requirement for today's youth to be skilled in mathematics, equipped to develop competence in engineering, manufacturing, science, research and education - all key to successful national economic progress. If nations are going to play an active part in the world economy, they need to increase their intellectual capital. Mathematical ability is one key aspect of that knowledge base. Through mathematics Olympiads, the finest mathematical minds are able to pit themselves against their peers around the world and to extend and refine their individual skills.

The promotion of student skills in mathematics in Hungary

The first impetus in nurturing problem-solving skills came from Hungary. In 1885, a group of Hungarian mathematicians and physicists started meeting together in a restaurant near the University of Budapest for the purpose of discussing scientific problems and news on mathematical or physical discoveries. From these informal gatherings, the idea arose of founding a society for people associated in some way with mathematics and physics and the Hungarian Society of Mathematicians and Physicists held its inaugural meeting on November 5, 1891. **Loránd Eötvös** (1848-1919), professor of physics at the University of Budapest was elected the first president of this society and, when nominated the minister of Religion and Public Education, he was the moving spirit in offering a competition in mathematics for students. This contest, initiated in October 1894, is generally recognised to be the forerunner of all modern mathematical competitions and was originally named after him. Later, it was renamed The Kürschák Competition.

Initially, this event was intended for new graduates from high school, but in later years participation was opened to talented high school students. The nature of the competition remains unchanged. Since 1894, it has allowed four hours for the solution of three problems. The questions remain very demanding and the prizes are awarded only if they are well-deserved. This testimony to the wisdom of the Kürschák Competition is most remarkable, especially as they had no example to follow. They were also aeons ahead of their time, for it took 40 or more years for most other countries to promote their own competitions - which then closely followed the Hungarian pattern.

The transfer to Austria

One successor to the Kürschák Competition has been The Austrian Mathematical Olympiad. As compared with other countries, this descendant began fairly late in 1968 - despite the fact that in 1894 Austria and Hungary were still linked by a common monarchy. 'The Etvs competition never managed to transcend the language barrier between Hungary and Austria, and Austria's first mathematics competitions of this calibre did not come until 76 years later. In 1968, Moscow was host to the 10th International Mathematical Olympiad

and, on that occasion, the Austrian authorities were officially invited to send a team to participate for the first time. But the competent authorities exercised restraint and merely delegated an observer. Nonetheless, in order not to lose contact with the leading nations participating in the IMO, it was decided to commence special training courses for the mathematical Olympiad in as many schools as possible with the idea of picking the most capable students following a national contest to form a highly competitive team to participate in the IMO. Thus, the Austrian Mathematical Olympiad was born.

Reaching out to Teachers

Implementation of this project wasn't a particularly easy task, for there was hardly anyone who had experience to start it. The initiators decided on the following: the courses should be taught for the most part by mathematics school teachers, rather than university lecturers. Therefore it was necessary not only to find teachers able to attain the qualification required to coach preparatory courses, but also to arrange professional training schemes, where university mathematicians would tutor them in the art of problem solving at the appropriate level. The founders of the Austrian Mathematical Olympiad were faced at the same time with another dilemma: the lack of preliminary material available. Apart from questions posed at the IMOs prior to Moscow, only a book of problems edited in the then Soviet Union was then to hand. However, many highly qualified mathematicians stepped in and helped out with individual collections of problems, tried and tested in numerous contests. Special mention should be given here to Prof. Edmund Hlawka, of the University of Vienna, for his fresh and original approach to problem solving that went a long way towards motivating teachers and restoring the element of fun in that process. The Austrian Ministry of Education invited school teachers from far and wide to take part in these introductory seminars and then to provide courses for their students. The first of these courses were held in schools throughout Austria in 1969/70 and, once a qualifying round was over, the very first competition in the Austrian Mathematical Olympiad was launched on June 22, 1970.

General structure of the competition

The teachers conducting courses for students preparing for the Olympiad are paid. 'These preparatory courses are not obligatory and so can be offered to interested students without examination phobia setting in. As teachers are paid, their motivation for training students to Olympiad standards is increased though, obviously, it still requires a measure of idealism to undertake all the additional work necessary to make these courses successful. In fact, anyone with any understanding of this situation will know that a great part of the qualities required of the coach is motivation. If the number of students participating stays below a minimum size (currently eight), the course does not run, so it is in the teacher's interest to keep his or her group alive. Most courses are attended by students from different schools, different grades, and diverse backgrounds in mathematics. The structure of the courses is very loose, allowing students to network with groups of their peers and view mathematics from differing perspectives. The lectures should reflect the mathematics that is most important to learn and, therefore, the methods and tasks included in a competition should be aligned with world-wide needs. There are no grades and the courses run at the times most convenient for both students and teachers. Undeniably, this system of courses provides an atmosphere generating enthusiasm for learning mathematics, encouraging creativity and rewarding excellence. Nevertheless, owing to budgetary developments in the Austrian school system in the last few years, there has been a general tendency to cut back the associated budget in most schools and in some cases the point has been reached where schools are not in a position to offer any courses at all.

Additionally, these classes compete with the even more popular team sports and other modern diversions. Consequently, the supply of courses is on the wane, and the system currently does not really allow equal access to all mathematically-talented students. Several Austrian provinces have tried to improve this unsatisfactory situation by making it possible for schools to offer courses despite competition with other interests but the access problem remains. A student at a school with no special course on offer has no real chance to participate in the national competition. At present a few dozen such courses are being offered, whereas the number was approaching 100 in their heyday. An annual three-day professional development seminar, held in November at Mariazell, is open to all teachers involved in Olympiad courses. Unfortunately, owing to the decrease in the number of courses on offer, participation in these study courses has been declining also. For that reason, six years ago another way of qualifying for the Olympiad was tried: students are now permitted to qualify for competing in the Austrian Mathematical Olympiad through passing a special round held at provincial level.

More information on the Austrian modification of the Hungarian prototype will be given in the next few *Problem Corners*. I obtained parts of the above detail through an Austrian teacher who has long experience

in preparing students for the national contest within his school: Robert Geretschlger, a mathematics teacher focusing mainly on geometry, based in Graz. He is also instrumental in running the annual training camp for the final round of the Austrian Mathematical Olympiad and the preparatory camp for the Austrian IMO team.

The first four problems below, chosen from the 1996 Competition, give a preview of the actual sequence of events during the national Austrian contest and also demonstrate the gradually increasing level of difficulty. The last two questions have been supplied by readers.

Q.80 How many positive integers n with $1 \leq n \leq 1996$ exist that solve the equation

$$\left[\frac{n}{2}\right] + \left[\frac{n}{3}\right] + \left[\frac{n}{4}\right] = \frac{n}{2} + \frac{n}{3} + \frac{n}{4}?$$

($[x]$ is the greatest integer not exceeding x.) **(Beginners' Round)**

Q.81 Let a and b be non-negative real numbers. Determine all sets of solutions $\{x_1, x_2, \ldots, x_{96}\}$ of the following systems of equation (all x_i non-negative integers):

$$\begin{aligned} x_1 - ax_3 &= b \\ x_2 - ax_4 &= b \\ &\vdots \\ x_{94} - ax_{96} &= b \\ -ax_1 + x_{95} &= b \\ -ax_2 + x_{96} &= b \\ x_1 + x_2 + \ldots + x_{96} &= b \end{aligned}$$

(Regional Competition, Second Round)

Q.82 Let a, b, c, d, A and B be positive real numbers such that $a^2 + b^2 = A^2$ and $c + d = B$ hold. Determine the greatest and least possible values for the expression $(a+d)^2 + (b-c)^2$.

(Final Round, First Day)

Q.83 How many *joker numbers* (i.e. six digit numbers composed of the digits 0 to 9) exist, containing precisely four digits? **(This question arose from the Austrian Lotto)** **(Final Round, Second Day)**

Q.84 (Proposed by Dr **Oddvar Iden**, Department of Mathematics, University of Bergen) Given two intersecting circles and their centres, how can we construct the midpoint between the centres using only a ruler?

Q.85 (Dr **Z Reut**, London) The Special Relativistic differential equations of motion of a particle, when presented in 3-dimensional vector form, are

$$\left(\frac{d}{dt}\right)\left[m\mathbf{v}\left(1 - \frac{\mathbf{v}^2}{c^2}\right)^{-1/2}\right] = \mathbf{F},$$

where m and c are constants, and $\mathbf{v}$ and $\mathbf{F}$ are vector functions. Considering $\mathbf{v}$ as a vector function of time t, show that the differential equations of motion can be represented in another 3-dimensional form as follows:

$$m\frac{d\mathbf{v}}{dt} = \left(1 - \frac{\mathbf{v}^2}{c^2}\right)^{0.5}\mathbf{F} - \left(1 - \frac{\mathbf{v}^2}{c^2}\right)^{0.5}\frac{\mathbf{v}(\mathbf{v}-\mathbf{F})}{c^2}.$$

In this issue we will clear out the old questions from Newsletter No. 23. **Dr J.N. Lillington**, Winfrith Technology Centre, Dorchester, takes a start with problem 63, and he nearly enters a one-man show. However, questions 66, 69 and 72 remain unsolved.

Q.63 Someone has a rectangular block of wood of size $a \times b \times c$, where a, b and c are integers, and $a \leq b \leq c$. He paints the surface of the block, cuts it into unit cubes and notices that half the cubes are completely unpainted. Find the number of blocks with this property.

