



European Mathematical Society

NEWSLETTER No. 18

December 1995

European Congress of Mathematics

2nd Announcement

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ERRATA:

EMS Newsletter 17 (September 1995)

In the first announcement for the Council meeting of the EMS, the name of one member of the Executive Committee of the EMS, **Professor Alberto Conte** (1994-98), was inadvertently omitted. We apologise for this error to all concerned.

Also in the article 'The Zentralblatt für Mathematik and Specialized Information' a

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wrong address for the author was given at the beginning.

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Rupprecht-Karls-Universität Heidelberg
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D-69120 Heidelberg
Germany

Peter Michor, Secretary

Election of Council Delegates

As announced in the previous issue of the Newsletter, nominations are required for Council delegates representing individual members of the Society. On 1 November 1995 there were 1674 individual members, and this means that there should be 17 delegates representing them. During the term ending with this year the delegates representing individual members were:

Term 1992–95:

Aubin, Thierry; Bérard, Pierre; Branner, Bodil; Deshouillers, Jean-Marc; Desolneux-Moulis, N; Dineen, Sean; Fenn, Roger Andrew; Howie, John M; Karoubi, Max; Malliavin, Paul; Martin-Deschamps, Mireille.

Term 1994-97:

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

The terms of the first mentioned 11 delegates ends now. They are all eligible for re-election but Professors Deschamps, Howie and Malliavin have informed the Secretary that they do not wish to continue as delegates.

Nominations are now sought for 11 delegates to serve for the years 1996–1999. Attached to this notice is a nomination form. Completed nomination forms must arrive at the Society's office in Helsinki by 10 February 1996. If there are more nominations than the allowed number of delegates, a postal election will be held; members will receive ballot forms at the end of February 1996 and these must be returned by 10 April 1996.

Nominated delegates must be individual members of the Society and they must be proposed and seconded by individual members. The Society will pay subsistence costs for them to attend the Council meetings, if needed, but is not able to cover travel costs except perhaps in cases of particular hardship.

Candidates for election are invited to submit with their nomination form a short biography

(not more than 200 words) together with a Statement of not more than 100 words in support of their candidature. These will be circulated to the members with the ballot forms. A copy of these can be sent as a text file by e-mail to the Secretariat to makelainen@cc.helsinki.fi.

Peter Michor, Secretary

Nomination Form for Council Delegate

NAME:

TITLE:

ADDRESS:

.....

.....

PROPOSER:

SECONDER:

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

SIGNATURE OF CANDIDATE:

.....

DATE:

Completed forms should be sent to:

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

to arrive by February 10, 1996.

A photocopy of this form is acceptable.

2nd EUROPEAN CONGRESS OF MATHEMATICS
Budapest, Hungary
July 21–27, 1996

Budapest welcomes you

SECOND ANNOUNCEMENT

Bures-sur-Yvette, December 4th 1995

Dear Colleagues and Friends,

It is my privilege to encourage you to participate in the second European Congress of Mathematics to be held next July, and to enjoy the deep sense of culture and warm hospitality of Hungary, the host country. This big event has been placed under the auspices of the European Mathematical Society since the Council of the society decided to continue the series inaugurated in Paris four years ago.

Allow me to express some of my feelings towards this endeavour. A scientific congress is in the first instance a great occasion for meeting people and for listening to distinguished colleagues. It also offers a special opportunity for assessing where one stands. In the context of such a European demonstration, I feel it is of the utmost importance to cultivate and confront our diversity. The Round Tables, one of the distinctive features of the European congresses, allow us to make our differences visible and to strengthen our efforts to prevent them from becoming obstacles. This will certainly make us more receptive to the theme under which the Scientific Committee has decided to place the Congress, the Unity of Mathematics.

The success of the Congress will above all be the result of the hard work of our Hungarian colleagues. It will to a lesser extent reflect our personal involvement in its preparation and its organization. It is up to us to make the European Mathematical Society an efficient tool for developing projects of this kind, with the general public of mathematicians in mind, or an even wider one. Indeed, we cannot think of ourselves as alone in a corner of the planet. It is our task to make Mathematics accessible to the public at large, and to try and understand its power and limitations. A congress like this one provides an exceptional opportunity.

Europe can only prosper in developing compatibility between its inhabitants, no matter what their speciality. This is a condition for the passage of its existence from a virtual world of symbols to the real one. It falls to us to work at this, and we hope to succeed.

Looking forward to meeting you in Budapest in July, I remain

Sincerely yours,

Jean-Pierre Bourguignon
President of the European Mathematical Society

The Organizing Committee extends a hearty invitation to all members of the international mathematical community to attend the Second European Congress of Mathematics in Budapest, Hungary, July 21–27, 1996.

The Congress is organized by the János Bolyai Mathematical Society and will be held under the auspices of the European Mathematical Society.

1. LOCATION

Budapest, the capital of Hungary is situated on the banks of Danube. The city is a major attraction in world tourism, offering rich programmes in culture, sport and nightlife as well as spectacular walking tours of the city of Pest and of the nearby hills of Buda.

Events will be at three convenient locations:

- (i) the modern Convention Center providing 1700 seats for the plenary lectures, as well as closed circuit television for remote viewing,
- (ii) the lecture rooms of the Technical University, where all other mathematical events will take place,
- (iii) the Hungarian National Gallery in the central building of the Royal Palace on the Castle Hill of Buda, where the Banquet is to be held.

2. SCIENTIFIC PROGRAM

2 .1. **Opening Ceremony**, Monday, July 22, 10:00 am at the Convention Center, including the European Mathematical Society prize awards and followed by a plenary lecture at 11:30.

- 2 .2. **Plenary Lectures**, 50 minutes long, are scheduled in the Convention Center on
Monday, July 22 at 11:30 am, 2:30 pm, 3:30 pm, 4:30 pm;
Wednesday, July 24 at 9:00 am, 10:00 am, 11:00 am;
Friday, July 26 at 9:00 am, 10:00 am, 11:00 am.

It is our pleasure to announce the following speakers:

N. Alon, G. Ben Arous, D. McDuff, B. Dubrovin, J. Kollár, J. Laskar, A. Merkurjev, V. Milman, S. Müller, J.-P. Serre .

- 2 .3. **Parallel sessions** of 45 minute talks are scheduled at the Technical University on
Tuesday, July 23 from 9:00 am to 5:00 pm;
Wednesday, July 24 from 2:00 pm to 5:00 pm;
Thursday, July 25 from 9:00 am to 5:00 pm;
Friday, July 26 from 2:00 pm to 4:00 am.

The list of speakers will be made public on the EMS server whose address is
<http://www.emis.de>
and by anonymous ftp from circle.math-inst.hu/pub/ecm2.

- 2 .4. **Round tables** covering 7 different topics are scheduled at the Technical University on
Tuesday, July 23, 9 am – 12 am, and 2 pm – 5 pm;
Thursday, July 25, 9 am – 12 am, and 2 pm – 5pm.

Round table topics (and chairs if known already):

- A) Communication in mathematics - J. Körner;
- B) Mathematical games - D. Singmaster;
- C) Demography of mathematicians;
- D) Women and mathematics - K. Haag;
- E) Public image of mathematics;
- F) Mathematics and Eastern Europe - D. Cioranescu;
- G) The role of publication in the career.

2 .5. **Award Lectures**. EMS prize winners will be given the opportunity of giving a 30 minute presentation of their work.

2 .6. **Poster sessions**. All registered members may present their work in scheduled poster sessions provided they submit an abstract together with the AMS classification code(s) to the János Bolyai Mathematical Society (Fő u. 68, H-1027 Budapest, Hungary) by March 15, 1996. Abstracts sent by e-mail will not be considered.

Authors are responsible for the contents of their poster and are requested to prepare and bring their sheets ready for presentation. Posters must be of size A2 or smaller.

Poster sessions are scheduled at the Technical University,
Tuesday, July 23 from 9:00 am to 5:00 pm;
Wednesday, July 24 from 2:00 pm to 5:00 pm;
Thursday, July 25 from 9:00 am to 5:00 pm;
Friday, July 26 from 2:00 pm to 4:00 am.

2 .7. **Informal discussion.** Lecture rooms and additional premises at the Technical University will be available from 9:00 am - 9:00 pm for free discussions.

2 .8. **Movies** of mathematical interest, **films and videos** on mathematics will be shown. Participants may suggest specific films for presentation. Such requests must be filed to the Organizing Committee by March 15 and a copy of film be sent not later than May 15.

2 .9. **Exhibitions** (including books).

2 .10. **Closing Ceremony** will take place in the Convention Center on July 26 at 7:00 pm, followed by the Amadinda concert.

2 .11. A listing of **satellite conferences** is enclosed on a separate leaflet.

3. PUBLICATIONS

All registered participants will receive a full program, the Abstracts of Lectures, and a list of participants (registered prior to July 1, 1996) upon arrival at the Congress Reception Desk.

The Proceedings of the Congress can be ordered at a special discount price during the meeting.

The Proceedings will contain refereed papers of lectures and summarized discussions of Round Table meetings.

4. IMPORTANT DEADLINES

4.1. Grant applications received after January 31, 1996, will not be processed.

4.2. Poster proposals and early registrations are to be received by March 15, 1996.

4.3. Hotel reservations are guaranteed upon requests received by June 1, 1996.

5. SOCIAL AND CULTURAL EVENTS

1. All registered participants are welcome to the Banquet of the Congress held on July 22 (Monday) at 7.30 p.m. in the premises of the National Gallery.

2. A concert of unique musical experience will be presented by the Amadinda Percussion Group on July 26 (Friday) at the Convention Center following the Closing Ceremony. The concert is free of charge for all registered participants.

3. Additional cultural programmes. Various concerts and folklore programmes will be offered every evening. The Third Announcement will contain a complete list of these optional events. The list and prices will also be available at the Congress Reception Desk.

6. REGISTRATION to the Congress

Applicants for registration should complete and return the enclosed Registration Form.

All participants, including the invited speakers, are to submit their completed Registration Form to the Registration Office.

All applications should be accompanied by the full payment of the registration fee.

Registration Office: MALÉV AIR TOURS,

Roosevelt tér 2,

H-1051, Budapest

Hungary Tel: +361-266 7836, Fax: +361-266 6006, e-mail: ecm2mat@math-inst.hu.

Registration fee in Swiss Francs if received:

	prior to March 15	March 16 – May 15	after May 16 and on site
Members of EMS	130	165	240
Non-members	165	200	240
Accompanying persons	110	130	160

For way of payment see below.

On-site registration and reception desks

On-site registration as well as the participants' registration packages and additional information will be available at the reception desks in the Assembly Hall of the Technical University, building "K", main entrance. Reception service will be provided from July 21, Sunday to July 27, Saturday at the following hours:

July 21, 14.00 – 22.00;
July 22-26, 8.00 – 18.00;
July 27 8.00 – 14.00.

The registration fee includes

- admission to all sessions of the congress;
- admission to the Banquet on July 22;
- admission to the exhibitions and films;
- admission to the Amadinda concert on July 26;
- ticket for free transport in Budapest;
- the registration package.

The registration fee of accompanying persons includes

- admission to the Banquet on July 22;
- admission to (i) a sightseeing tour or (ii) a guided museum tour (see the optional tours);
- admission to the exhibitions and films;
- admission to the Amadinda concert on July 26;
- ticket for free transport in Budapest.

7. PAYMENT

Payment of the registration fee, deposits on accommodation and optional tours can be made in any major currency (using the rate of exchange on the day of payment) by certified cheque or by any major credit card. No personal cheques will be accepted.

Certified cheques should be sent to: MALÉV AIR TOURS, Congress Department,
Roosevelt tér 2,
H – 1051 Budapest, Hungary

Please make sure that your name and program number 4006-06-21076 are clearly written on your cheque.

Cancellation of participation and refunds

Cancellation has to be made in writing to MALÉV AIR TOURS, Congress Department. The amount of the refund depends on the date of cancellation as follows.

- cancellations before June 1: 90 % of the total amount,
- cancellations between June 1 and July 1: 50 % of the total amount,
- cancellations after July 1: no refund.

