European Mathematical Society

June 1998 *Issue 28*

ISNN = 1027 - 488X

Produced at the Department of Mathematics, Glasgow Caledonian University

NEWSLETTER

de Gruyter Proceedings

Number Theory

Diophantine, Computational and Algebraic Aspects

Proceedings of the International Conference held in Eger, Hungary, July 29–August 2, 1996

EDITED BY KÁLMÁN GYŰRY • ATTILA PETHŰ • VERA T. SÓS

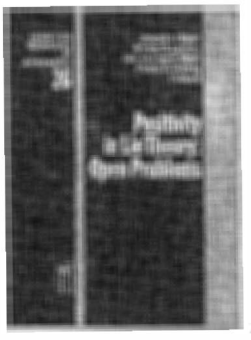
1998. 24 x 17 cm. XVII, 595 pages. Hardcover.
DM 348,–/öS 2.540,–/sFr 310,–/approx. £ 119.00
• ISBN 3-11-015364-5

These proceedings contain 41 selected and refereed research and survey articles based on lectures delivered at the International Conference on Number Theory held in Eger, Hungary, July 29–August 2, 1996. A significant part of contributions involve various aspects of Diophantine equations ranging from general effective finiteness theorems to efficient algorithms and numerical results. Other topics covered are Diophantine approximations, transcendence theory and in particular Baker's method concerning linear forms in logarithms, the arithmetic theory of elliptic and algebraic curves, the arithmetic of polynomials and algebraic number fields, the geometry of numbers, linear recurrences and digital expansions. This volume is of interest to researchers and graduate students in applied and computational number theory, computer algebra, and dynamical systems.

de Gruyter Expositions in Mathematics

26 Positivity in Lie Theory: Open Problems

EDITED BY JOACHIM HILGERT • JIMMIE D. LAWSON • KARL-HERMANN NEEB • ERNEST B. VINBERG



1998. 24 x 17 cm. XII, 290 pages. Hardcover.
DM 258,–/öS 1.883,–/sFr 230,–/approx. £ 88.00
• ISBN 3-11016112-5

Contents:

Prices are subject to change

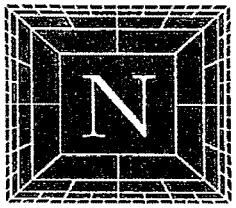
WALTER DE GRUYTER GMBH & CO
Genthiner Straße 13 · D–10785 Berlin
Tel. +49 (0)30 2 60 05–0
Fax +49 (0)30 2 60 05–251
Internet: www.deGruyter.de

de Gruyter
Berlin · New York

ISSN 1027 – 488X

CONTENTS

EUROPEAN MATHEMATICAL SOCIETY



NEWSLETTER No. 28
June 1998

Produced at the Department of Mathematics, Glasgow Caledonian University
Printed by Armstrong Press, Southampton, UK

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.

Editorial: The European Mathematical Information Service

Peter W. Michor
Secretary of the European Mathematical Society

A description of EMIS

If you open the internet address

`http://www.emis.de`

you will see the homepage of the European Mathematical Information Service (EMIS), by courtesy of the EMS. If the download is slow you may click on one of the mirror sites nearer to you. They are listed on the left hand margin. Copies of EMIS can now be found in more than 30 mirror sites throughout the world, in all continents with the exception of the Antarctic. The main server is in Berlin and is maintained by the Zentralblatt team of 'Fachinformationszentrum Karlsruhe'. EMIS was implemented by Bernd Wegner and Michael Jost in the year 1995.

In EMIS you can find information on **Activities** of the European Mathematical Society, lists of all its corporate members, you can search for individual members, and browse through a list of all committee members of the EMS.

The main part of EMIS is the **Electronic Library of Mathematics** (ELibM), with its sections 'Journals', 'Conference Proceedings', and 'Monographs'. At this time the journals section contains more than 26 freely accessible mathematical journals, some are selectronic versions of printed journals and others purely electronic journals. Among them you can find the Mathematics section of the Annals of the Finnish Academy of Science, the New York Journal of Mathematics, and the DOCUMENTA MATHEMATICA (Journal der Deutschen Mathematiker Vereinigung) in which the proceedings of the next Congress of Mathematicians (Berlin 1998) will appear as special volumes. The guidelines for mathematical journals and proceedings volumes to be included in the electronic library of Mathematics can be seen at

`http://www.emis.de/journal-requirements.html`

It contains some interesting statements on scientific publishing in a time of dramatically rising costs, and it addresses questions of copyright, archiving, permanence, and fair use. The electronic library shows that, in the electronic age, low cost scientific publishing is again possible. Surprisingly (or not so surprisingly), none of the journals which offer electronic versions in the electronic library has felt any decline in subscriptions. On the contrary, some journals report even a modest increase. It is my belief, that a fairly priced journal which is widely visible in a freely accessible electronic library such as ours, will not have difficulties in the future and will be able to continue to serve the mathematical community. Editors of journals are cordially invited to consider participation in the electronic library.

EMIS provides direct **electronic access** to the online servers of 'MATH-Zentralblatt'. For requests made by any user, the first three answers are free of charge. For more than three answers your institution needs a subscription to Zentralblatt. The database MATH-Zentralblatt is now available in at least three mirrors (Copenhagen, New York, Strasburg). There is also direct **electronic access** available to the electronic version of 'Zentralblatt für Didaktik der Mathematik'.

As any good server, EMIS offers also a list of Mathematical 'links' which should ideally contain all internet servers of mathematical institutions. The main part of this is mirrored from the service offered by Pennsylvania State University, but this list is not updated any more. We are trying to find a European institution willing to maintain such a list.
The server of the **International Mathematical Union** is mirrored in EMIS. The direct address is

`http://www.emis.de/EMIS/mirror/IMU/`

Here one finds interesting information on the history of IMU, on International Congresses of Mathematicians, and on Fields medal lists.
A currently small but important service in EMIS is the '**Euromath-Job**' that publishes open positions for mathematicians by linking to national servers.

Future plans for EMIS

A new mathematical data base to be called CAP-EMS (Current Awareness of Mathematical Publications of the European Mathematical Society) will soon be launched in EMIS. It will have two basic aims. Firstly, it will provide summaries of all articles to appear in the most recent numbers of mathematical journals (hopefully often prior to the actual publication of these journals). Secondly, the summaries of all articles from the participating journals will be stored in the data base

MATH-Zentralblatt, as extra, early information to complement the usual reviews written by independent specialists. The implementation of this service is difficult because for the moment data come in many different formats.
Work continues for an integrated information interface to be offered in EMIS in the future. This is developed in the project EULER (European Libraries and Electronic Resources in Mathematical Sciences) which is supported by the European Union in its 'Telematics for Libraries' sector. The aim of the project is to provide access to mathematical publications in a strictly user-oriented way. It intends to offer a 'one-stop shopping site' for users interested in Mathematics. Different types of relevant resources such as bibliographic databases, library online public access catalogues, electronic journals from academic publishers, online archives of preprints and grey literature, and indexes of mathematical internet resources will be made interoperable by the use of a common protocol, the so called Dublin Core based Metadata description. A common user interface—the EULER Engine—will assist the user in searching for relevant topics in different sources in a single effort. The EULER system will be designed as an open, scaleable and extensible information system, which will integrate payment (document delivery at libraries, commercial information providers, scientific databases like MATH, commercial electronic journals) and free services (library online public access catalogues, preprint and other Internet servers, and some free electronic academic journals) for mathematicians.

In connection with the EULER development efforts, a decentralised universal preprint server system is under construction, see:

`http://www.mathematik.uni-osnabrueck.de/harvest/brokers/FraGer/`

At the same location, `stats.html` contains the statistics of this system.

In a project sponsored by 'Deutsche Forschungsgemeinschaft' the contents of 'Jahrbuch über die Fortschritte der Mathematik (1868–1943)' will be digitised and enriched by evaluations. See

`http://www.emis.de/projects/JFM/`.

for more information. Moreover the relevant part of the literature will be scanned and linked to this new database.

Other mathematical information services

Here I want to indicate some other services which are freely available or are offered at low cost for the end-user.
One of the most active preprint servers is the one which was started by Alan Ginsparg in the year 1992 for high energy physics. In January 1998 it was enhanced by a renovated mathematics section. See

`http://xxx.lanl.gov/archive/math`

and 14 mirrors worldwide. Mathematical preprints are classified in 30 fields, though unfortunately not according to our (by now fairly universal) MSC-scheme.

A service offering scientific journals online is JSTOR (Journal Storage),

`http://www.jstor.org/`

which is suported by the Mellon Foundation. Complete runs of important journals for different subjects in science and humanities are there stored as pictures, with abstracts and bibliographical data as text. In Mathematics, one finds the Annals of Mathematics and the journals of the American Mathematical Society and of the Society for Industrial and Applied Mathematics.

Conclusion

If one asks a mathematician about the most pressing problems of Mathematics today, and if he is not from a major centre having access to good libraries, the chances are good that he or she will point to the seriously rising costs of publications and increasingly difficult access to literature. The European Mathematical Society is trying to be active in this field, and the electronic library in EMIS is one of its contributions towards solving this problem. Of course EMIS depends on the volunteer work of many people—editors, referees, technical managers of journals, editors of proceedings—and a lot on the work done at the central server in Berlin. We must be grateful to all of them.

EMS AGENDA

1998

June 5–6
Third Diderot mathematical Forum, *"Mathematics as a Force of Cultural Evolution"* in Berlin (Germany), Florence (Italy) and Kraków (Poland)
(*Contact*: Mireille Chaleyat-Maurel, mcm@ccr.jussieu.fr)

June 29–July 10
EMS Summer School in Orsay (France) in Applied Mathematics *"Wavelet Methods in Analysis and Simulation"*.
Organiser: A. Cohen (University Paris 6, France)
(*Contact*: Mme Butin, butin@asci.fr) (*Information*: EMIS, http://www.emis.de)

July 1
Deadline for submission of information or papers to the September issue of EMS Newsletter. The deadline has been moved to July 1st in order to have this issue available during ICM 98.
(*Contact*: Martin Speller, msp@gcal.ac.uk)

July 27–August 14
EMS Summer School in CLUJ (Romania) in Pure Mathematics *"Spaces with Singularities and Monopoles"*.
Organiser: N. Teleman (Ancona, Italy)
(*Contact*: N. Teleman, teleman@anvaxi.uniam.it) (*Informations*: EMIS, http://www.emis.de)

August 18–27
EMS booth at the International Congress (ICM98) in Berlin (Germany)
Launching of JEMS (the Journal of EMS) at ICM98
Executive Committee Meeting in Berlin (Germany)

August 28–29
EMS Council in Berlin (Germany) hosted by the Deutsche Mathematiker Vereinigung. The Council will take place at the Humboldt University (Unter den Linden 6, 10099 Berlin) and will start at 10 a.m. on Friday.
Election of the President, a Vice-President, the Treasurer, the Secretary, EC members.

November 15
Deadline for submission of information or papers to the December issue of EMS Newsletter
(*Contact*: Martin Speller, msp@gcal.ac.uk)

November, 28–29
Executive Committee Meeting in Copenhagen (Denmark)

1999

EMS Lectures 3, "Real and Complex Dynamics"
The lecturer will be Professor M. Lyubich, from SUNY Stony Brook (USA). The lectures will be given at Barcelona, St.Petersburg and TU Denmark.

December 3–4
DMF "Mathematics and Music" in Lisbon (Portugal), Paris (France) and Vienna (Austria)
(*Contact*: Mireille Chaleyat-Maurel, mcm@ccr.jussieu.fr)

2000

July 10–14
Third European Congress of Mathematics (3ECM) in Barcelona (Spain)
(*Contact*: S. Xambo-Descamps, sxd@grec.upc.es)

EUROPEAN MATHEMATICAL SOCIETY

Meeting of the Executive Committee
Helsinki (Finland) March 21–22, 1998

SCIENTIFIC ACTIVITIES

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

The Scientific Committee met in Barcelona in October: the structure of the congress is taking shape. The members of the round tables and prize committees will be proposed before the Berlin EC meeting.
3ECM will be advertised in the EMS booth in Berlin where a computer terminal will allow pre-registration for the congress.
Information: on the Web (`http://www.iec.es/3ecm/`)

Diderot Mathematical Forums

DMF3, Mathematics as a Force of Cultural Evolution (June 5-6 1998)

The third Diderot Mathematical Forum "Mathematics as a Force of Cultural Evolution" will be held on June 5–6 1998 in Berlin (Organisers: Jochen Brüning and Eberhard Knobloch), Florence (Organiser: Enrico Giusti) and Kraków (Organiser: Andrzej Pelczar).
Information: EMIS (`http://www.emis.de`)

DMF4, Mathematics and Music (December, 1999)

The fourth Diderot Mathematical Forum "Mathematics and Music" will be held in December, 1999 in Lisbon (Organiser: José-Francisco Rodrigues), Paris (Organisers: Gérard Assayag and Laurent Mazliak) and Vienna (Organiser: Hans G. Feichtinger).
Contact: Mireille Chaleyat-Maurel (`mcm@ccr.jussieu.fr`)

EMS Lectures 3 (1999)

Professor M. Lyubich, from SUNY Stony Brook, USA, will be the 1999 EMS lecturer with the subject "Real and Complex Dynamics". The lectures will be given at Barcelona, St. Petersburg and TU Denmark.
Contact: Peter Michor (`michor@esi.ac.at`)

Summer Schools

Summer Schools 1998

"Wavelet Methods in Analysis and Simulation" (June 29–July 10 1998)

This Summer School in applied mathematics will be held in Orsay (France) and is organised by A. Cohen from Paris.

"Spaces with Singularities and Monopoles" (July 27–August 14 1998)

This Summer School in pure mathematics will be held in Cluj (Romania) and is organized by N. Teleman from Ancona (Italy).

Contact: Giovanni Monegato (`monegato@itopoli.bitnet`) *Information*: EMIS (`http://www.emis.de`)

Journal of EMS (JEMS)

The launching of JEMS will be at the Berlin ICM.
Contact: Carles Casacuberta (`casac@manwe.mat.uab.es`)

Zentralblatt für Mathematik/MATH-Zentralblatt

Databases can be included in the Fifth Framework Programme. The member of the European Parliament in charge of this Programme has been contacted and a one page note should be prepared. The Jahrbuch project of re-keyboarding the older material from 1868 up to now is on the road: 120 volunteers are evaluating the material.
It was agreed that the title of the new product is to be MATH-Zentralblatt and the CD-rom must have the same name MATH-Zentralblatt.
Contact: Berndt Wegner (`wegner@math.tu-berlin.de`)

INFORMATION SERVICES

Server (EMIS)

EMIS has now 32–33 mirrors, including one in Bogota and one in Japan. The server contains 25 journals, with agreements made with 45 journals, including Documenta Mathematica, implying that the Proceedings of ICM98 will be in the server.

Euro-Math-Job

Sigmundur Gudmundsson from Lund has started the Euro-Math-Job service on EMIS as links between the home pages of different societies containing job advertisements. It could be one of EMS priorities with the EU/EC. This programme has already induced some countries to set up central servers but still more countries should be persuaded to join. The service as such is working well and it is now visible: acknowledgments are due to S. Gudmundsson.
Contact: Peter Michor (michor@esi.ac.at)

The Newsletter

The March Issue presented the new cover and new sections.
A proposal was made to collect articles and statements about the influence of the political changes of the past ten years in Eastern Europe on Mathematics. The presentation of institutes should continue.
The possibility to subscribe to the Newsletter will be investigated: the problems with taxation should be clarified.
Contact: Carles Casacuberta (casac@manwe.mat.uab.es)

Mathematical Press Agency (EMPRESSA)

It is disappointing because the Editors of the main European mathematical Newsletters have not given their articles to EMPRESSA, so its content is empty. The editorial written by the President and the interview of Sir Michael Atiyah, in the March issue of the Newsletter, should be sent to EMPRESSSA.
Contact: Mireille Chaleyat-Maurel (mcm@ccr.jussieu.fr)

RELATIONS WITH EUROPEAN INSTITUTIONS

European Commission

The President, with Luc Lemaire, has paid several visits to the European Commission. The EMS is definitely recognised as a partner and has established good relations with the Commission. EMS has been able to secure EU/EC contracts for the Budapest congress, the Portugal Summer School and the second Diderot Mathematical Forum; there is an application pending for one more Summer School.

European Libraries and Electronic Resources in Mathematical Sciences (EULER)

EULER is a project to be co-funded by the European Commission in the *Telematics for Libraries* sector. 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 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 and indexes of mathematical Internet resources will be made interoperable by using common Dublin Core based Metadata descriptions. A common user interface - the EULER Engine - will assist the user in searching for relevant topics in different sources in a single effort.

Contact: Peter Michor (michor@esi.ac.at)

EMS COMMITTEES

Electronic publishing committee

In this committee there is a continuing discussion about the stability of TEX and other formats. The aim is to write a letter to the development teams for TEX to the effect that backwards-compatibility is essential for any dialect of TEX for the sake of accessibility of archived material; opinions in the committee are divided.
Contact: Peter Michor (michor@esi.ac.at)

ERCOM

A meeting of ERCOM was held at the beginning of March. A description of centres will be drawn and presented to the EMS EC at the next meeting. The list of proposed members should be received. The eligibility of centres is decided by the EMS Executive Committee after consultations with ERCOM.

LIFE OF THE SOCIETY

Membership

Corporate Membership
The applications of the Real Sociedad Matematica Espanola and the Sociedad Espanola de Matématica Aplicada to become corporate members of EMS were forwarded to the Council with recommendation for approval.
Some other points discussed were the possibility of EMS helping to establish links betwen member societies, giving information about societies, finding general common projects, and widening joint co-operation.

Individual Membership
The scheme by the Zentralblatt for its reviewers to join EMS has worked out very well: more than 100 new members have joined through it.
Individual membership should be encouraged and new ways to attract members should be found.

Council 1998

Delegates of individual members
The following delegates of individual members were declared elected as delegates for the years 1998–2001 without ballot as there were fewer nominations than seats available: Manuel Castellet (Barcelona, Spain), George Jaiani (Tbilisi, Georgia), Marina Marchisio (Torino, Italy), Peter Michor (Vienna, Austria), Vitali Milman (Ramat-Aviv, Israel), Jan Slovak (Brno, Czech Republic).

Presence of the EMS at ICM98

EMS will share a booth with Zentralblatt. Special events to be arranged during the ICM include the launching of JEMS.
EMS could provide a framework of publishing for member societies: can they join efforts in publishing, advertising, distribution, to be announced before Council, at a meeting in Berlin. Definite questions to be discussed at a possible meeting in Berlin are:
1. well-defined attitude to electronic publishing; 2. joint efforts for advertisement; 3. production - joint agreements with printer. The plan is to exchange ideas, share experience and provide frameworks for further co-operation. It was agreed that a letter will be written inviting persons interested in publishing to a meeting dealing with the questions mentioned above.

NEXT MEETINGS

- Berlin, August 25, 1998
- Copenhagen, November 28-29, 1998

An Interview with Jacques-Louis Lions,

Professor at Collège de France,
President of the Académie des Sciences de Paris
Jean Pierre Bourguignon, E.M.S. President

1) JPB : *Jacques-Louis Lions, une bonne partie de vos travaux ont porté sur l'utilisation de techniques d'analyse fonctionnelle abstraite en vue de la résolution d'équations aux dérivées partielles. Lorsque vous regardez aujourd'hui cette épopée, comment appréciez-vous le chemin parcouru, les perspectives pour l'avenir proche? Selon vous quel a été le rôle de la disponibilité de puissants moyens de calcul dans le développement de ce domaine?*

JLL : Avant de répondre, je relève dans la formulation de la question une petite erreur, classique chez les mathématiciens purs. Elle laisse en effet entendre que *"les techniques d'analyse fonctionnelle abstraite"* existent avant toute chose... En général, les méthodes n'existent pas. L'expression *"mathématiques appliquées"* est une terminologie impossible, car elle a la connotation qu'on ne fait qu'appliquer des mathématiques qui existent par ailleurs. Ce n'est pas comme ça que ça marche.
Disposer de puissants moyens de calcul pour traiter de problèmes venant de l'industrie est à la fois un atout énorme et en un certain sens peu de choses : c'est énorme en ce sens que ça donne la motivation, le courage d'attaquer des problèmes qu'autrement on n'attaquerait pas ; au fond ça donne un filet. Quand un industriel vient avec telle ou telle question, impliquant des matériaux d'une complexité diabolique, avec des trucs qui se joignent partout, par exemple des problèmes de rivets ou de corrosion dans un avion, alors là les problèmes mathématiques sont d'une complexité telle que, si on n'avait pas d'une part la motivation industrielle et d'autre part les ordinateurs, on dirait écoutez, faites-les vous-même, c'est trop compliqué. Et alors, comme des acrobates qui ne feraient pas les prouesses qu'ils font s'il n'y avait pas un filet, on s'y colle. De ce point de vue c'est énorme.
Mais par certains côtés, cela ne compte pas beaucoup dans le résultat final. Tout cela dépend de la façon dont on évalue le résultat final, car le but ultime de tout mathématicien appliqué ou non, c'est quand même d'arriver à quelque chose d'aussi net et clair qu'il est possible et, à la limite, d'obtenir des idées transmissibles indépendamment de l'ordinateur. Donc, à ce moment-là on a une responsabilité assez étrange, qui consiste à dire à un certain stade à l'industriel client qu'il fait ce qu'il veut du résultat numérique,... et on espère qu'il en fasse bon usage, et puis nous, si on pense qu'il y a dans ce travail des idées profondes à l'œuvre, nous voulons nous débarasser de l'ordinateur.

JPB : *Vous n'avez pas parlé des perspectives pour l'avenir proche. Par exemple est-ce que les problèmes non-linéaires amènent quand même à découvrir des territoires mathématiques complètement nouveaux.*

JLL : C'est toujours cette histoire de filet. Il y a tellement de problèmes d'une complexité absolument extraordinaire qui nous arrivent tous les jours. Grâce à l'ordinateur, des gens qui ne sont pas des mathématiciens, mais de bons scientifiques, qui auparavant n'auraient jamais songé à modéliser savent que maintenant il y a un grand frère qui peut les aider. La seule question est : *"Que va-t-il se passer pour les sciences de la vie... L'épopée qui se passe depuis l'éternité va-t-elle recommencer avec les sciences de la vie?"* Ce n'est pas évident. Certains disent que oui, mais pour l'instant ce sont surtout des questions de tri qui ont été considérées et, je crois, qu'elles n'ont pas encore changé ni les mathématiques ni l'informatique.

JPB : *Et ça pourrait arriver?*

JLL : L'avenir le dira.

2) JPB : *Vous avez été un des mathématiciens qui, en France, a le plus contribué à ce que la modélisation de situations issues des problèmes de l'ingénieur soit prise en compte substantiellement par les mathématiciens. Quels sont selon vous les plus grands défis que ces domaines vont poser aux mathématiciens dans l'avenir immédiat? En vous projetant dans le futur, comment voyez-vous les relations entre l'informatique et les mathématiques?*

JLL : Je ne me pose pas vraiment ces questions, parce que, lorqu'on travaille sur des problèmes en liaison avec des applications, on est vraiment en contact avec des gens qui veulent des réponses à des questions qui n'appartiennent pas à une discipline plutôt qu'à une autre. Pour eux, ce qui compte ce n'est pas que ce soit un problème mathématique, mais une solution constructive. Le plus grand défi posé aux mathématiciens et aux informaticiens, et je dirais à tout le monde, est de savoir travailler dans un groupe. Devant un problème industriel complexe, (comme la commission d'analyse et d'enquête sur un échec spatial par exemple), on a besoin de tous les spécialistes, de l'informatique à la modélisation jusqu'aux mécaniciens pointus, et la grande difficulté est d'arriver à travailler ensemble et ça les mathématiciens, je crois, ont intérêt à apprendre à travailler dans ce sens.

JPB : *Ils ont du retard?*

JLL : Je pense qu'ils ont du retard, et notamment, du côté des mathématiciens dits purs. Je suis sûr qu'il y a des trésors potentiels d'applications possibles, qu'eux-mêmes seraient intéressés à y participer mais que pour cela il faudrait qu'ils aient la patience d'écouter des trucs mal dégrossis, ce que le plus souvent ils ne savent pas faire, parce qu'ils ne supportent pas que ce soit aussi peu clair. C'est typique dans la physique de l'atmosphère : les principales difficultés sont à nouveau aux interfaces, par exemple pour l'étude de la végétation, entre la physico-chimie et les sciences de la vie, ...

JPB : *Est-ce que cela veut dire, par exemple, que les modèles mathématiques dont on dispose aujourd'hui sont d'une certaine façon aussi bien établis que le sont des modèles d'un certain nombre de sciences classiques.*

JLL : Il faut s'habituer à travailler sérieusement dans des conditions qui peuvent apparaître pour des mathématiciens qui viennent des mathématiques fondamentales comme des situations un peu floues ; il est vrai que la modélisation des conditions aux limites aux interfaces entre l'océan et l'atmosphère par exemple n'est rien à côté de l'interface entre l'atmosphère et la forêt. Que font les modèles maintenant? ils forcent, comme ils disent, l'un par l'autre c'est-à-dire ils résolvent le modèle global physico-chimique et à partir de ces données, évaluent l'effet possible sur la forêt. Si la forêt disparaît, l'albedo change par exemple. Alors du coup, il faut corriger le modèle.
Ce n'est pas très satisfaisant bien sûr et cela peut être la source de nouveaux problèmes.