Solution The integers a, b, c satisfy

$$(a-2)(b-2)(c-2) = \frac{abc}{2} \qquad \text{(I)}$$

Without loss of generality assume that $a \leq b \leq c$. Then

$$\frac{a-2}{a} \leq \frac{b-2}{b} \leq \frac{c-2}{c}.$$

Now it is not possible that

$$\frac{a-2}{a} \leq \frac{1}{2^{1/3}}$$

for otherwise

$$\left(\frac{a-2}{a}\right)\left(\frac{b-2}{b}\right)\left(\frac{c-2}{c}\right) > \frac{1}{2}$$

which contradicts (I). Therefore

$$\frac{a-2}{a} \leq \frac{1}{2^{1/3}} \Rightarrow a \leq \frac{2.2^{1/3}}{2^{1/3}-1} (\approx 9.69) \Rightarrow a \leq 9 \text{ (since } a \text{ is an integer).}$$

Also $a \geq 5$ for otherwise if $a \leq 4$ then by (I),

$$bc = \frac{2(a-2)}{a}.(b-2)(c-2) \leq (b-2)(c-2)$$

which is impossible. Thus we have proved that $5 \leq a \leq 9$.

If **a=5** then by (I), $(b-12)(c-12) = 120 = 2^3.3.5$. The 8 possible solutions are:
$(5,13,132)$, $(5,14,72)$, $(5,15,52)$, $(5,16,42)$, $(5,17,36)$, $(5,18,32)$, $(5,20,27)$, $(5,22,24)$.

If **a=6** then by (I), $(b-8)(c-8) = 48 = 2^4.3$. We get 5 blocks:
$(6,9,56)$, $(6,10,32)$, $(6,11,24)$, $(6,12,20)$ and $(6,14,16)$.

If **a=7** then (I) becomes $(b-\frac{20}{3})(c-\frac{20}{3}) = \frac{280}{9} = \frac{2^3.3.5}{3^2}$. This gives 4 blocks:
$(7,7,100)$, $(7,8,30)$, $(7,9,20)$ and $(7,10,16)$.

If **a=8** then we have $(b-6)(c-6) = 24 = 2^3.3$. This gives 3 blocks:
$(8,8,18)$, $(8,9,14)$ and $(8,10,12)$.

If **a=9** similar working gives no further solutions.

The total number of different blocks is therefore **20**.
Also solved by **Nico Lorentz**, Howald, Luxembourg.

Q.65 Determine all integers x such that $x^2 + 19x + 97$ is a square number.

Solution **(Nico Lorentz)** Soit $(x;n) \in \mathbf{Z} \times \mathbf{N}$ et soit $n - x = k \in \mathbf{Z}$. Alors

$$x^2 + 19x + 97 = n^2 \iff (x + \frac{19}{2})^2 + \frac{27}{4} = (k-x)^2 \qquad (1)$$

$$\iff (19 - 2k)(4x + 19 + 2k) = -27$$

$$\iff 4x = -19 - 2k + \frac{27}{2k-19} \qquad (2)$$

Comme $k + n = n \in \mathbf{N}$, on déduit de (1) que $k + x > x + \frac{19}{2}$, soit $2k - 19 > 0$.
Ainsi, d'après (2), $4x \in \mathbf{Z}$ exige $27 \equiv 0 \bmod (2k-19)$, soit $2k - 19 \in \{1;3;9;27\}$, ou encore $k \in \{10;11;14;23\}$.
Dans ce cas $x \in \{-3;-8;-11;-16\}$.
Also solved by Dr J.N. Lillington.

Q. 70 Several (but no fewer than two) non-zero numbers are written on a blackboard. One may erase any two numbers A and B and then write the numbers $A+\frac{B}{2}$ and $B-\frac{A}{2}$ in their place. Prove that the set of numbers on the blackboard, after performing any number of the preceding operations, cannot coincide with the initial set.

Solution **(Dr J.N. Lillington)** Let the numbers be

$$A_0(=A), B_0(=B), C_0(=C), \ldots \qquad (3)$$

After one operation, assume the numbers are $A_1, B_1, C_1, \ldots$

$\vdots$ $\vdots$

After N operations the numbers are $A_N, B_N, C_N, \ldots$

Let $N > 1$ be the minimum numbers such that all numbers coincide with the original set. Then $A_N = A$, $B_N = B$ and $A_{N-1} + \frac{B_{N-1}}{2} = A$, $B_{N-1} - \frac{A_{N-1}}{2} = B$ say. Solving for A_{N-1}, B_{N-1} gives

$$A_{N-1} = \frac{4}{5}\left(A - \frac{B}{2}\right) \quad B_{N-1} = \frac{4}{5}\left(B + \frac{A}{2}\right).$$

Hence $A_{N-2} = \frac{4}{5}A$, $B_{N-2} = \frac{4}{5}B$. If $N > 1$ is even, then inductively,

$$A_0 = \left(\frac{4}{5}\right)^{N/2} A \text{ and } B_0 = \left(\frac{4}{5}\right)^{N/2} B \text{ which contradicts (3).}$$

If $N > 1$ is odd, then

$$A_1 = \left(\frac{4}{5}\right)^{(N-1)/2} A \text{ and } B_1 = \left(\frac{4}{5}\right)^{(N-1)/2} B \text{ implies}$$

$$A + \frac{B}{2} = \left(\frac{4}{5}\right)^{(N-1)/2} A \text{ and } B - \frac{A}{2} = \left(\frac{4}{5}\right)^{(N-1)/2} B \qquad (4)$$

But (4) has no non-trivial solutions in A and B. Hence for no N do the numbers coincide with the original set.

Q. 71 An astronomer added all the distances between 50 stars that he observed with a telescope. The result was S. Suddenly a cloud obscured 25 of the stars. Prove that the sum of the distances between the 25 visible stars is less than $\frac{S}{2}$.

Solution **(Niels Bejlegaard, Stavanger, Norway)** Let A be the set of stars uncovered by cloud, and whose total distance sum is S_A. Similarly, for the set B of invisible stars, the sum is S_B. Before the cloud turns up, I group all interconnecting lines in three groups – A, B, and all lines connecting points of A with those in B. I denote this set of segments C with sum S_C. If S denotes the sum of all possible distances then clearly $S = S_A + S_B + S_C$.

We have $\binom{25}{2} = 300$ distances both in A and B, whereas there are $25^2 = 625 > 2 \times 300$ distances in set C. I can therefore choose points in A and B and apply the triangle inequality twice, in such a way that each of the segments in set C used are counted only once, and some are left over. So we have $S_A + S_B < S_C$. Now

$$S = S_A + S_B + S_C < 2S_C \Rightarrow S_C > \frac{1}{2}S \Rightarrow S_A + S_B < \frac{1}{2}S.$$

Therefore $S_A < \frac{S}{2}$ and $S_B < \frac{S}{2}$.

(*Editor's note:* The solver asks: 'Why 50 stars?' The argument clearly holds for $2n$ stars, since $2\binom{n}{2} < n^2$ $(n \geq 2)$. Is it for pedagogical reasons perhaps? *Bejlegaard* also wonders whether the factor $\frac{1}{2}$ is the 'best' upper bound of this estimation. Indeed we can replace the given bound by a better one. Let us denote the stars obscured by the cloud by $A_1, A_2, \ldots, A_{25}$ and all the other stars by $B_1, B_2, \ldots, B_{25}$. Now add all triangle inequalities of type $|B_i B_j| \leq |B_i A_k| + |B_j A_k|$

for $1 \leq i, j, k \leq 25$.The left-hand side of the inequality is equal to $25T$, where T is the sum of the distances between visible stars. The right-hand side contains each distance $|B_iA_k|$ exactly 24 times (as $i \neq j$), and therefore is no greater than $24(S-T)$. Finally, we have $25T \leq 24(S-T)$ and thus $T \leq \frac{24}{49}S < \frac{1}{2}S$, with the better bound $\frac{24}{49}$.)

Also solved by Dr J.N. Lillington.

Q.73 All possible sequences of seven digits are written down one after another, in a row, in any order at all, to form a 70,000,000-digit number. Prove that this number is divisible by 239.

Solution **(Dr J.N. Lillington)** Let N be the number. Then

$$N = \sum_{n=0}^{10^7-1} (a_1 + a_2 10 + \ldots + a_7 10^6) 10^{7n}$$

where summation is over all possible sequences of digits $0 \leq a_1, a_2, \ldots, a_7 \leq 9$. Thus

$$N = \underbrace{\sum_{n=0}^{10^7-1} (a_1 + a_2 10 + \ldots + a_7 10^6)}_{(5)} + \underbrace{\sum_{n=0}^{10^7-1} (a_1 + a_2 10 + \ldots + a_7 10^6)(10^7 - 1)}_{(6)}.$$

Now $10^7 - 1 = 239 \times 41841 = 239 \times 9 \times 4649$ (7)

Therefore 239 divides $10^7 - 1$ and also $10^{7n} - 1$, $n \geq 1$, and is a divisor of (6). Also

$$\begin{aligned} \sum_{n=0}^{10^7-1} (a_1 + a_2 10 + \ldots + a_7 10^6) &= 10^6(0 + 1 + 2 + \ldots + 9)(1 + 10 + \ldots + 10^6) \\ &= 10^6 \times 45 \times 1,111,111 \\ &= 10^6 \times 5 \times 9 \times 239 \times 4649 \qquad (8) \end{aligned}$$

Therefore 239 also divides (5).

(*Editor's note*: Lillington indicates that (7) and (8) yield a much larger number, $10^7 - 1$ to divide N. To cope with this problem, we note that the remainder of 10^7 modulo 239 is equal to 1, which can be easily verified by direct inspection. This shows that the given 70,000,000-digit number has the same remainder modulo 239 as the sum of all seven-digit numbers that form it. The latter sum is equal to $1 + 2 + \ldots + 9,999,999 = 10^7(10^7 - 1)/2$ and thus is divisible by 239. As a matter of fact, the idea that $10^7 - 1$ is a multiple of 239 does *not* require a great feat of imagination. The problem asserts that divisibility of the given number by 239 does not depend on the order of the seven-digit numbers forming it, so the difference between any such 70,000,000-digit numbers must be a multiple of 239. Taking two numbers only, we immediately conclude that $10^7 - 1$ must be a multiple of 239.)

Another (incorrect) solution was sent in.