Note: All refunds will be paid after the congress.

8. HOTEL INFORMATION

Malév Air Tours is ready to accept reservations of hotel rooms and will provide special reduced prices for participants.

Prices of rooms in some recommended hotels:

category	name of hotel	price in Swiss Franks of	
		single room	double room
*****	Hilton	245	275
	Hyatt	170	205
	Marriott	295	320
****	Novotel	150	170
	Flamenco	136	162
	Korona	162	180
	Gellért	160	270
***	Taverna	126	165
**	Ventura	77	85
	Platanus	77	85
	Griff	47	60
	Student hostel	20	24

Please complete the enclosed hotel reservation form and return it with your deposit by June 1, 1996 (see PAYMENT above). Receipt of the returned form will be confirmed and you will be notified of the hotel where the preliminary reservation has been made. Prices are quoted per night per room and include breakfast, service and all taxes. (Tax is subject to increase by government regulation.) Since the Congress takes place in the high tourist season, an early booking of hotel rooms is highly recommended.

Please note: **the deadline for guaranteed room reservation is June 1, 1996.**

Cancellation

Cancellation of hotel reservation can only be made by written notice sent to the MALÉV AIR TOURS Congress Department.

Refunds:

- - cancellations received prior to June 1, 1996, are subject to a 10% cancellation charge,
- - no refunds for cancellations received after June 1, 1996.

9. GRANTS for mathematicians from Eastern European countries

A very limited number of grants for such colleagues will be available. These grants should cover the registration fee and part of the student style lodging expenses.

Copies of the Second Announcement going to Eastern European countries have a special grant application form inserted. If you want to apply for such a grant you should carefully fill in this form and send it together with your registration form in time to reach ECM2 no later than January 31, 1996. If you apply for a grant, you need not pay the registration fee and the hotel deposit when you send in the application forms. Applicants for grants will be notified of the decision by April 25, 1996. From those applicants who do not get the support the prior-March-15 registration fee will be accepted if sent in till May 15.

Several requests for financial support have already reached the congress office during preregistration. These requests have not been processed. Therefore, even if you already have placed such a request, you should nonetheless follow the procedure outlined above. In effect, grants will be awarded on the basis of the documents to be enclosed with the grant request form.

10. OPTIONAL PROGRAMMES (tours and excursions)

All tours are based on a minimum number of 10 participants. If this number is not reached, alternate arrangements can be chosen, or the deposit will be fully refunded upon request at the MALÉV Air Tours Information Desk during the event. All tours are led by English speaking guides and depart from the main entrance of the Technical University.

(i) S/S – **City Sightseeing Tour**

This three-hour tour presents the most attractive features of Budapest.

Dates: July 21 and 22, Price: CHF 22.

(ii) BM – **Budapest Museums**

The tour will visit two of the most important museums: the National Museum and the National Gallery in the Buda Castle.

Date: July 23, Price: CHF 25.

(iii) BN – **Budapest by Night**

Sightseeing in the evening with a sample of Budapest's champagne night life.

Date: July 25, Price: CHF 35.

(iv) HD – **Hungarian Dinner with Folklore Show**

Dinner in a traditional Hungarian restaurant with a floorshow highlighting Hungarian folklore.

Date: July 26, Price: CHF 50.

(v) DB – **Excursion to the Danube Bend**

One-day trip along the Danube visiting three historic river towns: Esztergom, Visegrád and Szentendre. The tour includes a lunch.

Date: July 24, Price: CHF 60.

(vi) PU – **Excursion to the Puszta**

A taste of the traditional life of the horsemen of the Great Hungarian Plain. The horse show will be followed by a lunch in a typical Hungarian inn.

Date: July 28, Price: CHF 68.

(vii) LB – **Lake Balaton**

Balaton, the "Hungarian Sea", is the largest lake in Central Europe. The two-day tour visits the nicest and most important places around the lake, and also the world famous Herend porcelain factory. Meals are included in the price.

Date: July 20-21,

price: CHF 315/person in double room, CHF 77/single supplement

Cancellation of optional tours

before June 1, 1996: total refund;

between June 1 and July 1: 90 % of the payment;

after July 1: no refund.

11. GENERAL INFORMATION

VISA

Visitors from most European countries (and several others, including the USA) can enter Hungary without a visa. In case of doubt please consult a Hungarian embassy or consulate. The congress office can issue an official invitation if needed.

CUSTOMS

According to the present regulations visitors may not carry more than 1000 Hungarian Forints when entering or leaving the country. There is no limitation on foreign currencies. 1 liter of hard liquor, 2 liters of wine and 2000 cigarettes can be brought into Hungary duty free.

CLIMATE

The climate in Hungary is generally pleasant and sunny in July with an average temperature of 25 degrees Celsius (77 F).

CURRENCY EXCHANGE

Exchange offices are available at the airport, at railway stations, in hotels, banks and during the conference at the registration desk. (Visitors are advised not to change money in the street.)

INSURANCE

Health and luggage insurance in Hungary may not be included in your current policy. Insurance covering the period of your visit to Hungary can be purchased from MALÉV AIR TOURS when you arrange your travel.

TRAVEL

See the list of MALÉV representations on page ...

MEALS

There is a large variety of restaurants in any district of Budapest. Prices are low relative to Western European standards. Inexpensive lunch will be available at the restaurant of the Technical University.

COMMITTEES

The Scientific Committee consists of

J. Moser (CH), chair, L. Babai (H), E. Bayer (F), L. Carleson (S), C. De Concini (I), S.K. Donaldson (UK), B. Engquist (S), S. Hildebrandt (D), S. Novikov (Russia), E. Pardoux (F), A. Schinzel (PL), D. Szász (H).

The Round Table Committee consists of

B. Prum (F) chair, C. Duhamel (F), A. Figà-Talamanca (I), D. Gabay (F), A. Recski (H) co - chair H. Sendov (BG).

The **Satellite Meeting Committee** is co-chaired by G.O.H. Katona and Á. Szendrei.

Please note that this announcement (as well as the later ones) is (will be) available by anonymous ftp from

circle.math-inst.hu:/pub/ecm2 and at the Server of the European Mathematical Society
<http://www.emis.de>.

Important notice: If you have any questions about

- - lodging and optional programmes, please contact MALÉV Air Tours, Congress Department, Roosevelt tér 2, H - 1051 Budapest, Hungary; fax: (36 - 1) 266 - 6006; e-mail ecm2mat@math-inst.hu;

- - scientific program, exhibitions and grants, please contact J. Bolyai Mathematical Society, Fő u. 68, H - 1027 Budapest, Hungary; fax: (36 - 1) 201 - 6974; e-mail ecm2jbms@math-inst.hu.

Budapest, December 6, 1995.

G.O.H. Katona
President of the Organizing Committee

A. Balog
Secretary

Cecília Kulcsár
Treasurer

L. Márki
Representative of the EMS

Report of the Meeting of the Executive Committee

Besançon (France)

20-21 October 1995

The Editor regrets that for technical reasons it is not possible to include this report in the present issue of the Newsletter. The text can, however, be read on the EMIS server on

<http://www.emis.de>

and also under the anonymous ftp server

<ftp.emis.de>

and will appear in Newsletter 19. Members without access to these outlets may obtain a copy of the text on application to the Editor.

REGISTRATION FORM

PARTICIPANT

Family name _____ First Name _____
 Institution _____
 Mailing address _____
 Postal code _____ City _____ Country _____
 Phone _____ Fax _____ e-mail _____

ACCOMPANYING PERSON(S)

Family name _____ First Name _____

I intend to present a poster YES _____ NO _____

I am enclosing my application form for a congress grant YES _____ NO _____

REGISTRATION FEE

prior to March 15 March 16 — May 15 after May 16 and on site

Members of the EMS
 Non-members
 Accompanying persons

WAY OF PAYMENT

Registration fee, one night hotel deposit and full payment of the tours should be paid by certified cheque or credit card. Each remittance must show the name of the participant and the following programme number: 4006-06-21076.

1. Cheque should be sent to: Malév Air Tours, Congress Department
 Roosevelt tér 2, H-1051 Budapest, Hungary

2. Credit card number _____ expiry date _____

Diners Club _____ Visa _____ Master Card/Eurocard _____ American Express _____

I authorise Malév Air Tours to charge my account with the registration fee, hotel deposit and optional programmes.

Date _____

Signature _____

HOTEL RESERVATION

Choice	Name of hotel	Number of rooms		Date of	
		single	double	check in	check out
1st					
2nd					
3rd					

Hotel reservation will be made only upon receipt of hotel deposit which is one night's fee of each booked room of your choice.

OPTIONAL PROGRAMMES

Name of the tour	Date of the tour	Number of persons

Putting the IMU on the WWW

Dear colleague:

We are writing on behalf of the International Mathematical Union to draw your attention to a new initiative of putting the IMU on the World Wide Web. The Konrad-Zuse-Zentrum für Informationstechnik in Berlin (ZIB) has been working together with the Executive Committee of the IMU to compose a "home page" for IMU. You can access this home page using any of the standard Internet tools, such as Mosaic, Netscape, etc. through the URL:

<http://elib.zib-berlin.de/IMU>

Gopher access is possible through the following address:

<gopher://elib.zib-berlin.de:70/11imu>

The IMU server can be accessed via telnet as follows:

```
telnet elib.zib-berlin.de
Login: imu
no password required
```

We invite you to try this out and send us your comments.

We hope this WWW home page will serve several purposes. The first is to inform all members of the international mathematical community of what the IMU is doing. Secondly, they can find there descriptions of various programs from which they can benefit:

- the IMU lectures,
- exchanges with the developing countries,
- conferences being sponsored, etc.

Thirdly, the IMU server is also a collection of data that everyone can use to find the addresses of the main mathematical organizations of the world. We are planning to extend the scope of the IMU server so that it will become a true "home page of the world of mathematics". You can already find a number of links to mathematical and mathematics related information offered around the world.

Just look at the "Links to the Mathematical World" in the IMU server.

Fourthly, the IMU server will give everyone immediate access to the latest information on the next International Congress (ICM98 in Berlin), as well as the ability to preregister for this congress by the WWW server of ICM98 that can be "clicked" in the IMU server or can be directly accessed through the following URL:

<http://elib.zib-berlin.de/ICM98>

The ICM98 server contains a forms page for "preliminary preregistration". This is not a formal registration yet. Everybody preregistered for ICM98 will be informed in the future automatically about the progress of the organization of the congress by email and will receive the final registration material etc. this way. Please encourage your colleagues interested in ICM98 to preregister for the congress.

Whoever does not have the possibility to use the advanced Internet tools described above can send an email to the following address:

icm98@zib-berlin.de

and writing

PRELIMINARY PREREGISTRATION

into the SUBJECT line.

In the body of the mail the following information should be contained:

Last Name:
First and Middle Name:
E-mail:
Phone Number:
Fax Number:
Institution:
Street:
ZIP Code:
City:
Country:

Every member country of IMU is listed in the IMU server. We have one very specific request:

Can you examine the entry dealing with your country, and check whether the names and addresses are correct? We want to make every effort to keep this data collection up to date and correct. Of course we would be happy if you could provide us with additional information that we could add to the entry of your country. In particular, links to existing or planned servers of mathematical societies, institutes etc. are most welcome. The best way to inform us of any changes is to email us the corrections and suggestions to

“groetschel@ZIB-Berlin.DE”,
with a copy to “imu@impa.br”.

We have a second request. We are aware of the fact that Internet communication is sometimes slow due to network overload. We would therefore be glad if some institution in your country would agree to mirror both the IMU and the ICM98 servers so that mathematicians in your country have a faster and more comfortable access. Technical details concerning this matter will be handled by the Konrad-Zuse-Zentrum für Informationstechnik in Berlin (ZIB). An institution willing to mirror the servers should contact Martin Groetschel (email: groetschel@zib-berlin.de).

Finally we have a third request. We would be happy if you could distribute the information contained in this letter to the mathematicians in your society and your country in whatever form you find appropriate (emailing a copy of this letter to interested colleagues, a note about this letter in your newsletter, etc.).