3) JPB : *En 1992 vous avez été l'initiateur de l'opération qui a conduit l'UNESCO à reconnaître l'an 2000 comme Année Mondiale des Mathématiques. J'imagine que vous suivez avec curiosité les différentes initiatives qui se mettent en place dans ce cadre. Pourriez-vous dire si elles correspondent à votre vision initiale de l'événement ou si vous pensez que certains aspects ne sont pas développés comme ils devraient l'être? En d'autres termes pensez-vous que les mathématiciens se saisissent de la chance qui leur est donnée de présenter les différentes facettes de leur discipline au public le plus large?*

JLL : Je suis très favorablement impressionné. La vision initiale était de dire : on va faire ce qu'on peut. Et le départ a été plutôt laborieux. En effet le premier problème est venu de ce que l'UNESCO ou moi, je ne sais pas, l'un au moins des deux avait perdu le papier. Il a été retrouvé grâce à Angelo Marzollo, et l'insistance de Mireille Chaleyat-Maurel. Le lancement a eu lieu en 92, et j'avais anticipé que le démarrage serait difficile, mais pas à ce point, et donc vers les années 95/96 je me disais : "les mathématiciens, ils ne veulent pas avancer." Et puis maintenant, je trouve que la mayonnaise a pris et cela va au-delà de ce que j'espérais, je dois dire, par le nombre de manifestations annoncées et surtout peut-être plus important que cela, c'est que maintenant toute manifestation nouvelle doit se situer par rapport à cette première initiative. Ce qui montre qu'elle est bien le pivot de l'an 2000. Le défi maintenant, est de savoir ce qu'on fait après? Est-ce qu'on va pouvoir garder la mémoire? Il va y avoir un potentiel énorme de réalisé ; il ne faudrait surtout pas que ce soit un soufflé qui retombe. Il faut donc probablement enregistrer des événements de manière à pouvoir les réutiliser, avoir des expositions itinérantes. Vu le succès, ce serait dommage qu'on ait une foule de manifestations en l'an 2000 et qu'à la fin de l'an 2000 on range tout en disant voilà c'est fini.
Dans une perspective plus mitigée on pouvait espérer plus d'actions pour les pays en développement. C'est une chose extraordinairement difficile. Je sais qu'il y a des idées qui sont lancées de-ci, de-là, par exemple d'avoir un satellite dédié pour l'éducation mais il reste beaucoup à faire.

JPB : *Et à votre avis c'est une chose jouable?*

JLL : Oui, je crois.

4) JPB : *Les mathématiciens n'ont pas été spécialement efficaces pour faire prendre en compte leurs besoins par la Commission Européenne. Selon vous, quelles devraient être leurs priorités dans cette direction?*

JLL : Je crois qu'il faut attendre l'évolution politique. J'ai la réputation d'être un solide anti-européen, ce qui est une réputation que je ne mérite pas, car en fait c'est tout le contraire. Je souhaite une Europe qui marche et ce que j'ai vu m'a désespéré, par le fait qu'il y a trop de technocratie et trop de rigidité. Quand dans un pays il y a des choses qu'on pense mal engagées - à tort ou à raison -, on sait qui il faut aller voir : le Ministre, quel qu'il soit, en général vous reçoit gentiment. Au niveau de l'Europe, je regrette mais je ne sais pas ce qu'il faut faire. Je n'ai pas vocation, moi, à aller voir treize, quatorze ou quinze ministres. Même si on va à Bruxelles, quel va être l'impact sur la marche d'un programme? C'est dans ce sens-là que je suis anti-européen mais je suis un anti-européen constructif.

JPB : *Et pour vous quel est l'avenir politique?*

JLL : Ça ne peut que s'améliorer. La génération suivante aura à choisir en fonction de l'évolution politique. et pour les mathématiques une génération c'est dix ans. Avec l'EURO, tout devrait s'accélérer.

5) JPB : *En France vous avez été un des premiers à mettre en place des relations contractuelles entre des entreprises et les structures de recherche dont vous aviez la responsabilité. Comment voyez-vous le développement futur de relations de ce type?*

JLL : Oui. Le premier, je ne sais pas mais j'ai contribué à mettre en place de telles relations, et dans des conditions très précises qu'il ne faut pas oublier. La première c'est la transparence absolue, c'est-à-dire que lorsque quelqu'un est conseil dans une société ou travaille en liaison avec une entreprise, ou que le laboratoire a un contrat avec une société, cela doit être transparent. Éventuellement, il peut y avoir des clauses de confidentialité, mais le fait que tel groupe travaille avec tel laboratoire doit être transparent, sinon tous les abus sont possibles.
La deuxième, c'est qu'au niveau d'un individu qui est conseil, il faut absolument que ces relations portent sur des problèmes à risques et pas sur des problèmes de routine. Pour moi, un laboratoire de recherche qui se met à travailler avec l'industrie sur des problèmes de routine, donc pour des raisons financières, c'est dévastateur.
Si je rappelle ces deux principes (que je crois avoir toujours respecté), c'est que le danger est immense. Ce danger a toujours existé. Au début de ma carrière, on me disait, vous avez 3 contrats industriels, tel autre labo en a 40, pour sous-entendre qu'il avait plus de rapports avec l'industrie. Je disais: *"si je veux, j'en ai 500"*.
Ces remarques montrent l'extraordinaire difficulté qu'il y a à développer les mathématiques en liaison avec les applications dans les pays en développement par exemple parce que les mathématiciens doivent choisir avec qui ils vont travailler.

6) JPB :*Quelle est votre opinion sur la formation mathématique qu'il est souhaitable de donner aux étudiants en cette période de grande diversification des activités professionnelles dans lesquelles l'usage des mathématiques est requis ou sous-jacent?*

JLL : La formation mathématique dépend d'abord des enseignants et finalement peu des programmes. Si l'enseignant est d'un niveau suffisant, quel est le domaine des mathématiques qui historiquement n'a pas eu une motivation, un lien avec quelque application qui peut intéresser tout le monde? Evidemment, certains sujets s'y prêtent mieux que d'autres. Il faut montrer partout, dans tous les cours, les liens avec l'extérieur. Mais, ça c'est très difficile. Et on retombe sur une question mille fois évoquée qui est notre grande responsabilité à nous enseignants du supérieur de ne pas avoir rédigé de livres pour les maîtres ni suffisamment maintenu le contact avec eux. On a trop facilement oublié cela.
En effet rien n'est plus difficile que de faire un cours grand public ou un cours élémentaire qui ait du souffle, parce que raconter des trucs de science-fiction, c'est facile. Mais raconter quelque chose qui ait un sens, c'est drôlement plus difficile. Gelfand a fait cela par exemple mais il y a tellement peu d'exemples.

JPB : *Vous parlez bien ici de l'enseignement secondaire?*

JLL : Oui, du lycée ..... Là, je peux rajouter quelque chose de spécifique. L'Académie des Sciences doit répondre à des questions posées par le Président de la République et par le Ministre de l'Éducation Nationale, Claude Allègre, qui ne sont d'ailleurs pas orthogonales. Concernant les questions des uns ou des autres, on tombe régulièrement sur la question de la statistique. La statistique n'est pas un sujet facile ; c'est clair que le grand public n'y comprend rien. Moi-même, j'ai vu souvent des gens éduqués, dans l'avion de Paris à Cayenne, mal estimer la probabilité d'échec d'Arianne : on en était à ce moment-à à un échec sur 17 tirs et lorsque l'on en était au 15ème ou au 16ème succès, il y avait toujours dans l'avion quelqu'un qui disait : *"Dites-donc, là on approche...."*
Donc, les statistiques, c'est un sujet fondamental. Plutôt que de se plaindre, ce que l'Académie des Sciences va essayer de promouvoir, c'est de coordonner, suggérer, susciter la rédaction d'un ou de plusieurs livres simples, tel le livre *"La main à la pâte"* de Charpak. Un telle initiative n'a aucune raison de se placer dans un cadre national car il y a de très bons statisticiens en Europe. Il faut aussi les placer dans les contextes les plus variés comme l'histoire, la géographie, etc.

JPB : *Y a-t-il une question que je n'aurais pas posée et qui vous semblerait importante ?*

JLL : Oui. La question qui n'était pas posée et qui me tient à cœur porte sur l'importance de l'ouverture internationale dans les systèmes d'évaluation. Je viens de participer avec Sir Michael Atiyah et Yuri Manin à l'exercice de "benchmarking" des mathématiques américaines présidé par Peter Lax. Je suis en ce moment co-chairman de l'évaluation de la NASDA, la NASA japonaise, l'autre chairman étant japonais. Je ne suis pas sûr qu'il y ait suffisamment d'évaluations internationales de nos différentes institutions.

JPB : *Merci.*

Freedom in the Conduct of Science: An International Committee

Peter Schindler, Executive Secretary of SCFCS / ICSU

Most scientists fortunately never come in contact with ICSU's Standing Committee on Freedom in the Conduct of Science (SCFCS). It is not unlike our relation with the fire brigade: we know it exists, some of us even know how to contact them, but never having to call them is much preferable to seeing them in action. I do hope that you will never need to ask SCFCS for help; but it might be good to know that there is such an organisation.

First a word on ICSU: the acronym is derived from International Council of Scientific Unions, an international umbrella organisation encompassing 25 Scientific Unions—among them IMU, International Mathematical Union—and 75 "National Members", in most cases Academies like the British Royal Society or the US National Academy of Sciences. The organisation has recently been renamed "International Council for Science"; the acronym remains ICSU.

ICSU has some policy committees, among then SCFCS. Its full name used to be "Standing Committee on Free Circulation of Scientists"; in 1993 it was given its new name. As the old name indicates, the main concern of the committee was to help bona fide scientists to be allowed to travel, something that was sometimes not self-evident in many countries. As we are all aware, the political problems—in particular in Eastern Europe—have more or less disappeared; but new problems appeared. I mention just two:

Contrary to the eighties, when some western countries actively encouraged students from developing countries to defect and stay in the west, these same countries now sometimes refuse visitor visa to students from developing countries who are participants in scientific meetings out of fear these students might apply for asylum once they are in the country hosting the meeting.

Contrary to the UN sanctions in earlier years, e.g. against South Africa, when scientific exchange was always excluded from sanctions, the sanctions against Serbia in the Bosnian conflict specifically included scientific exchanges. This led to the situation that publishers refused to print articles authored by Serbian scientists.

SCFCS has no legal means to force a country to issue visas to students or publishers to print articles of Serbian authors. In the case of the sanctions against Serbia, it is impossible to change the resolution of the UN General Assembly. What was done was to convince national governments to interpret the sanctions in such a way that to a limited extent publishing such papers would be tolerated, even though strictly speaking it might be considered as violation of the sanctions.

SCFCS has a network of 'contact-persons' in many countries. If the ICSU headquarters in Paris or the executive secretary of SCFCS in Bern hear of a problem, the contact person in the country that seemingly violates the principles is contacted. Often this person can convince the authorities in question that they have a moral obligation to enable scientists to attend conferences in their field.

SCFCS has a number of strict limitations to its scope:

1. only travel to conferences organised under the name of ICSU is considered
2. only "bona fide" scientists are considered; activities by scientists outside their scientific activities are not covered by the ICSU rules.
3. SCFCS actions are almost always taken on a confidential, person to person level; SCFCS does no "marketing" of its efforts.
4. the only "sanction" open to ICSU is to recommend to Scientific Unions to not organise any conference in a country that does not guarantee unrestricted access to bona fide participants in international conferences.

SCFCS does give advice to organisers of conferences on what kind of guarantees they should have from their governments on granting visas to participants. It is always easier to talk things over before a refusal happens; once a consular officer has made a decision, no matter how wrong, it is often very difficult and time consuming to reverse such a decision.

SCFCS publishes a 50 page "Blue Book" that contains the "terms of reference" of SCFCS, various statements and resolutions regarding the issues mentioned above, the list of liaison persons throughout the world and other useful information. A new edition is in print in the summer of 1998; it should be available in July.

The terms of reference are:

1. To safeguard and promote the free circulation of scientists;
2. To promote:
   - 2.1. Freedom to pursue science and to publish the results;
   - 2.2. Freedom to communicate among scientists and to disseminate scientific information;
   - 2.3. The freedom of movement of scientific material.

The committee has ten members, three from Africa (Nigeria, Senegal, Zimbabwe), four from Europe (Hungary, Ireland, Sweden, UK), one from the USA, one from the Republic of China (Taipei) and one from the Peoples Republic of China (Beijing). The committee is chaired by the former president of ICSU, Professor James Dooge from Ireland. Olof Tandberg from the Royal Swedish Academy acted for more than twenty years as executive secretary and now as vice president; Peter Schindler from the Swiss Academy of Science is the new executive secretary since 1997; also present at the SCFCS meetings are the secretary general of ICSU and the Executive Director of ICSU or another representative of the headquarters of ICSU. The committee meets usually once a year, this year in June in Beijing, and discusses policy questions; the individual cases are treated by the executive secretary, mostly in close contact with the chairman and with the ICSU headquarters in Paris plus, of course, the liaison person concerned.

If you have questions or would like to receive the new "Blue Book", contact the Executive Secretary or ICSU headquarters; the addresses are given below:

ICSU Secretariat, 51 Boulevard de Montmorency, 75016 Paris.
phone +33 1 45 25 03 29, fax +33 1 42 88 94 31,
e-mail icsu@lmcp.jussieu.fr

Executive Secretary of SCFCS/ICSU: Peter Schindler
Swiss Academy of Sciences, Baerenplatz 2, CH-3011 Bern, Switzerland.
phone +41 31 312 2726, fax +41 31 312 3291,
e-mail schindler@sanw.unibe.ch

E.M.S. EVENTS AT ICM 98

Berlin, August 18–27

◇ MR/Zbl Reception

A joint reception of Mathematical Reviews and Zentralblatt für Mathematik will take place on August 24 at 8 pm, in the Mathematics Building of the Technical University (TU) of Berlin. The programme includes introduction of editors and general remarks about history of MR and Zbl, reviewing, cooperation, the future, etc.

◇ RECEPTION FOR E.M.S. INDIVIDUAL MEMBERS

A reception for individual members of the European Mathematical Society will take place in the Lichthof of the TU, on August 26 at noon (12.00).

◇ Launching of JEMS

The Journal of the European Mathematical Society (JEMS) will be launched in the Lichthof on August 26 at 1 pm, as a culmination of the reception for E.M.S. individual members.

◇ Meeting of Editors

A meeting of Editors of mathematical journals and books edited by mathematical societies located in Europe will take place in the TU on August 27 at 10 am.

◇ E.M.S. Booth

The E.M.S. booth will be contiguous to that of Zentralblatt. Material about the E.M.S. and the Third European Congress of Mathematics will be on display. It will be possible to pre-register for the 3ECM.

Any changes in the date or place of the above events will be announced in the E.M.S. booth during the ICM, and on the EMIS web site as well.

Euro-Math-Job

The European Mathematical Society is now offering Euro-Math-Job on

`http://www.maths.lth.se/nordic/Euro-Math-Job.html`.

This is a web page collecting links to job pages around Europe set up and maintained by the following member societies of the EMS:

Dansk Matematisk Førening, DK
Deutsche Mathematiker-Vereinigung, DE
Íslenska stærðfræðafélagið, IS
London Mathematical Society, UK
Norsk Matematisk Førening, NO
Österreichische Mathematische Gesellschaft, AT
Société de Mathématiques Appliquées & Industrielles, FR
Société Mathématique de France, FR
Suomen Matemaatinen Yhdistys, FI
Svenska matematikersamfundet, SE
Unione Matematica Italiana, IT

The website contains information on vacant academic positions in many of the European departments of Mathematics and Statistics.

FERMAT PRIZE FOR MATHEMATICS RESEARCH
Université Paul Sabatier - Matra Marconi Space
1999 AWARD

The FERMAT PRIZE rewards research works in fields where the contributions of Pierre de FERMAT have been decisive:

- Statements of Variational Principles
- Foundations of Probability and Analytical Geometry
- Number Theory

The spirit of the prize is focused on rewarding the results of researches accessible to the greatest number of professional mathematicians within these fields.

The amount of the Fermat prize has been fixed at FF100,000 ($17,000). Organised under the patronage of the MATRA MARCONI SPACE Company, the FERMAT prize is awarded once every two years in Toulouse; the sixth award will be announced in October 1999.

Rules governing the award, candidacy formalities, etc. are available since spring 1998 from the organising secretariat of the Fermat prize:

Prix FERMAT de Recherche en Mathématiques, Service des Relations Publiques
Université Paul Sabatier, 118 route de Narbonne, 31062 TOULOUSE Cedex 4, France

or on the web: **http://www.ups-tlse.fr/PrixFermat**
Closing date for application forms: **30 June 1999**

University College Cork
Professorship of Applied Mathematics

Applications are invited for the above vacant post within the School of Mathematics, Applied Mathematics and Statistics. Applicants should have an internationally recognised record of achievement in research, preferably in an area of mainstream Applied Mathematics such as fluid or solid mechanics, computational mechanics, acoustics and wave phenomena, but candidates from other areas involving mathematical model building will also be considered. Substantial teaching experience will be sought. The appointee will be expected to provide leadership by example and initiative, to promote excellence in teaching and research, and to undertake administration. He/she will also have the obligation to be Head of Department of Applied Mathematics and/or Chairperson of the School of Mathematics, Applied Mathematics and Statistics when required to do so by the Governing Body of the University. There is a commitment to build on current strengths in the Department, and two other permament academic appointments will be made in conjunction with the Chair.

For informal discussion contact Professor Brian Twomey
Tel: +353 21 902464 / Fax: +353 21 903106 / Email: `twomeyjb@ucc.ie`
Internet: `http://ogham.ucc.ie/school/`

Salary scales: IR£48,215–IR£57,418 p.a. Application forms and further details of the post may be obtained from Academic Appointments, Personnel Office, University College, Cork, Ireland.
Tel: +353 21 902364 / Fax: +353 21 271568 / Email: `acad.per@ucc.ie`
For all vacancies see our website at: `http://www.ucc.ie`

Closing date: 30 JUNE 1998 University College Cork is an Equal Opportunities Employer

EUROPEAN NEWS: Country by Country

BELGIUM

Hopf algebras and quantum groups

Free University of Brussels, VUB, Belgium

Programme: Invited speakers will deliver one-hour lectures. A number of sessions for the presentation of 25-minute talks are also planned.

Topics: Hopf algebras, quantum groups, and related topics

Main lecturers: N. Andruskiewitz, S. Dascalescu (Bucharest), C. Kassel (Strasbourg), L. Lebruyn (Antwerp), A. Masuoka (Shimane), S. Montgomery (Los Angeles), G. Militaru (Bucharest), H.-J. Schneider (Munich), D. Stefan (Bucharest), A. Van Daele (Louvain), S. Woronowicz, Y. Zhang (Louvain)

Scientific committee: S. Caenepeel (Brussels), F. Van Oystaeyen (Antwerp), M. Van den Bergh (Hasselt), H-J. Schneider (München), S. Montgomery (Univ. of Southern California), and S. Dascalescu (Bucharest)

Local organiser: S. Caenepeel, Faculty of Applied Sciences, Free University of Brussels (VUB), Pleinlaan 2, B-1050 Brussel, Belgium, fax 32/2/629 28 59

Information: send e-mail to `scaenepe@vub.ac.be`.

CATALONIA

Activities organized by the "Centre de Recerca Matemàtica"

A) "Semester on Dynamical Systems"

Dates: September 15 to December 15, 1998
Place: Centre de Recerca Matemàtica
Organisers: Prof. Ll. Alsedà, A. Gasull, J. Llibre (Universitat Autònoma de Barcelona)
List of visitors:
Bodil Branner (The Technical University of Denmark)
Leonid Cherkas (Belarusian State University)
Hector Giacomini (Université de Tours)
John Guaschi (Université Toulouse III)
Ernesto Lacomba (Universidad Autònoma Metropolitana, México)
Li Chengzhi (Beijing University)
Li Wei-gu (Beijing University)
Jerome Los (Univesité de Nice-Sophia Antipolis)
Ernesto Pérez-Chavela (Universidad Autònoma Metropolitana, México)
Carsten Lunde Petersen (Roskilde University)
José Angel Rodríguez (Universidad de Oviedo)
Zhang Zhifen (Beijing University)

B) Advanced Course on Dynamical Systems

Dates: September 1 to September 10, 1998
Place: Centre de Recerca Matematica, Bellaterra
Speakers:
S. van Strien (University of Warwick): "Complex dynamics of real polynomials"
R. Devaney (Boston University): "Dynamics and topology of entire functions"
A. van den Essen (University of Nijmegen): "The Jacobian Conjecture and Dynamical Systems"

C) The Ferran Sunyer i Balaguer Prize 1998

Ferran Sunyer i Balaguer (1912-1967) was a self-taught Catalan mathematician who, in spite of a serious physical disability, was very active in research in classical Mathematical Analysis, an area in which he acquired international recognition.
Each year in honor of the memory of Ferran Sunyer i Balaguer, the Institut d'Estudis Catalans awards an international mathematical research prize bearing his name. This prize was awarded for the first time in April 1993. The competition is open to all mathematicians, subject to the following conditions:
1) The prize will be awarded for a mathematical monograph of an expository nature presenting the latest developments in an active area of research in Mathematics, in which the applicant has made important contributions.
2) The monograph must be original, written in English, and of at least 150 pages. The monograph must not be subject to any previous copyright agreement. In exceptional cases, manuscripts in other languages may be considered.
3) The prize, amounting to 1.800.000 pta, is provided by the Ferran Sunyer i Balaguer Foundation. The winning monograph will be published in Birkhäuser Verlag's series "Progress in Mathematics", subject to the usual regulations concerning copyright and author's rights.
4) The winner of the prize will be proposed by a Scientific Committee consisting of:
Prof. Friedrich Hirzebruch (Max-Planck Institute)
Prof. Paul Malliavin (Université de Paris VI)
Prof. Joseph Oesterlé (Université de Paris VI)
Prof. Joan Solà Morales (Universitat Politècnica de Catalunya)
Prof. Alan Weinstein (University of California at Berkeley)
5) Monographs should preferably be typeset in TEX. Authors should send a hard copy of the manuscript and two disks, one with the DVI file and one with the PS file (PostScript), and enclosing an accompanying letter to the Ferran Sunyer i Balaguer Foundation.

Submissions should be sent before December 5, 1998 to the following address:

Centre de Recerca Matemàtica (IEC)
Ferran Sunyer i Balaguer Foundation
Apartat 50
08193 Bellaterra
Spain
Electronic mail: crm@crm.es

6) The name of the prize-winner will be announced in Barcelona in April, 1999.
7) The submission of a monograph implies the acceptance of all of the above conditions.

For further information on the Ferran Sunyer i Balaguer Foundation, see
Web: http://crm.es/info/ffsb.htm

D) Winner of the Ferran Sunyer i Balaguer 1997

The Institut d'Estudis Catalans has awarded the sixth Ferran Sunyer i Balaguer Prize to Juan J. Morales Ruíz for his monograph entitled "Differential Galois Theory and Non-integrability of Hamiltonian Systems".
The awarded monograph is devoted to the connection between the two topics mentioned in the title, Differential Galois theory and Integrability of Hamiltonian systems. The main point is the relation between integrability in the Liouville-Arnold sense of a Hamiltonian system and the Galois differential integrability of the associated variational equations.
Juan J. Morales is an associate professor in the Departament de Matemàtica Aplicada II at the Universitat Politècnica de Catalunya. He obtained his M.S. in Physics in 1979 and his Ph.D. in Mathematics in 1990, both at the Universitat de Barcelona. His research interests are mainly focussed on Hamiltonian systems and the topics covered by the monograph.

The prize consists of 1.800.000 pta. The monograph will be published in Birkhäuser Verlag's series "Progress in Mathematics".

Each year, the Ferran Sunyer i Balaguer Prize will be awarded to a mathematical monograph of an expository nature presenting the latest development in an active area of research in Mathematics, in which the applicant has made important contributions.

CRETE

Euroconferences in Mathematics on Crete

The University of Crete announces the 1998 conferences of the series Euroconferences in Mathematics on Crete, sponsored by the Training and Mobility of Researchers Programme of the Commission of the European Union.