That completes the *Corner* for this issue. I need suitable exam materials, and I'm interested in programmes aimed at a much larger, and indeed increasing, group of mathematics students. Furthermore, I am interested in the way you look for new talent in schools and instil a love of mathematics and problem-solving through the presentation of interesting material and special tutoring. I would welcome your suggestions for the evolution of this feature in the **Newsletter**.

Finally, you are invited to 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.

I welcome your input, and especially problem sets and solutions for use!

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 75 Praha 8, Czech Republic.

L.Schneps, P.Lochak (Eds.): Geometric Galois Actions 1: Around Grothendieck's Esquisse d'un Programme, LMS Lecture Note Series, vol.242, Cambridge University Press, Cambridge, 1997, 293 pp., GBP 24.95, ISBN 0-521-59642-4

Alexandre Grothendieck is one of the most influential mathematicians of the 20th century. His work on the foundations of algebraic geometry has had a profound impact on almost all areas of pure mathematics. Since the early 1970s, Grothendieck has been living and working in a largely self-imposed seclusion from the rest of the mathematical community. During the 1980's he had produced several mathematical manuscripts of monumental length. The main ideas of one of them ("La Longue Marche à travers la Théorie de Galois") were sketched in a famous note "Esquisse d'un Programme". In this note Grothendieck sketched a rich arithmetical theory revolving around arithmetical fundamental groups (=3D generalised Galois groups). He proposed two main lines of investigations: (1) Anabelian geometry: for a suitable class of algebraic varieties (e.g. for all hyperbolic curves) their arithmetical fundamental groups contain all information about geometry; (2) Teichmüller tower: a highly nontrivial relation between the Galois group $Gal(\overline{Q}/Q)$ and geometry of various moduli spaces of pointed curves. "Esquisse" and an equally famous letter from G.Faltings to Grothendieck are for the first time published in this volume (both in their original versions and in the English translation). The rest of the book consists of articles explaining various aspects of Grothendieck's anabelian programme and its current status (the authors include F.Oort, L.Schneps, T.Oda, F.Pop, Y.Ihara, J.-P.Serre, H.Nakamura, J.Wolfahrt, D.Harbater, B.Teissier). The editors plan a companion volume containing more specialized research articles. The two volumes grew out of the Luminy conference "Geometry and Arithmetic of Moduli Spaces" (August 1995) and form a sequel to the book "The Grothendieck Theory of Dessins d'Enfants", this series No.200. (jnek)

J.-L.Loday, J.D.Stasheff, A.A.Voronov (Eds.): Operads: Proceedings of Renaissance Conferences. Special Session and Inter.Conference on Moduli Spaces, Operads and Representation Theory, 1995, Contemporary Mathematics, vol.202, American Mathematical Society, Providence, 1997, ix+443 pp., GBP 60.00, ISBN 0-821-80513-4

The notion of an operad was introduced in the seventies as a tool for the study of homotopy invariant structures on topological spaces. Independently, operads had existed under the name (algebraic) PROP in universal algebra, where they modelled various kinds of categories determined by given algebraic equations. At the beginning of this decade, an enormous revival of interest in operads was aroused by the discovery that some moduli spaces relevant for string field theory have a natural operad structure underlying the Segal's 'factorization axiom'. This, in turn, stimulated an intensive research of applications of the operadic approach in more classical areas, such as homological algebra, homotopy theory, theory of moduli spaces, etc. The volume of proceedings contains 15 contributions which present recent progress in the fields concentrated around this 'renaissance of operads.' The volume also contains two short overview papers, written by the founders of the theory, J.P. May and J.D. Stasheff. We believe that the book will be useful to everybody interested in this exciting area of active research in which pure mathematics and mathematical physics interact. (mm)

D.Cox, J.Little, D.O'Shea: Ideals, Varieties, and Algorithms. An Introduction to Computational Algebraic Geometry and Commutative Algebra. Second Edition, Undergraduate Texts in Mathematics, Springer-Verlag, New York, 1997, xiii+536 pp., 91 fig., DM 68.00, ISBN 0-387-94680-2

Many problems of classical geometry lead to the necessity of solving a system of non-linear algebraic equations in several unknowns. The elimination procedures used to solve such problems lead usually to many equations with a large number of unknowns, and this limited their use in the past. The recent development of computer algebra has led to a removal of these limits in the size of the equations considered and elimination algorithms are now very fast. The book is an excellent introduction to its subject matter. The theoretical background to elimination theory is developed to an extent which is more than satisfactory for practical use. Fundamental concepts of ideals, affine varieties and ordering are used to introduce the Groebner basis as the basic tool for elimination. The main theorems of ideal theory are explained, stated and proved. All algorithms are described in great detail and demonstrated by practical examples. Each paragraph has many exercises which

help to understand the material under exposition. Applications to the inverse kinematic problem in robotics and to automatic geometric theorem-proving illustrate how the methods of the book may be used. The book also contains more advanced sections on invariant theory, projective algebraic geometry and dimension. At the end the most-used Computer Algebra systems are described. The book can be recommended to anybody interested in algebraic geometry and wanting to combine the power of the theory with the speed and power of the computer. (aka)

D.M.Evans (Ed.): Model Theory of Groups and Automorphism Groups. Blaubeuren, August 1995, London Mathematical Society Lecture Note Series, vol.244, Cambridge University Press, Cambridge, 1997, xvi+212 pp., GBP 24.95, ISBN 0-521-58955-X

In this volume, invited lectures at the Summer School on Model Theory of Groups and Automorphism Groups (Blaubeuren '95) are presented. The articles are mostly expository, but bring the reader to very recent results, and key open problems, in the area. The main contribution (by Evans, Macpherson and Ivanov) is on the general method of finite covers; others deal with simple first order theories (Kim), pseudofinite fields (Chatzidakis, Hodges), groups (Lascar, Evans, Cameron, Boffa, Oger, Chiswell, Pfander) and rings (Burke and Prest). (jtrl)

S.Wolfram: The Mathematica Book. Third Edition, Cambridge University Press, Cambridge, 1996, xxiv+1403 pp., GBP 34.95, ISBN 0-521-58888-X, ISBN 0-521-58889-8

This is a substantially enlarged edition of the 2nd edition of the well-known Mathematica book. It serves as a complete introduction to the computer algebra system Mathematica version 3.0 and describes all its capabilities. Each new user of Mathematica has to learn the basics and some of the parts needed for particular calculations. The first section, A Practical Introduction to Mathematica, contains the elements of numerical calculations, symbolic mathematics, and graphics and sound. The second section, Principles of Mathematica, deals with the detailed description of the features of Mathematica such as the structure of expressions, patterns, transformation rules, manipulating strings, streams, files, and notebooks. This section is essential for developing a deeper knowledge of the system. The third section, Advanced Mathematics in Mathematica, describes topics like mathematical functions, algebraic manipulations, equations, calculus, series, limits, residues, and numerical operations. The Appendix contains a Mathematica Reference Guide. Among the sections in this Appendix, a new Section deals with internal implementation and is of particular interest. It contains useful information about the algorithms used and the general approaches to specific problems. Another very useful section is "Listing of Major Built-in Mathematica Objects" which contains a short description and example of the use of built-in functions. Although the Mathematica Book is now supplied with Version 3.0 on CD (some 42MB on disk), it remains, perhaps, more convenient to have the actual book available for everyday use. Recommended to users of Mathematica. (jh)

M.E.Taylor: Partial Differential Equations. Basic Theory, Texts in Applied Mathematics, vol. 23, Springer-Verlag, New York, 1996, xvi+563 pp., 37 fig., DM 58.00, ISBN 0-387-94654-3

The book is intended to provide a course for study of some major aspects of PDEs. The interaction with differential geometry is emphasised. The first chapter (Basic Theory of ODE and Vector Fields) gives, besides classical material, results on flows generated by vector fields, Hamiltonian systems and some applications to topological results. In Chapter 2, the theory of the Laplace operator acting on a Riemannian manifold, as well as the theory of the wave equation on a Lorentz manifold is developed. Chapters 3 and 4 are dedicated to the main tools, namely: Fourier analysis, distributions and their application to the local solvability of PDEs with constant coefficients, and Sobolev spaces. At the beginning of Chapter 5 (Linear Elliptic Equations), the Dirichlet problem for the Laplace operator determined by a Riemannian metric is considered for both smooth and rough boundaries. At the end of this chapter, general elliptic boundary problems are discussed. Chapter 6 is devoted to linear evolution equations. In addition, there are two appendices included. Appendix A provides an outline of functional analysis, Appendix B gives definitions and basic properties of manifolds and vector bundles and some properties of Lie groups. This short list of topics is far from being complete. The book, which is the first volume of a three-volume treatment of PDEs, gives an explanation of many important results and ideas. (oj)

S.S.Kutateladze: Fundamentals of Functional Analysis, Kluwer Texts in the Mathematical Sciences, vol.12, Kluwer Academic Publishers, Dordrecht, 1996, xiv+276 pp., GBP 110.00, ISBN 0-792-33898-7

The book under review is an English translation of that used for more than ten years as the standard textbook on functional analysis at the University of Novosibirsk. This translation of the second Russian edition contains additional sections (Radon measures, spaces of distributions) and a number of problems and exercises. Chapters entitled An Excursion into Set Theory, Vector

Spaces, Convex Analysis, etc., seem to be quite traditional but behind these names there is a very original exposition. The text itself is self-contained and very condensed: deep results, e.g. Riesz-Dunford integral representation theorem, Grothendieck criterion on approximation or Wendel theorem on Radon measures, are included. The exposition culminates in the Gelfand-Naĭmark-Segal construction for C^*-algebras. Each chapter is accompanied by 19 exercises. List of references contains 374 items. Substantial Notation and Subject Indexes are included. Recommended for graduate students and researchers. (jv)