Sincerely yours,

Martin Groetschel (President of the ICM98
Organizing Committee and
Vice-President of ZIB)

David Mumford (IMU President)

Jacob Palis (IMU Secretary)

Addresses:

Martin Groetschel

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E-Mail: jpalis@impa.br or imu@impa.br

MATHEMATICS SUBJECT CLASSIFICATION

To the Mathematical Community:

The editors of *Mathematical Reviews* and *Zentralblatt für Mathematik* have initiated the process of revising the 1991 Mathematics Subject Classification, which is used by both journals as their classification system. The editors do not plan a radical revision of the present 1991 system, but it is clear that some changes will be needed in order to accommodate recent developments in mathematical research.

It will be necessary to have this revision completed by the end of 1998 so that it can begin to be used in *Current Mathematical Publications* in mid 1999, and in *Mathematical Reviews* and *Zentralblatt für Mathematik* beginning in 2000.

We hereby solicit comments and suggestions from the mathematical community to be considered in this revision process. These should be submitted by June, 1997. The preferred method of communication is by e-mail:

msc2000@math.ams.org or
msc2000@zblmath.fiz-karlsruhe.de

(Comments and suggestions may also be sent to either one of us at the addresses given below.) We are eager that research mathematicians and

scholars have input in this revision process as soon as possible.

Additional information as well as copies of the 1991 Mathematics Subject Classification Scheme may be found at

<http://e-math.ams.org/> and
<http://www.emis.de/>

Copies can also be found in the most recent index issues of *Mathematical Reviews* and *Zentralblatt für Mathematik*.

R. Keith Dennis
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Franklinstr. 11
D-10587 Berlin
Germany

FESTSCHRIFT In Honour of Lennart Carleson and Yngve Domar

Proceedings of a Conference at Uppsala University in May, 1993

Contains expository articles by Peter Jones, Michael Benedicks and Nikolai Nikolski on the contributions to Mathematics by Lennart Carleson and Yngve Domar, as well as papers by a number of their students. There is also a historical survey (in Swedish) on the period 1945-93 of the Institute of Mathematics at Uppsala University. Paperbound, 263 pp.

Price SEK 217:- (incl. VAT) (174 excl. VAT), postage and packing *not* included. The volume can be ordered from

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European Science Foundation European Research Conferences

The Programme of European Research Conferences is run by the European Science Foundation, in association with several learned societies, and with funding from the Human Capital and Mobility Programme of the European Union. Each Conference consists of a series of meetings, held typically every other year. There are neither written contributions nor proceedings.

The Commission of the European Community subsidises EURESCO. Young mathematicians under the age of 35 who are EU citizens (or residents in an EU country for more than a year) are encouraged to apply to the EURESCO programme. The applications should be sent directly to the EURESCO office:

Dr. J. Hendekovic, EURESCO;
European Science Foundation;
1, quai Lezay-Marnésia;
F-67080 Strasbourg;
France

I. MATHEMATICAL METHODS IN INDUSTRIAL PROBLEMS

1994

Multi-scale Analysis in Image Processing.

Chair: Pierre-Louis Lions (Paris), Vice-Chair:
Alfio Quarteroni (Milano)

15–20 October 1994.

Lunteren, The Netherlands

1996:

Mathematical and Numerical Models for the
Simulation of Turbulent and Reactive Flows.

Chair: Alfio Quarteroni (Milano)

16–21 February 1996

Mont St. Odile (near Strasbourg), France

II. ALGEBRA AND DISCRETE MATHEMATICS

1996:

Group Theory: Finite to Infinite.

Chair: Laszlo Babai (Chicago);

Vice-Chair: Anders Björner (Stockholm)

13–18 July 1996

Castelvecchio, Italy

III. MATHEMATICAL ANALYSIS

**Local singularities of solutions to nonlin-
ear and singular PDE's**

Chair: Bogdan Ziemian (Warsaw);

Vice-Chair: Werner Müller, MPI Bonn

September 19–24, 1995.

San Feliu de Guixols, Spain

IV. NUMBER THEORY AND

ARITHMETICAL GEOMETRY

The first conference will be organised by
Gerhard Frey (Essen), and will take place in
the fall of 1997.

EUROPEAN NEWS: Country by Country

BELGIUM

A.M.S. - Benelux Meeting

The Mathematical Societies of Belgium, The Netherlands and Luxembourg, and the American Mathematical Society have the pleasure of announcing their first joint meeting, to be held in

Antwerp (Belgium)

22-24 May 1996

Programme

The programme will include 8 plenary lectures (in the mornings) and parallel sections.

Two special events will be the **Brouwer Medal Ceremony** and the **Beeger Lecture**.

The **main lectures** will be given by:

J. Bourgain (to be confirmed), J. McLaughlin, A. Schrijver, S. Smale, E. Stein, F. Takens, C. Taubes and M. Van den Bergh.

The subject and organizers of the **parallel sessions** known so far are:

Discrete Mathematics and Finite Geometry.
A. Blokhuis, R. Calderbank.

Mathematical Physics.
J. Bricmont, B. Nachtergaele.

Harmonic Analysis.
J. Ludwig, J.-P. Pier.

History of Mathematics.
J. Mawhin, J.-P. Pier.

Number Theory and Discrete Mathematics.
H. Lenstra, R. Tijdeman.

The **Beeger Lecture** is included here.

Algebraic Geometry. J. de Jong.

Algebra.
S. Caenepeel, S. Montgomery.

Differential Geometry.
L. Lemaire, L. Vanhecke.

Buildings.
M. Ronan, J. Van Maldeghem.

Logic.

M. Boffa, Y. Gurevich.

Numerical Mathematics.

P. W. Hemker, S. Vandewalle.

Section connected to the **Brouwer Medal**

Dynamical Systems.

F. Dumortier, F. Takens.

Motivic Cohomology and Algebraic K-Theory.

E. Friedlander, J. Murre.

Wavelets.

I. Daubechies, T. Koornwinder.

Inverse problems.

C. De Mol, F. Santosa.

Modular Functions.

J. Top, D. Zagier.

Contributed papers.

Coordinated by F. Van Oystaeyen.

Registration is already possible as follows:

By e-mail: VROMPAY@UIA.UA.AC.BE

By mail: C. Van Rompay, Dept. Wiskunde, U. I. A. Universiteitsplein 1, 2610 Wilrijk.

There will be a registration fee of BEF 1,000.

Contributed papers

Interested mathematicians are welcome to submit a contributed paper, either in one of the specific sections or in section 17, if their subject does not fit well with the specific ones.

Please send a proposed title and abstract to a section organizer or to F. Van Oystaeyen before January 11, 1996.

(e-mail: VOYST@HWINS.UIA.AC.BE)

Accommodation

The five stars hotel SWITEL has offered a 50% discount (around BEF 2,500 for a single room). Other hotels are of course available.

Booking can be made by contacting L. Willaert at the U. I. A.

(e-mail: Willaert@UIA.UA.AC.BE).

Social events

All participants are invited to the **Brouwer Medal** ceremony on May 22.

An (optional) dinner will take place on May 23.

Various excursions will be organized on Saturday May 25.

Information on this programme is now available directly from the EC via Internet on:

<http://www.cordis.lu>

Recall that the various parts of this programme are the following.

Individual fellowships

These are grants for scientists of one member state wishing to work for a period in a department of another member state.

There are various categories.

B20: Doctoral grants

B30: Post-doctoral grants, for those having already obtained their Ph.D.

Essentially, the age limit is 35

B40: Grants for established researchers, particularly from industrialized regions, who wish to join a team in a less favoured region to import their research experience.

Return grants: For researchers of less favoured regions, who have benefited from a grant and want to go back to their country.

There are regular calls for proposals.

Networks These are networks of at least 5 groups in at least 3 countries, working

on a specific theme. The accent is put on training, so that more than half the money should be used as salaries for young researchers. The rest should help improving collaboration of the groups in the network. Note that these rules lead to a situation not suitable for mathematical research: large amounts of money have to be concentrated on a small number of small specialized networks. It is possible that some rules change before the next call for proposals, so that it will be necessary to check regularly Cordis. In particular, the next deadline for applications could change. In the fellowships and networks categories, the available budget is shared between the various sciences proportionally to the amounts applied for. The applicants who were not funded (the rates of success are very small) might find some solace in the fact that their application increased the number of successful ones in mathematics.

Accompanying measures These are essentially Euroconferences and Summer Schools, defined as series of meetings on a theme. The Summer Schools should particularly stress the training of young scientists.

Cordis The final advise will be to consult Cordis rather regularly, to be able to introduce applications within the deadlines.

Luc LEMAIRE Liaison Officer with the E.C.

CROATIA**1st Croatian Mathematical Congress**

18-20 July 1996

Zagreb, Croatia

Sponsor: Croatian Mathematical Society

Invited Speakers (tentative list): J. Azema (Univ. P. et M. Curie), J. Bertoin (Univ. P. et M. Curie), A. Bourgeat (Saint- Etienne), R.J. Daverman (Univ. of Tennessee), Z. Janko (Heidelberg), A. Ivic Weiss (York Univ.), A. Mikelic (Univ. Lyon 1), D. Milicic (Univ.

of Utah), S.J. Patterson (Göttingen), M. Rao (Univ. of Florida), J.M.R. Sanjurjo (Univ. Complutense), K. Veselic (Hagen), M.V. Wickerhauser (Washington Univ., St. Louis).

Application deadline: January 1, 1996.

Information:

Hrvoje Sikic
Department of Mathematics
University of Zagreb
Bijenicka 30
Croatia
E-mail: congress@math.hr

Catalonia

Centre de Recerca Matemàtica Barcelona, Apartat 50, E-08193 Bellaterra

Tel: 343 5811081 Fax: 343 5812202

e-mail:crm@crm.es www <http://crm.es>

Visiting research mathematicians for the academic year 1995–1996

A. Mathias, Oberwolfach	01.09.93 – 30.03.96	Logic
Q. Jiang, Jianguo	01.11.94 – 31.12.95	Dynamical systems
J. Xiao, Beijing	18.07.95 – 30.12.95	Analysis
J. Viola-Prioli, Caracas	03.08.95 – 30.08.96	Algebra
A. Da Rocha, Caracas	03.08.95 – 30.08.96	Algebra
E. Formanek, Illinois	21.08.95 – 30.06.96	Algebra
P. Ahern, Minnesota	24.08.95 – 31.07.96	Analysis
N. Fagella, Berkeley	01.09.95 – 30.06.97	Dynamical systems
J. Coates, Cambridge	01.09.95 – 09.09.95	Number theory
M. Yousif, Ohio	04.09.95 – 31.07.96	Algebra
D. Pigozzi, Ames	06.09.95 – 31.12.95	Logic
R. Pérez-Marco, Paris	01.09.95 – 30.09.95	Analysis
A. Bishop, Clayton	11.09.95 – 17.09.95	Math. education
J. C. Yoccoz, Paris	22.09.95 – 30.09.95	Analysis
E. Dubtsov, S. Petersburg	01.10.95 – 30.08.96	Harmonic analysis
M. Crossley, Aberdeen	01.10.95 – 31.08.96	Algebraic topology
M. Mathieu, Tübingen	01.10.95 – 31.12.95	Algebra
S. Olevskii, Ramat Aviv	01.10.95 – 30.10.95	Analysis
T. Jech, Pennsylvania	10.11.95 – 10.12.95	Logic
R. Baeza-Yates, Santiago de Chile	08.01.96 – 08.03.96	Algorithmics
M. Sudan, New York	08.01.96 – 08.02.96	Algorithmics
H. Mahmoud, Washington	08.01.96 – 31.01.96	Algorithmics
A. Sinclair, Berkeley	10.01.96 – 31.01.96	Algorithmics
M. Luby, Berkeley	10.01.96 – 31.01.96	Algorithmics
E. Lacombe, México	01.02.96 – 31.07.96	Dynamical systems
A. Stray, Bergen	01.02.96 – 30.04.96	Analysis
N. Nisan, Jerusalem	01.02.96 – 28.02.96	Algorithmics
M. Mihail, Bell Labs	01.02.96 – 28.02.96	Algorithmics
M. Santha, Orsay	01.02.96 – 28.02.96	Algorithmics
O. Watanabe, Tokyo	15.02.96 – 30.03.96	Algorithmics
U. Vazirani, Berkeley	01.03.96 – 30.04.96	Algorithmics
R. Motwani, Stanford	15.03.96 – 31.03.96	Algorithmics
V. Vazirani, New Delhi	15.03.96 – 31.03.96	Algorithmics
C. Kearton, Durham	09.04.96 – 30.06.96	Topology
P. Spirakis, Patras	01.05.96 – 31.05.96	Algorithmics
J. McNeal, New Jersey	15.05.96 – 15.06.96	Analysis
K. Goodearl, Santa Barbara	01.05.96 – 30.06.96	Algebra
N. Yui, Ontario	01.05.96 – 30.06.96	Number theory
K. Stephenson, Knoxville	01.06.96 – 30.06.96	Analysis
P. Jones, New Haven	01.06.96 – 31.07.96	Analysis