21-27 June 1998 **Groups of Finite Morley Rank**
Organisers: A. Borovik (Manchester, United Kingdom), G. Cherlin (Rutgers University, U.S.A.), A. Nesin (Istanbul, Turkey)
Main Speakers: T. Altinel (Universite Lion 1, France), A. Borovik (Manchester, United Kingdom), E. Bouscaren (Universite Paris VII, France), Z. Chatzidakis (Universite Paris VII, France), G. Cherlin (Rutgers University, U.S.A.), R. Lyons (Rutgers University, U.S.A.), H. van Maldeghem (Gent, Belgium), A. Nesin (Istanbul, Turkey), K. Peterzil (Haifa, Israel)

19-25 July 1998 **Galois Representations in Arithmetic Geometry**
Organisers: I. Antoniadis (Crete, Greece), G. Pappas (Princeton, U.S.A.), M. Taylor (Manchester, United Kingdom)
Main Speakers: D. Burns (London, United Kingdom), T. Chinburg (University of Pennsylvania, U.S.A.), K. Kato (Tokyo, Japan), T. Saito (Tokyo, Japan)

26 July-1 August 1998 **Front Propagation: Theory and Applications**
Organisers: P. L. Lions (Paris-Dauphine, France), A. Majda (Courant Institute, U.S.A.), P. Souganidis (University of Wisconsin, U.S.A)
Main Speakers: G. Barles (Tours, France), V. Caselles (Illes Balears University, Spain), M. G. Crandall (University of California at Santa Barbara, U.S.A), P.-L. Lions (Universite Paris-Dauphin, France), S. Luckhaus (Bonn, Germany), A. Majda (Courant Institute, U.S.A.), C. Verdi (Milano, Italy)

The conferences will take place at the Anogia Academic Village, a conference centre located at the traditional Cretan village of Anogia on the slopes of the mountain Ida. Anogia is located at an elevation of 750m, about 45 minutes by car from Heraklion, the largest city of Crete, and about half an hour from the closest coast. The living expenses (accommodation plus meals) per day for a person are estimated at about 30 ECU in a double room or 38 ECU in a single room. The registration fee amounts to 250 ECU.
The Training and Mobility of Researchers Programme supports young researchers from the country of the European Economic Area to enable them to attend the conferences. There will be also some limited funds from other sources available to support participants not belonging to the above group. Support can cover (all or certain) travel, living and registration expenses. For information please con-

tact the local co-ordinator of the conference series indicated below.
It is planned that the conference series will continue in the next years. The topics are decided by the international scientific committee consisting of: H. Abels (Bielefeld, Germany), C. Dafermos (Brown University, U.S.A.), J.-P. Kahane (Paris-Sud, France), O. Kegel (Freiburg, Germany), S. Papádopoulou (Crete, Greece), V. Thomee (Goeteborg, Sweden), A. Wilkie (Oxford, United Kingdom).

For additional information please contact the local co-ordinator:

Susanna Papadopoulou
Department of Mathematics
University of Crete
Heraklion, Crete, GREECE Fax-Nr: 81-234516
e-mail: souzana@math.uch.gr

or, for the conferences of 1998:

A. Borovik
Department of Mathematics
UMIST
PO BOX 88
Manchester M60 1QD
UNITED KINGDOM
e-mail: sasha@ma.umist.ac.uk

I. Antoniadis
Department of Mathematics
University of Crete
71409 Heraklion, Crete
GREECE
e-mail: antoniad@talos.cc.uch.gr

P.Souganidis
Department of Mathematics
University of Wisconsin
Madison, Wisconsin 53706 U.S.A.
e-mail: souganid@math.wisc.edu

DENMARK

The Wessel Symposium

Copenhagen, Denmark, 11–15 August 1998.

Organiser: Jesper Lützen, Copenhagen.

Location: The Royal Danish Academy of of Sciences and Letters.

List of speakers: Olov Amelin (Uppsala), Kirsti Andersen (Aarhus), Tom Archibald (Wolfville), Otto Bekken (Kristiansand), Hans Christian Bjerg (Copenhagen), Liv Bliksrud (Oslo), Umberto Bottazzini (Roma), Bodil Branner (Copenhagen), Dan Charlie Christensen (Copenhagen), Moritz Epple (Mainz), Paolo Freguglia (Porto S. Stefano), Jeremy Gray (Milton Keynes), Leif Kahl Kristensen (Aarhus), Nils Voje Johansen (Oslo), Michael Langkjær (Copenhagen), Jesper Lützen (Copenhagen), Kurt Møller Pedersen (Aarhus), Adrian Rice (London), David Rowe (Mainz), Karl-Heinz Schlote (Altenburg), Erhard Scholz (Wuppertal), Gert Schubring (Bielefeld), C.C. Tscherning (Copenhagen).

In 1797 the Norwegian surveyor Caspar Wessel presented a paper entitled *On the analytical representation of direction* to The Royal Danish Academy of Sciences and Letters. The paper was published separately the following year and included in the Academy's collected papers in 1799. It has become famous in the history of mathematics because it presented the first geometric representation of the complex numbers. The Symposium celebrating the bicentenary of this event will be devoted to Caspar Wessel, his family, his time, his work as a surveyor and to general questions in the history of mathematics somehow related to complex functions and their geometric representation.

Further information: visit the web site
http://www.math.ku.dk/mi/forsk/moede/wessel-symposium/

Application: Those interested in attending the symposium should send an e-mail to Jesper Lützen (lutzen@math.ku.dk). The number of participants is limited by the relatively small number of seats in the meeting room of the Academy.

GERMANY

Conformal Geometry and Geometric Function Theory

August 11–15, 1998, TU-Berlin, Germany
Organisers: M. Bonk, C. Pommerenke, S. Rohde

Second Announcement
This satellite conference of the ICM is the second in a series of three Euro Conferences . The conference is part of the activity of a European research network.

The topic of this meeting is Geometric Function Theory in its broadest sense, including areas such as quasiconformal mappings and complex dynamics. This meeting will bring together researchers in this area and give young mathematicians an opportunity to learn about recent developments.

The conference will take place at the Technical University of Berlin. The conference opens on Tuesday, August 11 and closes on Saturday, August 15, in the afternoon.

The **Programme** will consist of invited lectures of 45 minutes, including
K. Astala, S. Buckley, M. Denker, A. Eremenko, F. Gehring, J. Graczyk, W. Hayman, P. Koskela, J. Langley, N. Makarov, D. Marshall, G. Martin, D. Minda, R. Perez-Marco, F. Przytycki, H. Reimann, S. Rickmann, S. Smirnov, G. Swiatek, P. Tukia.

In addition, there will be one afternoon of shorter talks (20 minutes) in parallel sessions.
There will be no lectures on Thursday afternoon. A conference dinner (to be paid for by the participants) is planned.

Registration forms can be obtained from the internet under

`www.math.tu-berlin.de/funktion/euro98/reg_form.html`

or upon request from S. Rohde, TU Berlin, Department of Mathematics, Strasse des 17. Juni 136, Germany; email: `rohde@math.tu-berlin.de`. Please return the completed registration form no later than June 15.

ITALY

School on Complex Tori, Integrable Systems and Seiberg-Witten Theory

October 26 to October 30 1998
Grand Hotel Bellavista, LevicoTerme (Trento)

Scientific Organiser: G. Bolondi (Milano).
Europroj co-sponsors this school. For further information interested persons can also contact Prof. Bolondi (e-mail: `bolondi@science.unitn.it`). There will be 4 series of lectures held by: C. Birkenhake (Erlangen), R. Donagi (Philadelphia), B. van Geemen (Torino), H. Lange (Erlangen). Deadline for applications: July 31, 1998.

Short School on Operators on Manifolds with Singularities and Spectral Theory.

November 27–28, 1998.
Dipartimento di Matematica, Università di Torino, Italy.

Eight 1-hour lectures from introductory to advanced level by C. Parenti, E. Schrohe, B.-W. Schulze, D. Vassiliev.

Organizing committee: E. Buzano, G. Garello, L. Rodino.

Information: e-mail: `school@dm.unito.it`
WWW:

`http://www.dm.unito.it/convegniseminari/differential.htm`

or: E. Buzano, Dipartimento di Matematica, Via Carlo Alberto 10, 10123 Torino, Italy
fax 39-11-670-2878

Program of C.I.R.M. (Trento) for the year 1998

The Centro Internazionale per la Ricerca Matematica (C.I.R.M.) of Trento will organise during the year 1998 the following Conferences:

1. "Calculus of Variations: Geometric Measure Theory, Relaxation and Γ-Convergence", from April 20 to April 24 1998, at the Grand Hotel Bellavista in Levico Terme (Trento).
Scientific Organisers: G. Anzellotti (Trento) and I. Tamanini (Trento).
The Department of Mathematics of the University of Trento co-sponsors this meeting.

Deadline for applications: March 31, 1998.

2. "Finite Groups and Locally Finite Groups with Applications", from May 17 to May 21 1998, at the Grand Hotel Bellavista in Levico Terme (Trento).
Scientific Organisers: L. Di Martino (Milano), U. Meierfraenkenfeld (East Lansing) and B. Stellmacher (Kiel).
The conference is also sponsored by M.U.R.S.T. project "Teoria dei Gruppi ed Algebra Non Commutativa", by G.N.S.A.G.A.-C.N.R. and by the Mathematics Departments of the Universities of Milano and Padova.
Provisional list of speakers: V.V. Belyaev (Krasnoyarsk), A. Borovik (Manchester), R. Guralnick (Los Angeles), J. Hall (East Lansing), A. Ivanov (London), M. Kuzucuoglu (Ankara), F. Leinen (Mainz), M. Liebeck (London), A. Lubotzky (Jerusalem), A. Lucchini (Brescia), R. Lyons (New Brunswick), G. Malle (Heidelberg), U. Meierfraenkenfeld (East Lansing), G. Michler (Essen), C.W. Parker (Birmingham), R. Phillips (East Lansing), O. Puglisi (Trento), J. Saxl (Cambridge), Y. Segev (Beer-Sheva), A. Shalev (Jerusalem), S. Smith (Chicago), G. Stroth (Halle-Saale), M.C. Tamburini (Brescia), S. Thomas (New Brunswick), F. Timmesfeld (Giessen), V.I. Trofimov (Ekaterinburg), N. Vavilov (Petrodvorets), A.E. Zalesski (Norwich).

Deadline for applications: April 15, 1998.

3. "Transformation Groups in Differential Geometry", from May 25 to May 29 1998, at the Grand Hotel Bellavista in Levico Terme (Trento).
Scientific Organisers: G. Gentili (Firenze), E. Musso (L'Aquila) and F. Podestà (Firenze).
This conference is in honour of Professor Edoardo Vesentini on the occasion of his 70th birthday.
Provisional list of main lecturers: D. Alekseevsky (Moscow), P. De Bartolomeis (Firenze), E. Heintze

(Augsburg), R.S. Palais (Waltham), S. Salamon (Oxford), C.-L. Terng (Boston), G. Thorbergsson (Koeln), J.A. Wolf (Berkeley), W. Ziller (Philadelphia).

Deadline for applications: April 30, 1998.

4. "Advanced Course and Workshop on Mathematical Control Theory", from June 1 to June 10 1998, at the Grand Hotel Bellavista in Levico Terme (Trento).
This event is also sponsored by G.N.A.F.A.-C.N.R. and M.U.R.S.T. project "Problemi nonlineari nell'Analisi e nelle Applicazioni". The advanced course (June 1–6) will be followed by a workshop (June 8–10).
Scientific Organiser of the Advanced Course: M. Bardi (Padova).
Scientific Organisers of the workshop: M. Bardi, P. Cannarsa (Roma II) and I. Capuzzo Dolcetta (Roma I).

The school includes the following 5 courses, of 5 hours each:
a) P. Cannarsa (Roma II): *Dynamic programming methods for optimal control of evolution equations*;
b) I. Capuzzo Dolcetta (Roma I): *Viscosity solutions of dynamic programming equations: the finite dimensional case*;
c) F.H. Clarke (Lyon I): *Nonsmooth analysis and the control of ordinary differential equations*;
d) A. Isidori (Roma I): *Stabilization of nonlinear systems*;
e) H.J. Sussmann (Rutgers): *Differential-geometric and nonsmooth methods in finite-dimensional optimal control.*
The list of invited speakers in the workshop includes: O. Alvarez (Rouen), A. Bacciotti (Torino), G. Buttazzo (Pisa), M. Falcone (Roma I), H. Frankowska (Paris-Dauphine), H. Ishii (Tokyo), R. Jensen (Chicago), V. Komornik (Strasbourg), Y.S. Ledyaev (Kalamazoo), P.L. Lions (Paris-Dauphine), P. Loreti (IAC-CNR Roma), L. Pandolfi (Torino), J.P. Puel (Versailles), F. Rampazzo (Padova), A. Siconolfi (Roma I), C. Sinestrari (Roma II), P. Soravia (Padova), G. Stefani (Firenze), S. Zagatti (SISSA Trieste), T. Zolezzi (Genova), E. Zuazua (Madrid).

Deadline for applications: April 23, 1998.

5. "Summer School on K-Theory and algebraic groups", from June 28 to July 3 1998, at the Grand Hotel Bellavista in Levico Terme (Trento).
Scientific Organisers: M. Karoubi (Paris VII), C. Pedrini (Genova) and U. Rehmann (Bielefeld).
The European Research Project TMR FM RX - CT 970107 co-sponsors this school.

There will be 4 main series of lectures in the morning, and research talks in the afternoon. Each lecture series will consist of 5 hours of lectures covering the following topics:
a) E. Friedlander: *An introduction to K-Theory and its recent developments*;
b) A. Merkurjev: *K-Theory and Algebraic Groups*;
c) M. Kolster: *K-Theory of algebraic integers*;
d) B. Kahn: *K-Theory and quadratic forms over fields.*

Deadline for applications: May 15, 1998.

6. "Real Analytic and Algebraic Geometry", from September 20 to September 25 1998, at the Grand Hotel Bellavista in Levico Terme (Trento).
Scientific Organisers: F. Acquistapace (Pisa), F. Broglia (Pisa) and M. Coste (Rennes).

Provisional list of main speakers: S. Karlamov (Strasbourg), M.A. Marshall (Saskatoon), C. Scheiderer (Regensburg), M. Shiota (Nagoya), A. Tognoli (Trento).
Deadline for applications: July 31, 1998.

7. "Optimal Regularity in Elliptic, Hypoelliptic, and Parabolic Problems", from October 5 to October 10 1998, at the Grand Hotel Bellavista in Levico Terme (Trento).
Scientific Organiser: A. Lunardi (Parma).
The meeting is also sponsored by G.N.A.F.A.-C.N.R.
Provisional list of speakers: P. Acquistapace (Pisa), W. Arendt (Ulm), P. Auscher (Amiens), M. Biroli (Milano), P. Cannarsa (Roma II), S. Cerrai (Firenze), P. Clement (Delft), A. Cutri (Roma II), G. Da Prato (Pisa), E. Di Benedetto (Evanston), J. Escher (Kassel), A. Favini (Bologna), M.G. Garroni (Roma I), U. Gianazza (Pavia), P. Guidotti (Caltech), M. Hieber (Karlsruhe), R. Labbas (Le Havre), E. Lanconelli (Bologna), G.M. Lieberman (Ames), S. Lototsky (Cambridge), A.G.R. Macintosh (Macquarie), S. Maier (Zürich), A. Maugeri (Catania), S. Monniaux (Ulm), A. Parmeggiani (Bologna), S. Polidoro (Bologna), J. Prüss (Halle), S. Romanelli (Bari), G. Simonett (Nashville), N.S. Trudinger (Canberra), V. Vespri (Firenze).

Deadline for applications: July 31 1998.

8. "Trends in Algebraic Geometry and Applications - II", in a week of December 1998.
Scientific Organisers: M. Andreatta (Trento), E. Ballico (Trento) and J. Wisniewski (Warsaw).

For further information and applications please contact:

Mr. A. Micheletti - Secretary of CIRM

Centro Internazionale per la Ricerca Matematica
Istituto Trentino di Cultura
38050 Povo (Trento)
Tel. +39-461-881628 - Telefax +39-461-810629
email: michelet@science.unitn.it.

LUXEMBOURG

Developments of Mathematics at the Eve of the Year 2000 *25–26 September 1998*

Speakers: Jean-Pierre Bourguignon (IHES), Christian Houzel (Université Paris VII), Victor Kac (MIT Boston), Jean-Pierre Kahane (Université Paris-Orsay), Jean Mawhin (Université Catholique Louvain), Nikolai Nikolskii (Université Bordeaux I), Roger Penrose (Oxford University), jean-Paul Pier (Centre Universitaire Luxembourg), Rheinhold Rammert (Universität Münster)

Information: Séminaire de Mathématique, Centre Universitaire de Luxembourg, 162a Avenue de la Faïencerie, L-1511 Luxembourg

Tel: (352).46.66.44.236, Fax: (352).46.66.44.237, email: pier@cu.lu

SWEDEN

Workshop On Discrete Groups And Conformal Geometry

Malardalen University, Vasteras, Sweden, 27–31 August 1998

Provisional list of invited speakers:
J.Alonso (Stockholm), E.Bujalance (UNED Madrid), P.Buser (EPFL, Lausanne), M.Conder (Auckland), A.Costa (UNED, Madrid), T.Ekedahl (Stockholm), G.Gromadzki (Gdansk), B.Harvey (King's, London), G.Jones (Southampton), L.Keen (CUNY, New York), M.T.Lozano (Zaragoza), M.Naatanen (Helsinki), U.Persson (Goteborg), K-D.Semmler (EPFL, Lausanne), R.Silhol (Montpellier), D.Singerman (Southampton)

Organisers: B. Baumslag, G. Bergqvist and M. Izquierdo (Malardalen University)

Further information: email geometry@mdh.se or see the web-site

http://www.ima.mdh.se/geometry

TURKEY

Positivity and its applications

(in memory of the late Professor C.B. Huijmans)

Department of Mathematics, Middle East Technical University, Ankara, Turkey
22-26 June 1998

Sponsored by Scientific and Research Council of Turkey

Organising Committee:

Y.ABRAMOVICH
e-mail: yabramovich@math.inpui.edu

C.D.ALIPRANTIS
e-mail: raliprantis@math.inpui.edu

S.ALPAY
e-mail: safak@rorqual.cc.metu.edu.tr

A.WICKSTEAD
e-mail: A.Wickstead@Queens-Belfast.AC.UK

Speakers:
Yu. Abramovich, C.D. Aliprantis, S. Alpay, W. Arendt, A. Bukhvalov, G. Buskes, P. Dodds, Z. Ercan, W.A. Feldman, Y. Gordon, H. Gurcay, F. Hernandez, V. Khudalov, A. Kitover, A.G. Kusraev, S.S. Kutateladze, W. Luxemburg, P. Meyer-Nieberg, R. Nagel, V. Oliker, M. Orhon, B.de Pagter M. Pliev, I. Polyrakis, A.C.M. Van Rooij, A.R. Schep, G. Stotaev, V.C. Troitsky, B. Turan, L. Tzafriri, A. Wickstead

OUTSIDE EUROPE

CANADA

INTERNATIONAL CONFERENCE
ON OPERATOR THEORY AND
ITS APPLICATIONS TO
SCIENTIFIC AND
INDUSTRIAL PROBLEMS

Organized by the Institute of
Industrial Mathematical Sciences (IIMS)

October 7–11, 1998, Winnipeg, Canada

Principal Organizers: P.N.Shivakumar (Manitoba, Canada), A.G.Ramm (KSU,USA) A. Strauss (Ulyanovsk, Russia).

This conference is a sequel to the one held by IIMS in 1994. Its scope is considerably broader and includes theory and applications. The topics include: Functional models and characteristic functions of linear operators, operators in spaces with indefinite inner product, Schroedinger operators, spectral and scattering theory, infinite matrices and projection methods, interpolation of rational matrix functions, Hankel operators, operator theory and control thoery, wave propagation and scattering, mathematical physics and fluid mechanics, signal and image processing, inverse problems, biomathematics and financial mathematics.

IIMS Web Page: http://www.iims.umanitoba.ca

Contact: P.N.Shivakumar

e-mail: insmath@umanitoba.ca

Tel: 204 474 6724, Fax: 204 474 7602

Mathematisches Forschungsinstitut Oberwolfach

Lorenzenhof
D - 77709 Oberwolfach-Walke

Meetings 1999

Participants of the meetings are invited personally by the director of the institute. The participation is subject to such an invitation. Interested researchers, in particular young mathematicians, can contact the the administration of the institute. Since the number of participants is restricted not all enquiries can be considered.

Information is also available on our web site http://www.mfo.de.

03.01.-09.01.99	Inverse Problems in Statistics
Organizers:	Frits Ruymgaart, Lubbock Winfried Stute, Gießen Yehuda Y. Vardi, Piscataway
10.01.-16.01.99	Combinatorial Optimization
Organizers:	Rainer E. Burkard, Graz Martin Grötschel, Berlin
17.01.-23.01.99	Orders in Arithmetic and Geometry
Organizers:	Jürgen Ritter, Augsburg Martin J. Taylor, Manchester
24.01.-30.01.99	Ganzzahlige quadratische Formen und Gitter
Organizers:	Wilhelm Plesken, Aachen Heinz-Georg Quebbemann, Oldenburg Boris B. Venkov, St. Petersburg
31.01.-06.02.99	Applied and Computational Convexity
Organizers:	David Avis, Montreal Peter Gritzmann, München Victor L. Klee, Seattle
07.02.-13.02.99	Mathematische Analyse von FEM für Probleme in der Mechanik
Organizers:	Dietrich Braess, Bochum Ekkehard Ramm, Stuttgart Christoph Schwab, Zürich
14.02.-20.02.99	Funktionentheorie
Organizers:	Simon Hellerstein, Madison Stephan Ruscheweyh, Würzburg Norbert Steinmetz, Dortmund
21.02.-27.02.99	Nonstandard Analysis and Related Methods, and their Applications
Organizers:	S. Albeverio, Bochum L. Arkeryd, Göteborg N.J. Cutland, Hull C.W. Henson, Urbana; M. Wolff, Tübingen
28.02.-06.03.99	Reelle Methoden der Komplexen Analysis
Organizers:	Klas Diederich, Wuppertal Takeo Ohsawa, Nagoya Edgar Lee Stout, Seattle
07.03.-13.03.99	Mathematische Stochastik
Organizers:	Holger Dette, Bochum David C. Heath, Pittsburgh Martin Schweizer, Berlin
14.03.-20.03.99	Gewöhnliche Differentialgleichungen: Harmonic, Subharmonic, Homoclinic, and Heteroclinic Solutions
Organizers:	Jean Mawhin, Louvain-la-Neuve Klaus Schmitt, Salt Lake City Hans-Otto Walther, Gießen
21.03.-27.03.99	Regelungstheorie
Organizers:	Huibert Kwakernaak, Enschede Manfred Thoma, Hannover
28.03.-03.04.99	Mathematische Methoden der Geodäsie
Organizers:	Willi Freeden, Kaiserslautern Erik W. Grafarend, Stuttgart Leif Svensson, Lund
04.04.-10.04.99	Arbeitsgemeinschaft mit aktuellem Thema (wird in Heft 1/1998 der DMV-Mitteilungen bekanntgegeben)
11.04.-17.04.99	Geometric and Topological Combinatorics
Organizers:	Anders Björner, Stockholm Gil Kalai, Jerusalem Günter M. Ziegler, Berlin
18.04.-24.04.99	Mathematical Aspects of String Theory
Organizers:	David R. Morrison, Durham Werner Nahm, Bonn
25.04.-01.05.99	Numerik von Mikrostrukturen
Organizers:	Carsten Carstensen, Kiel Wolfgang Hackbusch, Kiel Mitchell B. Luskin, Minneapolis
25.04.-01.05.99	Geometry and Analysis on Loop Spaces
Organizers:	Michael Röckner, Bielefeld Stephan Stolz, Notre Dame
02.05.-08.05.99	Singularitäten
Organizers:	Gert-Martin Greuel, Kaiserslautern Joseph H.M. Steenbrink, Nijmegen Victor A. Vassiliev, Moscow
09.05.-15.05.99	Hyperbolic Aspects of Fluid Dynamics
Organizers:	Heinrich Freistühler, Aachen Benoit Perthame, Paris Anders Szepessy, Stockholm
16.05.-22.05.99	Quadratische und Hermitische Formen
Organizers:	Albrecht Pfister, Mainz Winfried Scharlau, Münster Jean-Pierre Tignol, Louvain-la-Neuve
23.05.-29.05.99	DMV-Seminare

The Centre de Recerca Matemàtica, Barcelona

In this article, general information is provided about the Centre de Recerca Matemàtica (CRM) and the institution upon which it depends, the Institut d'Estudis Catalans (IEC). The article also contains a record of activities of the CRM in 1997 and a summary of main events in 1998, some of which were announced in the December 1997 issue of the Newsletter.

The Institut d'Estudis Catalans

The IEC was founded in 1907. It is an academic, scientific, and cultural body whose sphere of activities includes all aspects of Catalan language and culture. The aim of the IEC is to advance scientific research, in particular research into all elements of Catalan culture. It contributes to the planning, coordination, and implementation of research in different fields of science, technology and humanities. Moreover, its own activities further the progress and development of society in general, and, when necessary, it acts as an advisor to the government and other institutions.

The IEC is made up of five different sections defined by broad subject units in science, technology, and humanities. Each section is formed by a maximum of 21 full members. There are 25 affiliated societies to the IEC, with more than 8,000 members. The headquarters of the IEC are the former Convalescent Home building, carrer del Carme 47, E-08001 Barcelona.

The Centre de Recerca Matemàtica

In 1984, the IEC created the CRM, with the main goal of providing Catalan mathematicians with a research institute which would stimulate the improvement of mathematical research in Catalonia, both qualitatively and quantitatively. To achieve this aim, the CRM invites outstanding mathematicians for research visits, facilitates scientific contacts between these visitors and young local researchers, carries out research programmes, organises talks, conferences and other scientific meetings, and disseminates research results through its preprint series.

The CRM is located in the Science building of the Universitat Autònoma de Barcelona (UAB), on its campus at Bellaterra, in accordance with an agreement signed by the IEC and the UAB.