M.S.Agranovich, Yu.V.Egorov, M.A.Shubin (Eds.): Partial Differential Equations IX. Elliptic Boundary Value Problems, Encyclopaedia of Mathematical Sciences, vol.79, Springer-Verlag, Berlin, 1997, 281 pp., DM 148.00, ISBN 3-540-57044-6

This volume of the Encyclopaedia consists of three extensive survey papers. In the first paper, "Elliptic Boundary Problems" by M.S. Agranovich, the author introduces the concept of a general linear elliptic operator of an arbitrary order, on a manifold. The ellipticity at the boundary is based on the Shapiro-Lopatinskij condition. Both scalar and vector valued cases are considered. The boundary is supposed smooth, except in special sections. Existence and estimates of solutions in function spaces, adjoint problems, spectral analysis and other questions are studied in high generality. The second paper is "Boundary Value Problems for Elliptic Pseudodifferential Operators" by A.V. Brenner and E.M. Shargorodsky. As pseudodifferential operators are not of local nature, certain problems occur with the action of the operator on functions whose natural domain is not the entire space. The Boutet de Monvel theory of operators with the transmission property and the theory of Vishik and Eskin for operators "without" the transmission property are both discussed. Significant space is devoted to parameter-dependent problems. The third paper, "Elliptic Boundary Value Problems in Domains with Piecewise Smooth Boundary" by B.A. Plamenevskij, studies boundary value problems for domains with conical points or edges. Discontinuities of the coefficients are allowed. Typical results state existence of solutions and describe their asymptotic behavior. Special weighted function spaces adapted to the problems are considered and Fredholm theory for the operators is investigated. The purpose of this book, as a part of the Encyclopaedia project, is to survey a great part of mathematical knowledge, without giving detailed proofs, but indicating main methods and ideas. The exposition is illustrated by examples. It is a valuable source of well-organised information for experienced readers. (jama)

J.M.Rassias: Counter Examples in Differential Equations and Related Topics, World Scientific, Singapore, 1991, vii+184 pp., GBP 35.00, ISBN 9-810-20460-4

A collection of 86 (counter) examples from the field of differential equations collected from various sources. About 80 sources were employed to prepare the collection. The counter examples were used in a semester course delivered by the author at the American College of Greece. In each chapter, very basic theoretical background is provided, but the text is by no means a textbook that could be used as a single source for a lecture. Most counter examples are concerned with existence (24), uniqueness (22) and stability (16). (jv)

H.König: Measure and Integration. An Advanced Course in Basic Procedures and Applications. Springer-Verlag, Berlin, 1997, xxi+260 pp., DM 98.00, ISBN 3-540-61858-9

The book develops a new systematic theory of the fundamentals in measure and integration theory. It is based on an recent approach started in the seventies that was on the one hand motivated by the needs of topological measure theory and, on the other hand, by an effort to free classical measure theory from some notorious drawbacks. Also, methods based on traditional results such as the Daniell-Stone theorem turned out to be inadequate whenever the locally compact context was replaced by the setting of an arbitrary Hausdorff topological space. The unifying approach adopted in this book makes it possible to cover not only various aspects of measure theory, but also permits inclusion of non-additive set functions like capacities. A substantial part of the book is devoted to the construction of measures from elementary sets. It is known that standard procedures of extension of a content from a ring to a σ-algebra cause difficulties as, in applications, the natural set systems are seldom rings. Therefore, the monograph stresses the role of lattices. Special attention is paid to (inner as well as outer) extension theories covering formations of sequential and also non-sequential types (special types of envelopes). Another central point of the book is its general approach to the construction of measures from elementary integrals; lattice cones of functions appear here in a natural setting. The book is not written as a textbook; it is instead a research monograph. Although essentially self-contained, it is rather too technical for non-specialist readers. However, a detailed introduction clearly describes the aim of the theories presented and explains the main advantage of the approach adopted. The unifying, very general treatment, being quite natural, is reflected in a high level of abstraction and in the investigation of somewhat unusual structures. In view of this, the text is not easy to follow. There is no doubt that this

book, restructuring as it does a large part of the fundamentals of measure and integration theory and will attract the attention of research workers and university teachers in mathematical analysis. (in)

R.Kaluža: Through a reporter's eyes: The Life of Stefan Banach, Birkhäuser, Boston, 1996, x+137 pp., DM 39.80, ISBN 0-817-63772-9, ISBN 3-764-33772-9

The book describes the life story of one of the most famous mathematicians of this century. Written by a man outside mathematics, the author's intentions to collaborate with mathematicians was met by a refusal from nineteen of them. Despite this fact, the book will be of interest to mathematicians who wish to know more about their discipline than mere theorems and proofs. It is a well-written scientific biography, based on carefully collected information from many people, including Banach's relatives, friends, collaborators and students. Their opinions and information sometimes differ but the author presents all views. Also, materials from archives and excerpts from the writings on Banach by mathematicians, from different countries are included. Apart from fairly well-known facts like those on Scottish Café (Lvov), the book contains many other interesting details which are published for the first time (including photographs). It is obvious that a book of this kind must include also some notes on mathematics; these were prepared with the help of Stanislaw Kwapień. Enjoyable reading for a broad mathematical audience. (jv)

D.L.Johnson: Presentations of Groups. Second Edition, London Mathematical Society Students Texts, vol.15, Cambridge University Press, Cambridge, 1997, x+216 pp., GBP 17.95, ISBN 0-521-58542-2

Johnson's book carefully exhibits several fundamental methods of combinatorial group theory, like Schreier's method, Nielsen's method, Tietze transformations, and Todd and Coxeter coset enumeration. Some more advanced topics are considered without proving the main results (for example HNN-extensions and Schur multiplier), and some are treated more completely (free differential calculus, nilpotent quotient algorithm and the Golod-Shafarevich theorem). However, the main virtue of the book seems to be the large number of examples which include a wide selection of often used groups. The book appears in its second edition, with a new chapter on Gaschütz-Newman formulae and their connections to Fibonacci groups. The book is written from the computational viewpoint and does not use geometric methods. This makes it easily accessible to students, as it can be read with very few prerequisites. (ad)

E.Maor: Die Zahl e - Geschichte und Geschichten, Birkhäuser, Basel, 1996, xii+213 pp., DM 48.00, ISBN 3-764-35093-8, ISBN 0-817-95093-8

A good portion of the history of mathematics in connection with the Euler number e is explained in the book. The story begins with the introduction of Napier's logarithm and describes the contributions of famous mathematicians to the development of related topics. Readers of the book will learn not only about the relation of e to finance, continued fractions, and catenaries but also about limits, curves, complex numbers and even music. The Mathematics incorporated in the text is not always elementary (algebraic numbers, hyperbolic functions, distribution of prime numbers, etc.) but its lively style and well-chosen examples make it accessible to students and secondary school teachers and to everybody interested in the history of mathematics. (jv)

J.-C.Martzloff: A History of Chinese Mathematics, Springer-Verlag, Berlin, 1997, xxiv+485 pp., 185 fig., DM 78.00, ISBN 3-540-54749-5

This book consists of two parts. The first describes the long history of Chinese mathematics from its beginning to the 20th century including general historical and cultural background. Martzloff demonstrates that Chinese mathematics was oriented towards cosmological speculations and practical studies of the basic principles of the universe as much as towards applications of mathematical knowledge to a host of practical problems in astronomy, commerce and engineering. This book is a major contribution to the modern history of Chinese mathematics because it considers the significance of cultural issues and political contexts in determining the development, and therefore the history, of mathematics. Martzloff provides an excellent analysis of all aspects of the history of Chinese mathematics. He describes the social situation of mathematicians and the place of mathematics in Chinese civilisation and philosophy. At the end of the first part the book deals with Chinese contacts with India and other countries of Asia, as well as Islamic and European countries. He analyses the efforts to translate Chinese works into European languages and the Chinese efforts to spread their knowledge. The last chapter of the first part contains an exposition of the main works and main authors since 16●●. The second part of the book analyses the development of each mathematical discipline and subdiscipline (numbers and numerations, geometry, calculating instruments and techniques, special Chinese indeterminate problems, ...). This part is organised more by topic than by chronology and contains the original Chinese mathematical texts with their translations, their interpretations and extensive references (both mathematical and sinological). This book is recommended to those interested in the history of Chinese mathematics and philosophy. (nmem)

J.M.Selig: Geometrical Methods in Robotics, Monographs in Computer Science, Springer-Verlag, New York, 1996, xiii+269 pp., 18 fig., DM 78.00, ISBN 0-387-94728-0

The aim of this book is to give an overview of the topics of modern geometry that have applications in robotics. The book starts with an introduction to the theory of Lie groups and algebras, nowadays a basic tool for kinematics and its applications in robotics. It gives a standard introduction to the subject, with special attention given to the Euclidean group. It also presents some applications to kinematics and robotics. This part is easily accessible to a nonspecialist in the field. A considerable part of the book is devoted to line geometry and screw systems. The material is classical but is developed using modern terminology and thereby shows the connections between the classical and the modern approach. A short introduction to representation theory of the Euclidean group gives a small hint to what is behind the various formalisms used in kinematics (quaternions, dual matrices and similar), but is difficult to digest on a first reading. The chapter on Clifford algebras shows the construction of Clifford's biquaternions, which are now popular in the robotics community. They constitute a basic tool for the Study representation of the Euclidean group, treated in the next chapter. The Study representation of the Euclidean group is very useful for motion-interpolation purposes as well as for kinematics of parallel manipulators. The last two chapters give a general approach to statics and dynamics of robot manipulators using the dual space to screws as the basic tool. Many problems in robotics lead to the problem of intersection of several algebraic surfaces which is equivalent to the solution of systems of non-linear algebraic equations in several unknowns. This is a difficult problem and the short introduction to intersection theory given in the book will stimulate the reader to consult the associated literature indicated by the author. The book can be useful in two directions: for engineers working in robotics research it can give a theoretical background to mathematical tools which are frequently used intuitively; for a mathematician it indicates the large variety of purely mathematical results which are used in applications. For the sake of completeness, it should be mentioned that there are also other fields of geometry which are connected with kinematics and robotics, for instance connections to non-Euclidean geometry discovered by W.Blaschke. The natural geometry of the Euclidean group also leads to semi-Riemannian geometry, the Cartan connection, and similar concepts. (aka)