**Some future visitor programmes at the
Centre de Recerca Matemàtica**

Semester on Probabilistic Methods in Algorithmics January 8 to April 3, 1996

Sci. Committee	J. Díaz (Barcelona), R. Gabalda (Barcelona), O. Watanabe (Tokyo)
Speakers	R. Baeza-Yates, M. Luby, H. Mahmoud, M. Mihail, R. Motwani, N. Nisan, M. Santha, A. Sinclair, P. Spirakis, M. Sudan, U. Vazirani, V. V. Vazirani, O. Watanabe.
Contact	www http://crm.es or mail crm@crm.es

**Techniques and Applications of Set Theory
June 3 to June 14, 1996**

Sci. Committee	J. Bagaria (Barcelona), A. Mathias (Barcelona)
Speakers	M. Magridos, C. di Prisco, A. Krawczyk, P. Dehornoy, D. Fremlin, A. Dow, R. Jensen, T. Carlson, I. Leader, S. Todorcevic, J. Adamek
Contact	www http://crm.es or mail crm@crm.es

**Summer School on Commutative Algebra
July 15 to July 26, 1996**

Sci. Committee	J. Elias (Barcelona), J. M. Giral (Barcelona), R. M. Miró-Roig (Barcelona), S. Zarzuela (Barcelona)
Speakers	L. Avramov, M. L. Green, C. Huneke, P. Schenzel, G. Valla, W. Vasconcelos
Contact	www http://crm.es or mail crm@crm.es

**CRM Advanced Course on Geometry and Physics
July 1 to July 13, 1996**

Coordinator	S. Xambó (Barcelona)
Speakers	G. Segal, D. Kotschick, M. Kontsevich, S. Katz
Contact	www http://crm.es or mail crm@crm.es

CRM Advanced Course on Homotopy Theory September 3 to September 14, 1996

Coordinator	C. Broto (Barcelona)
Speakers	D. C. Ravenel, E. Dror Farjoun
Contact	www http://crm.es or mail crm@crm.es

REPUBLIC OF GEORGIA

**Tbilisi International Centre
of Mathematics and
Informatics (TICMI)**

Advanced Course on Theory of Elasticity

Date: 29 October-8 November 1996

Location: TICMI (Tbilisi, Telavi)

David Gordeziani
(University of Tbilisi, Georgia)

I. Vekua's Version of the Theory of Plates and Shells

Summary: Reduction of three-dimensional problems of the theory of elasticity to the two- and one-dimensional mathematical models by Vekua's reduction method. Analysis of the models, their accuracy, and comparison with other models (variational-difference and finite elements methods, method of complex variables, justification of methods). (7 hours)

George C. Hsiao (University of Delaware, USA)
Wolfgang W. Wendland (University Stuttgart,
Germany)

Boundary Integral Equations Methods for Exterior Boundary Value Problems

Summary: The variational formulation of boundary integral equations and its connection to variational solutions of partial differential equations. Radiation conditions for exterior problems and their incorporation into boundary integral methods. Coerciveness properties, transmission problems, coercive boundary integral equations. (4 hours)

Small Frequency Asymptotic for Bound- ary Integral Equation Methods

Summary: Acoustic scattering, the Stokes expansion for exterior flows, scattering problems with elastic vibrations. (4 hours)

On the Coupling of Hybrid Finite and Boundary Element Methods

Summary: Trefftz elements, hybrid macro-elements, mortar elements, relaxed continuity requirements, coerciveness inequalities and error estimates, iterative solution techniques and parallelization. (4 hours)

David Natroshvili (Georgian Technical University, Tbilisi, Georgia)

Mathematical Problems of Anisotropic Elasticity

Summary: Investigation of steady state oscillation problems for anisotropic media: fundamental matrices and properties of potentials, properties of boundary integral operators; generalized Sommerfeld-Kupradze type radiation conditions in anisotropic elasticity; uniqueness and existence theorems of solutions to the basic, interface, mixed and cracked pipe boundary value problems. (7 hours)

Coordinator: George Jaiani

Deadline for registration: August 20, 1996.

Further information:

Tbilisi International Centre of Mathematics and Informatics Vekua Institute of Applied Mathematics of Tbilisi State University University Str. 2, Tbilisi - 43, Republic of Georgia

e-mail: gmu@imath.kheta.ge (George Jaiani)

Tel: (007 8832) 30 30 40

Fax: (007 8832) 30 46 97

This is the first of a series of courses, at a level suitable for advanced graduate students or recent Ph.D.'s, which the TICMI plans to offer every year at fall.

PORTUGAL**Summer School on Spectral Analysis and Related Topics****3 -13 September 1996 Universidade de Aveiro and****Universidade de Coimbra, Portugal****Lecturers:** Prof.B. Carl (Friedrich-Schiller Universität, Germany), Prof. F. Cobos (Universidad Complutense de Madrid, Spain), Prof. D.E. Edmunds (University of Sussex, UK), Prof. W.D. Evans (Univ. of Wales College of Cardiff, UK)**Organizers:** A.M. Caetano (Universidade de Aveiro, Portugal) D.E. Edmunds (University

of Sussex, UK) J.W. Martins (Universidade de Coimbra, Portugal)

Information: Updated information can be obtained on the World Wide Webb at <http://www.mat.ua.pt/~ssart> or by sending an e-mail message to ssart@mat.ua.pt with the word Information in the Subject Field. In case of difficulty, or for other enquiries, contactA. M. Caetano
Departamento de Matemática
Universidade de Aveiro
3810 AVEIRO Portugal

Fax: 351-34-382014

E-mail: acaetano@mat.ua.pt**SPAIN****25-29 Summer School on Conformal Geometry and Geometric Function Theory.****Segovia, Spain****JUNE 1996****Program:** The school consists of the following five-lecture courses:

Hausdorff dimension and Kleinian Groups, C. Bishop, (SUNY, Stony Brook);

Holomorphic dynamics: puzzles, parapuzzles, complex bounds and local connectivity, B. Branner, (technical University of Denmark);

Quasiconformal mappings and analysis on metric spaces, J. Heinonen, (University of Michigan);

The Schwarzian derivative and conformal mapping, B. Osgood, (Stanford University).

Funding: Limited number of grants to cover travel/expenses of graduate students and recent Ph.D.'s.**Information:** verano@ccuam3.sdi.uam.es or contact the organizers.**Organizers:** Antonio Sánchez-Calle, José L. Fernández; Departamento de Matemáticas, Universidad Autónoma de Madrid, 28049 Madrid, Spain.

UNITED KINGDOM

1996 London Mathematical Society Invited Lectures

Professor F.J. Almgren, Jr

The Society organises an annual series of about 10 expository lectures given over the space of one week by a distinguished mathematician. The 1996 Invited Lecturer will be Professor F.J. Almgren, Jr., of Princeton University, who will lecture on the topic 'Geometric Measure Theory and the Calculus of Variations' at University College, London between 15 and 19 April 1996.

Enquiries:

Professor D. Preiss
University College
Gower Street
London WC1E 6BT

E-mail: dp@maths.ucl.ac.uk

Tel: 0171-387-7050, ext. 2850.

NATO ASI on Nonstandard Analysis and its Applications

1-13 July 1996

Edinburgh

A NATO Advanced Study Institute (ASI) will be held in Edinburgh, 1-13th July 1996. The organisers are N.J.Cutland (Hull) (Director); L.Arkerud (Goteborg); C.W.Henson (Illinois)

This intensive Instructional Conference will be hosted by the International Centre for Mathematical Sciences (ICMS), at the University of Edinburgh. It is aimed at the postdoctoral level, but will be accessible to good research students. The aim is to teach the basics of nonstandard analysis and to make the wide range of applications more widely known amongst research mathematicians. There will be courses and tutorial sessions covering: Foundations of nonstandard analysis and nonstandard models, nonstandard real analysis, topological applications, Loeb measure theory, applications in probability and stochastic analysis, functional analysis, differential equations (ODEs, PDEs, SDEs and SPDEs), applications in mathematical physics and mathematical finance theory.

The lecturers will be: L.Arkerud, E.Benoit, M.Capinski, N.J.Cutland, C.W.Henson, R.Jin, H.J.Keisler, P.E.Kopp, T.Lindstrom, P.A. Loeb, D.A.Ross, M.Wolff.

Financial support for suitable participants from NATO countries and NATO Cooperation Partner countries is available. The deadline for applications is 31 January 1996.

For Further information:

ICMS 14 India Street Edinburgh EH3 6EZ;

e-mail: icms@maths.ed.ac.uk

FAX (+44)-(0)131-220-1053)

WWW: <http://www.ma.hw.ac.uk/icms/>

UNITED KINGDOM continued

International Research Symposium: Nonstandard Analysis and its Applications

Edinburgh

11-17 August 1996

Organisers: N.J.Cutland (Hull), L.Arkerud (Goteborg), C.W.Henson (Illinois)

This conference will be hosted by the International Centre for Mathematical Sciences (ICMS) at the University of Edinburgh. Invited speakers and contributed talks will report on recent developments in Nonstandard Analysis and its Applications.

For further information:

ICMS 14 India Street Edinburgh EH3 6EZ;

e-mail: icms@maths.ed.ac.uk

FAX (+44)-(0)131-220-1053)

WWW: <http://www.ma.hw.ac.uk/icms/>

Thirteenth Conference on Ordinary and Partial Differential Equations

25 -28 June 1996

Dundee, Scotland

The purpose of the Conference is to bring together research workers with a common interest in differential equations and their application. The theme of the meeting is the study of ODEs and PDEs as models arising in physical and biological systems, including electromagnetic, acoustics, electronics, and fluids. Particular attention will be focussed on recent developments in the analysis of wave propagation, inverse problems, and dynamical systems, including non-linear systems.

The programme will consist of invited and contributed lectures.

Invited Speakers: D.S.Broomhead, F.X. Canning, K.P. Hadeler, R.E. Kleinman, M.J. Miksis, D.L. Rod, B.D. Sleeman, J.M.T. Thompson.

Contributed talks are invited on any work connected with ordinary and partial differential equations and their applications. Twenty-five minutes will be allocated to each speaker for presentation of results and discussion.

Information and applications: may be obtained from the Conference WWW page:
<http://www.mcs.dundee.ac.uk:8080/~deconf/index.html>

Contact: Conference Secretary Conference on Differential Equations Dr R.J. Jarvis Department of Mathematics and Computer Science University of Dundee DUNDEE, DD1 4HN, Scotland, U.K.

email: deconf@mcs.dund.ac.uk

Two months ago a report on the teaching of mathematics in schools caused a big stir in the British Media. Here **Dr. K.E. Hirst** of the University of Southampton, gives a brief account of this important document.

Tackling the Mathematics Problem

A Report from the London Mathematical Society, the IMA and the RSS

UK mathematicians in Higher Education are not alone in Europe in expressing concern at the present time about the mathematical preparation of undergraduates entering courses in mathematics and related subjects (particularly science and engineering).