The address of the CRM is

Centre de Recerca Matemàtica
Institut d'Estudis Catalans
Apartat 50
E-08193 Bellaterra
Tel: +34 93 581 1081
Fax: +34 93 581 2202
e-mail: crm@crm.es
web: http://crm.es

Governing Body and Structure

The CRM is directed by a Council consisting of four members from the area of Mathematics of the IEC, together with a representative of the Societat Catalana de Matemàtiques. The current members of the Council are Eduard Bonet, Manuel Castellet, Joan Girbau, Sebastià Xambó, and Josep Vaquer.

The Council elects a Director to serve for a period of four years. The current Director is Manuel Castellet, who was re-elected for the period 1996–1999 at the meeting of September 1995.

At the meeting of May 1994, the Council agreed to create a Scientific Committee. The current members of this committee are Jaume Aguadé, Lluís Alsedà, Felipe Cucker, Joan Elias, Josep M. Font, Joaquín Ortega, Marta Sanz, Joan Solà-Morales, Joan Verdera, and Sebastià Xambó.

The persons in charge of the administration of the CRM are Consol Roca and Maria Julià. They also look after the guests and take care of the preparation of scientific papers.

Facilities

The CRM occupies a total of 940 square metres, containing 8 single offices, 2 double offices, 3 triple offices, a secretarial office, a director's office, a computer room, a storage room, 2 lecture rooms (one for 50 people and another one for 25 people), a meeting room, and an informal meeting space. The computer equipment of the CRM includes several workstations and personal computers, all connected to a network.

CRM visitors may use, without any limitation, the Science Library of the UAB, which contains a Mathematics corpus consisting of 391 journals and more than 10,000 books.
The CRM has 12 permanently rented furnished apartments for its guests. They are located in the town of Sant Cugat and in the Vila Universitària of the UAB Campus.

Events in 1997
Since 1989, the CRM organizes every year one or two specialised semesters, in connection with the Mathematics Department of the UAB. The most recent semesters and related activities are listed below.

(1) *Analysis Semester*, from October 1996 to March 1997, coordinated by Joan Cerdà.
(2) *Mathematics and Education: Principles and State of the Art*, January 1997, coordinated by Núria Gorgorió.
(3) *The Third Barcelona Logic Meeting*, in January 1997, organized by E. Casanovas, K. Došen, R. Elgueta, R. Farré, D. Lascar, and A. Mathias.
(4) *Semester on Algebraic Logic and Model Theory*, from April to July 1997, organized by Josep M. Font and Enrique Casanovas. It included a *Workshop on Abstract Algebraic Logic*, held in July 1997.
(5) *Symposium on Discrete Dynamical Systems in honor of Wiesław Szlenk*, in August 1997, organized by Lluís Alsedà, Jaume Llibre, and Michał Misiurewicz, with the collaboration of the Ministerio de Educación y Cultura, and the Group of Dynamical Systems of the Universidad de Murcia.
(6) *Workshop on Statistical Inference for Mathematical Finance*, in November 1997, organized jointly with the Borsa de Barcelona and the Mercat Espanyol de Futurs Financers, by X. Aguilà, J. del Castillo, and P. Viñolas, under the supervision of O. Barndorff-Nielsen.
(7) *Workshop on the Ramsey Theory of the Reals*, in December 1997, organized by Joan Bagaria.

The CRM has welcomed 61 researchers in 1997, six of which were postdoctoral fellows; 187 lectures were given during this year. The CRM has also published 30 preprints of research articles and one volume of *Quaderns*, a series which outlines the contents of specialized activities.

Events in 1998

(1) *Intensive Winter Term on Mathematical Education*, from January to March 1998, coordinated by Alan J. Bishop and Núria Gorgorió. It included a *Workshop on Current Trends in Research on Mathematics Education*, in February 1998.
(2) *The Fourth Barcelona Logic Meeting*, in February 1998, organized by J. Bagaria, E. Casanovas, R. Elgueta, S. Friedman, D. Mundici, B. Poizat, and J. Rebagliato.
(3) *Seminari de Primavera* on Mathematical Finance, from April to May 1998, coordinated by Joan del Castillo.
(4) *Semester on Algebraic Topology*, from April to July 1998, organized by Jaume Aguadé, Carles Broto, and Carles Casacuberta. The chief event of this semester is the *1998 Barcelona Conference on Algebraic Topology*, held in June 1998. It is a Euroconference. The programme and abstracts of talks of the 1998 BCAT can be found on the conference web site `http://mat.uab.es/bcat98`.
(5) *Semester on Dynamical Systems*, from September to December 1998, organized by Lluís Alsedà, Armengol Gasull, and Jaume Llibre.

Courses and Fellowships
The CRM also organizes Advanced Courses of international scope every year. The topics treated in 1997 were *Stochastic Analysis*, and *Statistical Inference for Mathematical Finance*. In 1998 there are courses on *Classifying Spaces and Cohomology of Groups* (in May), and *Dynamical Systems* (in September).
Two postdoctoral fellowships were awarded in 1997 to applicants with less than three years of postdoctoral research; 71 applications had been received. Moreover, the CRM has hosted two postdoctoral fellows in 1997 within the Human Capital and Mobility Programme of the EC.

The TIMSS-Video-Study: Teaching Mathematics Differently?

R. Sträßer - IDM Bielefeld, Germany

1 The TIMSS-Video-Study

In some national and the international Mathematics Educators communities a recent study of Mathematics and Science teaching and learning is widely discussed: the "Third International Mathematics and Science Study (TIMSS)". More than 40 nations all over the world participated in this large scale study which was designed to compare Mathematics teaching and learning in three age cohorts: "population 1" in primary level (grade 4), "population 2" in the middle/at the end of junior secondary schooling (grade 7/8) and "population 3" in upper secondary level. Data and interpretations about "population 2" were first published and reactions to the findings were rather heavy and widespread. This paper also concentrates on findings in "population 2" (grade 7/8). Official descriptions of the TIMSS identify four components:

- a curriculum-Study
- an achievement study
- some survey questionnaires (for heads of schools and teachers)
- an in-depth comparison of three countries, namely—in alphabetic order—Germany, Japan and the United States of America.

This in-depth comparison included case studies (on the teaching style, the schools and the school administration as well as the home situation and the lifestyle of students) and a video-study on teaching mathematics in these three countries. The following paper concentrates on the video-study because it is the part of the TIMSS which is nearest to the actual teaching of Mathematics and provides some surprising facts on this (for further details on TIMSS and its video-study in particular the best source seems to be the "Web", for instance at

`http://ustimss.msu.edu/frame.htm`,
`http://www.ed.gov/NCES/`,
`http://www.nsf.gov/`

and more specifically on the video-study:

`http://www.ed.gov/NCES/timss/video/`

A German perspective on TIMSS is offered in Baumert et al. 1997).

For the video study, in Germany 100 lessons were videographed, in Japan they videotaped 50 lessons and they had 81 lessons documented by video in the USA—in total more than 200 lessons all in grade 8. In the WWW-presentation of the study, these videographed lessons are presented as representative of the Mathematics teaching in the respective countries, while there is no explanation for a somewhat different sampling in Japan if compared to the USA and Germany (cf. Baumert et al. 1997, p. 207). An expert consultant of the TIMSS-video- study even doubted the representativeness of the Japanese videos explicitly (Keitel 1998). If we place this study in the overall research framework of TIMSS, we should mention the three "TIMSS"-levels of a curriculum, namely the "intended curriculum" (on the national educational system level), the "implemented curriculum" (on the community, school and classroom level) and the "attained curriculum" (at the student level, from Robitaille et al. 1996, p. 35). The video-study obviously can be placed at the "implemented/attained curriculum" borderline of the three "TIMSS"-levels of curriculum.

2 Teaching Mathematics in Germany, Japan and the USA

The most interesting fact of the video-study is that the research team of the video-study condensed the videographed lessons into national "standard" lessons of each country. If we forget about the problem of representativeness mentioned above (!!) and apart from accidental differences between the individual lessons, every nation seems to have a "script" of a mathematics lesson which can easily be described and used to characterise the national way to teach Mathematics at grade 8. In this paragraph, I will briefly describe these scripts and end with a rough comparison of the three scripts.

2.1 The lesson script in the USA

The lesson script in the USA can briefly be described by the following sequence:

(1) revision of homework and/or sharing results
(2) repetition of difficult topics from homework
(3) presentation of a new subject matter by the teacher
(4) examples of the new subject matter (a classroom discussion or teamwork)
(5) routine practice of the solution method on analogous problems (seatwork, while the teacher coaches individuals).

2.2 The lesson script in Germany

The German script is only minimally more complicated, because there are two "versions" of the same script, depending on the whether the subject to be taught has been somehow "prepared" before the actual lesson. The sequence goes as follows:

(1) revision of homework / sharing results
(2) short repetition

(3a) new subject matter introduced by a teacher directed classroom discussion, the discussion aims at one solution and is documented by teacher
(3b) if the subject matter has been prepared in advance: a student (standing at and writing at the blackboard) develops one solution with the help of fellow students and the teacher
(4) routine practice of the solution method on analogous problems (seatwork, while the teacher coaches individuals)

2.3 "Standard" lesson in the Japanese videos

The Japanese script, in remarkable ways is different from the American and German script, but can also be described by a sequence:

(1) the teacher presents a complex problem
(2) the students work on a solution (individually or in teamwork)
(3) students present different solutions at the blackboard
(4) classroom discussion of the solutions
(5) summary of results by the teacher
(6) students work on new problems (individually or in teamwork).

To illustrate the Japanese script, I "quote" from the video offered by the TIMSS-video-study group. In this video, we see the teacher pose the following problem: No more than 2.100 Yen should be spent to buy 10 cakes. There is cake at 230 Yen per piece and cake at 200 Yen per piece of cake. What is the best buy if as many cakes per 230 Yen as possible are bought ? (translation R.S.)
After some individual work on the problem, three solutions are presented:

- Solution 1 (by a student): Try out 10 cakes of 230 Yen, reduce the expensive cakes until spending less than 2.100 Yen.
- Solution 2 (by the teacher): Buying 10 cakes at 230 Yen implies paying 200 Yen too much. The difference of the prices is 30 Yen per cake. Dividing 200 by 30, it is obvious to buy 7 cakes at 200.
- Solution 3 (by a student): An inequality gives $230x + 200(10 - x) \leq 2100$; hence $x = 3$.

2.4 An attempt at comparing

These and some additional differences can be summed up in the following table:

US videos	German videos	Japanese videos
one solution to a problem		*different* solutions to a problem
presentation of concepts / procedures	*development* of concepts / procedures	
"broadcasting" of knowledge		construction of knowledge
"no" proofs	rarely proofs (≈10%)	"many" proofs (≈50%)
many routine problems (>90%)		rarely routine problems (≈40%)
≈20% teamwork	teamwork<10%	≈30% teamwork

If we sum up this comparison, the "case" of the Japanese videos (mind the representativeness) shows that teaching Mathematics is possible in heterogeneous classes of the same age with mathematically demanding problems—constructively using the intuitive concepts of students. The students have a chance to bring in their individual competencies and ways of knowing, as well as their way to solve problems. They can take over the responsibility for the solution(s) of the problems—and the results from the TIMSS-achievement tests show that this type of teaching does not necessarily hinder satisfactory "results" in terms of achievement: For grade 8, Japan came off at the third rank of the achievement test (cf. Baumert et al. 1997, p. 88; for more details of the comparison cf. loc.cit., p. 183ff; a somehow less comfortable interpretation stresses the fact that more than 60% Japanese students attend private coaching in grade 8—compared to approx. 15% in Germany and 30% in the USA, cf. Baumert et al. 1997, p. 208f).

3 Teaching Mathematics the Japanese Way?

Having seen such a convincing model, why don't the other nations all over the world teach the way the Japanese videos illustrate? Why don't they develop different solutions to the same problems in their lessons? Why don't they differentiate their teaching/learning within the same classroom? Why don't they offer demanding drill and practice? Why don't they foster team work?

Part of the answers to these questions can also be found in the videos and the publications analysing these videos. Also taking into account the cultural and historical background of the Japanese educational system, it becomes obvious that there are individual and cultural conditions and constraints in Japan which differ considerably from the American and European situation, such as:

- extensive tutoring by families and "private", though partly professionalised afternoon coaching,
- a highly developed and culturally supported intensive co-operation between teachers,
- a rather detailed, central national (intended) curriculum, including model lessons,
- a most important selection and allocation function of the educational system,
- a very high societal esteem of education.

Do we have this—and/or do we want this—in (different countries of) Europe—as seems to be the case in Japan?

References:

Baumert, J., Lehmann, R., Lehrke, M., Schmitz, B., Clausen, M., Hosenfeld, I., Kller, O. & Neubrand, J. (1997). TIMSS Mathematisch-Naturwissenschaftlicher Unterricht im internationalen Vergleich. Deskriptive Befunde. Opladen: Leske & Budrich.

Keitel, C. (1998). Mathematikunterricht zwischen Wissenschaft und Politik, TIMSS und die Folgen des Mythos Japan. In: Kolloquium des Instituts fr Didaktik der Mathematik (IDM), Bielefeld

de Lange, J. (1997). Looking through the TIMSS-mirror from a teaching angle. In Learning from TIMSS: A NRC symposium on the Research of the Third International Mathematics and Science Study, (no numbered pages). Washington: National Academy of Sciences / National Research Council.

Robitaille, D. F. & Garden, R. A. (eds.). (1996). Research questions and study design.Vancouver: Pacific Educational Press.

Robitaille, D. F., Schmidt, W. H., Raizen, S., Mc Knight, C., Britton, E. & Nicol, C. (1993). Curriculum Frameworks for Mathematics and Science. Vancouver: Pacific Educational Press.

Some useful www-URLs:

`http://ustimss.msu.edu/frame.htm`
`http://www.ed.gov/NCES/`
`http://www.nsf.gov/`

for the video-study more specifically:

`http://www.ed.gov/NCES/timss/video/`

Promoting Research – A Challenge for Professors

K. W. Roggenkamp

Mathematisches Institut B, Universität Stuttgart, Pfaffenwaldring 57, D–70550 Stuttgart, Germany
email: kwr@mathematik.uni-stuttgart.de

This is an adapted version of a talk given in Kronstadt – Romania.

1. Introduction

It is a privilege for me to participate in this meeting. Although not a Romanian, I have been to Romanian universities several times, and during these visits I was able to get an impression of Romanian higher education.

2. The Ingredients

What do we need in order to develop a high level of research? The two main ingredients are surely eager students and committed professors—and also, perhaps, school teachers.

I have heard that at a Senate meeting of a Romanian University, a professor proposed to limit times of absence during the semester for professors. This met with silence and objection. It is apparently common to leave the university during the semester for extensive periods—some "TEMPUS" projects encourage this. Such a practice does not encourage research. In this respect we have very strict rules in Germany—yet I still have enough leeway to participate at meetings and to visit colleagues. Interaction between students and professors must be close and continuing.

I believe the following are necessary for fruitful interaction:

- Students and professors need a long-term view;
- Students need to know that hard work will gain rewards—either in money or reputation;
- Recognition is required: the students by their professors and teachers, the professors by society.

I am an active mathematician, and so I can only talk about research in mathematics and related subjects such as the natural and exact sciences. But there are some general things which can be said, based upon my observations during my visits here:

(1) In my opinion, university teachers here—I mean *preparators, assistants, lectors, conferentiars* and *professors*—have too many teaching obligations. Just as in Germany, a teaching load of 6–8 hours per week is enough at Ph.D. granting institutions. Young scientists should teach even less and the older professors more. Too high a load has the consequence that the professors regard teaching as a necessary duty they sometimes dislike. However, teachers who dislike their job cannot offer a good education—**we need committed and enthusiastic teachers.**

(2) The salaries of the university teachers must be increased considerably, otherwise the talented young people will leave the country, and it will take a generation—maybe even longer—to fill this gap. This is what has happened and is still happening in many countries of the former Soviet Union.

(3) The curricula at the universities must become—at least for the scholarly students—much more flexible; they—as well as the professors—must have freedom of choice according to their talent and taste.

From now on, when talking about students and professors, I am primarily talking about students and professors of the natural sciences and mathematics.

3. Facts of Life

Everyone accepts that quality has its price, yet this rule apparently does not apply to teachers and university professors. Education is the most important investment in the future. It is the seed-corn of future prosperity. *As long as the state and society do not realise that a good education has its price something is wrong and has to be changed.*

When Germany was one of the leading countries in research and science (1850–1935), being a University Professor—although it did not pay very well (a medical doctor at that time would earn more than a professor)—conferred both ranking and respect in society. In the past 60 years the status of being a professor has systematically been diminished in Germany and, as a consequence, German research and science overall have dropped to mediocrity.

It is not appropriate to talk about an "élite" in my country, and it is still less appropriate to ask for this "élite" to obtain special training. German "Professors" are no longer the "élite" of Germany: we have "Professors" who only teach and "Universities" where one can get a "Diploma" in "Computer-Simulation of Special Effects in Films". In Germany, universities are misused and students misled.

A Romanian professor compared the social status of a medical doctor and a professor as follows:
"The medical doctors are more highly respected than the professors. The salaries (of the professors) are too small in any case to have a high esteem in society."
Although I note a similar tendency in Germany, I was shocked by this comment.

Professors educate future leaders of the country. They lead them to the frontiers of research and teach them the first steps in contributing to research.
This select group—the university students—has been taught by their professors to use their intellect and their skills effectively; they serve science to serve themselves and thus serve their country.

Something must be wrong if a group of such importance for their country as the university professors are less highly respected than the medical doctors—who obtained their professional education with the help of university professors. Something must be wrong if the professors, to whom the country owes so much, do not have a high esteem in society *because they do not earn enough money.*
Yet is money all that counts? Have we come so far that money is the sole measure for reputation in society? Have intellectual values, which have made us what we are over the past centuries, been so devalued? Can a country that does not honour and respect its professors, its intellectual leaders, survive in the future?

I suggest that substantial progress in research can only be achieved if doing research is highly respected by society, and that the social esteem of professors and teachers must be increased substantially.

I also believe that the *good students wishing to pursue research should have more freedom in choosing lectures, seminars and professors. They should not be forced to study in depth something which they reject. The curriculum for them should be somewhat flexible.*

I believe that we must select at a relatively early stage the young people we wish to train seriously to do essential research and whom we wish to nurture. I suggest the following selection criteria:

(1) *Logical thinking and arguing*
(2) *Creativity*
(3) *Persistence*
(4) *Intelligence*
(5) *Strong will*
(6) *Responsibility*
(7) *Fairness*
(8) *Ambition*
(9) *Curiosity*

Most of these criteria can already be detected in primary school. Note that I purposefully omitted:

(1) a *requirement for a good memory.*
(2) *the ability to learn quickly.*

I believe that these talents may be more of a handicap than a help: In science there is no such thing as "learning", there is only "understanding". Someone with a poor memory is forced to delve deeper into the fundamentals of the theory, being forced to reduce a mathematical proof or a theory in physics to a few *essentials*, which can be memorised. Quick learners often overlook details which can later turn out to be important.

Before I make a critical comment on *mathematical olympiads*, let me congratulate the Romanian country for winning the 1997 *International Mathematical Olympiad* in Bombay. Every country can and should be proud if its team wins the *IMO.* I do not think, though, that training for olympiads should be taught at research-oriented universities. As a matter of f
I know personally, there are very few who have been outstanding participants at such olympiads. As far as I can judge, these olympiads test technique and problem-solving under pressure of time. They do not test depth of thought—a good idea cannot be forced.
I cannot see any point from my list of criteria that such training promotes; scientific genius and creativity cannot be forced to appear at a certain date and at a certain hour.
My experience is that working for half a year unsuccessfully on some problem has, day by day, given a little more insight into it and, day by day, I understood the problem better. Such days of apparently unsuccessful research are necessary to appreciate the nature of the problem. The eventual solution typically comes suddenly and unexpectedly, and seems "obvious" in retrospect.
Today it is clear to me that I could not have found the solution earlier: *productive research is a process:*

So far as professors are concerned, I believe that:

(1) Professors must be or must have been active and successful researcher—*ie.* doing active research—not just being scholars.
(2) They must know what is important in their field and must not be narrow-minded.
(3) They must be devoted to science, research and scholarship.
(4) They must be "good" and "committed" teachers.
(5) They must recognise talent in their students and they must nurture this talent.
(6) They must not be arrogant—they should not forget how hard life was for them when they first started.

Let me first talk about arrogance: In Urbana, at the University of Illinois, my Ph.D. advisor, Irving Reiner, told me one day:
"One of the things which is very difficult to accept is to realise that some of your students—Ph.D. candidates—are better at research than you yourself and then to promote them nevertheless. Being aware that one of these days they might give the main lecture at a meeting, while you will only give an ordinary talk."
I also believe that it is very useful for a Professor to learn, say, every 5 years or so, a newly developed subject—new concepts, new theories and new techniques—and to learn this to research level. This has two advantages:

(1) That way the professor does not forget how students feel when they have to struggle through new theories.
(2) It keeps him up to date with the new developments—one quite often sees that for the last 20 years professors did not keep up with the development of the research in areas close to their original field.

Some comment on the meaning of *good and committed teachers* is required. There is currently much comment in Germany to the effect that professors are in general poor teachers. We even have prizes (money) which are given to *"good"* teachers every year. We are on the way to the Canadian situation where evaluation of the professors by the students has considerable influence on salaries and promotion.
The consequences of this policy are that some professors' main goal in their lectures is to keep students happy:

(1) The material is not presented rigorously.
(2) The tests are too easy.
(3) The teacher makes a joke every 5 minutes.

How can one expect quality from such teaching?

Professors as Teachers

I believe that

(1) The Professor must be a specialist on the subject taught, able to highlight important theorems, proofs and applications.
(2) The lectures must concentrate on the essential.
(3) The content of the lectures must be more demanding than the students want to take.
(4) The exercises are just as important as the lectures; they must be chosen with great care and in close connection with the lectures, and they should not be easy.
(5) The teacher should be forbidden to "read from a manuscript". The advantage is a more lively lecture—the teacher is forced to think, and hence underlines the crucial steps.
(6) It is very bad if a good professor is asked to follow a textbook during a course, since then he cannot present the subject according to personal taste.
(7) The curriculum should list some key-words, say 5 to 10 for a special course—key-words for topics which should be covered.
(8) It is the professor's freedom to select the topics and value them according to taste.

As I said before, I do not have the criteria for judging a good teacher: I know that the fruits of good teaching have not yet ripened at the end of the course. It is like in school: The teachers one remembers later on as good teachers when thinking back at the age of 30 are in general those one did somehow dislike in school because their lessons were hard and one had to study very much for their classes. I think at the universities it is similar.

4. Financing

I believe that entrance to universities should be strictly controlled: only the best in their field should get the chance to enter. To achieve this, entrance tests should be introduced. However, these should not only depend on the knowledge in the special field and on the suitability of the candidates; they should test their personality and general education, as these young people will be the future leaders of the country—in industry as well as in intellectual life and in politics.
The universities should not be for free: the institutions, the professors and the material at the universities are paid for by the taxpayer. In industry, the training of workers (in the widest sense) is paid for by the enterprises. Thus, it is not fair towards the taxpayer—as is done in Germany—to make the universities open and free for everybody—no matter whether they are qualified or suited.
If a potential—qualified according to the above-mentioned criteria—student can afford to pay—most probably via parents—then that student should pay. However, for the very gifted students who are qualified and do not have the means of paying for their studies there should be enough scholarships available to allow them to lead life as a student, *without having to worry about money or to work for their living.*

The Curriculum

In the USA, one needs a university degree for almost everything—even for the lowest jobs. I think this is a system which is not in the spirit of the European university tradition, where only subjects of intellectual importance were taught. Now—at least in Germany—things have changed: intellectual importance has been replaced by making young

people feel important by giving then an academic degree.
At the "universities", only those subjects should be taught which substantially promote:

- the intellectual life—fine arts such as literature and history. Sport is not such a subject.
- the basics of science "Bildung—nicht Ausbildung" (a poor translation would be "education—not training").
- the foundations of the natural sciences.

Industrial applications should play a minor part at Universities—these are the subjects for Polytechnics. Industrial research is very important for every country; but it should be taught at Polytechnics, not at Universities.

5. What is Education?

The word 'education' is derived from the Latin *educo*—

(1) to nourish, to bring up,
(2) to promote mental fitness—not "teaching tricks"—*ie.* to make fit for a life worthy of a human being,
(3) to extract—to bring to light the hidden talents and capabilities.

I think in our time we have to add "Teaching the skills and techniques" our society needs for everyday life. In many countries, and this includes my home country, I observe with uneasiness a tendency in the education at schools and universities towards the attitude shown by a student of Euclid who had just learned the first mathematical theorem and asked him:

"*What do I gain, since I have learned these things?*"

Euclid called a slave and told him:

"*Give this man a Drachma, as he has to make a profit from what he has learned*"

I observe that the "values" of what makes life worth living have changed from ideal values to profane values. The answer one gets quite often—in Germany—when asking the man in the street what he wants from life is:

(1) Material possessions.
(2) More spare time (to watch more TV).
(3) More vacations to lie for hours packed like sardines at some exotic beach.

But is this really everything we want our young people to expect from life?