J.Barwise, L.Moss: Vicious Circles. On the Mathematics of Non-Wellfounded Phenomena, CSLI Lecture Notes, vol.60, Stanford, 1996, x+390 pp., GBP 16.95, ISBN 1-575-86008-2, ISBN 1-575-86009-0

In the book, a non-well founded set theory of hypersets with urelements is introduced. This theory is suitable for modelling circular systems, such as streams and labeled transition systems. Modelling is realised by means of systems of equations between sets. The postulate stating that the solution of these systems of equations exists and is unique is called the Anti-Foundation Axiom (AFA). This postulate is equivalent to a unique decorativity of graphs, thus giving a connection with the version of the Anti-Foundation Axiom presented by Aczel. It is proved, by using AFA, that every labelled transition system is equivalent (bisimilar) to a canonical one; this is a typical result about representations of systems, based on AFA. Further applications of the ideas are introduced. For example, modal logic is treated in such a way that a Kripke structure over a set of urelements is a labeled graph over this set. Next, modelling games are studied, semantical paradoxes and streams are analysed. Moreover, some generalizations, which are related to the greatest fixed points of suitable operators, are developed and some further applications are given. A number of useful commentaries and discussions of topics connected with computer science, philosophy, linguistics and various paradoxes represent an important feature of this book covering a rich material. Many exercises with solutions at the end of the book make it possible to comprehend the topic in question more deeply. (jml)

M.Lothaire: Combinatorics on Words, Cambridge Mathematical Library, Cambridge University Press, Cambridge, 1997, xvii+238 pp., GBP 17.95, ISBN 0-521-59924-5, ISBN 0-201-13516-7

This book has become a standard reference for basic results about properties of words (i.e., strings of symbols over an alphabet). There are defined and studied notions like periodicity, conjugacy, square-free words, unavoidable and avoidable regularities, Lyndon words, division ordering, equations on words and associated graphs, rearrangment classes and coding of trees. Statements include the defect theorem, the proposition of Fine and Wilf, van der Waerden's theorem, the critical factorisation theorem and the Lagrange inversion formula. The second edition does not bring any changes, with the exception of corrections of misprints and errors. However, a new volume on the subject is announced. The book is divided into eleven chapters written by eleven authors headed by D.Perrin. They have achieved a unified treatment oft he subject, and this fact has been expressed by the choice of a mythical

author, M. Lothaire (where M. stands for Monsieur and Lothaire is the name of the grandson of Carolus Magnus who reigned over Lotharingia). The book is accessible to anyone with a standard mathematical background and can be used as a textbook. (ad)

K.Doets: Basic Model Theory. Studies in Logic, Language and Information, CSLI Publications, Stanford, 1996, xiii+130 pp., GBP 10.95, ISBN 1-575-86048-1, ISBN 1-575-86049-X

A quick presentation of the basic results in model theory of first-order languages and some extensions concerning second-order and infinitary formulas (of the languages $L_{\infty\omega}$) are proposed. In chapters 1 and 2, some fundamental notions of model theory, such as model, satisfaction, submodel, isomorphism, are presented. In the third chapter, Ehrenfeucht games are defined; these are used to study n-equivalences and elementary equivalent structures. Some consequences concerning definability in first- and second-order logic are discussed. The connection between infinite games and infinitary formulas (of the languages $L_{\omega_1\omega}$) is also treated. Chapter 4 contains some basic themes of model theory, such as compactness, diagrams, ultraproducts, saturation, recursive saturation and interpolation; the Lindström theorem is also treated. Categoricity is touched upon in the third chapter. Set-theoretic preliminaries are summarised in Appendix B (while the completeness theorem is proved in Appendix A). Some commentaries and details are to be found in the exercises. The whole text is rather condensed and must be read carefully. (jml)

J.R.Norris: Markov Chains, Cambridge Series in Statistical and Probabilistic Mathematics, Cambridge University Press, Cambridge, 1997, xvi+237 pp., GBP 27.50, ISBN 0-521-48181-3

This is a textbook aimed at masters' level students although the first half is also suitable for undergraduates. Both discrete-time and continuous-time Markov chains are treated. As their state-space is at most countable, the exposition can be done quite rigorously, almost without measure-theoretical prerequisities. A few exceptions needed in the text (e.g. monotone convergence theorem, Fubini theorem, the strong Markov property) are rigorously discussed in an appendix. The second half of the book is devoted to both theoretical and practical applications of Markov chains; the former include discrete potential theory or electrical networks, the latter covers genetics, epidemics, queues, resource management, optimal control and Markov chain Monte Carlo methods. The lucid style of the exposition and the appealing applications will be appreciated by any reader interested in the topic. (jd)

I.Borg, P.Groenen: Modern Multidimensional Scaling. Theory and Applications, Springer Series in Statistics, Springer-Verlag, New York, 1997, xvii+471 pp., 116 fig., DM 88.00, ISBN 0-387-94845-7

Multidimensional scaling (MDS) deals with methods for representation of measurements of similarity among pairs of objects as distances in a low-dimensional space. The book contains 22 chapters which are grouped into five parts. Part I describes fundamental concepts of MDS. Part II presents MDS models and methods for solving MDS problems. Part III deals with unfolding, part IV is devoted to MDS geometry, and part V contains Procrustean models and some methods related to MDS. In an appendix, computer programs available for doing MDS are introduced. The authors do not assume that readers have a strong mathematical background. Elementary matrix operations are described in Chapter 7; the definition of the derivative and its application to finding extrema are given in Chapter 8. The book is written as an introduction to MDS for students and researchers in psychology, sociology, political science, marketing, and other fields. (ja)

F.Belgacem: Elliptic Boundary Value Problems with Indefinite Weights: Variational Formulations of the Principal Eigenvalue and Applications, Pitman Research Notes in Mathematics Series, vol.368, Addison Wesley Longman, Harlow, 1997, 236 pp., $ 59.75, ISBN 0-582-31597-2

In this book a uniformly elliptic model $L[u] \equiv \nabla[-a\nabla u + bu] = 3D\lambda mu$ which describes the stationary dynamics of a population is treated. (Here $u = 3Du(x)$ is the density, $a = 3Da_{ij}(x)$ a diffusion matrix, $b = 3Db_i(x)$ a drift vector, $m = 3Dm(x)$ a sign indefinite weight.) The author's contribution concerns a characterisation of the principal eigenvalue in the case when the operator is non self-adjoint and when the weight function m (a "food" source in the ecological applications) is not required to be of one sign. The research is based, among others, on the results of C. Cosner and S. Cantrell and P. Hess. The book consists 5 chapters and an Appendix containing prerequisite mathematical concepts. A comprehensive bibliography of 304 items is included which, together with the Literature Review, gives a good indication to the field. With its emphasis on applications, the book may be of interest not only to mathematicians but also to biologists, ecologists and engineers. (oj)

L.Fahrmeir, G.Tutz: Multivariate Statistical Modelling Based on Generalized Linear Models. With Contributions by Wolfgang Hennevogl, Springer Series in Statistics, Springer-Verlag, New York, 1994, xxiv+425 pp., 45 fig., DM 89.00, ISBN 0-387-94233-5, ISBN 3-540-94233-5

Classical linear models describe the dependence of

expectation μ_i of an observable random variable Y_i on a design vector z_i by $\mu_i = 3Dz_i'\beta$ where β is a vector of unknown parameters. The generalized linear models (GLM) have the form $\mu_i = 3Dh(z_i'\beta)$ where h is a smooth response function. A well-known example is the logistic model for a dichotomous variable $Y_i \in \{0,1\}$ with $E(Y_i|z_i) = 3DP(Y_i = 3D1|z_i) = 3D\exp(z_i'\beta)/[1+\exp(z_i'\beta)]$. The authors give a review of GLM, introduce their multivariate extensions and describe methods for selecting and checking models. Some models are discussed in detail, e.g. models for time series and longitudinal data, random effect models, state space models, and survival models. The book is oriented mainly to categorical data. Some topics belonging to GLM are not included in the book, for example log-linear models for contingency tables. (There are special monographs devoted to such models.) The methods treated are illustrated on real data. Technical details and proofs are deferred to an appendix, or the reader is referred to the literature. The book is suited for applied statisticians and students of statistics. (ja)

J.W.P.Hirschfeld, S.S.Magliveras, M.J.de Resmini (Eds.): Geometry, Combinatorial Designs and Related Structures. Proceedings of the first Pythagorean conference, London Mathematical Society Lecture Note Series, vol.245, Cambridge University Press, Cambridge, 1997, vii+258 pp., GBP 27.95, ISBN 0-521-59538-X

The book contains 18 papers contributed by participants of a conference held in Greece in June 1996. About a half of the papers are more or less connected to finite projective spaces, including a survey by P.J. Cameron that reviews results and problems of projective geometry with respect to classification of maximal subgroups of $PGL(n,q)$. There is also an up-to-date survey on difference sets by D.Jungnickel and B. Schmidt, a survey on embeddings of partial cycle systems to full cycle systems by C.C. Lindner, and a survey on geometries of rank 3 with simplicial residues by E.E. Shult. A paper of A. Betten and al. gives 7-designs with small parameters obtained by the Kramer-Mesner method, a paper by P. Danzinger and E. Mendelsohn shows that for every $n \neq 1,3,5,7$ there exists such a Latin square that every cell is contained in a subsquare of order 2 (an intercalate), and C.H. Ling with C.J. Colbourn settle the question of existence of Rosa triple systems. Results of other authors cannot be stated so simply. (ad)