The situation has recently been changing again in England & Wales (the Scottish pre-university curriculum is different in structure), and this prompted the London Mathematical Society, together with the Institute of Mathematics and its Applications and the Royal Statistical Society, to set up a committee of enquiry to consider the issues involved, under the Chairmanship of Professor Geoffrey Howson of Southampton University. Its conclusions were published in October 1995 as a report *Tackling the Mathematics Problem*.

The enquiry, together with other studies recently undertaken, found an unprecedented degree of concern in higher education, summarised as

- “(i) a serious lack of essential technical fluency - the ability to undertake numerical and algebraic calculation with fluency and accuracy;
- (ii) a marked decline in analytical powers when faced with simple problems requiring more than one step;
- (iii) a changed perception of what mathematics is - in particular of the essential place within it of precision and proof.”

The report makes the point that these perceptions are confirmed by international comparisons which have been undertaken in recent years.

The report has been widely circulated and so it was appropriate that the continuing reasons for the importance of mathematics as an intellectual, cultural, technological and economic tool should be stressed: they paraphrase the title of the 1982 Cockcroft report¹ as “Why Mathematics Still Counts”.

Early on the report states “We stress at the very outset that, in our view, the main responsibility for the weaknesses we identify cannot be laid at the door of classroom teachers.”

The report identifies a number of factors which *are* felt to be important in giving rise to the perceived problems. Among the most important is “English school mathematics has seen a marked shift of emphasis, introducing a number of time-consuming activities (investigations, problem-solving, data surveys, etc.) at the expense of ‘core’ technique. In practice, many of these activities are poorly focused;... Such approaches, if well-directed, have value, but priorities must be agreed.” It is

¹ *Mathematics Counts* Report of the Committee of Inquiry into the Teaching of Mathematics in Schools. HMSO 1982

pointed out that there has been an effective reduction of around 20% in the time available in school for mathematics. It is felt that the recent changes to the National Curriculum, and the impending changes to the GCE Advanced level² examinations in mathematics, will not address the problem, and could exacerbate it.

There are also concerns about student numbers. There has been a period of demographic decline since 1965, while the total number of A-level entries has doubled. Over that period the number of male students taking A-level mathematics has remained stationary at around 36,500, and the number of female entries has increased from 6,400 to 20,400. However, mathematics entries as a proportion of all A-level entries has declined from 15.9% in 1965 to 8.7% in 1994. Much more worrying is the position of Further Mathematics³. The number of entries has dropped from 15,600 in 1965 to only 5,400 in 1994. The reasons for this are various, including a shortage of well-qualified mathematics teachers and other pressures on resources. This has had a major effect on university mathematics departments. To take the University of Southampton Mathematics Department as an example, in 1965 around 95% of the undergraduates entered with two mathematics A-levels. In 1994 that figure had dropped to less than 30%.

Another factor highlighted in the report arises from the peculiar structure of the A-level examining boards. Historically these arose from universities setting entrance examinations, but now they are autonomous bodies (although some still retain university affiliation), and more importantly are self-financing. The presence of competitive market forces as a factor within the examinations system is seen as having possible consequences in terms of standards of syllabuses and grading. Unlike some other countries, the examination boards are not government agencies. Their activities are monitored and syllabuses approved by a government Schools Curriculum and Assessment Authority (SCAA), and one of the criticisms in the report is the lack of effective mathematical presence in the work of SCAA.

So to summarise, the main conclusions of the report are that:

- (i) the lack of a proper input from professional mathematicians into discussion of the school curriculum and examinations needs to be addressed, at government level;
- (ii) changes in emphasis in the National Curriculum for mathematics are needed;
- (iii) the reduction in content in the core A-level mathematics syllabus should be seriously questioned and a larger core agreed;
- (iv) consideration should be given to cutting the number of A-level syllabuses (the report draws particular attention to the present diversity);
- (v) steps should be taken to counter the unfortunate effects of 'market forces' within the examination system
- (vi) efforts must be made to increase the supply of well-qualified mathematics teachers;
- (vii) efforts must be made to attract more able students into mathematics, science and engineering.

A final quotation from the report: "We are facing serious challenges. Only if all parts of the education system work together will true progress be made."

² GCE Advanced level (A-level) is the examination taken at around age 18 by pupils in England, Wales and Northern Ireland (and some overseas countries), and it is the primary subject-based entrance qualification for university undergraduate study.

³ Mathematics is almost unique in having two A-level subjects. Further Mathematics has the single subject Mathematics A-level as prerequisite. Sometimes the two A-level subjects are organised as Pure Mathematics and Applied Mathematics (mechanics and/or statistics).

Fast Access to Literature in Mathematical Education

Gerhard König

1. Introduction

There has been a substantial growth in publications dealing with research in mathematics education, reform experiments in various countries, new pedagogical concepts and insights, topics, and teaching concepts. One feature of this growth is the increasing number of conference proceedings, collections of papers, reports, etc. being published. Another aspect is the expansion of journals in this field in both number and page count. Journals are of great importance for everyone interested in the national development as well as for an international exchange of ideas. About 50,000 to 80,000 scientific journals serve worldwide as channels for scientific communication. This ever increasing flood of information is a problem to be encountered in most fields of science: for example, some 120,000 books and papers on physics and engineering are published every year and some 50,000 on mathematics and its applications. Educational professionals, like other scientists, are thus faced with the problem of how to extract from a vast pool of potential information those pieces of information which they need for their own work.

The purpose of this note is to provide an insight into how to cope with this flood of information. I will try to give some information on the institutions and services which may help readers keep up to date with the current progress in elementary mathematics and mathematical education: abstracting journals and online data bases; especially I will mention Zentralblatt für Didaktik der Mathematik/International Reviews on Mathematical Education produced by the German non-profit organization Fachinformationszentrum Karlsruhe (FIZ- Karlsruhe)

2. Abstracting Services

Abstracting services in mathematics

As already stated mathematics literature, in general, has grown dramatically, and in order to improve access to this literature of abstracting services several have developed. Abstracting services assist in maximizing the use of the time an academic or researcher has available for reading. Such a person spends the available reading time in scanning core journals, and can use abstracting services to identify other relevant papers that may be published abroad or in less familiar journals, and to trace reports, dissertations and other grey material.

The most important abstracting journals in mathematics are Mathematical Reviews (MR) and Zentralblatt für Mathematik (ZfM). Zentralblatt, founded in 1931 by O. Neugebauer, is today the longest running abstracting and reviewing service in mathematics. Published by Springer Verlag, the Zentralblatt/Mathematics Abstracts is edited by Fachinformationszentrum (FIZ) Karlsruhe and the Heidelberger Akademie der Wissenschaften. Each of MR and ZfM each provides a very thorough coverage of the mathematics literature. Overall the two abstracting services devote approximately four-fifths of their coverage to journal articles. The citations are classified according to the well-known Mathematics Subject Classification.

Abstracting service in mathematics education: Zentralblatt für Didaktik der Mathematik (ZDM)

Zentralblatt für Didaktik der Mathematik (ZDM) (English subtitle: International Reviews on Mathematical Education) is an information and abstract journal in the field of mathematical and computer education, from elementary level to teachers' training and

adult education. This well established journal started in 1968 within the field of mathematical education and expanded its scope ten years ago to computer science education. The journal appears every two months, each issue containing an 'articles' section with articles of particular interest to educational professionals and a 'documentation' section.

The main part of Zentralblatt für Didaktik der Mathematik is dedicated to documentation. The documentation section is an abstract service and reference tool providing ready access to worldwide publications on topics such as research in mathematics teaching, basic pedagogical and psychological problems, elementary mathematics and its applications as well as computer science education. The information presented is extracted from all relevant documents. This includes journal articles (of more than 400 journals), textbooks, teaching aids, reports, dissertations, conference papers, curricula, and software. The publications are announced in the documentation section by bibliographic data and an abstract.

ERIC publications

There are two abstracting services edited by the American Educational Resources Information Center, ERIC; Current Index to Journals in Education (CIJE) and Resources in Education (RIE). Both journals are the key to American educational literature in general. RIE deals with all manner of material not covered by periodical indexing (for example research reports, dissertations, etc.). The publishing house of RIE and CIJE: ORYX Press, 2214 North Central at Encanto, Phoenix, Arizona 85004, USA.

3. Online Databases

The last two decades have witnessed the development of the online computer search service. It has given the searcher almost unlimited flexibility to tailor the results to precise specifications, to be as broad or as narrow as desired, to include or exclude

certain factors, or to combine concepts - all without losing precious hours, and merely by typing several well chosen words into the computer terminal, connected by telephone or the Internet to the host computer.

The world-wide existing knowledge is internationally stored in about 6.000 data bases accessible to the public. All abstracting services mentioned above are also available online and on CD-ROM.

The most common and also most important data base for mathematics and education is MATHDI.

MATHDI (MATHEMATICAL DIDACTICS) is the world's unique EDP-supported information service in the fields of mathematics and computer science education. It contains all literature reviewed in ZDM since 1967 amounting to 63.000 literary references at 31.12.1995. Some 4.000 citations are added each year.

MATHDI aims at: - didacticians of mathematics and computer science in research and education, - teacher educators - politicians with responsibility for education and curriculum experts - teachers at general, special and vocational schools

It may be mentioned that the field of education was one of the pioneers in online computer-based information retrieval with the development of the well known ERIC data base in the early 1960's. This data base can be used from mathematics educators as complement to the MATHDI data base and vice versa.

The data base MATHDI is a data base established and maintained by the Fachinformationszentrum Karlsruhe (FIZ Karlsruhe). FIZ Karlsruhe produces and provides scientific and technical information services in printed and electronic form. In cooperation with national and international institutions. FIZ Karlsruhe produces databases in the areas of energy, nuclear research and technology, aeronautics and astronautics, mathematics, computer science, as well as reference databases for conferences,

grey literature, research reports, and more. So the database MATH, the online version of Zentralblatt für Mathematik/Mathematics Abstracts, for researchers in pure and applied mathematics is also produced and offered by FIZ Karlsruhe.

To meet the wishes of its customers, the FIZ-databases are also available by Internet or on CD-ROM. Especially the CD-ROMs are the fastest and most comfortable-to-use components of the two mathematics "Zentralblatt families". CompactMATH for the mathematicians and CD-ROM MATHDI for the mathematics educators offer now the attractive fea-

ture of time-independent searching in all relevant publications. Special prices for subscribers to the printed Zentralblatt versions are another attractive feature.

We have described some possibilities for maths educators to keep informed on what happens in mathematics education and related areas. For more information on ZDM/MATHDI, FIZ Karlsruhe or other institutions please contact:

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From Hypertexts to Virtual Reality: Didactical Implications with Particular Reference to the Teaching of Mathematics

In Alghero (Sardinia) a meeting on hypertexts and virtual reality at school took place in April 1995.

The particular aim was that of discussing potentialities and risks of new technologies in school at all levels.

As it is well known, computer technology (the Internet in particular) which is already advanced and will continue to develop further, makes for ease of communication between people and enables them to share their experiences.

Concerning school are there negative aspects? Are those people wrong who think that the era of sophisticated computers will lead to the depersonalisation and isolation of the individual? In particular, will schools particularly, gain or lose thereby?

In order to discuss and to try to answer to these

questions O.Montaldo, the director of CRSEM (Center for the research and experimentation of mathematics education) decided to organize the meeting, one aim of which was also that of taking into account the potentiality of interdisciplinary aspects in hypertexts and virtual reality approach.

Some links between language education - seen as the development of an awareness of the role of language and languages as means of reflecting on the world and acting in the world - and mathematics education - seen as the study of a number of specialised languages each of which has its own specific morphology, syntax and semantics - were explored.

All the plenaries and oral communications will be published in both Italian and English.

Lucia Grugnetti

CONCERNING CIEAEM 47

In the NEWSLETTER n. 15 the first announcement of the 47th international meeting of CIEAEM (Commission Internationale pour l'Etude et l'Amélioration de l'Enseignement des Mathématiques - International Commission for the Study and Improvement of Mathematics Education) appeared.