- Don't we want them to be educated at heart, instead of showing off with their new car?
- Don't we want them to read literature—of which Romania is so rich of, take for example the poetry of Eminescu, the novels of Rebreanu and Sadoveanu—and draw strength from it, instead of watching soap operas on TV?
- Don't we want them to enjoy the beauty of nature instead of having vacations in a fashionable place?
- Don't we want them to be knowledgable and ambitious in their job, to regard their profession and their job as something which is part of their life as a challenge, not something which has to be done—being finished at 5 o'clock?

Surely the young generation should seek these higher goals, and I shall elaborate later on the role of mathematics in contributing to this vision. I think that we university professors have a considerable responsibility towards our students in developing this vision. But our responsibility as professors does not end here. It is our duty to use our influence through our societies and academies as well as through the media to change things for the better:

- We have to remind the parents of their responsibility for their children, which does not end with supplying food, shelter and money.
- We have to encourage the parents to open the eyes and minds of the children to ideal values and productive occupations: Is a game of chess not more satisfactory than a computer game, where the winner is the one who has killed the most enemies?
- We have to remind the politicians of their responsibility for the young generation, which exceeds the period between two elections. We have to push them to introduce again more and more of the classical subjects such as literature, fine arts, philosophy and history in the school curriculum.
- We have to convince them that a country can only flourish—history has shown this – if it vividly promotes literature, arts and science as ends in themselves.
- As parents we also have to remind the school teachers of their responsibility in forming their pupils for life, and because of this great responsibility the school teachers have to be paid appropriately and their social status has to be elevated in order to attract the gifted teachers to the schools.

The situation can only be changed if the state takes its responsibility for education more seriously—not only as learning skills and techniques, but providing the foundations on which a life following the values listed above can be built. The pupils also must be encouraged to give their best in their profession and in life.

6. The Universities—universitas

Let me go back here as well to the origin of the word:

(1) *Universitas* – totality, the whole, the universe
(2) *universus* – general, taken collectively, based on principle

We also have the Polytechnics, institutions where the engineering sciences are taught.
Today the difference is diminishing and there is a tendency in Germany—I note this with uneasiness—of more and more universities becoming Polytechnics, meaning that the foundations of science and humanities get pushed more and more into the background, that the curriculum at the universities is increasingly composed according to the momentary interests and needs of industry.
A country where the politicians are taking the attitude of Euclid's student is a mentally poor one.
The dangers of this development to Mathematics are

- Mathematics degenerates to a slave of the needs of industry and its applications.
- The free mind, which is needed to develop new ideas and techniques, is chained in the prison of applications.

These are counterproductive for Mathematics:

- Students learn the techniques of solving problems from applications by *using the presently available knowledge and understanding.*
- The student is ill-equipped to develop new techniques from new fields over a working life of, say, 40 years.

A student, however, who learns a variety of abstract mathematical concepts and who has a profound mathematical background, is flexible enough to turn to new techniques in later professional life.

7. Education in the foundations

'παντα ρει'
(–'everything flows', Heraklid)

Thomas Edison, commonly hailed as the world's greatest inventor, confessed once: *when he was not successful the reason was in general a lack of knowledge of the foundations of science.*
Accordingly, I believe that *the unknown future can only be shaped by people who possess a deep understanding of the foundations of the sciences.* It is shortsighted to educate the future leaders of the state and of industry only in the ways of thinking which are *en vogue.*
Education must not simply prepare students for a profession, but should inculcate a good knowledge of the foundations of science, arts an literature. By no means should a school train its pupils for later professions, as the requirements for most professions currently change rapidly. Education in schools should lay the foundations for subsequent specialist training. Looking at today's requirements in the various professions, one can see that due to more automation and more "technicalisation", more and more flexibility is demanded. Today we cannot predict the direction of future developments.

8. Mathematics as education of the mind

Today, mathematics is nowadays regarded as an applied science by most people—unfortunately including the politicians. People may have a high opinion of mathematics, and most people have a high respect for mathematics; they may even know about the important contributions of mathematics to applied science and to technology. They tend to identify mathematics, however, with computers and computation. But this is only a very small and recent part of mathematics. I see with regret that mathematics in schools is turning more and more towards computers and superficial applications. I believe that a vital part of mathematics in schools and universities should be the development of both logical thinking and the skill of understanding complex abstract structures. Someone with these attributes is better off in almost all situations in life than someone without.
In Græco-Roman times this aspect was one of the main reasons why "abstract mathematics" was taught in philosophical academies.
I believe:

(1) *Abstract mathematics such as Geometry and Algebra should be a vital part of the school curriculum.*
(2) *At university, all students whose later profession requires abstract and logical thinking should have one year of abstract mathematics such as Algebraic Geometry or Algebraic Topology.*

9. The Greek world

In Platonic times, mathematics was seen as:

(1) a necessary prerequisite for practical military officers for arranging their army—*ie.* applied mathematics;
(2) the honest friend of science;
(3) obligatory for everybody in school;
(4) a suitable study for politicians and leaders of the country, thought not for its practical aspects but rather in understanding ideas and concepts.

I have no problem with these. Unfortunately the situation today is reversed:

(1) Applied mathematics and its applications are important, as they are "*useful*".
(2) The abstract and intellectual value of mathematics has been diminished.

In Renaissance times the value of mathematics can be inferred from two encyclopædia:

Mathematischen Lexikon
Christian Wolffen Leipzig 1716
(a purely mathematical encyclopædia) and
Zedlers 'Grossem vollständiges Universallexikon'
Halle/Leipzig 1739
(an encyclopædia in which mathematics only occupies a small section).

In each encyclopædia, the general value of mathematics is stressed:

(1) Logical thinking of mathematics and the clearness of thought in mathematics should be applied to other sciences.
(2) Wolffen criticises scientific publications outside mathematics: often the arguments are not clearly enough laid down, like a mathematical proof would be, and the theories are not as rigid as a mathematical theory.
(3) Zedler, in his encyclopædia, points out as virtues mathematical clear thinking, sharpening of argument and a better understanding of interconnections.
(4) Both authors point out that mathematical reasoning must enter into the other sciences and that mathematics should be an essential part of the education.

These values must be revitalised in out time.

10. Epilogue

Mathematics is not only a proper language, it is a way of thinking, an attitude of mind. Its intrinsic difficulty and its specialist language probably makes mathematics suspicious to most. Unfortunately, mathematicians work too much in isolation. Their pioneering results often cannot be understood in general—sometimes not even by other colleagues—but only by a very small number of specialists.

The reputation of research in pure mathematics in public and among politicians has to be improved. It has to be regarded as an endeavour, whose promotion is a matter of prestige for the state—just like fine arts, to which it belongs after all.

The applications of mathematics are a different matter; wherever you look in our age of technology you can see—fairly visibly for everyone—computers that are calculating; but unfortunately this reinforces the view of the man in the street (including our politicians of science) that mathematics is synonymous with calculating and computers.

However, mathematics as I understand it has only little to do with calculating or with computers. These are only means. They can be used for applications in order to open pure mathematics to applications. Mathematics is not subordinate to the application—on the contrary, it delivers techniques and ideas.

Let me point out the profound role mathematics plays in the eyes of Goethe, by quoting from *Goethe's* "Wilhelm Meisters Wanderjahre" (1829), "Betrachtungen im Sinne der Wanderer":

"Just like dialectics, Mathematics is an agent of the inner higher intellect; in its execution it is an art."

Mathematics—not the applications—in its rigour and logic—should again become—as it has been in times and countries of high civilisation—a vital part of education, both in school and at the Universities. It should be a matter of prestige for a state to promote mathematics.

Committed teachers have to work hard in the schools and in the Universities to raise the reputation of mathematics in the mind of the people. In this spirit Nietzsche wrote in "Fröhliche Wissenschaft":

"We want to carry the rigour and harmony of mathematics into all sciences, as much as possible; not in the belief that we understand things that way, but in order to recognize our human relation to the things. Mathematics is the "ultimatima ratio" of the knowledge of human nature."[1]

Special thanks go to Stefanie Ide, who helped me prepare the manuscript.

[1] "Wir wollen die Feinheit und Strenge der Mathematik in alle Wissenschaften hineintreiben, soweit dies nur irgend möglich ist; nicht im Glauben, daß wir auf diesem Wege die Dinge erkennen werden, sondern um damit unsere menschliche Relation zu den Dingen festzustellen. Die Mathematik ist nur das Mittel der allgemeinen letzten Menschenkenntnis."

Problem Corner

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

Lighting the Runway

The Austrian Mathematical Olympiad (Part II) - The Format

Super-trading-powers play a leading role in global economics. Smaller countries naturally tend to dance to their tune. Yet many a small state has found a specific and even lucrative niche in competition with these monetary giants. Luxembourg, for instance, is the epitome of a bank's paradise, Hong Kong has blossomed into a leading stock exchange site and Singapore became one of the 'Tiger States'. And it can be the export of culture comes about in reverse order.

It is not uncommon that small countries are great cultural nations at the same time: the Netherlands are lauded for the outstanding painters they have produced. And the art of problem solving was first cultivated and highly polished in Hungary, which seems decidedly diminutive compared with its giant neighbour Russia. Perhaps this old saying sums it up: 'Mathematics is the shortest and cheapest way to intellectual development in countries without a scientific tradition worth mentioning'. What I like about Hungary are its brilliant ideas in running mathematics contests. Forward-looking Magyars demonstrated to the then mathematical world how to extend the competitive idea into a powerful stimulant for students. The *Eötvös Contests* in elementary mathematics are famous for the simplicity of the concepts employed, the mathematical depth reached and the diversity of elementary mathematical fields touched.

A competition in a small country differs from that organised in a bigger one. In Austria, for instance, students are permitted to participate in the national competition only if they are willing to attend courses in mathematics offered throughout the country. Elsewhere, it is often accepted that only outstanding results achieved in contests will smooth the way for further promotion; Austria swims against the tide here. After this preface, I will return once more to the Austrian Mathematics Olympiad, an event held in a small country.

'Beginners' Round

Students participating in this mathematics competition for the first time, and who are not yet in their final year of school, can enter for the 'Beginners' Round. This Austrian prelude to a national competition is held in two stages. The first round is denoted 'Kurswettbewerb' (or course competition) and is implemented in courses as its name indicates. The questions are selected by the teachers conducting the courses. The topics remain within the bounds of the theory of equations, inequalities and number theory. As each teacher chooses his or her own problems, the first round is not necessarily held in concert with all schools. But there is a fixed week, however, during which the paper has to be taken by the students, if at all possible. Those who emerge best from each course competition (up to a maximum of five) are permitted to enter for the second and final round, called 'Landeswettbewerb' (or provincial competition). The pinnacle of the competition will always take place in a central location in each of the nine Austrian provinces simultaneously including the capital Vienna, which is counted as an independent area. The questions set in the final stage are generally chosen from a manageable set of topics which are assumed to form the syllabus for such events (for example geometry, number theory, theory of equations, classical inequalities). The scientific co-ordinator for the entire Austrian Mathematics Olympiad is **Professor Gerd Baron** at Vienna Technical University, who has had his hands full for years with the choice of the problems posed at the final test and it he has the happy knack of making good choices. As the second round is also the final round, there is no national level of the 'Beginners' Round. (In the early days of the Austrian contest there had been a third level but it was soon abandoned owing to difficulties in connection with organisation). The top students in this stage receive book prizes, and all participants get diplomas commemorating their involvement in the initial phase of the Olympiad.

The General-Level Competition

The heart of the national Austrian contest is run in three legs. The first part called 'Kurswettbewerb' (or course competition) is held usually towards the end of April. Only those students in the front rank of participants are allowed to enter the subsequent second stage, named 'Gebietswettbewerb' (regional competition), and at most five students from each course can compete at that level. There are three regional events of this type which take place simultaneously sometime in May, and all entrants have to grapple with the same set of questions. The task of selecting challenging problems is again in Prof. Baron's care, and papers are sent out to the regional organisers of the competition just ahead of the date of the fixed examination. Most of the problems set in this round require straightforward arguments from elementary mathematics (number theory, geometry, systems of equations and series) with only the occasional foray into sophisticated or advanced ideas. The top-notch students from each of the regional stages of the competition are certified

then to enter the third and final leg of the Austrian Olympiad. Although the number of participants that have qualified can vary slightly from year to year, it is beginning to be the norm that approximately eight students from each region are able to take part in the final round but, rightly, those students who are old hands in competitions because they have experience of an international contest (IMO or the Austrian-Polish Mathematics Competition), do not count in this quota. Altogether, a maximum of thirty top-flight young people are entitled to participate in the climax of the Austrian Olympiad.

The Preparatory Course For The Final Event

The pick of the bunch of competitors of the Olympiad meets for the final showdown annually in June. The last lap consists of a two-day meeting with a set of three problems posed each day, and four hours time per day allowed to come up with answers. As a preliminary to the final round, students who are selected using the results from previous stages are offered a two-week seminar in order to set them up for the finale. This is popularly referred to as a 'preparatory camp' for the IMO team as well as the APMC contestants, as students only have a few weeks left after the final round to swot for their international deployment. The framework of the preparatory seminar is somewhat crammed with strategy or tactics in problem-solving. The purpose of this seminar is to identify and draw attention to the most important techniques typically encountered in international competitions. The material to include in the four lectures, each of one and a half hours duration, is influenced strongly by the problems that have been set in the IMOs. Among other things, last year's IMO problems are discussed at length and theoretical instruction is given on subjects such as functional equations, inequalities and so on. The aim throughout is to show how a basic set of simple techniques can be applied in diverse ways to solve an enormous variety of questions, and the participants should regard this collection as a starter set and attempt to solve numerous problems of varying levels of difficulty in any spare time they might have.

The seminar soon became well-established, possibly because it has been instituted very carefully, and has been held for many years in *Raach am Hochgebirge*, a quaint village in the mountains of Lower Austria. There is virtually nothing to do for the participants other than to work on mathematics. Although The 'Bundesheim' that accommodates the course is quite comfortable, and offers the chance to play tennis, soccer or watch TV, this lovely little spot itself doesn't afford any other diversions apart from going for a stroll in the immediate environs. This means that students who are keen on getting put up for the Austrian IMO team can concentrate alone on mathematics for two full weeks, without the danger of distraction. Some crack young 'campers' manage to move into the preparatory encampment as often as four times, and so it is always difficult to offer a scientific programme that will be of equal interest to first time participants and old hands. Moreover, it is not always easy to get more experienced students to work together with newcomers, which is perhaps not surprising, as they are destined to be adversaries in the up-coming competition, where each one is competing for the same places in the teams put together for the IMO and APMC.

In summing up I should like to maintain that running a competition in a small country provides a useful experience: it can beacon the runway for others. For, possibly the most positive outcome of participating in mathematics contests is the potential for changing the image of mathematics from something austere and intellectual to something that is sociable and enjoyable. And, the almost proverbial commercialism that dominates especially the American community has conquered the mathematics market itself. Students there can have T-shirts, luncheons, parties and school recognition. In many schools a mathematics club becomes more popular simply because the preparation for contests gives the students a focal point for communication. They can help one another (and should be encouraged to do so). It would not be uncommon for twelfth-grade students to befriend ninth-graders. It is know of schools where the 'mathematics' dinner party gained a social status topped only by the traditional events of homecoming and the prom.

Experiences in small countries have principally shown one facet plainly: there is some light in the tunnel in the general acceptance of the use of mathematics competitions as a fillip for the learning of mathematics. For example, the following, an extract from the Preface of a former UNESCO publication, is certainly supportive: "*there is no doubt that many concerned educationalists and scientists who support the olympiad movements within their countries, consider the annual challenge of national events as an important stimulus for their talented students as well as an opportunity for these students to meet similarly gifted and like-minded young people from all around their country; and that such interactions will have a significant influence for the future welfare of our planet*". And a little later the UNESCO report recommends that its member states should "*promote out-of-school activities such as the international and regional olympiads in ... mathematics in order to encourage mathematical talent and initiative among the youth*".

The competitions held in 'miniature states' can point the way ahead for densely populated countries. **Exactly for this reason I want to make an extra appeal to you to provide me with materials coming**

especially from contests organised in small countries. I'm very interested in receiving facts and figures dealing with national mathematics competitions, but I'm also agog to get articles dealing with competitions at a lower level than Olympiad level such as regional or local competitions. There is a great need in many countries for such information.

After we have sung many praises of the competitive spirit in small states, it's your turn now to demonstrate whether you know your stuff in the field of professional problem-cracking. Here is another fire-work of questions in the Austrian Mathematical Olympiad.

Q. 92 Find all polynomials $p(x) = x^5 + a_4x^4 + a_3x^3 + a_2x^2 + a_1x + a_0$, where the coefficients a_i are real constants, which satisfy the following condition:
If a is a real or complex root of $p(x)$, then $\frac{1}{a}$ and $1 - a$ are also zeros of the equation $p(x) = 0$.

Q. 93 If a and b are non-negative real numbers such that $a^2 + b^2 = 4$, show that $\frac{a.b}{a+b+2} \leq \sqrt{2} - 1$.

Q. 94 Prove, that in any convex polygon of $2n$ sides, there exists at least one diagonal which is not parallel to a side.

Q. 95 Let a be a real number. For what values of a do the following simultaneous equations have real solutions?

$$x^2 + y^2 + z^2 = 5$$
$$xy + yz + xz = 2$$
$$xyz = a.$$

Q. 96 Consider sequences of the form $x_1, x_2, \ldots, x_n$ in which each x_i is either a, b or c. Determine the number of different sequences
(i) which have length n,
(ii) begin and end with the letter a, and
(iii) in which adjacent terms are always different letters.

Q. 97 Suppose a, b, and c are the lengths of the sides of a triangle with $a \leq b \leq c$. Let S and T be real numbers. Find the minimum value S and the maximum value T, respectively, satisfying the inequality

$$S \leq \frac{(a+b+c)^2}{b.c} \leq T.$$

Determine when there is equality.

That should provide some problems for your puzzling pleasure over the next couple of weeks or months. Now we return to readers' solutions to problems featured in earlier issues.

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 $(a + d)^2 + (b - c)^2$.

Solution 1 **(J.N.Lillington,** Winfrith Technology Centre, Dorchester, UK) Let $a^2 + b^2 = A^2$, $0 \leq a, b, \leq A$ and $c + d = B$, $0 \leq c, d \leq B$. Writing

$$\begin{aligned} E &= (a+d)^2 + (b-c)^2 \\ &= a^2 + d^2 + 2ad + b^2 - 2bc + c^2 \qquad (1) \\ &= A^2 + B^2 + 2(ad - c(b+d)) \\ &\leq A^2 + B^2 + 2AB = (A+B)^2 \end{aligned}$$

with equality if and only if $a = A$, $b = 0$, $c = 0$, $d = B$. Thus $(A + B)^2$ is the greatest value of E. By (1),

$$\begin{aligned} E &= A^2 + d^2 + c^2 + 2ad - 2bc \\ &\geq A^2 - 2Ac + c^2 + d^2 \text{ with equality if and only if } a = 0,\ b = A \\ &= (A-c)^2 + (B-c)^2. \end{aligned}$$

Suppose $A \leq B$. Then $E'(c) = 0$ and $E''(c) > 0$ at $c = \frac{A+B}{2} \implies E$ is minimum and $E = \frac{1}{2}(A-B)^2$. Otherwise, if $A > B$, then $E(c)$ is at least at $c = B$ as c varies in $0 \leq c \leq B$, i.e. $E = (A-B)^2$. In summary, $\frac{1}{2}(A-B)^2$ is the least value of E if $A \leq B$ and $(A-B)^2$ is the least value of E if $A > B$.

Solution 2 (**Niels Bejlegaard,** Stavanger, Norway) Looking geometrically I take the expression as the square of the distance between the points $P(a,b)$ and $Q(-d,c)$. Then the first point moves on a circle with radius A; the other point moves on the line $y = x + B$ in the second quadrant. Snce $0 < \frac{|A-B|}{\sqrt{2}} < |A-B|$, $\inf\{(a+d)^2 + (b-c)^2\}$ takes the value 0 for $A = B$ and $\frac{(A-B)^2}{2}$ for $A \neq B$ (general case). It is immediately clear that $\sup\{(a+d)^2 + (b-c)^2\} = (A+B)^2$. That is we have: $\frac{(A-B)^2}{2} < (a+d)^2 = (b-c)^2 < (A+B)^2$.

Q. 83 How many *joker numbers* (i.e. six digit numbers composed of the digits 0 to 9) exist, containing precisely four digits?

Solution (J.F.Lillington) Consider first the subset of numbers where one digit occurs in precisely three places in the 6 digit number, e.g. the number is of the type $AAABCD$. These three places can be chosen in $\binom{6}{3}$ ways. The digit can be chosen in 10 ways. The next digit (not repeated) can be chosen in 9 ways, the next in 8 ways and the last in 7 ways.

There are therefore $\binom{6}{3}.10.9.8.7$ joker numbers of this kind. ... (1)

next, look at the subset of numbers where two distinct digits each occur in precisely two places, e.g. the numbers are of the type $AABBCD$. The first digit occurs in two places which can be chosen in $\binom{6}{2}$ ways. The digit can be chosen in 10 ways. The second digit occurs in 2 of the remaining 4 places which can be chosen in $\binom{4}{2}$ ways. This digit can be chosen in 9 ways. The next digit (not repeated) can be chosen in 8 ways, the last in 7 ways.

There are therefor $\binom{6}{2}.10.\binom{4}{2}.9.8.7$ joker numbers of this kind. (2)

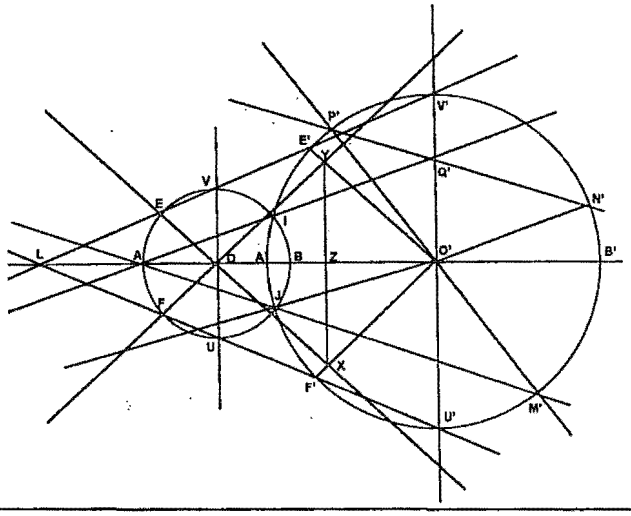
From (1) and (2), there are a total of

$$\left(\binom{6}{3} + \binom{6}{2}\cdot\binom{4}{2}\right).10.9.8.7 = (20 + 15.6).10.9.8.7 = 554,400 \text{ joker numbers.}$$

One incorrect solution was also submitted

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?

Solution (**Jean Lefort, Wintzenheim, France**)



Soit (C) le cercle de centre O et de diamètre $[AB]$, (C') le cercle de centre O' et de diamètre $[A'B']$ avec A, A', B, B' alignés dans cet ordre sur la droite (D). Soit I et J les points d'intersection de (C) et (C'). La figure ci-dessous permet de suivre les principales étapes de la construction. La droite (AJ) coups le cercle (C') en M'. La droite (JO') coupe le cercle (C') en N' et enfin la droite $(M'O')$ coupe le cercle (C') en P'.
Par construction les droites (AJ) et (AI) sont symétriques par rapport à (D) tandis que (AM') et $(N'P')$ sont symétriques par rapport à O'. Par suite (AI) et $(N'P')$ sont symétriques par rapport à la perpendiculaire en O' à (D) et elles se coupent en Q' sur cette perpendiculaire. La droite $(O'Q')$ coupe cercle (C')en U' et V'.
En changeant les rôles des cercles (C) et (C') on construit de même la perpendiculaire en O à (D) qui coupe le cercle (C) en U et V. La droite (UU') coupe la droite (D) en L qui est le centre d'homothétie positive h transformant un des cercles en l'autre.
Soit E et E' les deuxièmes points d'intersection de la droite (VV') avec les cercles (C) et (C') respectivement. Soit de même f et F' construit à partir de la droite (UU'). Les droite (OE) et $(O'E')$ d'une part et les droites symétriques par rapport à (D), (OF) et $(O'F')$ d'autre part, se correspondent dans l'homothétie h. Ces quatre droites forment donc le parallélogramme $XOYO'$ et par conséquent droite (XY) coupe la droite (D) en Z milieu segment $[OO']$.
Also solved by the proposer, J.F.Lillington and Niels Bejlegaard.

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:

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

Solution (J.F.Lillington) Let the vectors $\mathbf{F}$, $\mathbf{v}$ have magnitudes F, v. Then

$$\mathbf{F}=\left(\frac{d}{dt}\right)\left[m\mathbf{v}\left(1-\frac{v^2}{c^2}\right)^{-\frac{1}{2}}\right]=\left(1-\frac{v^2}{c^2}\right)^{-\frac{1}{2}}m\frac{d\mathbf{v}}{dt}+\left(1-\frac{v^2}{c^2}\right)^{-\frac{3}{2}}\left(\frac{m\mathbf{v}}{c^2}\right)\frac{d\mathbf{v}}{dt}\mathbf{v}$$

i.e.