L.Berggren, J.Borwein, P.Borwein: Pi: A Source Book, Springer-Verlag, New York, 1997, xix+716 pp., DM 98.00, ISBN 0-387-94924-0

This source book contains 70 important works on π, three appendices, a bibliography and a very good index. The selection contains 15 papers concerning the Pre-Newtonian period, about 10 others dealing with developments up to the end of the 19th century, with the remainder devoted to 20th century work. Every item is somewhat briefly introduced in the Contents but the authors avoid any evaluation or explanatory comments even when the source is not in English. Apart from the classical works of Archimedes (Measurement of a Circle), Viète (Variorum de Rebus Mathematicis Reponsorum Liber VII), Newton (Of the Method of Fluxions and Infinite Series), Euler (10th Chapter of Introduction to Analysis of the Infinite), Lindemann (Über die Zahl π), to name but a few, the reader will find House Bill No. 246 (an attempt of Indiana State Legislature to fix the value of π in 1897), Niven's simple proof that π is irrational (1947), Eve's collection of mathematical stories and anecdotes about π, Keith's mnemonic for the first 402 decimal places of π, etc. Related topics like articles on the transcendency of e, on the calculation of the Euler constant γ or on the arithmetic-geometric mean of Gauss are also included. The book is a very good tool to introduce seminar topics like irrationality and transcendence, elliptic integrals or just the history of π — the authors provide readers with suggestions on where to start. As works are reproduced, the book has an appealing flavour of times gone by, even from the point of view of the graphics. An indispensable source for historians and scholars, and recommended for a student's independent study of the development of mathematics. (jv)

R.Isaac: The Pleasures of Probability, Undergraduate Texts in Mathematics. Readings in Mathematics, Springer-Verlag, New York, 1995, xv+241 pp., 17 fig., DM 48.00, ISBN 0-387-94415-6

Although modern probability theory is a serious mathematical discipline with important applications, "it should also be said that probability can be lots of fun. It is a subject where you can start thinking about amusing, interesting, and often difficult problems with very little mathematical background" (p. vii). The author starts with discrete sample spaces and conditional probability. Further chapters are devoted to Bayes' formula, independence, random variables, the law of large numbers, normal distribution, random numbers, simulations, statistics, Markov chains, and Brownian motion. The probabilistic concepts are introduced and illustrated using interesting problems that are accessible to readers who have no special mathematical background. Examples of such problems are cars and goats, the birthday paradox, the prisoner's dilemma, blood tests, waiting for success, roulette, fair and unfair games, coupon collector's problem, a traffic problem, gambler's ruin, etc. A problem described on p.23 is as follows: *"The king comes from a family of*

two children. What is the probability that the other child is his sister?" The author derives the probability to be 2/3. The assumptions under which this solution is correct have been discussed furiously by some of the reviewer's colleagues. This episode proves that the book provides a real stimulus for teaching. (ja)

J.P.Klein, M.L.Moeschberger: Survival Analysis Techniques for Censored and Truncated Data, Statistics for Biology and Health, Springer-Verlag, New York, 1997. xiv+502 pp., 97 fig., DM 94.00, ISBN 0-387-94829-5

The book is devoted to statistical analysis of survival experiments where the data are complicated by censoring and/or truncation. Censored data arise when an individual's life length is known to occur only in a certain period of time. Truncation means that only individuals who have experienced the event by a specific time are included in the sample (right truncation) or individuals who survive a sufficient time are included (left truncation). After an introduction, the authors describe estimation of summary survival statistics such as the survival function, cumulative hazard rate, and measures of centrality. The next topic is hypothesis testing. One of the most important parts of the book concerns regression analysis for censored and/or truncated data. Multivariate models for survival data are discussed in the last part of the monograph. The book is written for investigators who need to analyse lifetime data. It can also be recommended as a textbook for students. The material is presented in an attractive and readable form. Mathematical theory is illustrated using real data, with many practical remarks and recommendations. The book is a pleasure to read. (ja)

Multigraph. A software package for multivariable calculus that fills the gap between graphic calculators and high powered computer algebra systems., J.Wiley & Sons, Inc., New York, 1996, GBP 22.50, ISBN 0-471-10618-6

Multigraph is a software package that is devoted to one part of calculus - multivariable calculus. It is not a computer algebra system, and the program is largely intended for a graphic representation of functions. It is possible to display 3D-surface plots, contour plots and 2D-vector fields. Users need not choose only from parameterised predefined functions, they can also enter their own. The program also allows specification of the plot area. Each type of graph offers several options according to the requirements of the users. It is possible to select, for instance, parallel or perspective projection, wire frame or solid surface (surface plot), number of contours or level curve outlines (contour plot). The program has further capabilities: for instance, it is able to draw directional derivatives or count values of integrals. This software may be a useful aid to trying to understand the properties of functions of several real variables. (mli)

M.Freidlin: Markov Processes and Differential Equations: Asymptotic Problems, Lectures in Mathematics ETH Zürich, Birkhäuser, Basel, 1996, vi+152 pp., DM 44.00, ISBN 3-764-35392-9, ISBN 0-817-65392-9

This monograph covers some recent advances in the field of asymptotic problems that arise from the interplay between the theory of partial differential equations (PDE) and that of Markov processes, some striking basic results of which are reviewed for example in Chapter 4 of [Karatzas, I. and Shreve E.S. (1991), Springer Verlag New York): Brownian Motion and Stochastic Calculus] (the solutions to many problems of partial differential equations have natural and useful stochastic representations). One can for example use the Wiener process to characterise the Dirichlet problems for which a solution exists, to construct it and to prove uniqueness. The author treats four complex topics in this book: the Dirichlet problem with a small parameter in higher derivatives; the averaging principle for processes and PDEs; homogenisation in PDEs and stochastic processes; wave-front propagation for semilinear equations and systems. The reader is supposed to be actively familiar with the theory of stochastic processes and to possess a good background in PDEs. The author, as a rule, does not present detailed proofs that are elsewhere available in the literature; the text will serve, therefore, more as a reference and a guide for specialists rather than as introductory lecture course. (jste)

M.Simonnet: Measures and Probabilities, Universitext, Springer-Verlag, New York, 1996, xiii+510 pp., DM 68.00, ISBN 0-387-94644-6

This book presents a sophisticated treatment of measure theory which should prove useful to both practising mathematicians and advanced students in the fields of analysis and probability theory. The reason is that the text unifies in an elegant manner the approach based on the notion of a measure defined on a family of sets with that based on the notion of Radon measure understood as a linear functional on the space of continuous functions with compact support. Both integration theories, the former of which is perhaps better suited to probability theory, are deduced as special cases of the integration with respect to a Daniell measure, the concept of which is defined as a linear form on a Riesz subspace of the space of real-valued funtions on a given set (typically either the space of simple measurable functions on a semiring or the space of continuous functions with compact support on a locally compact space). The exposition leads quickly and smoothly to the important results of measure

theory such as extension theorems for measures defined on a Boolean semiring or convergence theorems for the Lebesgue integral. The approach chosen by the author allows him to present from the beginning a fairly general integration theory for Banach space-valued integrands and complex-valued measures. The book offers in Chapter III a nice introduction to probability theory that covers the strong law of large numbers, the central limit theorem, and conditional expectations, while Chapter IV comprises, in Bourbaki's manner, all the major results on operations with Radon measures — such as their images, products and convolutions. (jste)

G.Baker, A.Freire (Eds.): Nonlinear Partial Differential Equations in Geometry and Physics. The 1995 Barrett Lectures, Progress in Nonlinear Differential Equations and Their Applications, vol. 29, Birkhäuser, Basel, 1997, xi+153 pp., DM 68.00, ISBN 3-764-35493-3, ISBN 0-817-65493-3

This volume contains four series of lectures presented at the Mathematics Department of the University of Tennessee, Knoxville in March 1995 as the John Barrett Memorial Lectures. The lectures are expository and represent different applications of PDEs in geometry, topology and theoretical physics. In the first series of lectures, Ronald Fintushel gives a brief overwiev of the theory of Donaldson invariants and Seiberg-Witten equations and their applications to classification theory of smooth four-dimensional manifolds. The second series by Sergiu Klainerman is devoted to the study of hyperbolic PDEs which arise from classical field theories such as the wave, Yang-Mills and Einstein equations. The Ginzburg-Landau equations in a classical model for superconductivity and related problems are presented in the third series of survey lectures by Fang-Hua Lin. The last series of lectures, by Michael Struwe, provides a survey of local existence results for the quasilinear hyperbolic system defined by wave maps together with global existence problems, weak-compactness results etc. (jbu)

J.C.Taylor: An Introduction to Measure and Probability, Springer-Verlag, Berlin, 1997, xvii+299 pp., 12 fig., DM 64.00, ISBN 0-387-94830-9

This book is intended to provide the reader with a self-contained and user-friendly approach to more advanced topics in probability theory. Chapters I and II present the main tools and techniques of measure theory and Lebesgue integration in a way that also respects the needs of students not possessing the usual background in analysis. The author, for example, does not hesitate to verify that Q is, and R is not, a countable set or to prove the Heine-Borel theorem when constructing a Borel probability measure on R from a distribution function. Chapter III is concerned with independence and products of measures both finite and countable, and proves the existence of Markov chains associated with transition kernels. The main convergence concepts for random variables are treated in Chapter IV. These techniques are employed to present and to prove the Kolmogorov law of large numbers for i.i.d. integrable random variables. Chapter V covers conditional expectations and martingales, Doob's optimal stopping theorem, and the martingale convergence theorem being its principal goals. The final Chapter VI examines weak convergence on R, presents the uniqueness and continuity theorems for the characteristic functions and concludes the presentation with the Lévy-Lindeberg and Feller-Lindeberg central limit theorems for independent random variables. Each chapter, except Chapter IV, offers a set of exercises that considerably enrich the material presented by the core of the text. Students of mathematics and also those with backgrounds in engineering, finance, etc. may find the book a useful aid to acquiring basic understanding and technical skills in probability. (jste)