The central aim of the conference on "Mathematics education and common sense: the challenge of social change and technological development" would be to review, analyse, and evaluate present models and theories of the mathematics curriculum and the teaching of mathematics - at all levels from school to university and professional training - in the light of fundamental social changes and technological developments. The conference should contribute to a systematisation and restructuring of the specialised research approaches in mathematics education and to the integrating of recent results from the related disciplines. To foster pluridisciplinary forms of cooperation the conference tries to apply various means for intensive communication of mathematicians, social scientist, psychologists, philosophers, computer scientists as well as pedagogues and teachers at all levels of the educational system.

WHY SUCH A CONFERENCE?

The Executive of CIEAEM has proposed Berlin as the geographical centre of the enlarged new Europe to be the venue for the 47th conference and celebration of the 45th anniversary of CIEAEM in 1995. The Federal Republic of Germany has been chosen only twice to host the participants of CIEAEM conferences. Both conferences - 1954 in Calw and 1962 in the Institute for Advanced Mathematical Research in Oberwolfach - took place at a time when CIEAEM conferences were very small, but both, they aimed at overcoming the feeling of resentment against Germany in this post-war era and at Integrating German colleagues into the work of the Commission.

After the political turn and the re-unification of Germany we felt a strong need to experience this new Germany and the atmosphere of a new beginning, in particular at a place where it can be felt quite strongly: in Berlin without the wall! There in addition, we hope, our colleagues from Eastern European countries could join us in greater number much easier. The theme of our conference is addressing crucial questions and offers exciting opportunities to explore these new social changes and developments with their impact on mathematics education. How to create a new common sense?

The meeting, organized in a very interesting and dynamical way by Christine Keitel, took place in Berlin from the 23th to the 29th July. About 180 participants from several countries in the five continents attended the meeting. Teachers of the different school levels and researchers could meet and debate in both the languages English and French). During a week four plenaries, sixty-three individual presentations, nineteen workshops took into care the difficult theme. Some of the individual presentations have been presented and discussed inside six working groups concerning the following subthemes: 1) Mathematics and common sense; 2) the teaching and learning aspect; 3) the impact of social changes; 4) the impact of technological development; 5) the cognitive and epistemological aspect; 6) the innovative aspect.

The plenaries have been given by Alan J. Bishop (Monash University, Clayton/Victoria, Australia), Philip Davis (Brown University, Department of Applied Mathematics, Providence, USA), Rijkie Dekker (University of Amsterdam Graduate School of teaching and Learning), Juliana Szendrei (Teacher Training Institute of Budapest). Philip Davis, with his 'intellectual charm' introduced the participants into the subject by his conference "Mathematics and Common Sense, Cooperation or conflict?"

For him Mathematics exists embedded in a prior (not in the sense of time) world of material objects and human artifacts, human language and social arrangements in which it is pursued, interpreted and validated. By using Leibniz's quotation which asserts that mathematics and its applications are amphibians that live between common sense (*Ens*) and the irrelevance of common sense (*Non-Ens*), Philip Davis said that the tension that exists between the pairs of opposites (what is intuitive and what is counter-intuitive; the obvious and the esoteric; what seems rational and what seems to be "trans-rational" or magical hocus-pocus), between the elements of mathematics that are stable and those that are in flux, is the source of its creative strength. But he argued that it is important to foster a critical attitude toward both the existence of common sense in mathematics and the ambiguous role that it occupies.

On the other hand, the title of the plenary given by Rijkje Dekker was "Use your common sense" and she argued the possible influence of people's good common sense on the improvement, of mathematics education as well as the difficulties or "fakes" which are generated when transforming ideas into textbooks or classroom activities.

By Juliana Szendrei plenary "Is Mathematics Education Independent of Social and Political Changes?" the influence of fundamental social changes on mathematics education, in particular concerned with school systems and textbooks, have been analysed. Juliana Szendrei explained that, after the political changes in the early nineties, a number of schoolbooks in history, literature, geography, etc., must have been rewritten, according to the new, explicit or implicit, requirements on the official side. However, schoolbooks in mathematics avoided such revision. One could easily draw the conclusion that mathematics, as a school subject, was more or less intact from everyday actualities. But the radical changes of the social, political, and, last but not least, economical environment have deeply influenced the role and prestige of mathematics education.

The last plenary "Mathematics Education between Technology and Ethnomathematics. Should it be common? Does it make sense?" took advantage of the two 'natures' and 'cultures' of the European Alan Bishop who now lives in Australia and is interested also in the Aboriginal side as well in Papua New Guinea society.

By several examples and situations concerning both technology and ethnomathematics Alan Bishop argued that there is more to learn from the common features of them than by focussing on their differences.

The theme of the meeting was very complex also owing to the not always equivalent means in different languages. Even if the meeting could not answer all the questions certainly the rich debate on Mathematics and Common Sense gave participants interesting ideas on mathematics education for thinking about .

The appointment with the next CIEAEM meeting is for July 1987 (23-29) in Setubal (Portugal). Next year only a Commission Members meeting will take place in Spain after ICME.

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 Dipartimento di Matematica
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Problem Corner

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Maths on the move

A competition between classes and across frontiers

There's nothing special about mathematics in European Schools. Meanwhile it is the most natural thing that thousands of students of different languages and of distinct cultures coming from fifty or more countries will obtain in one system a baccalaureate equivalent to the one achievable in any other member country of the European Community. These European Schools are based on that *raison d'être*. Divided by nine diverse language sections, the students follow a common syllabus. Mathematics lessons are held in the language of that part to which the student belongs. Twelve years of study leads according to a stipulated scheme, to a centralized degree.

But that's exceptional when whole classes prepare to compete with one another without frontiers not submitted to external constraints. And who is to blame for it? *Mathématiques sans frontières!* The newcomer among a confusing number of competitions is luring students because of the aspect of crossing frontiers. There are I repeat many faces of mathematical contests. But *Maths with frontiers* are amongst the few ones helping to jump over language barriers inside Europe. Therefore mathematics is forging links between young people. At least in this new form of competition all participants are not foreigners to the world of mathematics. The noble object of their efforts is to awake European Spirit. For, schools are small but durable constituents on the way to a Common Europe. In an allusion to *Peter Gabriel*, the famous British pop musician, who celebrated in song in the eighties *games without frontiers*, we now can laud the joys of contesting in a similar way: *Mathematical games without frontiers, fight with tears!*

This new mathematical event was hatched and is still organized by *L'Inspection Pédagogique Régionale of Mathematics* and *L'Institut de Recherche sur L'Enseignement des Mathématiques* of the *Académie de Strasbourg*; this competition is open to third and second forms or to classes of an equivalent level in foreign countries. Its aim is to encourage team work and relationships between colleges and lycées, to open up to foreign languages, to foster scientific vocations and in a small way to contribute to the quality of Maths teaching.

Maths on the move is a knockout! Its meteoric ascent began in 1990. When it started five years ago, the competition involved only the North of Alsace. In 1991, it was extended to Haute-Alsace as well as Germany. Next year, Centre-Alsace joined the competition together with Lombardy and Switzerland. In 1993 the entire Académie de Strasbourg was comprised divided into four areas (making up 75% of participants). The competition has greatly spread out in international teams from Scotland to Lebanon, from Poland to Switzerland being held in Italy, Germany, Luxembourg, Belgium and Romania.

In 1994 when *Mathématiques sans frontières* celebrated its fifth anniversary participation increased and other European countries such as Germany, Italy, Switzerland, Hungary, Spain, Ireland and Denmark became more and more involved to partake in this stupendous contest. Within just five years the participation has raised from 2,400 to 45,000 students, almost 2,000 classes most of them from outside France. The numbers have rocketed! Beyond compare the further date: In May and June 1994 more than ten prize-giving ceremonies were held during which nearly 350 classes received merit prizes.

Here are some further details from inside the competition.

- Complete classes of 10th and 11th formers (or classes of a similar level in Maths) compete against each other.
- A range of problems is presented (12 questions for students in form 10 and 15 for eleventh graders)
- Within two hours the members of the class have to find the answers to the problem set. They are expected to work together on the exercises and must hand in one answer sheet for each problem.
- The competition, which takes place in March, is supervised by a teacher from another school.

How to take part

- Only complete tenth or eleventh year classes may apply
- As from this year the competition will be open to state-run or private schools situated in a selected area indicated before

- In order to take part the Maths teacher and the school administration respectively first must give consent to partaking.

The organizers

- The competition is organized by a group of teachers, headmasters and school inspectors
- The organizers are authorized to modify regulations whenever need arises
- They have set up a cultural and scientific association which goes by the name of MATHÉMATIQUES SANS FRONTIÈRES.

Objectives

The association has set himself an ambitious goal. We pick out some items.

- Lifting of barriers between
 - France and neighbouring countries, different schools, local firms and local authorities
 - Mathematics and modern languages
 - middle and upper schools, students of different and the same class(es)
- Promotion of
 - interest in Mathematics and foreign languages
 - team work, and a greater sense of involvement
 - student-centre initiatives.

Problems

- The questions posed vary in type and degree of difficulty
- They stimulate group work and are meant to be tackled by all pupils
- The exercises must be written out in either French, English, German or Spanish
- Every student will find something that appeals to his taste and abilities.

Prizes

- For each territory taking part two prize lists are available: one for tenth formers, and another for eleventh graders
- All the participants of a winning class will be awarded prizes (for example trips, entrance tickets to concerts, shows etc.)
- The classes, their teachers, local dignitaries, sponsors and press representatives are invited to the prize-giving ceremony
- Finally, a few prizes were handed out to participants by lots.

From above we can conclude that *maths on the move* imparts a lot of pleasure in doing mathematics. And quite incidentally viewed in this light the disreputable subject mathematics this way can gradually lose his awkward reputation: instead of ruminating about dull arithmetical problems in peace and quiet there's often boisterous mood when *Mathématique sans Frontières* has come into school. So, a completely successful model of teaching has been created. The competition makes arithmetic pleasurable and at the same time fosters team-work and combines mathematics with a foreign language.

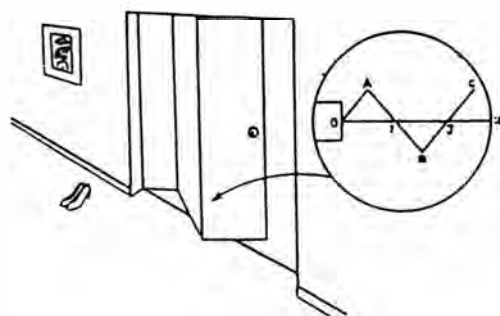
For further information, please contact:

MATHÉMATIQUES SANS FRONTIÈRES
Collège FUSTEL DE COULANGES
4, rue Jacques Peirotes
F-67805 STRASBOURG Cedex.

Tel: 88 35 21 81 Fax: 88 35 53 31

Because of lengthy wordings of the chosen problems, this time I give only four samples from past rounds of *Maths on the move*. All examples share a specific trade mark: they are taken from every-day life.

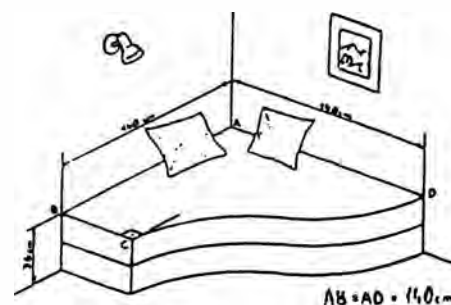
Q34. The diagram shows the view from above a folding door. Point O is fixed: it is the point where the door is connected with the wall. Points I and J move along the rail OX. The distances OA, AI, IB, BJ and JC are equal and remain constant as the door moves. Clearly I and J are always the midpoints of lines AB and BC.



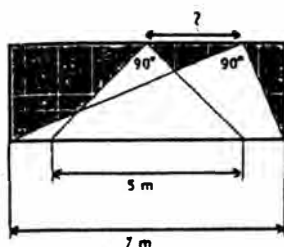
Take $OA=4\text{cm}$ and construct on the same diagram the paths taken by A, B and C as the door takes up all possible positions.

Q35. Designed to be a comfortable seat this corner bench changes easily into a bed 140 cm by 190cm (height 18cm). To do so you fit together the two blocks of foam rubber that makes up the sofa.