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

Taking the scalar product of (1) with $\mathbf{v}$ yields

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

i.e.

$$m\mathbf{v}.\frac{d\mathbf{v}}{dt}=\left(1-\frac{v^2}{c^2}\right)^{\frac{3}{2}}\mathbf{v}.\mathbf{F}.$$

Substituting for $m\mathbf{v}.\frac{d\mathbf{v}}{dt}$ in (1) yields

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

Also solved by the proposer.

(*Ed.* 1. Please accept my apologies for a mistake in the formulation of the question (obviously $\mathbf{v} - \mathbf{F}$ gives no physical meaning!) Dr Reut points out that the last differential equations of motions of a particle (*) can be represented in the form

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

where $(\mathbf{v}.\mathbf{F})$ is the scalar product of the vectors $\mathbf{v}$ and $\mathbf{F}$. Let m be the rest mass of the particle, $\mathbf{v}$ be its velocity, and $\mathbf{F}$ be the classical force acting on the particle, e.g. Coulomb's force between charged particles, or Lorentz's force on a charged particle in electric and magnetic fields. We assume that the rest mass m is constant. Let us consider two particular cases:

(i) When the motion is in the direction of the force, the vectors $\mathbf{v}$ and $\mathbf{F}$ are parallel, the scalar product $(\mathbf{v}.\mathbf{F}) = vF$, and the equation is reduced to :

$$m\frac{d\mathbf{v}}{dt} = \left(1 - \frac{v^2}{c^2}\right)^{\frac{1}{2}} \left(1 - \frac{v^2}{c^2}\right)\mathbf{F} = \left(1 - \frac{v^2}{c^2}\right)^{\frac{3}{2}}\mathbf{F},$$

which corresponds to the case of the so-called longitudinal mass.

(ii)When the motion is in the direction perpendicular to the force, the vectors $\mathbf{v}$ and $\mathbf{F}$ are orthogonal, the scalar product vanishes, i.e. $(\mathbf{v}.\mathbf{F})$ and the equation is reduced to:

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

which corresponds to the case of the so-called transverse mass.

2. *P. Deligne*, Institute for Advanced Study, School of Mathematics, Princeton, NJ, was puzzled by the solution I printed of Q77, which assumed that the weights are integral numbers of *tonnes*, not *kg*, as given. I concede that he is right. He suggests: *As I understand, the basic equation for n_i, the weight of the ith elephant in kg, should be written $n_i - 5000 = -2(n_{i+1} - 5000)$. The difference to 5000 is magnified from right to left, and as $2^{14} > 10,000$, all elephants must weigh 5,000 kg.*)

That completes the Corner for this issue. I need good contest materials at all levels from Europe (or even around the world). Please send me materials for use in the Problem Corner as well as suggestions for future directions for the column.

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, most especially problem sets and solutions for future 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.

J.M.Lee: Riemannian Manifolds. An Introduction to Curvature, Graduate Texts in Mathematics, vol.176, Springer-Verlag, New York, 1997, xv+224 pp., 88 fig., DM 59.00, ISBN 0-387-98322-8

This textbook is intended as a standard introduction to Riemannian geometry for those who are familiar with two topics: a) Elements of analysis on manifolds, including the general version of Stokes Theorem. b) Basic knowledge about Lie groups (transformation groups, classical groups) and Lie algebras. Under this assumption, the exposition is elementary and very well done. It starts with the definition of tensors and ends with more advanced topis in the field like Gauss-Bonnet Theorem, study of Jacobi fields and the relationship between curvature and topology. Some more difficult results (like "Rauch Comparison Theorem") are given without proof. Most of the 11 chapters is accompanied by exercises of various level of demands. These exercises ("problems") form an integral part of the book. Many references are given to more advanced or more specialised literature at many places in the book. This text can be strongly recommended to graduate students. (ok)

P.J.Hilton, U.Stammbach: A Course in Homological Algebra. Second Edition, Graduate Texts in Mathematics, vol.4, Springer-Verlag, New York, 1997, xii+364 pp., DM 79.00, ISBN 0-387-94823-6

The first edition of this famous course appeared in 1971 and since that time has become a very popular and favourite textbook. In this second edition the authors added one chapter (the last chapter X), the aim of which is to inform the reader about some more recent developments and applications of homological algebra. They present here results the greater part of which was not available in the time of the first edition. Especially, they describe applications of homological algebra in other parts of algebra, showing when possible connections with topology. This chapter is rather brief but the reader can find here sufficiently many references. (jiva)

A.Borel: Automorphic Forms on $SL_2(\mathbf{R})$, Cambridge Tracts in Mathematics, vol.130, Cambridge University Press, Cambridge, 1997, x+192 pp., GBP 32.50, ISBN 0-521-58049-8

The book is an outcome of author's series of lectures on the subject during the last three decades, the last one at the Mathematical Institute of the Academica Sinica in 1993. In the preface the author says that a more accurate title would be "Introduction to some aspects of the analytic theory of automorphic forms on $G = SL_2(\mathbf{R})$ and the upper half–plane X" with respect to a discrete subgroup Γ of G of finite covolume. The approach is inspired by looking upon automorphic functions as functions on $\Gamma\backslash SL_2(\mathbf{R})$ satisfying certain conditions ($\mathbb{C}(C)$–finiteness, where C is the Casimir operator, and K–finiteness) known from the theory of infinite dimensional representations of semisimple Lie groups. Reading of the book requires some knowledge in functional analysis and elementary theory of Lie groups and algebras. The book is intended for graduate students and mathematicians interested in the use of automorphic forms in analysis, number theory or algebraic geometry. The contents of the book can be characterised by the titles of its chapters. The first part "Basic material on $SL_2(\mathbf{R})$, discrete subgroups, and the upper half–plane" has four sections: (1) Prerequisites and notation, (2) Review of $SL_2(\mathbf{R})$, differential operators, and convolution, (3) Action of G on X. Discrete subgroups of G. Reduction theory, (4) The unit disc model. The second part "Automorphic forms and cusp forms" continues with (5) Groups conditions. Automorphic forms, (6) Poincaré series, (7) Constant term: the fundamental estimate, (8) Finite dimensionality of the space of automorphic forms of a given type, (9) convolution operators on cuspidal functions. The third part "Eisenstein series" has three sections (10) Definition and convergence of Eisenstein series, (11) Analytic continuation of the Eisenstein series, (12) Eisenstein series and automorphic forms orthogonal to cusp forms. The final part "Spectral decomposition and representation" (13) Spectral decomposition of $L^2(\Gamma\backslash G)^m$ with respect to C, (14) Generalities on representation of G. (15) Representation of G, (16) Spectral decomposition of $L^2(\Gamma\backslash G)$: the discrete spectrum. (šp)

R.W.Sharpe: Differential Geometry. Cartan's Generalization of Klein's Erlangen Program, Graduate Texts in Mathematics, vol.166, Springer-Verlag, New York, 1997, xix+421 pp., 104 fig., DM 79.00, ISBN 0-387-94732-9

The author begins the Preface with 'This book is a study of an aspect of Elie Cartan's contribution to the question "What is geometry?"...' and a bit later he adds another question '... Why is differential geometry the study of a connection on a principal bundle?...'.

The proposed answer consists of proper understanding of Cartan geometries (called 'espaces généralisés' by Cartan himself). This is provided, step by step,

from early basic concepts of smooth manifolds, fibre bundles, foliations, and Lie groups, through thorough description of Klein geometries (i.e., homogeneous spaces), up to the deformations of the latter concepts called Cartan connections. Roughly speaking, the main object on a homogeneous space is the Maurer-Cartan form and the latter connections are forms on principal bundles which enjoy very similar properties. Then three basic examples of Cartan geometries are studied in detail: Riemannian geometry, Möbius geometry (i.e., conformal Riemannian), and Projective geometry. Finally, the book includes four Appendices: Ehresmann Connections, Rolling without slipping or twisting, Classification of one-dimensional effective Klein pairs, and characterization of principal bundles. The whole book is written in a very illuminating way, providing many non-standard views on the subject of differential geometry. It can be warmly recommended to a wide audience. (jsl)

L.Gårding: Some Points of Analysis and Their History, University Lecture Series, vol.11, American Mathematical Society, Providence, 1997, vii+88 pp., GBP 10.00, ISBN 0-821-80757-9

L. Gårding presents 12 nicely presented survey articles on some concepts of classical analysis. They are the following: Picard's great theorem, On Holmgren's uniqueness theorem, the Phragmén-Lindelöf principle, Nevanlinna theory, the Riesz-Thorin interpolation theorem, Wiener's Tauberian theorem, Tarski-Seidenberg theorem, Intrinsic hyperbolicity, Hypoellipticity, Dirichlet's problem and Gårding's inequality, the sharp form of Gårding's inequality and the impact of distributions in analysis. This well presented booklet will be surely of interest to specialists in analysis and PDE's. (šs)

M.F.Atiyah, M.S.Narasimhan (Eds.): Collected Papers of V.K.Patodi, World Scientific, Singapore, 1996, x+294 pp., GBP 40.00, ISBN 9-810-22659-4

The book contains collected papers of the outstanding mathematician V.K.Patodi. Throughout his short life (his health was always fragile and he died at the age of 31), he succeeded to influence substantially, in collaboration with M.F.Atiyah, R.Bott and I.M.Singer, a formulation of local versions of index theory for elliptic operators on manifolds. There are 13 papers altogether in the book, including the paper "On the heat equation and the index theorem" (with M.F. Atiyah and R. Bott) published in Inventiones in 1973 and a series of papers "Spectral asymmetry and Riemannian geometry" (with M.F.Atiyah and I.M.Singer) published in Math.Proc.Camb.Phil.Soc. in the period 1975–6, which are devoted to a study of certain elliptic operators arising in Riemannian geometry and their spectral properties and relations to the geometry and topology. It is useful to have all of them at hand in one volume. (jbu)

P.Lounesto: Clifford Algebras and Spinors, London Mathematical Society Lecture Note Series, vol.239, Cambridge University Press, Cambridge, 1997, ix+306 pp., GBP 27.95, ISBN 0-521-59916-4

This is a remarkable book. It is centered around Clifford algebras and its main aim is to present applications of Clifford algebras in physics, geometry and analysis. I completely agree with the author who writes in the preface that it is intended for people who are not primarily algebraists but have a background in the above mentioned areas or in engineering. I would even add that in order to enjoy the book properly, one needs background especially in physics. The author starts at very low level, namely with the definition of a vector space, and for a long time treats only low dimensional objects. Before defining a notion he presents a motivation which justifies its introduction and then usually presents many different aspects and applications of this notion. These are well chosen and interesting applications. You find coordinates and also coordinate-free descriptions. The presentation is complete in the sense that in the last chapters the reader finds also the more standard (and more abstract) definitions. It is worth mentioning that the author brings also quite recent results. In my opinion, this book will be of interest to any mathematician (algebraists included) who likes applications in physics. (But I repeat once more that some physical prerequisities are necessary.) From the formal point of view the book is perfectly presented. The author tries to make the text as interesting as possible and also tries to help the reader as much as possible. At the end of almost every chapter you find a historical survey, questions and answers to them, exercices and hints or solutions to them, and usually a vast bibliography. The list of notations is also quite helpful. (jiva)

B.Bollobás, A.Thomason (Eds.): Combinatorics, Geometry and Probability: In Honor of Paul Erdös, Cambridge University Press, Cambridge, 1997, xxi+562 pp., GBP 60.00, ISBN 0-521-58472-8

Paul Erdös was one of the greatest and most famous mathematicians of the century. The contributions of participants of a conference held in his honour at Trinity College, Cambridge, on the date of his 80th birthday, are collected here. The areas represented range from set theory and geometry, through graph theory, group theory and combinatorial probability, to randomised algorithms and statistical physics. Professor Erdös himself gave a survey of recent progress made on his favourite problems, and presented also some new open problems from different areas of mathematics. The book appeared in print after the death of Professor Erdös and it

contains the 'Farewell to Paul Erdös' by Professor Bollobás. (mloe)

R.P.Stanley: Enumerative Combinatorics. Volume I, Cambridge Studies in Advanced Mathematics, vol.49, Cambridge University Press, Cambridge, 1997, xi+325 pp., GBP 40.00, ISBN 0-521-55309-1

This book is the first of a two-volume basic introduction to enumerative combinatorics. There has been an explosive growth in combinatorics in recent years, including enumerative combinatorics. Prodigious effort brought coherence and unity to the discipline of combinatorics, particularly enumeration, and incorporated it into the mainstream of contemporary mathematics. Enumerative combinatorics has been greatly elucidated by this effort, as has its role in such areas of mathematics as finite group theory, representation theory, commutative algebra, algebraic geometry and algebraic topology. The four chapters of the book are devoted to an introduction to enumeration at a less advanced level, sieve methods with the Principle of Inclusion-Exclusion, partially ordered sets and rational generating functions. There are a large number of exercises. The emphasis is given to applicability and to connections with other areas of mathematics. The book may be used as a graduate-level introduction to a fascinating area of mathematics, or as a general reference for professional combinatorists. (mloe)

S.Lang: Undergraduate Analysis. Second Edition, Undergraduate Texts in Mathematics, Springer-Verlag, New York, 1997, xv+642 pp., 91 fig., DM 78.00, ISBN 0-387-94841-4

The book under review has five parts. The first part contains the basic information on real functions of one variable (limits, continuity, derivative...). The second part deals with convergence in normed vector spaces. Connections with uniform convergence of functions and series are also presented. The next part shows several applications of integral, in particular Fourier series and Fourier integral. The fourth part deals with calculus in normed vector spaces and includes also a chapter concerning ordinary differential equations. Some basic facts on multiple integration and differential forms form the last part of the book. The book contains a lot of exercises. (mzel)

F.Wagner: Stable Groups, London Mathematical Society Lecture Note Series, vol.240, Cambridge University Press, Cambridge, 1997, ix+309 pp., GBP 27.95, ISBN 0-521-59839-7

This book provides a fair account of the theory of stable groups, starting with groups and model theory from the beginning. Stable groups can be used in abstract model theory, as in a partial proof of Vaught's Conjecture, and, also, in examining group-theoretical and geometrical structure, for instance finding a group to be an algebraic group. In this book stable groups are approached in a unified manner extending the theory of groups of finite Morley rank. The author uses model-theoretical tools such as generic types, forking relation on types, Lascar rank and its generalisations or the notion of dimensional theory. On the side of algebra nilpotency of the Fitting subgroup of a stable group, abelian-by-finiteness of a locally modular group and structure of the corresponding ring of quasi-endomorphisms are shown and explored among others. The final chapter concerns groups and fields satisfying certain property which generalises rank properties. The property holds both for small stable and superstable groups and forces the fields to be algebraically closed and with only few automorphisms and the groups to have large abelian subgroups. (rb)

T.Friedrich: Dirac-Operatoren in der Riemannschen Geometrie. Mit einem Ausblick auf die Seiberg-Witten-Theorie, Advanced Lectures in Mathematics, Friedrich Vieweg & Sohn, Braunschweig, 1997, xii+207 pp., DM 64.00, ISBN 3-528-06926-0

This book follows the author's recent lectures at Humboldt-Universitätin Berlin. Without many prerequisites required, the reader is quickly introduced to the core of some modern parts of global analysis and differential geometry. It might seem to be impossible in 140 pages, but a detailed, clear and concise treatment of the necessary algebra (the Clifford algebras and their representations), the geometric structures over Riemannian manifolds (Spin-structures), the global analysis of Dirac operators, and the topological consequences of the existence of their eigenvalues (Killing Spinors), is presented in this book. Two appendices follow. The first one deals with Seiberg-Witten equations and invariants, leading to recent theorems by Witten, Taubes, and LeBrun on Kaehler Riemannian manifolds. The last Appendix reviews basic facts on principal bundles and connections. Each section is followed by a list of relevant references and a few exercises. The book can be warmly recommended to a wide audience of mathematicians and mathematical physicists. (jsl)

H.R.Varian (Ed.): Computational Economics and Finance. Modelling and Analysis with Mathematica, The Electronic Library of Science, Springer-Verlag, New York, 1996, xi+468 pp., DM 88.00, ISBN 0-387-94518-0

This is another book in TELOS (The Electronic Library of Science) series. It may be considered as a continuation of *Economic and Financial Modelling with Mathematica,* the book by the same editor published also in TELOS series 1992. Three main parts of the book cover economics, finance and statistics. In every chapter, a brief description of

the problem is given together with the underlying theory. The computational aspects of the methods are then illustrated using *Mathematica* language. The Economics part covers the following topics: linear programming (the simplex algorithm and sensitivity analysis), optimising with piecewise smooth functions, data screening and envelopment analysis, efficiency in production and consumption, cost allocation and simulating the effects of mergers among noncooperative oligopolists. The Finance part deals with auctions, yield management, implementing numerical Option Pricing Model, and Yield Curve. The Statistics part is concerned with log spectral analysis (Variance Components of Asset Pricing), data analysis, Monte Carlo methods, and probability density functions. Most of the contributions do not provide a general solution to the mentioned problems, rather they provide the reader and the user of *Mathematica* with interesting ideas and approaches on how to manage the tasks with *Mathematica.* Recommended for all users of *Mathematica* in the field of economics and finance. (jh)

D.Applebaum: Probability and information. An Integrated Approach, Cambridge University Press, Cambridge, 1996, xiii+212 pp., GBP 15.95, ISBN 0-521-55507-8, ISBN 0-521-55528-0

"Information is a quality that removes prior lack of knowledge on the part of those who receive it" (C. Shannon, 1949). The present book serves precisely this purpose: it provides information on probability theory and information theory. The author succeeds in familiarising the reader (on a rigorous mathematical level), with the theory of probability as a starting point, of building up information theory whose important role in many branches of science is widely recognised nowadays. The book contains an application of probabilistic tools: combinatorial analysis, set and measure theory, probability distributions (both discrete and continuous, univariate and multivariate). The tools are used to define and interpret basic concepts of information theory and their applications in the theory of communication (coding, channels, transmission of the results, their vivid and illustrative interpretation). There is a wealth of examples; both worked-out in the text and left as exercises for the reader. The book is suitable as a text for (undergraduate) students of mathematics: it may serve as a useful source of information for a wider scientific public of all whose activities are somehow related to *information* in general. (ff)

Zhe-Xian Wan: Geometry of Matrices. In Memory of Professor L K Hua (1910-1985), World Scientific, Singapore, 1996, ix+376 pp., GBP 33.00, ISBN 9-810-22638-1

This book is a detailed exposition on the geometry of matrices as initiated by a series of papers written by L.K.Hua in 1945-1949. The book has a very clear structure: the first chapter contains auxiliary material from linear algebra over division rings. The second chapter presents affine spaces, affine groups and projective geometry (including Fundamental Theorems of affine and projective geometry over any division ring). The remaining chapters 3,4,5 and 6 are devoted in turn to the four basic geometries of matrices (rectangular, alternate, symmetric and hermitian). The book is intended for scientists, graduate students and third or fourth year undergraduate students interested in matrix theory and related topics. It contains a lot of applications to problems in algebra, geometry and graph theory. The text is enriched by many new results of the author which are published in a monograph for the first time. Some results presented in the book were available only in Chinese. (lbe)

H.G.Zimmer (Ed.): Group Theory, Algebra, and Number Theory. Colloquium in Memory of Hans Zassenhaus held in Saarbrücken, Germany, June 4-5, 1993, Walter de Gruyter, Berlin, 1996, xx+201 pp., DM 228.00, ISBN 3-110-15347-5

The book is based on lecture presented at the mathematical colloquium held at the University of Saarbrücken in 1993. It covers fields such as complex simple Lie algebras, modular Lie algebras, near fields, computational number theory, crystallographic groups, Zassenhaus groups, group rings and Galois groups. The volume contains 4 lectures written in English (by P.H.Tiep, A.I.Kostrikin, M.E.Pohst and K.Hoechsmann) and 2 in German (by W.Plesken and H.Bender), the Introductory Address given by Horst G.Zimmer and the names and addresses of Conference contributors. An extensive and very useful bibliography is included at the end of every lecture. (lbe)

P.J.Eccles: An Introduction to Mathematical Reasoning. Numbers, sets and functions, Cambridge University Press, Cambridge, 1997, xii+350 pp., GBP 14.95, ISBN 0-521-59718-8, ISBN 0-521-59269-0

The book is designed for students who begin to study university mathematics and its purpose is to make them acquainted with the basic language of mathematics. In the first three chapters various forms of mathematical statements and standard methods of proofs (especially proof by contradiction and by induction) are explained; they also include essential material on sets and functions and on counting finite and infinite sets. The last three parts are about number theory - Euclidean algorithm, modular arithmetic and prime numbers. Throughout the book the emphasis is on helping the reader to understand fundamental ideas; studying

the book the reader can also see the continuity of mathematics from Greek times to present days. In every chapter there is a number of relatively straightforward exercises accompanied by solutions. There are also more than 250 problems of various difficulty - some of them are similar to exercises but many of them could be interesting for more advanced students. The book is written with understanding of the needs of students and can help them to cross the limits of school mathematics. Some of them will also see that mathematics is a matter of interest. (ec)

H.J.Kushner, C.G.Yin: Stochastic Approximation Algorithms and Applications, Applications of Mathematics, vol.35, Springer-Verlag, New York, 1997, xxi+417 pp., 24 fig., DM 94.00, ISBN 0-387-94916-X

This book is well-organised. It starts with a review of classes of problems to which stochastic approximation can be successfully applied. They vary from traditional to new ones – pattern classification, signal processing, adaptive control, neural networks, animal learning, Q-learning, queuing system optimisation. The problems are described precisely, avoiding oversimplification. Theoretical chapters then follow. Convergence of the algorithms with probability one and their weak convergence are investigated for algorithms with step-size tending to zero and step-size small but fixed. Martingale difference noise and correlated noise are considered; also problems without and with constraints. Convergence proofs are mostly based on the ODE method (that separates from noise an ordinary differential equation describing the asymptotic behavior of the algorithm). Perturbation analysis is another tool. Theoretical results are then applied to problems that have been formulated at the beginning. The final chapters of the book treat the rate of convergence and the latest topics on averaged iterates and on distributed and parallel algorithms. The book will be appreciated by readers in the fields of mathematical statistics, informatics, data processing and optimisation, as well as by users of the algorithms in diverse branches. (vd)

L.I.Nicolaescu: Lectures on the Geometry of Manifolds, World Scientific, Singapore, 1996, xvii+481 pp., GBP 43.00, ISBN 9-810-22836-8

This is an extensive lecture course on Differential Geometry focusing on global, analytical and topological aspects. The first half of the book introduces the reader to the basic structures and tools, the rest aims to provide deeper development of global analysis and gauge theory on smooth manifolds. The more advanced features follow the author's graduate course at the University of Michigan in 1996. Only basic prerequisites are required. The topological core of the book consists of chapters 7 and 8, where the cohomological theory and characteristic classes on manifolds are discussed. The next two chapters are devoted to global analysis on manifold, and in particular to the general theory of elliptic operators, followed by recent important applications. The last chapter focuses on Dirac operators. During the whole exposition, the author makes a considerable effort to provide intuitive reasonings for the development and the text reads very smoothly. (For some reason the Index is shifted – the page numbers fit approximately when multiplied by 0.985!) This book can be recomended to all levels of readers. (jsl)

J.D.Hart: Nonparametric Smoothing and Lack-of-Fit Tests, Springer Series in Statistics, Springer-Verlag, New York, 1997, xii+287 pp., DM 79.00, ISBN 0-387-94980-1

The book explores the use of nonparametric regression methodology in testing the fit of parametric regression models. Chapters 2–4 give a general introduction to estimation of regression curve in the case of a single design variable with a particular emphasis on the smoothing methods. Chapters 5–10 concern the problem of testing the fit of probability models. Chapter 5 reviews classical lack-of-fit tests, chapter 6 considers the more recently proposed lack of fit tests based on nonparametric, linear smoothers. Chapters 7–10 are the real body of the monograph—the lack of fit tests based on data-driven smoothing parameters are studied. Chapters 7–8 contain treatment of distributional properties of various "data-driven test" statistics. Chapter 9 discusses extensions and chapter 10 provides a number of illustrations of the studied tests on some data sets. This is probably the first book dealing with tests of adequacy of parametric function estimates within nonparametric framework reflecting recent development in the area. The reader can focus on the the application of estimation and testing procedures (for practitioners) and/or can learn more theoretical background of the procedures (for reseachers). The book is well written, suitable for graduate students, the material is explained without too many technical details. (mah)

R.M.Kauffman: Eigenfunction Expansions, Operator Algebras and Riemannian Symmetric Spaces, Pitman Research Notes in Mathematics Series, vol. 355, Addison Wesley Longman Ltd., Harlow, 1996, 147 pp., GBP 25.00, ISBN 0-582-27634-9

The ultimate goal of this book is to provide a rigorous study of (bounded or differential) linear operators on a Riemannian symmetric space that commute with the group of isometries; however — more broadly — the book is, in fact, a systematic treatment of generalised eigenfunction expansions

for families of commuting operators from the point of view of operator theory and operator algebras in particular. The first chapter, occupying almost half of the book, contains an exhaustive review of the necessary background material from differential geometry, functional analysis and PDE; though sometimes too condensed for a comfortable reading, it definitely serves as a good guide for a non-expert and makes the book quite self-contained. The next three chapters constitute the heart of the book. A general framework is developed for simultaneous eigenprojection expansions of families of normal operators, parameterised by the maximal ideal space of a certain commutative von Neumann algebra. Replacing the maximal ideal space by the joint spectrum, the more traditional expansions parameterised by points in the complex n-space are then also obtained. In the last three chapters the exposition culminates by applying this apparatus to the study of von Neumann algebras of operators on a Riemannian symmetric space that commute with the identity component of the isometry group. Although some of the material can be found scattered in various sources, a concise monographic treatment like this has been lacking in the literature. The applications to Riemannian symmetric spaces are probably interesting only to specialists, but the general theory developed in this book will be of benefit for any analyst. (me)