Y.Meyer, R.Coifman: Wavelets: Calderón-Zigmund and Multilinear Operators, Cambridge Studies in Advanced Mathematics, vol.48, Cambridge University Press, Cambridge, 1997, xix+314 pp., GBP 40.00, ISBN 0-521-42001-6

The new theory of Calderón-Zygmund operators is fully described, in particular so-called paradifferential operators and the Cauchy kernel on Lipschitz curves, and their connection with wavelet bases is explored. These operators are very different from the "historical operators" studied by Calderón and Zygmund in the 1950s and 60s. Calderón-Zygmund operators have a special relationship with wavelets and with classical pseudo-differential operators, of which they are a remarkable generalisation. Sparse matrix representation of these operators can be given in terms of wavelet bases which have important applications in, for example, image processing and numerical analysis. This book consists of ten chapters (Chapters 7-16). In Chapters 7 to 11, the Calderón-Zygmund operators are completely and autonomously explained. Multilinear analysis is one route into the non-linear problems studied in Chapters 12 to 16. This route is only possible for those non-linear problems with a holomorphic structure, enabling them to be decomposed into a series of multilinear terms of increasing complexity. A. Calderón was the pioneer of this method of attack, and some of the examples the authors give here are part of his programme. The first part of this book may be read directly, assuming only the results about wavelets quoted in the introduction to the first five chapters. Finally, the reader can go straight to Chapters 12, 13, 14, 15, or 16,

because each of them forms a coherent account of a subject of independent interest (complex analysis, holomorphic functionals on Banach spaces, Kato theory, elliptic partial differential equations in Lipschitz domains, and, lastly, non-linear partial differential equations). The thread linking these different themes is the use of wavelets in Calderón's programme in operator theory. The books *Wavelets and Operators* and *Wavelets: Calderón-Zygmund and Multilinear Operators* have been written at a level appropriate for first-year postgraduates, and the authors have tested them in France, and in the U.S.A, on various audiences of mathematicians and engineers. Written by two of the leading experts in the area, this book will be an essential purchase for all interested in wavelets. (knaj)

R.L.Borelli, C.S.Coleman: Differential Equations. A Modelling perspective. Preliminary Edition, J.Wiley & Sons, Inc., New York, 1996, xv+647 pp., GBP 40.00, ISBN 0-471-04181-5

This book is another textbook covering one of the most important topic of mathematical analysis - differential equations. Two basic principles are emphasized in this text: mathematical modelling and graphical visualisation. From this latter point of view, there is an interesting Appendix D - an Atlas of graphs of solutions of differential equations, which helps students understand the properties of these solutions. The authors introduce numerical methods for the solution of differential equations almost at the beginning of this book to give students an early opportunity to examine the solutions. Simple systems of differential equations are also introduced very early because the difficulty of solving these systems with the computer is the same as the difficulty of solving a single differential equation. The theory, which appears throughout the text, is basic and includes only short proofs; longer proofs are given in Appendix A. The text contains many problems and projects for a group of students. Answers to chosen problems are included at the end of the book. Some of the problems require the use of a computer (and are marked in the text), but no special computer program is presumed. The book is recommended to everybody. (mli)

Vy Khoi Le, K.Schmitt: Global Bifurcation in Variational Inequalities. Applications to Obstacle and Unilateral Problems, Applied Mathematical Sciences, vol.123, Springer-Verlag, New York, 1997, xiv+250 pp., 22 fig., DM 88.00, ISBN 0-387-94886-4

In the book the theory of global bifurcations in variational inequalities based on the topological methods is systematically explained. To cope with the differences between bifurcation problems for equations containing smooth operators and variational inequalities, the authors must overcome the problem of associating a simpler variational inequality to the original. For this they introduce the concept of homogenised inequality. The next problem is to determine the relationships between respective topological degrees and how to calculate them. Another group of problems arises when studying bifurcations from infinity. Chapters 3, 4 deal with bifurcations in Hilbert space. The abstract results are applied to obstacle problems for elliptic operators and to unilateral problems for plates and beams. In Chapter 6, the bifurcations in Banach spaces are studied. The results are applied to inequalities containing the p-Laplacian. Chapters 5 and 7 contain the theory of bifurcations from infinity and its applications. The book will be of interest to graduate students and researchers working in nonlinear analysis, partial differential equations and continuum mechanics. (oj)

M.Aschbacher: 3-Transposition Groups, Cambridge Tracts in Mathematics, vol.124, Cambridge University Press, Cambridge, 1997, vii+260 pp., GBP 35.00, ISBN 0-521-57196-0

A 3-transposition group is a group generated by a set of involutions that is closed under conjugation and satisfies the condition that a product of two involutions has order 1, 2 or 3. Three sporadic groups are 3-transposition groups and were discovered by B. Fischer, who classified all finite 3-transposition groups that are almost simple. This classification is presented in the first two fifths of Aschbacher's book, and this part of the book does not require much background. However, the existence of the 3-transposition sporadic groups is established much later, by identifying $M(24)$ in the Monster. The book is a part of the programme of a unified approach to sporadic groups and is a continuation, in certain sense, of Aschbacher's preceding book Sporadic groups. The 3-transposition sporadic groups are thus characterized by centralisers of involutions with extraspecial generalised Fitting subgroup, and their local structure is studied. The book is well written. (ad)

A.Beutelspacher, B.Petri: Der Goldene Schnitt. 2., überarbeitete und erweiterte Auflage, Spektrum Akademischer Verlag, Heidelberg, 1996, 187 pp., DM 48.00, ISBN 3-860-25404-9

This little nice book brings a carefully documented list of different known connections of the Golden section to other mathematical notions. The introductory chapter is devoted to an explanation of the basic notion of the Golden section and related topics. The other nine chapters include not only material on pentagons, Platonic solids, gold spirals, Fibonacci sequences, continued fractions and similar things but also relations to architecture, painting, music and literature are mentioned. This is a useful

book for helping prospective teachers make lectures more interesting; most of the material is accessible at the the secondary school level. (jv)

P.Garrett: Buildings and Classical Groups, Chapman & Hall, London, 1997, x+373 pp., GBP 55.00, ISBN 0-412-06331-X

The book introduces Coxeter groups, chambers, buildings and BN-pairs, and the first half of the book also includes construction of spherical buildings for Coxeter systems A_n, C_n and D_n. Each of the constructions, including the oriflamme one, is presented in detail. The second half of the book is dedicated to affine buildings, and, again, the buildings for $SL(n)$ and isometry groups are fully developed. The author presents all needed material that is not of standard basic nature, and this includes Iwahori-Hecke algebras and discrete valuation rings, and also Perron-Frobenius lemma. This makes the book well suited for readers with little background knowledge and this aspect is further supported by the detailed exposition. (ad)

M.Capinski, N.J.Cutland: Nonstandard Methods for Stochastic Fluid Mechanics, Series on Advances in Mathematics for Applied Sciences, vol.27, World Scientific, Singapore, 1995, xii+227 pp., GBP 44.00, ISBN 9-810-21710-2

The main topic treated in the book are equations of hydromechanics (especially Navier-Stokes equations) with stochastic perturbations. New techniques, based on nonstandard analysis, and new results proved by the authors are presented here. The results are formulated standardly in the conventional Hilbert space setting of the Navier-Stokes equations. The Chapters 4 and 5 treat weak solutions and statistical solutions of Navier-Stokes equations, Chapters 6 and 7 discuss stochastic Navier-Stokes equations and statistical solutions of stochastic Navier-Stokes equations. The last chapter is devoted to the study of the Euler equation. The power of nonstandard methods can be demonstrated by comparison of the results proved for solutions of general stochastic Navier-Stokes equations by Bensounssan and by the authors (both obtained in 1991). Bensounssan proved an existence theorem for the space dimension 2 and the authors for the dimension 3. They were able to prove, moreover, the existence of solutions under weaker assumptions and with better regularity. Basic nonstandard tools that are needed for understanding of the explanation are presented in a self-contained introduction in the Chapters 2 (Nonstandard Preliminaries) and 3 (Loeb Measures and Integration Theory). Standard Preliminaries - functional analysis and stochastic analysis - can be found in the Chapter 1. The book is an all-round good presentation of the subject matter. (joml)

I.Anderson: Combinatorial Designs and Tournaments, Oxford Lecture Series in Mathematics and Its Applications, vol.6, Clarendon Press, Oxford, 1997, xi+237 pp., ISBN 0-198-50029-7

This is a considerably revised version of the book *Combinatorial Designs* by the same author published by Ellis Horwood in 1990. The book itself has two aims, i.e.:

(i) to present some of the basic material on block designs and orthogonal Latin squares, emphasising in particular methods of constructing cyclic examples by means of difference systems;

(ii) to give an account of the construction of league schedules, tournaments with various balance requirements and bridge/whist tournaments.