As a design feature the curve CD is made up of 2 arcs of circles. The tangent to the curve at C is perpendicular to side BC. Construct a plan view of the two parts of the sofa fitting together to form a rectangle. Use a scale of 1:10. Show all your construction lines.



Q36. In the cellar Pitt has set up the room which is 7m long with an interesting lighting system. He has installed two moveable spotlights which send out a conical beam with an apex angle of 90° (see the diagram).



The first spot, placed right in the centre of the room's ceiling, is set up in a way that lights up the floor in a circle 5m in diameter. Calculate the exact distance between the spots.

Q37. Madam Yolande is at the hairdresser. When she sits down in the chair it is exactly 14.00 (2.00 pm) on her watch and she sees in the mirror in front of her the reflection of the salon clock. It shows 6.40 as depicted in the picture. The assistant has just changed the battery but has not reset the correct time.



At the end of her appointment just as she leaves her chair Mme Yolande notices with amazement that the hands of her watch and those of the reflection of the clock are in exactly the same position.

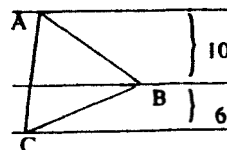
What time must it be given that the clock and the watch are working perfectly?

Q38. (François Sigrist, Institut de Mathématiques, L'Université de Neuchatel, Suisse)

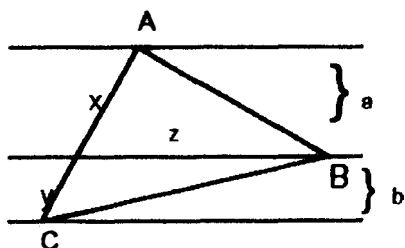
Five spherical caps of the same radius are disjoint on a sphere. Prove that one can move them so as to make space for a sixth one.

Now let's turn to the solutions. No problem is ever permanently closed. The editor will always be pleased to consider for publication new solutions or new insights on past problems. Two solutions to an earlier problem have been received. The one revision makes use of an exotic geometrical result indeed.

Q.17 In the diagram, what is the area of the equilateral triangle ABC?



Solution 1. (M. Maurice Brémond, Avignon, France)
Soit S l'aire cherchée. On a:



$$S = \frac{(x+y)^2 \sqrt{3}}{4} = \frac{(a+b)z}{2} \text{ avec (al Kaschi): } z^2 = x^2 + y^2 + xy \text{ et (Thales):}$$

$$\frac{x}{a} = \frac{y}{b} = \frac{x+y}{a+b}, \text{ d'ou: } \frac{x^2}{a^2} = \frac{y^2}{b^2} = \frac{xy}{ab} = \frac{(x+y)^2}{(a+b)^2} = \frac{x^2 + y^2 + xy}{a^2 + b^2 + ab} = \frac{z^2}{a^2 + ab + b^2} =$$

$$\frac{(a+b)^2 z^2}{(a+b)^2 (a^2 + ab + b^2)} = \frac{4S^2}{(a+b)^2 (a^2 + ab + b^2)} = \frac{4S^2}{(a+b)^2 \sqrt{3}} \Rightarrow S = \frac{a^2 + ab + b^2}{\sqrt{3}}$$

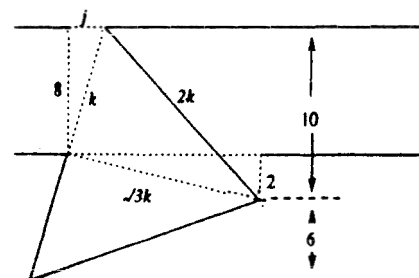
En particulier avec $a = 10$ et $b = 6 \Rightarrow S = \frac{196}{\sqrt{3}}$

Solution 2. (Brian R. Stonebridge, Department of Computer Science, Bristol)

The dotted triangles are similar, thus $j = \frac{2}{\sqrt{3}}$

By Pythagoras' Theorem, in triangle $\{8, j, k\}$

$$k^2 = 64 + \frac{4}{3} = \frac{196}{3} \text{ . Thus, area of triangle } = \sqrt{3} \cdot k^2 = \sqrt{3} \cdot \frac{196}{3}$$



Q25. Can one split the numbers $1, 2, \dots, 100$ into three groups so that the sum of the numbers in the first group is divisible by 102, the sum of the numbers in the second group is divisible by 203, and the sum of the numbers in the third group is divisible by 304?

Solution: (Sonja Maus, Bonn, Germany)

No, it is impossible.

Proof: Let $102a, 203b, 304c$, be the three sums in question, and $n = 100$. Then

$$(n+2)a + (2n+3)b + (3n+4)c = \frac{n(n+1)}{2} \quad (*) .$$

Let $k = a + 2b + 3c$. Then $(n+2)k - \frac{n(n+1)}{2} = b + 2c \geq 0$, $\frac{3n(n+1)}{2} - (3n+4)k = 2a + b \geq 0$.

Therefore $2k \geq \frac{n(n+1)}{n+2} = n - \frac{n}{n+2} > n-1$ and $2k \leq \frac{3n(n+1)}{3n+4} = n - \frac{n}{3n+4} < n$.

But $n-1 < 2k < n$ is impossible for integers.

(The proof also shows that (*) is impossible for any nonnegative integers n, a, b, c).

Finally, propose problems for 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 came 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 by readers to share them with their colleagues and students. I welcome your input, and especially problem sets and solutions for use!

That is all the space we have in this number. Send me your nice solutions and your Olympiad contests.

BRIEF REVIEWS

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

C. Allday, V. Puppe: Cohomological Methods in Transformation Groups, Cambridge Studies in Advanced Mathematics 32, Cambridge University Press, Cambridge, 1993, vii+470 pp; GBP 50.00, ISBN 0-521-35022-0

This book deals with transformation groups. The groups in question are compact Lie groups. The authors investigate first of all the actions of tori and p -tori (p is a prime), but many results concern general compact Lie groups. As for the technique, their main tools are ordinary cohomology theory and rational homotopy theory. The aim of the authors was twofold. The book was designed firstly as a textbook providing an introduction to the subject, secondly as a convenient reference book. In both these directions, the book is very good. The reader is very carefully instructed about possible ways of reading the book, the presentation is very nice and clear, each chapter is followed by interesting exercises, and for the convenience of the reader there are attached two appendices (A: Commutative algebra, B: Some homotopy theory of differential modules). On the other hand, a substantial amount of the material contained in the book, including quite recent results, ensure that it will be a useful reference book. It is quite obvious that the authors prepared the book with great care. It makes very interesting reading and can be strongly recommended. (jiva)

Yu.G.Reshetnyak (Ed.): Geometry IV. Non-regular Riemannian Geometry, Encyclopaedia of Mathematical Sciences, vol. 70, Springer-Verlag, Berlin, 1993, 243 pp., 58 fig., DM 144.00, ISBN 3-540-54701-0, ISBN 0-387-54701-0

This volume presents a survey of results concerning generalizations of Riemannian geometries. The theory originates in the work of A. D. Aleksandrov on intrinsic geometry of convex surfaces and it is based on the later development worked out mainly by Soviet authors in the period 1945–1970. The book splits into two parts. The first part, written by Yu. G. Reshetnyak, carries the title Two-dimensional Manifolds of Bounded Curvature. The two-dimensional Riemannian manifolds are generalized in the setting of intrinsic metric spaces, i.e., spaces where any two points can be joined by a curve of a finite length and the distance of any two points is given as the maximal lower bound of the length of curves joining them. An analogue of curvature is defined for such spaces and the spaces with bounded curvature are studied. Essential parts of the theory of two-dimensional Riemannian manifolds are extended into this setting and remarkable completeness results are achieved, for example the passage to a limit of a sequence of such spaces is a space of the same type

under certain natural assumptions. Moreover, there are also new techniques available, first of all the results on cutting and pasting, estimates and solutions of extremal problems. In particular, an approximation of 2-dimensional Riemannian manifolds by polyhedra and the translation of certain geometric problems on manifolds into problems on polyhedra is possible. The second part, Multidimensional Generalized Riemannian Spaces, is written by V. N. Berestovskij and I. G. Nikolaev. Also based on original ideas by D. A. Aleksandrov, the theory is developed here for higher dimensional spaces. The curvature is defined in terms of lengths of curves in intrinsic metric spaces and the geometry of such spaces is discussed. The exposition focuses on spaces with the curvature bounded between two constants. In particular, such spaces are Riemannian and the present approach yields an axiomatic definition of Riemannian spaces in the spirit of synthetic geometry. (jslo)

I.Kolář, P.W.Michor, J.Slovák: Natural Operations in Differential Geometry, Springer-Verlag, Berlin, 1993, vi+434 pp., DM 128.00, ISBN 3-540-56235-4, ISBN 0-387-56235-4

The modern development of differential geometry established fiber bundles over manifolds as basic objects of study in differential geometry. This point of view was introduced by Nijenhuis and the present book is a monography bringing this point of view to perfection. All classical geometric objects fit in, each one can be interpreted as a natural bundle, i.e., as a map F from the category of manifolds to the category of fibred manifolds. The book presents for the first time in a book form all the available information on natural bundles and the corresponding natural operators between them. Similar questions are also studied under the name of invariant operators, the approach of the book offers a unified concept and a method for the classification of natural operators. On the way, jets spaces are used systematically as a very efficient tool. In order to be self-contained, the book includes an introduction to the basic facts of differential geometry regarded from the point of view of natural operators and a description of the Frölicher-Nijenhuis bracket, which is used then for a description of curvature and Bianchi identities. The book is very nicely and carefully written and needs almost no prerequisites. Warmly recommended to anybody interested in differential geometry. (vs)

G.Karpilovsky: Group Representations. Volume 3, North-Holland Mathematics Studies Volume 180, North-Holland, Amsterdam, 1994, xv+907 pp., \$ 214.25, ISBN 0-444-87433-X

This book covers projective character theory, Clifford theory and, in part, projective representation theory. The author treats in detail Clifford theory for

projective characters and pays special attention to spin representations and corresponding tables of characters. Further on, the following topics in projective representation theory are investigated: projective representations of finite groups, splitting fields for twisted group algebras, projective Schur index and projective representations of abelian groups. The second main theme is Clifford theory for graded algebras and its applications to group algebras. Here, the role of Brauer groups and G -normal algebras is emphasized. Finally, the closing part contains the study of the Schur index for ordinary representations. (tk)

V.I.Nazaikinskii, V.E.Shatalov, B.Yu.Sternin: *Contact Geometry and Linear Differential Equations*, Walter de Gruyter, Berlin, 1992, viii+216 pp., DM 138.00, ISBN 3-110-13381-4

It is well known that the classical method of characteristics for the solution of differential equations is very closely related to geometry. The last two decades have seen a considerable progress in this direction. The aim of this book is to make the reader familiar with important aspects of this development. The book is divided into three chapters. The first chapter has a preparatory character and brings together necessary facts both from geometry and analysis (e.g. symplectic and contact geometry, distributions, Fourier transform). The second chapter deals with analysis. We can find there the Maslov canonical operator, Fourier-Maslov integral operators, and applications of the Maslov canonical operator theory (propagation of discontinuity, metamorphosis of discontinuity, investigation of lacunas of Green function of the Cauchy problem). The last chapter presents applications of the previous theory to the equations of principal and subprincipal types. We find there also microlocal classification of pseudodifferential operators. Reading this book needs some prerequisites from analysis and geometry but their extent is rather limited. It cannot be recommended to a complete beginner in the field because he would hardly feel sufficient motivation for these advanced investigations. The presentation also contains many quite difficult and long computations. To write this book was evidently not easy, but the result is very good. The presentation is clear, systematic and thorough. The book can be strongly recommended. (jiva)

G.Lusztig: *Introduction to Quantum Groups*, Progress in Mathematics, vol.110, Birkhäuser, Boston, 1993, xii+340 pp., DM 112.00, ISBN 3-764-33721-5, ISBN 0-817-63721-5