R.E.Showalter: Monotone Operators in Banach Space and Nonlinear Partial Differential Equations, Mathematical Surveys and Monographs, vol.49, American Mathematical Society, Providence, 1997, xiii+278 pp., GBP 55.00, ISBN 0-821-80500-2

The author presents some topics from the theory of monotone operators and nonlinear semigroup theory which are directly applicable to the existence and uniqueness theory of initial-boundary-value problems for partial differential equations. The connection between the theory of nonlinear operators and differential equations is illustrated by many examples of various nature. Particularly, semilinear and quasilinear equations of elliptic and parabolic type, equations changing the type and variational inequalities are studied with various types of boudary conditions. Evolution problems with nonlocal conditions, history value problems and models of hysteresis are included. The main goal of the author is to develop an instinct for the right place to look for a solution and the right techniques to use for the study of the existence and uniqueness in appropriate function spaces. The first chapter of the book gives an overview of the subject for the particular case of linear problems in one spatial dimension. Simple boundary and initial-boundary-value problems are considered and motivate an explanation of basic notions and tools, including the Lax-Milgram-Lions Theorem and the Hille-Yosida Theorem. The second and the third chapters are devoted to nonlinear stationary and evolution problems, respectively. The theory of nonlinear monotone operators from a reflexive Banach space to its dual is presented and appropriate boundary-value and initial-boundary-value problems are studied. The fourth chapter is concerned with the theory of accretive operators in a Hilbert or Banach space and with nonlinear Cauchy problems. Some elements of the convex analysis are also explained. Initial-boundary-value problems for heat transport, for flow through porous media and some vibration problems are derived in the Appendix, elementary physical considerations are included. The book is self-contained, no special knowledge is supposed. The completeness and the way of presentation makes the text understandable to anybody who can be interested in existence and uniqueness theory for initial-boundary-value problems. (mku)

V.N.Sachkov: Probabilistic Methods in Combinatorial Analysis, Encyclopedia of Mathematics and Its Applications, vol.56, Cambridge University Press, Cambridge, 1997, x+246 pp., GBP 40.00, ISBN 0-521-45512-X

The book explores the role of probabilistic methods for solving combinatorial problems. The basic objects under investigation are nonnegative matrices and their permanents, partitions and mappings of finite sets, with special emphasis on permutations and graphs, and equivalence classes specified on sequences of a given length constituted by elements of partially ordered sets. These combinatorial structures which specify the probabilistic setting of Sachkov's general combinatorial scheme, include the allocations of objects into cells, with various restrictions on the form of possible allocations that describe whether the objects and/or cells are distinguishable or not. Each time, a probability distribution is specified on the set of objects under consideration. The main problems in studying these objects are to find interrelations between the exact and asymptotic distributions of random variables associated with these objects. The author pays special attention to the use of probabilistic methods ranging from characteristic and generating functions, the moment method, to the powerful limit theorems, in order to obtain asymptotic formulae that are difficult to derive using combinatorial methods. (mloe)

P.Thiran: Dynamics and Self-oranization of Locally Coupled Neural Networks, Collection Meta, Presses Polytechniques et Universitaires Romandes, Lausanne, 1997, xiv+209 pp., sFr 75.00, ISBN 2-880-74351-6

Due to the increased availability of computing power, artificial neural networks have attracted a

lot of interest in recent years. Also, these new algorithms make it possible to solve computationally very intensive cognitive tasks. However, many questions are still left open for future investigations. This text provides a rigorous mathematical analysis of two kinds of locally coupled neural networks which are in general very hard to analyse—cellular neural networks and self-organising maps. The text can be roughly divided into three main parts. In the first part, the dynamics of 1-dimensional cellular neural networks with nearest-neighbour coupling is examined in detail. The next part of the book deals with two essential mechanisms of information propagation in cellular networks - local diffusion and global propagation. From these mechanisms a lot of properties of cellular neural networks can be inferred. Some of them are analysed exactly in this book, while others need further study. The 2-dimensional networks are then explored from the point of view of pattern formation. In particular, some biological patterns—like animal coat markings or stripes formed in the visual cortex—that can be created with second-order reaction-diffusion models have been compared with those obtained with band-pass templates. The last part of the publication is devoted to self-organisation and Kohonen maps. For the 1-dimensional case, the author provides also a thorough and rigorous analysis of the training process in Kohonen maps with quantised parameters. A number of rigorous and semirigorous results supplied here give the work a rather theoretical nature. On the other side, it addresses also practical questions of great importance for the application and/or VLSI implementation of the described models—e.g. for low-level signal and image processing. Moreover, the book contains a number of illustrative pictures, graphs and drawings and each of nine chapters provides the reader with sufficient references. Thus, the text might be of great value for readers interested both in the theory of locally coupled neural networks and in applications of the discussed models. (im)

J.K.Truss: Foundations of Mathematical Analysis, Clarendon Press, Oxford, 1997, xiii+349 pp., GBP 40.00, ISBN 0-198-53375-6

As the author in the preface to the book writes, "one of my principal goals is to show that it really is possible to begin at the beginning and, by a process of logical development, derive a large part of traditional 'analysis' in not too great a number of pages...Mathematics is fundamentally an egalitarian subject. It should in principle be possible for anyone to check the correctness of any argument; nothing needs to be taken on trust. This is the philosophy. The reality is that some parts of mathematics are much harder to grasp than the others, and the difficulty of the material presented will fluctuate considerably. I believe this variation of level will enable a wider range of readers to follow at least part of the book, while those with greater experience should still find something new." I think that this self-evaluation is remarkably accurate. The author starts with the very fundamental questions such as the construction of basic number systems in the context of the role they play in analysis. The author does not hesitate to open and discuss various more or less delicate complexes of questions which are seldom touched in traditional textbooks. Thus for instance, the first chapter "The natural numbers" culminates in Gödel's incompleteness theorem. In the second chapter "Some set theory" the reader finds the sections "Non-standard models of arithmetics", "Partially ordered sets and Zorn's lemma" or "Introduction to cardinals". In the next chapter "The integers" besides construction of integers as the ordered ring, the author discusses relations between Euclidean domains and factorisation of a section about ideals. The chapter "The rational numbers" contains an non-standard section "Basic linear algebra and introduction to fields" with an 'closure' approach to linear (in)dependency. In the chapter "The real numbers" there is a section on Suslin's problem and its connections to usual axioms of set theory. The chapter "Metric spaces" discusses various constructions of real numbers, and also has sections "Order-completeness versus sequential completeness" or "p-adic numbers". The chapter "Beginnings of analysis" contains sections "Topology of real line: the Heine-Borel theorem", "Integration", "Differentiation" and "Standard analytic functions". In chapter "The complex numbers" the reader finds sections on elementary Galois theory and the basic ideas of several proofs of the fundamental theorem of algebra. The ninth chapter "Irrational numbers" contains the basic idea of the Liouville method, proofs of transcendency of e and π, and several methods how to calculate the values of certain irrationals. The permeating theme of the next three chapters "Classical spaces associated with $\mathbf{R}$", "Measure and category" and "The continuum hypothesis" is descriptive set theory. The final chapter "Constructive analysis" is devoted to the main ideas of intuitionistic number theory and analysis. The book can be warmly recommended to students interested to find various connections and intersection of analysis and other branches of classical mathematics and provides a very interesting second reading for virtually everyone. (šp)

J.E.Cremona: Algorithms for Modular Elliptic Curves. 2nd Edition, Cambridge University Press, Cambridge, 1997, 376 pp., GBP 45.00, ISBN 0-521-59820-6

This is the second edition of the book which

accounts the advances made in the subject (for instance, by proofs by Wiles and Taylor–Wiles) since the first edition in 1992. The new results imply that every elliptic curve over the rationals and of conductor less than 1000 is isomorphic to one given in Table 1 of the book. The book has as before three major sections, some parts of which has been completely rewritten or expanded. After the introductory Chapter I, Chapter II "Modular symbol algorithm" is devoted to various steps in the modular symbol algorithms. For instance, the entirely new Section 2.15 "Computing the degree of a modular parameterisation" follows author version of a method due to Zagier from 1985. The Appendix to Chapter II contains some worked examples of the methods described in the Chapter. The content of Chapter III "Elliptic curve algorithms" is almost self-explanatory from the title. The reader finds here the Kraus–Laska–Connell algorithms, Tate's one, algorithm for finding all torsion points, Silverman's algorithm for computing local heights at finite primes, algorithm for computing global canonical heights, algorithm for checking local and global solubility of a quartic, two–descent algorithm (this part contains the main changes in comparison with the first edition), etc. Chapter IV "Tables" discusses the results of computations and contains an extensive set of tables entitled Elliptic curves, Mordell–Weil generators, Hecke eigenvalues, Birch–Swinnerton–Dyer data and the new table giving the degree of the modular parameterisation for each strong Weil Curve. Due to the role of elliptic curves in computational number theory and its applications (e.g. in cryptography), the book can be only recommended to graduate students and researchers inclining to or using results of this exciting part of number theory, algebra and analysis. (šp)

R.Brigola: Fourieranalysis, Distributionen und Anwendungen. Ein Einstieg für Ingenieure, Naturwissenschaftler und Mathematiker, Friedrich Vieweg & Sohn, Braunschweig, 1997, viii+280 pp., DM 39.80, ISBN 3-528-06619-9

The principal concepts of Fourier analysis, distributions and Fourier transforms are presented in this volume. Trigonometric polynomials and Fourier series are the starting point and some computational tools are presented with applications of Fourier series. Problems of the convergence of Fourier series are dealt with in a classical setting. Elements of the theory of distributions are given again with some motivating applications. The last, 'purely' mathematical, topic is the Fourier transform with applications. This book is in fact a textbook for students of engineering, science, etc. Therefore it is a practical and useful source book for the beginner with much practical advice and a number of classical and modern applications. The mathematical level of the book aims at an audience with a basic background in calculus. (šs)

M.Andersson: Topics in Complex Analysis, Universitext: Tracts in Mathematics, Springer-Verlag, Berlin, 1997, xiii+157 pp., 4 fig., DM 49.00, ISBN 0-387-94754-X

Both classical and modern subjects from complex function theory can be found in the book. More classical parts of complex function theory are treated in first three chapters. Subharmonic functions and the Nevanlinna theory come next. The second half of the book contains a discussion of more advanced and more contemporary parts of complex analysis - H^p spaces, the corona theorem and the Fefferman theorem on H^1 and BMO. Methods used in proofs are often taken from real, harmonic or functional analysis, sometimes alternative proofs are for better understanding indicated in exercises. Each chapter ends with many exercises of various degrees of difficulty and with useful and pleasant Notes, containing comments on the topics and further references. The book can be quite helpful for preparing more advanced courses in complex analysis. (vs)

J.Jost: Compact Riemann Surfaces. An Introduction to Contemporary Mathematics, Universitext, Springer-Verlag, Berlin, 1997, xiv+291 pp., 22 fig., DM 68.00, ISBN 3-540-53334-6

Compact Riemann surfaces belong to classical areas and there are several good books on this topic. This one is nevertheless special in several respects. It includes a description of Teichmüller spaces based on properties of harmonic maps. Moreover, it elegantly demonstrates how methods from many different area of mathematics (elliptic PDE's, calculus of variation, differential geometry, algebraic topology and algebraic geometry) can be very efficiently combined together to treat a single topic. This is a very attractive feature of the book. Even if the topic is classical, the book deserves the subtitle 'An introduction to contemporary mathematics'. The first part treats topology and differential geometry of the topic, the topological classification of compact surfaces; the Gauss-Bonet and Riemann-Hurwitz theorems are presented in detail. The second main subject - harmonic maps of Riemann surfaces - is studied from several points of view and then applied to a study of properties of Teichmüller Spaces and uniformisation of compact Riemann Surfaces. The last part gives the description of geometric structures on Riemann surfaces, divisors and Riemann-Roch theorem, projective embeddings of Riemann surfaces and algebraic curves. Each paragraph ends with exercises (of different levels). This book is clearly written and readable. (jbu)

D.Bertoloni Meli: Equivalence and Priority: Newton versus Leibniz. Including Leibniz's Unpublished Manuscripts on the Principia, Clarendon Press, Oxford, 1997, ix+318 pp., GBP 25.00, ISBN 0-198-50143-9

The book presents a lucidly written insight into the development of mathematical physics around the turn of the seventeenth and eighteenth century and to the background of the analysis of Leibniz's reactions to Newton's Principia. The book consists of three parts with appendices. Part 1 "The background of the Newton–Leibniz dispute" provides a historical introduction for interpretation of Leibniz's manuscripts and has the following chapters: Chapter 1 "Astronomy and the Keplerian programme" is devoted to Leibniz's deployment of the Keplerian programme and to astronomy. Chapter 2 "Vortices and fluids: from gravity to elasticity" deals with celestial motions, gravity, and elasticity. The author discusses here Leibniz's excerpts from Descartes' Principia, he traces Huygens's influence on Leibniz and concludes with a brief discussion of the notion of elasticity. Chapter 3 "Geometry and the calculus" contrasts fundamental features of Leibnizian and Newtonian mathematics. Chapter 4 is entitled "Mathematical representations of motion and force". Part 2 "The transformation of a world system: from Principia Mathematica to the Tentamen" describes the main stages of the development of Leibniz's theory, beginning from his working sheets on the Principia, to the Tentamen. The manuscripts discussed are unpublished and those of most significant impact are reproduced and provided with a textual analysis in the Appendix. Part 3 "The Fortunes of Leibniz's response to Newton" consists of three chapters entitled "Reflections on Leibniz's theory and its development", "A reappraisal of Newton's itinerary" and "The reception of Newtonian and Leibnizian theories". In the last part, the author aims to show "how Leibniz's manuscripts affect our interpretation of mathematical theories of celestial motions around 1700, because only by contrasting the specific features of the intersection between mathematics, mechanics, and natural philosophy in Leibniz, Newton, and their successors, can we gain a deeper understanding of the intellectual subtleties and practice of the theories about the system of the world around 1700". The book provides an interesting reading and can be warmly recommended not only to those wishing to understand many facets of the Newton–Leibniz rivalry, but to general readers with an interest in the history of mathematics. (šp)

A.Beutelspacher, N.Henze, U.Kulisch, H.Wussing: Überblicke Mathematik 1996/1997, Friedrich Vieweg & Sohn, Braunschweig, 1997, 160 pp., DM 58.00, ISBN 3-528-06892-6

Mathematics is presented in this modern concept of a popular yearly overview. The editors are presenting a mixture of new developments in mathematics as well as some historical topics. An article about G. W. Leibniz as a mathematician is presented by H. Berger on the occasion of Leibniz' s 300th birthday. What is a proof?, Mathematics on the Internet, Mathematics in lyrics, Mechanical computing devices, Microprocessors, Penrose tilling, Stellar polyhedra and semilinear mappings, Spherical packings, Möbius planes and the geometry of the sphere, Prime twins, Projective geometry from the historical point of view, The early times in Oberwolfach and Paul Stäckel as a mathematician and historian of mathematics are the approximate translations of the titles of the German articles given in this nice volume. (šs)

O.Lehto: Mathematics Without Borders. A History of the International Mathematical Union, Springer-Verlag, New York, 1998, xvi+399 pp., 55 fig., DM 68.00, ISBN 0-387-98358-9

The present book of Prof. Olli Lehto gives a thorough insight into the history of the International Mathematical Union in the past 100 years from the first 1897 International Congress of Mathematicians in Zürich. The IMU was founded in fact in Strasbourg in September 1920. All the complicated circumstances (political, social, etc.) of the past 100 years are reflected in this monograph with respect to the worldwide cooperation of mathematicians on the institutional basis of the IMU. The book was written at the request of the 1991-1994 Executive Committee of the IMU and it is based on the large archives of Union located now in Helsinki. This history of the IMU is a very useful contribution to the institutional development of cooperation in mathematics worldwide and it will be of great interest for any mathematician as well as historian of science. (šs)

R.Schoen, S.-T.Yau: Lectures on Differential Geometry, Conference Proceedings and Lecture Notes in Geometry and Topology, vol. I, International Press, Cambridge, 1994, v+235 pp., ISBN 1-571-46012-8

The book mainly consists of written versions of the lectures by the authors. The first four chapters (Comparison Theorems and Gradient Estimates, Harmonic Functions on Manifolds, Eigenvalue Problems, Heat Kernel on Riemannian Manifolds) reflect the lectures in Princeton in Spring 1984, the next two parts (Conformal Deformation of Scalar Curvatures, Locally Conformally Flat Manifolds) a year later in San Diego. The notes, prepared originally in Chinese by several collaborators, circulated widely in China since 1986 and they have been translated into English now. The present book includes also three articles by the second author,

published previously elsewhere (Problem Section, Nonlinear Analysis in Geometry, Open Problems in Differential Geometry). Two of them present lists of open problems, while the other one provides a survey. (jsl)

W.G.McCallum, D.Hughes-Hallett, A.M.Gleason et al.: Multivariable Calculus, J.Wiley & Sons, Inc., New York, 1997, xv+503 pp., GBP 17.99, ISBN 0-471-31151-0

The book under review contains standard material concerning functions of several variables: partial derivatives, gradient, local and global extrema, multiple integral, vector fields, line and flux integrals. The authors show each topic from three different points of view (geometrical, numerical and algebraic ones) to provide a better understanding. The book contains a number of figures, which illustrate each chapter very well. The presentation of certain notions seems sometimes to be too informal (e.g. the precise definition of differentiability is given at the end of the chapter concerning differentiability). Moreover, several methods and solutions of examples are incomplete (see the chapter on Lagrange multipliers, pp. 196–205). (mzel)

A.T.Fomenko: Symplectic Geometry. Second Edition, Advanced Studies in Contemporary Mathematics, vol.5, Gordon and Breach Publishers, Luxembourg, 1995, xv+467 pp., GBP 66.00, ISBN 2-881-24901-9

This is an enlarged second edition, so let us focus on new features (for the review of the 1st edition see e.g. Zentrallblat, Nr. 716.53005). The original text is essentially unchanged, but a whole new chapter devoted to recent results on topological classification of integrable, non-degenerate Hamiltonian equations with two degrees of freedom is appended. The only visible changes to the first 5 chapters consist of the omission of sections 3.3.3, 5.8, and slight extension of the original Preface, explaining briefly the aims of the new chapter. Already the 1st edition could be described as an unusual mathematical monograph, combining quite classical exposition of mathematical definitions, theorems and proofs, sketchy surveys with many intuitive links and remarks, and even bibliographic researches. Now, the 6th chapter provides the reader with a mathematical essay starting with a nearly philosophical dispute on what the 'physically relevant' integrable systems are. The actual mathematical problem is the study of integrable Hamiltonian systems on four dimensional symplectic phase manifolds, i.e., having two degrees of freedom, subject to several strong regularity conditions. Such a system can be reduced to three-dimensional surface Q^3 of constant energy, which is always assumed to be a smooth compact manifold. Then the restriction of the second integral f to Q^3 must have critical points which cannot be isolated in general. The non-degenerate case is when the critical points of Q^3 form smooth submanifolds. Thus f has to be a Bott function on each such Q^3, the case found as most typical in physical systems, cf. [Fomenko A.T., Integrability and Nonintegrability in Geometry and Mechanics, Kluwer Academic Publishers, 1988]. Now, there is the obvious topological equivalence of two such Hamiltonian systems, requiring the existence of a diffeomorphism which preserves the Liouville foliations. In order to distinguish more easily the non-equivalent systems, the author introduces the so called rough topological equivalence, a much coarser equivalence allowing surgeries along regular Liouville tori. The ultimate classification with respect to these equivalence relations is described in sections 6.5–6.10, summarising a vast number of recent publications by the author and many of his collaborators. After a historical survey in section 6.7, the last two sections present deep applications of the theory. It is a pity that such an interesting topic is presented somewhat carelessly, in particular many assumptions are made only implicitly and often even the results are presented in quite a fuzzy way. However, it is even harder to accept the poor quality of the English translation. Anyhow, the book definitely deserves attention and it is worth looking at. (jsl)

F.W.Lawvere, S.H.Schanuel: Conceptual Mathematics. A first introduction to categories, Cambridge University Press, Cambridge, 1997, xii+358 pp., GBP 24.95, ISBN 0-521-47249-0, ISBN 0-521-47817-0

At the end of the book, the authors claim: "The goal of this book has been to show how the notion of composition of maps leads to the most natural account of the fundamental notions of mathematics, from multiplication, addition, and exponentiation, through the basic notions of logic. We hope the reader will want to continue on this path, and we extend our best wishes to those who are taking the next steps." The book is written in a style that approaches this goal. Though the book has 358 pages, its content is not comprehensive. It stays on an elementary level and culminates in the notion of an elementary topos. However, the presentation is rather unusual and original. The authors concentrate on providing a clear description of ideas and notions. First, they describe some situations "from life" inspiring the notions (e.g. flight of a bird, shape of plates and their price...), then they present the corresponding categorical notions (isomorphism, retracts, products, exponentiation etc.) and explain them in elementary examples (in the category of sets, graphs, dynamic systems...). They insert also philosophical explanation of aspects, quiz, questions

and answers of Alysia, Omer, Chad, Katie and Fatima (students of these topics?) and guides for the readers. The book is intended "to serve both as a skeleton key to mathematics for the general reader or beginning student and as an introduction to categories for computer scientists, logicians, physicists, linguistics, etc." (vt)

J.R.Birge, F.Louveax: Introduction to Stochastic Programming, Springer Series in Operations Research, Springer-Verlag, New York, 1997, xix+421 pp., 38 fig., DM 85.00, ISBN 0-387-98217-5

This is another item in the series of recent books on stochastic programming, see e.g. Kall and Wallace (1994) or Prékopa (1995). It covers in detail the main themes and methods of stochastic programming (model building, survey of basic theoretical properties, solution methods, approximation and sampling techniques). The new feature of this book is that it covers also a relatively extensive material devoted to various aspects of multistage stochastic programming and of integer stochastic programming, the subjects that belong at present to the main topics of the focused interest both in research and applications of stochastic programming. The book is aimed at researchers, master's level and postgraduate students of mathematics and also of related applied disciplines, such as operations research, finance, management, engineering. The authors included, with references to original papers, mathematically advanced themes (properties of expectation functionals, optimality conditions, convergence results, etc.) for which knowledge of convex analysis and of optimisation theory is expected. On the other hand, the worked examples, numerous exercises and the included case study delineate clearly the wide-ranging possibilities of applications of stochastic programming and, at the same time, they help to build an intuition how to model uncertainty within mathematical programs and how to interprete the obtained results. The book will thus certainly attract also the wide spectrum of readers whose main interest lies in possible exploitation of stochastic programming methodology. Naturally, much care is devoted to various aspects of solution methods. As a whole, the three main building blocks of stochastic programming—stochastic modelling, optimisation, numerical methods—are well represented and balanced. (jd)

W.Haussmann, K.Jetter, M.Reimer (Eds.): Multivariate Approximation. Recent Trends and Results. Proc. of the 2nd Int.Conf.,Witten-Bommerholz, Germany, Septemper 29-October 4, 1996, Mathematical Research, vol. 101, Akademie Verlag GmbH, Berlin, 1997, 320 pp., 11 fig., GBP 50.00, ISBN 3-055-91770-6

The proceedings contain 20 main contributions presented at the conference at Bommerholtz in 1996. The scientific scope of this conference was directed towards the following topics which combine classical aspects of Approximation Theory with new and modern methods in Applied Mathematics: Interpolation and Hyperinterpolation on the Sphere (I. H. Sloan), Quadrature (S. Blunck; U. Maier and J. Fliege), Disprepancy and Spherical Design (P. J. Grabner; B. Klinger and R. F. Tichy), Multivariate Hermite and Convex Spline Interpolation (H. Hakopian; J. W. Schmidt and M. Walther), Triangular Finite Element Spaces (A. Le Méhauté), Polar Form of Splines (R. Gormaz), Refinable Spline Pairs (T. N. T. Goodman), Local Box Dimension of Fractal Functions (Z. Ciesielski), Symbolic Treatment of Algebraic Systems (H. M. Möller), Harmonic Approximation and Boundary Behaviour (S. J. Gardiner), Quasi-Balayage (H. S. Shapiro), Landau-Kolmogorov Inequality (O. Kounchev), Trigonometric Approximation in Multivariate Periodic Hilbert Spaces (F.-J. Delvos), Orthonormal Polynomial Bases of Low Degree (J. Prestin and F. Sprengel), Synthesis and Analysis with Multivariate Wavelets and Frames (F. Sprengel; J. Stöckler; G. Zimmermann). (knaj)

B.Devlin, S.E.Fienberg, D.P.Resnick, K.Roeder (Eds.): Intelligence, Genes and Success. Scientists Respond to The Bell Curve, Springer-Verlag, New York, 1997, xi+376 pp., DM 49.00, ISBN 0-387-94986-0, ISBN 0-387-98234-5

The purpose of this book is to present a scientific response to the book The Bell Curve: Intelligence and Class Structure in American Life published in 1994. Its authors, social scientists R.J. Herrnstein and C. Murray, studied the measured intelligence (IQ). They claim that IQ is largely genetically determined and is therefore resistant to educational and environmental interventions. Some parts of this book are controversial, e.g. the chapter dealing with IQ differences across races. The book Intelligence, Genes and Success consists of several contributions by some respected social scientists and statisticians. They re-analyse data relied upon by Herrnstein and Murray and construct alternative models. The relationship between IQ and education, wages, criminality and other factors is investigated. The principal statistical technique of The Bell Curve is regression. In re-analysing data, factor analysis and Bayesian meta analysis were also used. In addition to the results of statistical analysis, some contributions are devoted to the explanation of the fundamental principles of heritability, the history of intelligence tests and the implications that arise from the scientific results for American public policy. (jzi)

L.T.Rigatelli: Evariste Galois (1811-1832), Vita Mathematica, vol.11, Birkhäuser, Basel, 1996, 162

pp., DM 38.00, ISBN 3-764-35410-0, ISBN 0-817-65410-0

The book is an English translation of Galois' bibliography written in Italian under the title *Evariste Galois, matematica sulle barricate* (Mathematics on the Barricades) to which new material has been added. Galois' life is a very romantic part of the mathematical folklore; a legend was created by many contributors (Bell's *Men of Mathematics*, Dalmas' *Evariste Galois, révolutionnaire et géomètre*, Infeld's *Whom the Gods Love*). We all were excited by the stories about this young mathematician ("Don't cry, I need all my courage to die at twenty"). There are different versions of the true circumstances of his death ("I die, the victim of a cruel coquette... Heaven is my witness that I could do nothing other than surrender to a provocation...") The most popular versions are the following two: (i) He had a real duel caused by an argument over a woman. (ii) His opponent was a man who was designated (by the police) to remove him from the political scene. The present book brings another version (p..109): "He explained...that his life had become pointless. All that was left for him was to offer it to the only things he still loved: France. The corpse they need (as a pretext to provoke the fury of the crowds) would be his." Laura Rigatelli's version supposes that the Société des Amis du Peuple accepted his offer. Can we believe it? The author says (p.9): "On the basis of the analysis and interpretation of a series of hitherto neglected documents, I have been able to provide a new version of the circumstances leading to Galois' death. These documents are: the article that appeared in the Lyons newspaper Le Précurseur, and memoirs written by H.J.Gisquet, prefect of police, and Lucien De La Hodde, one of Louis-Philippe's spies." It is bizarre enough, but the words in the last Galois letters seem to correspond (also) with this new version. It is a pity that the mentioned documents were not included in the book as photocopies. Perhaps we shall see them in future editions of the book. The text is well written, the author is a gifted narrator and it is a pleasure to read it, to see many good illustrations and to think about the ideas of the 19th century as presented here. There are some misprints which can be detected almost inevitably in every English text containing French words (see, e.g. pp.146,147). The execution of Louis XIV signed by Gaspard Monge (p.34) means of course the execution of Louis XVI. Also Jordan's paper "Commentaire sur la mémoire de Galois" (p.147) should be read ...sur le mémoire... since it was not intended to comment on Galois' memory but rather on a memoir written by him. There are papers on the life of Galois written by French mathematicians which are not quoted in the references. Let us hope that more extensive background research will be done next time.