It should be noticed that much of the material is accessible in book form for the first time, and of particular interest is the way that the author uses combinatorial designs and orthogonal latin squares for the construction. The book is not aimed at design theory researchers. It is, rather, aimed at students, both undergraduate and postgraduate, and professional mathematicians who wish to learn about the subject and then pass that knowledge to students. References are given throughout and it is hoped that the frequent references to the nineteenth-century mathematicians Kirkman, Anstice and Moore will help the reader to view the subject as one with a long and fascinating history. (jant)

L.Salem, F.Testard, C.Salem: The Most Beautiful Mathematical Formulas. An Entertaining Look at the Most Insightful, Useful, and Quirky Theorems of All Time, J.Wiley & Sons, Inc., New York, 1997, xiii+141 pp., GBP 11.99, ISBN 0-471-55276-3, ISBN 0-471-17662-1

A translation of the French book written by a mathematician (T.F.) in collaboration with a theoretical chemist specialising in the popularisation of science to the public and his daughter — who is an artist having a degree in graphic design. The book is aimed at attracting people with a very low level of knowledge in mathematics. Short stories (sometimes different from the most popular ones like that of Archimedes' "Eureka!") are intended to make the text more readable. The choice of formulae which have to be understood in a very broad sense (prime numbers are indivisible, $\pi \approx 355/113$ or Königsberg bridges are included) is determined by the taste of the author(s). The short chapters of the booklet are independent of each other and of widely varying difficulty. The stories involve almost 20 real characters; brief data about them are provided on 6 pages at the end of the brochure. Nice accompanying pictures form a substantial part of the chapters which mostly consist of two pages each. Good for youngsters but certainly not for serious information about the formulae included. (jv)

S.K.Stein: Strength in Numbers. Discovering the Joy and Power of Mathematics in Everyday Life, J.Wiley & Sons, Inc., New York, 1996, xiii+272 pp., GBP 19.99, ISBN 0-471-15252-8

The book consists of three parts of which perhaps the first is the most generally interesting. The author touches on the problems of anticipation of numbers and mathematics by every citizen, no matter what their profession. The prejudice toward numbers, the misuse of numbers in influencing public opinion, what statistics can and what they cannot tell, myths about mathematics and mathematicians, how pure mathematics becomes applied and what mathematics is really applied to at present in various occupations in America, and how the reforms of mathematics education have contributed (and contribute) to the significance of mathematics education for the everyday life - all these topics are discussed in the first part. In the second part, named "From High School to Kindergarten" the author approaches several problems from secondary-school mathematics in a spirit close to that of constructivism, whilst pointing to the weak points (or possible mishaps) of this approach, where this is necessary. The crucial role in this and the last part (named "Closer and Closer") of the book is played by the concept of a geometric sequence, the sum of the first finite number of terms and the sum to infinity. The geometric series is then used to solve problems in banking, to measure the steepness of a curve, to evaluate the area under parabola or to find the value of π. Through all the book the reader can find any number of interesting original methods for attacking mathematical problems with special attention paid to the aesthetical impact of the method used. On many occasions, the author presents his own opinions and judgements. They need not be always entirely correct, but they always are the interesting outcomes of the thoughtful considerations of a, competent, wise and experienced man. (jtro)

S.D.Chatterji: Course d'Analyse. Volume 2, Analyse complexe, Presses Polytechniques at Universitaires Romandes, Lausanne, 1997, xx+536 pp., sFr 92.00, ISBN 2-880-74346-X

This is the middle part of a three volume Cours d'Analyse taught at Ecole polytechnique fédérale de Lausanne for "futurs ingénieurs mathématiciens et physiciens". While the first volume called Vector analysis is devoted to differentiation and integration, the present volume develops in 500 pages a very detailed exposition of the theory of functions of one complex variable. The arrangement of the material is traditional: complex differentiation, holomorphic functions defined by power series, the Cauchy theorem and the Cauchy formula, the theorem on residues with applications, general properties of holomorphic functions, harmonic functions, various representations of holomorphic functions, conformal mappings. There is also a short chapter on Riemann surfaces and a section on continuous fractions, the concept not covered by most textbooks on complex functions. A nice feature of the book consists of the inclusion of topics of classical analysis, e.g. Bessel functions, Bernoulli numbers, special polynomials, double periodic functions, gamma function, zeta function (accompanied by comments on prime number theorem), conformal mapping and the Dirichlet problem etc. Numerous exercises, historical notes, applications of the theory to problems of "hard analysis", a detailed style of exposition, a large amount of material is covered — this all makes the textbook attractive for both students and teachers. (in)

A.Beauville: Complex Algebraic Surfaces. Second Edition, London Mathematical Society Students Texts, vol.34, Cambridge University Press, Cambridge, 1996, ix+132 pp., GBP 13.95, ISBN 0-521-49510-5, ISBN 0-521-49842-2

The aim of the book is to present the Enriques classification of complex algebraic surfaces with proofs, but in a relatively elementary way. It is written as a textbook for students familiar with basic algebraic geometry and sheaf theory. The classification is very nicely explained. It begins with ruled and rational surfaces followed by surfaces with small Kodaira dimension up to surfaces of general type. One of the main tools of study is Castelnuovo's theorem and some of its consequences, structure of minimal rational surfaces and the uniquenes of the minimal model for non-ruled surfaces. There are many exercises giving the reader possibilities to work with the techniques of the theory and historical notes giving information about the development of the field. In Appendices some related problems are mentioned, such as the classification of surfaces of characteristic p, and also indications for further study and research are given. (jbu)

M.Sewell (Ed.): Mathematics Masterclasses. Stretching the Imagination, Oxford University Press, Oxford, 1997, xvii+233 pp., GBP 14.95, ISBN 0-198-51494-8, ISBN 0-198-51493-X

Mathematics Masterclasses contains the selected lectures of several outstanding university teachers held in the Department of Mathematics at the University of Reading for the mathematics "masterclasses" of mathematically gifted 13 years old secondary-school pupils. Each of 12 chapters is the written version of a challenging lecture showing the use of mathematics in some interesting natural science problem. By ways appropriate to junior secondary-school pupils, young boys and girls get acquainted with the notion of probability, elements of the algebra of complex numbers, limitations

in constructions by compasses and ruler, the mathematics behind weather-forecasting, weighing dinosaurs, and many other interesting things. Each chapter is subdivided into paragraphs, some of which are followed by a list of problems. The solutions are given at the end of each chapter. All but two chapters are accompanied by a bibliography where the reader can find additional, and in most cases more profound, information on the topic discussed in that chapter. Mathematics Masterclasses provides an excellent read for all (regardless of age) interested in mathematics and even more so for those uninterested in mathematics. It can also serve as a very good examplar for those mathematics educators who organise activities (like masterclasses) for youngsters who show an interest in mathematics. (lboc)

A.Pinkus, S.Zafrany: Fourier Series and Integral Transforms, Cambridge University Press, Cambridge, 1997, vii+189 pp., GBP 12.95, ISBN 0-521-59771-4, ISBN 0-521-59209-7

The aim of this book is to introduce the reader to the basic concepts in Fourier series, Fourier transforms, Laplace transforms and their applications. The material was prepared on the basis of a third semester course for students at the Israel Institute of Technology, Haifa. This is a clearly written textbook containing the theory for piecewise continuous functions, solved examples, simple applications to ordinary and partial differential equations, integral equations, signal processing and integration, together with exercises at the end of each section. A knowledge of calculus should be sufficient background, as a chapter on inner product spaces and a short appendix on the residue theorem and Fubini's theorem are included. The book is a good first introduction to Fourier series and integral transforms for students of engineering. (efa)

A.Gardiner: The Mathematical Olympiad Handbook. An Introduction to Problem Solving. Oxford University Press, Oxford, 1997, xii + 229 pp., GBP 14.95, ISBN 0-19-850105-6

This introduction to problem solving is based on the first 32 British Mathematical Olympiads 1965 – 1996. The British Mathematical Olympiad (BMO) has changed its format aand character over the years. For example, the papers set between 1965 and 1974 differ considerably from the most recent papers. Currently the BMO consists of two rounds. This book restricts attention to the problems from the first round, which forms the start of the main process of selecting the United Kingdom team for the International Mathematical Olympiad.

The book consists of three parts. Part I, entitled "Background", provides a basic tool-kit for tackling the problems. Many Olympiad problems do not require advanced mathematics. What they do require is a solid grounding in certain areas which receive less attention in UK school syllabuses than they might. Accordingly, the tool-kit covers Numbers, Algebra, Proof, Elementary Number Theory, Geometry and Trigonometric Formulae. Part I concludes with "Some books for your bookshelf", an extensive list of excellent resources ranging from classic school textbooks of a bygone era to the latest collections of problems. The author provides a brief comment on each item listed.

Part II presents the problems from the first 32 BMOs, but in reverse order with the 32nd first and the 1st last! This idiosyncrasy can be justified by the fact that, as mentioned above, the latest papers are much more typical of a mathematical competition than the early ones, which were closer in spirit to standard school examination papers.

Part III provides Hints and Outline Solutions for the papers back to 1975, the others being omitted, again for the reasons indicated above. In each case, the outline solution consists of a number of steps. Some of the steps are in the nature of hints to nudge the reader in the right direction. Others require the reader to fill in blanks to obtain a detailed solution. The reader who uses Part III sensibly will end up with a full solution for eac problem, obtained only after some effort. Sometimes there is more than one method. In all cases, the reader will get a feel for the problem and how it relates to other problems in the book (or elsewhere).

For the last 10 – 15 years Tony Gardiner has been the dominant figure on the UK Olympiad scene. He has strong views, some of which appear at various stages in the book. In particular, able students " require a diet which goes beyond mere textbook exercises and examination questions". He expresses hope that the book will introduce such pupils to "a new world of challenging mathematical problems", as well as convincing *teachers* that the problems are not actually as daunting as they might appear at first sight. There is no doubt that the author's hope will be amply fulfilled. This book should be in the library of every secondary school, college and university. (acm)

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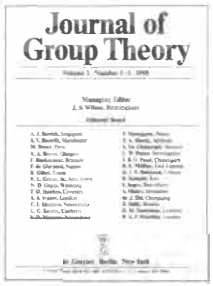

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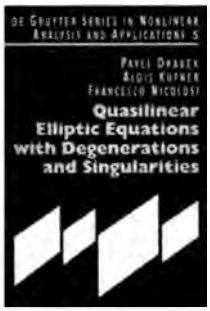

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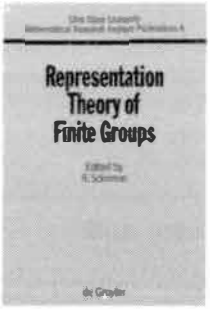

6 Representation Theory of Finite Groups

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