(lbe)

K.Devlin, D.Rosenberg: Language at Work: Analyzing Communication Breakdown in the Workplace to Inform Systems Design, Lecture Notes Number 66, CSLI Publications, Stanford, 1996, vii+212 pp., GBP 12.95, ISBN 1-575-86051-1, ISBN 1-575-86050-3

Since information is one of the assets of a modern company, it requires proper management. However, introducing a new computer system often causes an array of problems that had never arisen with the old way of doing things. The authors note that information-flow management training requires the formulation of the requisite body of knowledge and the appropriate sets of skills. Therefore, there is a need to understand what information is, how it is stored and how it flows through a company. The authors set out to analyse how a certain kind of document, namely *problem report forms* (PRFs), conveys information around a particular company, focussing on the interaction between various kinds of knowledge. Their approach combines the descriptive methods of ethnomethodology and the formalisation used in situation theory. The proposed technique is called *layered formalism and zooming' (LFZ analysis).* For a given body of communicative data it involves (i) an initial analysis using situation theory as a formal mathematical tool, and (ii) a process of stepwise refinement and increased formalisation, using mathematics to zoom in and examine the problems in detail. LFZ analysis uses the process of formalisation itself as an analytic technique. The authors compare their analysis to the approach to language understanding proposed by Harvey Sacks.

(ik)

J.-P.Kahane, P.-G.Lemarié-Riesset: Fourier Series and Wavelets, Studies in the Development of Modern Mathematics, vol.3, Gordon and Breach Publishers, Luxembourg, 1995, xii+394 pp., GBP 78.00, ISBN 2-881-24993-0

This monograph presents the history and achievements of one of the most important figures in modern mathematics, covering the work of Fourier from his first memoir on the Analytical Theory of Heat to the latest developments in wavelet theory. The book is divided into two parts. The first, written by Jean-Pierre Kahane, deals with Fourier series in the classical sense, Dirichlet and the convergence problem, Riemann and real analysis, Cantor and set theory, Lebesgue and functional analysis, probabilistic methods and algebraic structures. Some original papers by Fourier, Dirichlet, Riemann and Cantor are reproduced. The second part of the book is a self-contained exposition, and may serve as a reference on wavelets. The diverse applications of classical Fourier series and wavelets, covering such areas as theoretical physics, image analysis and telecommu-

nications, mean that this book will be of interest to mathematicians, engineers and physicists alike. (knaj)

D.S.Bridges: Foundations of Real and Abstract Analysis, Graduate Texts in Mathematics, vol.174, Springer-Verlag, New York, 1998, xiv+322 pp., DM 79.00, ISBN 0-387-98239-6

Six chapters, three appendices and a subject matter index on 322 pages form the introduction to abstract analysis presented in this book. The book starts with basics of analysis, carefully chosen according to the aim of the book to give a course on metric, normed and Hilbert spaces. His relatively condensed style enables the author to include a lot of material. The first chapter contains "basics" including power series and Riemann-Stieltjes integral. It is accompanied by 230 exercises. The second chapter (based on F. Riesz's approach) is devoted to the one-dimensional Lebesgue integration and its relation to differentiation. The third chapter consists of about 50 pages on metric spaces including all the important basic notions. The following chapter contains material on normed spaces and the Riesz-Fischer theorem, Ascoli's theorem, Weierstrass approximation theorem proved via Korovkin's three functions theorem, the Stone-Weierstrass theorem, the Banach contraction mapping theorem and its applications on existence and uniqueness of solutions of ODE. The last chapter contains material on Hilbert spaces. This includes, among other things, the Hahn-Banach theorem (complex version as an exercise) and its consequences, Baire's category theorem and its application to the proof of existence of a continuous, nowhere differentiable function and the divergence of the Fourier series for a continuous function, and the open mapping and closed graph theorem. Weak solutions of the Dirichlet problem and Pareto optimality are also treated. Altogether almost 750 exercises form a valuable part of the book; they contain not only parts which are very close to the material treated but also pointers to other interesting results. Recommended for independent students' work and for seminars, this book contains a large amount of material which students should master during their studies, as well as many references. (jive)

K.Ciesielski: Set Theory for the Working Mathematician, London Mathematical Society Students Texts, vol.39, Cambridge University Press, Cambridge, 1997, xi+236 pp., GBP 13.95, ISBN 0-521-59441-3, ISBN 0-521-59465-0

The book presents a course of modern set theory, from the axioms to the basics of forcing, explained in an easy-to-read way. A small Part III shows an application of the methods with emphasis on the transfinite induction. Here, several complicated subsets of Euclidean spaces (like Mazurkiewicz set, Bernstein set, Hamel basis) and pathological real functions (like nonmeasurable strongly Darboux, symmetrically discontinuous) are constructed and Baire and Borel hierarchy is introduced. The title is misleading; this book is nothing more than just another standard textbook for students. K.Kunen's excellent and concise Set Theory (Amsterdam, 1980) obviously served as a model for the book under review. Ciesielski, however, has paid for his effort to adopt an informal tone by many inaccuracies and even mistakes (the worst sample: AC is used to show the existence of a cardinal successor on p.65, and cannot be avoided, as remarked on p.67). (ps)

H.Groemer: Geometric Applications of Fourier Series and Spherical Harmonics, Encyclopedia of Mathematics and its Applications, vol.61, Cambridge University Press, Cambridge, 1996, xi+329 pp., GBP 40.00, ISBN 0-521-47318-7

In the presented volume of Encyclopedia of Mathematics and its applications, the main topic treated is the theory of Fourier series and spherical harmonics and its use in geometrical applications. The book has three parts. The first one is preparatory and contains a review of facts needed from real and functional analysis and geometry of convex sets. The second part describes properties of spherical harmonics in details. The methods coming from classical analysis are stressed here, the connection of these results to representation theory of orthogonal group is shortly mentioned without using its powerful tools. The main part of the book consists of two chapters. The first one describes geometrical applications of Fourier series (isoperimetric inequalities, the Wirtinger inequality, results on polygonal domains), the second one (the main and the longest one) does the same for applications of the theory of spherical harmonics (isoperimetric iequalities, the Wirtinger inequality, projections of convex bodies and their intersections with planes and half-spaces, rotors in polytopes). The book is very carefully written, each section ends with a short paragraphs containing historical remarks, bibliography and further comments on the subject. It is a useful reference book for the subject. (vs)

P.D.T.A.Elliott: Duality in Analytic Number Theory, Cambridge Tracts in Mathematics, vol.122, Cambridge University Press, Cambridge, 1997, xviii+341 pp., GBP 40.00, ISBN 0-521-56088-8

This is a quite remarkable publication. The author proves many theorems in number theory using a unified approach (based on methods from mathematical analysis). The book is designed for a reader willing to put a non-negligible effort to the study of it (a substantial number of results can be found in more than 250 exercises). The book includes well-known theorems by Wirsing

and Halász on arithmetical functions, parts of probabilistic number theory, the prime number theorem etc. The book is more suitable for experts than for beginners. (bn)

P.K.Kythe: Fundamental Solutions for Differential Operators and Applications, Birkhäuser, Boston, 1996, xix+414 pp., DM 118.00, ISBN 3-764-33869-5, ISBN 0-817-63869-5

The main aim of the book is to provide an introduction to fundamental solutions and their application to solving of boundary value problems and boundary elements method in computational mathematics. The use of fundamental solutions has provided a distinct advantage consisting in transformation of the boundary value problem to an integral equation on the boundary, which is often more easily numerically solved. After introducing the basic underlying concepts of distributions and fundamental solutions, the author considers a variety of differential operators, starting with linear elliptic, parabolic and hyperbolic equations in Chapters 2 - 4. Nonlinear operators are studied in Chapter 5. A choice of equations of mathematical physics (elastostatics, elastodynamics, fluid dynamics and piezoelectrics) is described in the following Chapters 6 - 9. A short explanation of the boundary elements method is given in Chapter 10 and different ways of how to reduce domain integrals to boundary ones are dealt with in Chapter 11. Chapter 12 is devoted to von Kármán equations and finally Chapter 13 to different topics from poroelasticity up to biomathematics. Unfortunately, the book contains an extraordinarily large number of misprints and/or inconsistencies. Thus scalar product in R^n is denoted simultaneously $(x.y)$ and $x.y$, Dirac measure with support in ξ is denoted simultaneously by $\delta_\xi, \delta(\xi, x), \delta(\xi - x)$, Schwarz theorem on p.27 states necessary and sufficient conditions under which a distribution in S to belongs to S'. The definition of Fourier transform on p.364 reads $F[f](\alpha) = \int_{R^n} f(x)e^{i(\alpha.x)}$ (1) (without denoting corresponding measure in the integral). On the following page this definition is used with (probably) Lebesgue measure on R^n, while for deducing inverse Fourier transform formula correctly the measure in (1) should be $(2\pi)^{-n/2}$ multiple of Lebesgue measure. A similar procedure continues in forthcoming paragraphs. On p.15, the paragraph Distributions starts with the following definition: "Let a real number $\int_{R^n} f(x)\Phi(x)dx = \langle f, \Phi \rangle$ be associated with each $x \in R^n$ for every test function $\Phi \in C_0^\infty(R^n)$. Then f is said to be a functional on R^n. Thus e.g., the Fourier series of $f \in C^1[0, \pi]$, defined by $f(x) = \sum_{n=1}^\infty b_n \sin nx$, where $b_n = (2/\pi)\int_0^\pi f(x)\sin nxdx$, is a functional on R^1, with test functions in the set $\{\sin x, \sin 2x, ...\}$." The choice of material is wide and interesting. (jsta)

I.Madsen, J.Tornehave: From Calculus to Cohomology: De Rham Cohomology and Characteristic Classes, Cambridge University Press, Cambridge, 1997, viii+286 pp., GBP 16.95, ISBN 0-521-58956-8, ISBN 0-521-58059-5

The book contains a systematic exposition of the theory of differential forms on manifolds, de Rham cohomology and theory of characteristic classes with several applications. In the first part, all objects are studied on open sets in Euclidean space. In this setting, de Rham cohomology of open sets is studied with standard applications (e.g. the Brouwer fixed point theorem, topological invariance of domains). Calculus of differential forms on manifolds is then explained together with a description of degree and index of vector fields. The second part of the book describes vector bundles, connections and their curvatures, theory of characteristic classes of vector bundles (expressed in de Rham theory using Chern-Weil isomorphism) and a general Gauss-Bonnet thereom. At the end, there are 35 pages of exercises, mostly of theoretical in character (many statements or definitions are quickly reviewed here with hints for proofs). The book is written in a precise and clear language, it combines well topics from differential geometry, differential topology and global analysis. (jbu)

A.A.Gonchar, V.P.Havin, N.K.Nikolski (Eds.): Complex Analysis I, Encyclopaedia of Mathematical Sciences, vol.85, Springer-Verlag, Berlin, 1997, 261 pp., DM 148.00, ISBN 3-540-54703-7

There are two main topics discussed in another volume of Encyclopaedia of Mathematical Sciences. The first one is a comprehensive description of properties of entire and meromorphic functions (written by A.A.Gold'berg, B.Ya.Levin and I.V. Ostrosvkii). The main topic is value distribution theory and its applications to interpolations and to solutions of ordinary differential equations. The second subject of the book is theory of polyanalytic functions (written by M.B.Balk). Polyanalytic functions are polynomials in $\bar{z}$ with coefficients in holomorphic functions (they are solutions of higher order CR equations). A number of function theoretical properties of polyanalytic functions are formulated (integral representations, zero sets, isolated singularities, boundary value behaviour, value distributions) and connections to other parts of mathematics are discussed. As is standard in the series, the book brings a description of results and a rich bibliography, where details and proofs can be found. (vs)

Oxford Classic Texts in the Physical Sciences

From James Clerk Maxwell's towering achievement, *A Treatise on Electricity and Magnetism*, to today's ground-breaking research, Oxford University Press has often been regarded as the publisher of first choice for generations of scientists. The legacy of this long publishing tradition is an unrivalled catalogue of past publications, some of which have been unavailable from us for many years.

By popular demand, Oxford University Press is now reissuing some of its most celebrated science classics in their new collection, **The Oxford Classic Texts in the Physical Sciences**. The titles to be included have been selected not only for their historic significance, but also for their enduring eloquence and clarity of presentation.

Individually, each book in this series represents a milestone in the development of scientific thought and pedagogy; collectively, these books amount to an unparalleled scientific library for the enjoyment of a new generation of readers.

Treatise on Electricity and Magnetism

James Clerk Maxwell, *late Professor, Trinity College, Cambridge*

'The formulation of these equations is the most important event in physics since Newton's time.'
ALBERT EINSTEIN IN THE EVOLUTION OF PHYSICS

Volume 1: Electricity
544 pp, 39 line figures, June 1998
0-19-850373-3 Paperback **£20.00**

Volume 2: Magnetism
528 pp, 68 line figures, June 1998
0-19-850374-1 Paperback **£20.00**

The Mathematical Theory of Plasticity

R. Hill, *formerly Professor of Mechanics of Solids, University of Cambridge*

First published in 1950, this important book details the mathematical theory underlying the behaviour of plastic materials, especially metals.

'... the author has done his work so well that it is difficult to see how it could be bettered. The book should rank for many years as an authoritative source of reference.'
ENGINEERING

'... this book should be in the possession of all those who wish to undertake study and research in the theory of plasticity'
MATHEMATICAL GAZETTE

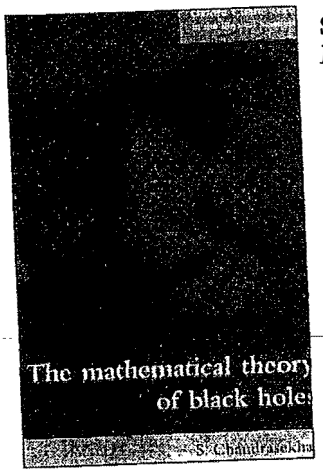
364 pp, 40 line figures, June 1998
0-19-850367-9 Paperback **£20.00**

For full details visit our website:
www.oup.co.uk
and listserver
www1.oup.co.uk/academic/
or email: **science.books@oup.co.uk**

The Mathematical Theory of Black Holes

S. Chandrasekhar, *late Professor Emeritus, University of Chicago, USA*

First published in 1983, this book is one of the great modern classics of relativity theory. It details one of the most beautiful areas of mathematical physics: the theory of black holes.



'There is no doubt in my mind that this book is a masterpiece... beautifully written and well-presented.'
ROGER PENROSE IN NATURE

672 pp, Clarendon Press, June 1998
0-19-850370-9 Paperback **£20.00**

ORDERING

To order direct by credit card, call either of the following two numbers, please have your details with you when you dial. Please quote the code EMS698.

Tel: +44 (0) 1536 454534 or
Fax: +44 (0) 1536 454518

For further details about this series please email Julia Walker on
walkerj@oup.co.uk

Dynamical Theory of Crystal Lattices

Max Born, *late Nobel Laureate, University of Edinburgh, and* **Huang Kun**, *Beijing University, China*

'The book can be highly recommended not only for its excellent survey on the particular subject but also for the clear presentation of important mathematical methods which should be of use in other subjects as well.'
BRITISH JOURNAL OF APPLIED PHYSICS

432 pp, 28 line figures,
Clarendon Press, June1998
0-19-850369-5 Paperback **£20.00**

The Theory of Probability

Sir Harold Jeffreys, *late Plumian Professor of Astronomy, University of Cambridge*

Published in 1939, this book was the first to develop a fundamental theory of scientific inference based on the ideas of Bayesian statistics. Recent advances in computer power and availability have brought Bayesian statistics into the limelight and make this book a must for all serious statisticians.

480 pp, 2 line figures, June 1998
0-19-850368-7
Paperback **£20.00**

Algebraic Projective Geometry

J. G. Semple, *late Professor Emeritus, King's College, London, and* **G. T. Kneebone**, *formerly Reader in Mathematics, Royal Holloway and Bedford College, London*

First published in 1952, this book has been recommended to generations of students. It provides a clear and systematic introduction to projective geometry, building on concepts from linear algebra.

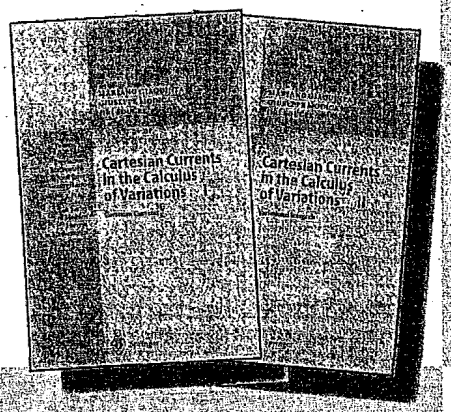
'[Topics are] presented with a simplicity and clarity of treatment... This interesting book may be warmly recommended.'
MATHEMATICAL GAZETTE

412 pp, 72 line figures,
Clarendon Press, June 1998
0-19-850363-6 Paperback **£20.00**

Prices and extents are subject to change.

OXFORD UNIVERSITY PRESS
Innovation • Excellence • Tradition

Springer for Mathematics



M. Giaquinta, G. Modica, J. Souček

Cartesian Currents in the Calculus of Variations I

Cartesian Currents

1998. Approx. 736 pp. 28 figs.
(Ergebnisse der Mathematik und ihrer Grenzgebiete. 3. Folge / A Series of Modern Surveys in Mathematics, Vol. 37)
Hardcover DM 229,-
ISBN 3-540-64009-6

This two-volumes monograph deals with non-scalar variational problems arising in geometry, and in physics. The presentation is selfcontained and accessible to non specialists. Topics are treated as far as possible in an elementary way, illustrating results with simple examples; in principle, chapters and even sections are readable independently of the general context, so that parts can be easily used for graduate courses.

M. Giaquinta, G. Modica, J. Souček

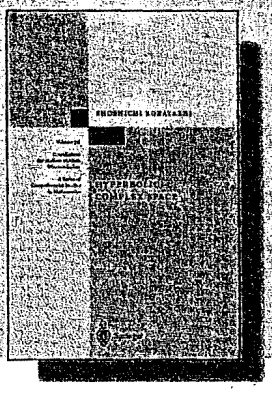
Cartesian Currents in the Calculus of Variations II

Variational Integrals

1998. Approx. 651 pp. 19 figs.
(Ergebnisse der Mathematik und ihrer Grenzgebiete. 3. Folge / A Series of Modern Surveys in Mathematics, Vol. 38)
Hardcover DM 229,-
ISBN 3-540-64010-X

Errors and omissions excepted.
Prices subject to change without notice.
In EU countries the local VAT is effective.

Ergebnisse Vol. 35
now as softcover edition



D. Goss

Basic Structures of Function Field Arithmetic

1st ed. 1996. Corr. 2nd printing 1998.
XV, 424 pp.
Softcover DM 108,-
ISBN 3-540-63541-6

From the reviews:
"...The arithmetic of function fields is a universe filled with beautiful surprises, in which familiar objects from classical number theory reappear in new guises, and in which entirely new objects play important roles.
Goss' clear exposition and lively style make this book an excellent introduction to this fascinating field."
Math. Reviews

E.B. Saff, V. Totik

Logarithmic Potentials with External Fields

1997. XV, 505 pp. 18 figs.
(Grundlehren der mathematischen Wissenschaften/ A Series of Comprehensive Studies in Mathematics, Vol. 316)
Hardcover DM 158,-
ISBN 3-540-57078-0

J. Jost

Riemannian Geometry, Geometric Analysis

2nd ed. 1998. XIII, 455 pp. (Universitext)
Softcover DM 78,-
ISBN 3-540-63654-4

Includes new material on Ginzburg-Landau, Seibert-Witten functionals, spin geometry, Dirac operators.

From the reviews:
"... a very readable introduction to Riemannian geometry and geometric analysis. The book is made more interesting by the perspectives in various sections where the author mentions the history and development of the material and provides the reader with references."
Math. Reviews

S. Kobayashi

Hyperbolic Complex Space

1998. XIII, 471 pp. 8 figs.
(Grundlehren der mathematischen Wissenschaften / A Series of Comprehensive Studies in Mathematics, Vol. 318)
Hardcover DM 168,-
ISBN 3-540-63534-3

This book gives a comprehensive and systematic account on the Carathéodory and Kobayashi distances, hyperbolic complex spaces and holomorphic mappings with geometric methods. A very complete list of references should be useful for prospective researchers in this area.

Please order from
Springer-Verlag Berlin
Fax: + 49 / 30 / 8 27 87-301
e-mail: orders@springer.de
or through your bookseller

Springer

Springer-Verlag, P. O. Box 31 13 40, D-10643 Berlin, Germany

Gha.5270/MNT/V/1

A TRIBUTE TO GERMAN MATHEMATICIANS

The venue of the *International Congress of Mathematicians* in Berlin, certainly the largest mathematical event of this end of the century, gives the European Mathematical Society the opportunity to *acknowledge the leading role played by German mathematicians in present-day mathematical life*, after the terrible years of the Nazi period that affected the German mathematical community so deeply.

This remarkable achievement is embodied in the action of individuals, of institutions and of services. In this issue are gathered what we felt are natural, and outstanding, illustrations of these different aspects. Indeed, as far as people are concerned, you will find an *Interview* with *Friedrich HIRZEBRUCH*, the first EMS President, and the *Editorial* written by *Jürgen JOST*, JEMS editor-in-chief. The *Deutsche Mathematiker-Vereinigung* (DMV) is the society and the *Mathematisches Forschungsinstitut Oberwolfach* (MFO) the institution that this Newsletter presents. The service that you are invited to know better is the database *Zentralblatt-MATH*, until very recently a German enterprise, involving reviewers from many different countries, of which the EMS recently became a partner.

All mean a lot to the EMS in its short life. This is why we would like to *pay a tribute to German mathematicians.* This of course encompasses the team of the Congress, who put so much effort in advertising it and great care in taking into account comments from colleagues from all over the world.

To all, our thanks for their help and support!

To ICM 98, our best wishes for success!

Jean-Pierre BOURGUIGNON, EMS President.