Since Drinfeld's address to the ICM in 1986, quantum groups have been intensively studied due to their connections with various areas of mathematics and theoretical physics. There are several recently published books describing various approaches to the field and its possible applications. A special feature of the book under review is that it presents an algebraic point of view treating quantum groups as a far reaching generalizations of the classical theory of semisimple Lie

algebras. Canonical bases with remarkable properties for the quantized enveloping algebras and for their modules are constructed here following methods developed by the author and by Kashiwara. Quantum analogues of Kac-Moody algebras are included as a special case. The last two parts of the book contain a discussion of special cases of roots of unity (including the case of fields of positive characteristic) and of the role of the braid group and its action in the theory. The book needs no preliminary knowledge of semisimple or Kac-Moody algebras but in one part of it, the theory of perverse sheaves (shortly reviewed in the book) is used for a construction of canonical bases. This is an important contribution to the field and can be recommended especially to mathematicians working in the field. (vs)

B.R.Gelbaum: *Modern Real and Complex Analysis*, J. Wiley & Sons, Inc., New York, 1995, xi+489 pp., GBP 49.95, ISBN 0-471-10715-8

This book covers the material from classical and modern mathematical analysis usually presented at the graduate and advanced undergraduate levels. Basic topology and functional analysis, integration and measure theory, holomorphic, meromorphic, entire, harmonic functions and conformal mapping. However, there are unique features which make the book different from standard text books and attractive for both students and teachers. Here are some examples: a thorough discussion of topology via open sets, via nets and via filters, uniform spaces, Brower's Fixed Point Theorem; Daniell's approach to integration (including e.g. Fubini-Tonelli Theorems, Haar measure) and confrontation with a measure theory approach to integration; elementary exterior calculus with applications to complex function theory, singular homology of the plane via the formulae and theorems of Cauchy; Perron's type of solution of the Dirichlet problem, Poisson's kernels and approximate identities in Banach algebras; Bergman's kernel functions and conformal mapping; analytic continuation, Riemann surfaces, covering spaces, sheaves, lifts, the general uniformization theorem; Thorin's theorem, M. Riesz's convexity theorem with applications; an invitation to the theory of several complex variables. There is also a lot of interesting exercises as well as suggestions for further reading. The book is recommended to everybody interested in mathematical analysis. (in)

W.W.D.Hodge, D.Pedoe: *Methods of Algebraic Geometry. Volume I*, Cambridge University Press, Cambridge, 1994, viii+440 pp., GBP 14.95, ISBN 0-521-46900-7

This is the first volume of the famous classical monograph on algebraic geometry. It was first published 1947, reprinted 1953 and 1968. The first paperback edition appeared 1968. This book is the first volume of the forthcoming second paperback edition. (jiva)

C.Tricot: *Curves and Fractal Dimension*, Springer-Verlag, New York, 1995, xiv+323 pp., 163 fig., DM 74.00, ISBN 0-387-94095-2, ISBN 3-540-94095-2

Those who are interested in fractals will find the book a nice introduction to the subject. Here the emphasis lies on curves and their size. The key notion is that of the fractal dimension and considerable space is given to its calculation. The book is divided into three parts. The first part deals with linear sets, their measure and dimension. Part II deals with rectifiable curves, their local geometry and with various approaches to their length. The last part is devoted to the study of nonrectifiable curves. In particular, fractal curves, curves constructed by similarities and graphs of non-differentiable functions are discussed in detail. The book requires two years of calculus as a prerequisite. It is not written in a traditional Definition-Theorem-Proof style, thus making it readily accessible also to physicists and engineers. Many illustrations clarify the concepts studied. Bibliographical notes put the exposition into a more general context and provide the orientation for further study. The book contains both old and new mathematics in an attractive context. It can be recommended to students and researchers in exact as well as experimental sciences. (in)

K.Nomizu, T.Sasaki: Affine Differential Geometry. Geometry of Affine Immersions, Cambridge Tracts in Mathematics, vol.111, Cambridge University Press, Cambridge, 1994, xiv+263 pp., GBP 35.00, ISBN 0-521-44177-3

The authors present a self-contained and systematic introduction to the subject from a modern point of view. They cover most of the classical concepts and results, and they also include recent developments. Additionally, relationships to other areas of differential geometry are indicated. The book starts with an introductory chapter on affine geometry and affine connections, then the classical theory of affine immersions is developed from a new point of view, including many generalizations. The third chapter focuses on important models for which many classical results are proved. The last chapter is devoted to the general geometry of affine immersions developed in the last decade. There are eleven further brief sections dealing with various concepts and results related to the main text and four appendices. An extensive bibliography including recent publications is also included. The book collects together much classical and new material in a very readable form. It should be appreciated both by experts in the area and by newcomers. (jslo)

S.A.Albeverio, R.J.Høegh-Krohn, J.A.Marion, D.H.Testard, B.S.Torrésani: Noncommutative Distributions. Unitary Representation of Gauge Groups and Algebras, Pure and Applied Mathematics, vol.175, Marcel Dekker, Inc., New York, 1993, iii+190 pp., \$ 99.75, ISBN 0-824-79131-2

Let us first explain the rather unusual title. Let X be a manifold and let $G = \mathbf{R}$ (real numbers). Then the group G^X of smooth functions on X with pointwise multiplication is a (commutative) infinite-dimensional group. For any distribution T on X ,

there is $U(1)$ -valued map $e^{i\langle T, \cdot \rangle}$ from the space of test functions on X . This map is a character of the group G^X , hence it corresponds to an irreducible unitary representation of G^X . Now it is easy to see that a noncommutative generalization of distributions consists of unitary irreducible representations of an infinite-dimensional group G^X of all smooth maps from X to a (non-commutative) group G with pointwise multiplication. Such representations are studied in the book. In more familiar terms, the group G^X is usually called the gauge group. As in the classical case, infinitesimal methods of Lie algebras are also used in the book even if the relation between the Lie groups and algebras is not so straightforward as in a finite-dimensional case. As a tool for constructions of examples of unitary representations of gauge groups, jet bundles are used. Two chapters are devoted to the study of energy representations. The case $\dim X=1$ includes the well known Kac-Moody algebras and their representations. In the case of higher dimensions only a few results are available. The book is of interest both for mathematicians and physicists working in the field. (vs)

P.Mattila: Geometry of Sets and Measures in Euclidean Spaces, Cambridge studies in advanced mathematics, vol.44, Cambridge University Press, Cambridge, 1995, xii+343 pp., ISBN 0-521-46576-1

This book deals mainly with the study of geometric structure of general Borel sets and Borel measures in Euclidean spaces. Chapters 1-7 develop the measure theory needed for further exposition (covering theorems, differentiation of measures, Hardy-Littlewood maximal function, invariant measures, Hausdorff measures, density theorems for Hausdorff measure as well as other measures, Rademacher and Sard-type theorems for Lipschitz maps). Chapter 8 shows how potential-theoretic methods can be used for the study of Hausdorff dimension. Relations between capacities and Hausdorff measures are discussed. The very recent Howroyd technique is used for the proof of Frostman's lemma as well as the proof of the existence of subsets with positive and finite Hausdorff measure. Hausdorff dimension of orthogonal projections is studied in chapter 9, plane sections in chapter 10. The local structure of s -dimensional sets and measures is investigated in chapter 11. It is shown in Chapter 12 that the Fourier transform represent an efficient tool for the study of Hausdorff dimension, capacities and energy-type integrals. Chapter 13 deals with Hausdorff dimension and capacities of intersections. In Chapter 14, tangent measures in the sense of Preiss are introduced and applied to prove Marstrand's theorem. Chapters 15 and 16 are devoted to rectifiable sets, Chapter 17 discusses the Preiss theorem characterizing rectifiability in terms of densities. Again, tangent measures turn out to be a basic tool. A characterization of rectifiability in terms of projection properties (Besicovitch, Federer) is proved in Chapter 18. The relation of rectifiability to analytic

capacity and to singular integrals are studied in Chapters 19 and 20. The book is strongly recommended to analysts interested in geometric measure theory and its application. The choice of material, the presentation and the emphasis on the recent development of the subject make the book very attractive. (in)

G.Fischer: Ebene Algebraische Kurven, Vieweg Studium. Aufbaukurs Mathematik, Bd. 67, Friedrich Vieweg & Sohn, Braunschweig, 1994, x+177 pp., 156 fig., DM 38.00, ISBN 3-528-07267-9

This book covers the material for an elementary introductory course in algebraic geometry and complex analysis, with the minimum of auxiliary apparatus. The text consists of two parts. Chapters 0 - 5 contain a brief theory of algebraic curves in the complex projective plane. The explanations which are as elementary as possible are based on simple methods, especially determinants (resultants, Hessians). This part includes a motivation for projective and complex approach, tangents, singularities, points of inflection, intersections (Bézouts Theorem), dual curves, local parametrization, Plücker formulae. In the second part (Chapters 6 - 9, Appendix) more technical tools are introduced (formal power series, constructive methods of Newton and Puiseux, fractional power series, places of curves). Relations between global and local numerical invariants of curves are deduced. Many examples and figures are presented. The book can be recommended as a useful textbook for beginners, which is rather easier than "Algebraic Curves" by R J Walker. (ava)

R.Friedman, J.W.Morgan: Smooth Four-Manifolds and Complex Surfaces, Ergebnisse der Mathematik und ihrer Grenzgebiete, 3. Folge, Band 27. A Series of Modern Surveys in Math., Springer-Verlag, Berlin, 1994, x+520 pp., 17 fig., DM 168.00, ISBN 3-540-57058-6, ISBN 0-387-57058-6

A classification of differentiable manifolds is still an open problem in dimension 4. A major step was taken fifteen years ago by S. Donaldson, who introduced new polynomial invariants for smooth 4-manifolds. The methods of gauge field theory used by him are very suitable for applications to algebraic surfaces. The book presents a discussion of the Donaldson polynomials of such surfaces using methods coming from algebraic geometry. The book begins with a review of the classification of surfaces and topology of elliptic surfaces. The Donaldson polynomials and their generalizations are explained in the third part. Donaldson's theorem (quoted here without proof) is described in the fourth chapter and establishes a connection between moduli spaces of antiselfdual connections and moduli spaces of stable holomorphic bundles on an algebraic surface. Explicit methods for computations of the Donaldson invariants are discussed in the last parts of the book together with some results concerning minimal models for smooth 4-manifolds. To read the book, different prerequisites are needed for the different parts. The first two chapters do not need much, basic facts from

gauge field theory are necessary for a description of the Donaldson polynomials, basics of several complex variables and Hermitean differential geometry are used in a discussion of holomorphic vector bundles, and a knowledge of a standard introductory course of algebraic geometry is supposed for computations of invariants. The book is an important contribution to the existing literature in the field and can be well recommended to the interested mathematical audience. (vs)

G.Fayolle, V.A.Malyshev, M.V.Menshikov: Topics in the Constructive Theory of Countable Markov Chains, Cambridge University Press, Cambridge, 1995, 169 pp., GBP 27.95, ISBN 0-521-46197-9

The main goal of this book is to provide methods that allow a complete classification of countable Markov chains. The classification criteria (necessary and sufficient conditions) are based on Lyapunov functions. The book brings many new theoretical results as well as details how the Lyapunov functions are constructed. In Chapter 1 exact definitions of recurrence, transience and ergodicity are given and some classical examples are demonstrated. General classification criteria involving semimartingales are summarized in Chapter 2. Chapter 3 provides techniques for an explicit geometrical construction of Lyapunov functions. Random walks in the space $\mathbf{Z}_+^2 = \{(i, j) : i, j \geq 0, \text{ integers}\}$, and in \mathbf{Z}_+^N , $N \geq 2$, especially Markovian Jackson networks are classified by means of such constructions. Second vector fields and paths are considered in Chapter 4. Chapter 5 deals with the random scattering, Chapter 6 with the continuity of stationary distributions for families of homogeneous irreducible and aperiodic Markov chains. The exponential rate of convergence to the stationary distribution and the exponential boundedness of the limiting probabilities are established in Chapter 7. (zp)

I.J.Bakelman: Convex Analysis and Nonlinear Geometric Elliptic Equations, Springer-Verlag, Berlin, 1994, xxi+510 pp., DM 168.00, ISBN 3-540-13620-7, ISBN 0-387-13620-7

This book is devoted to convex functions and sets, global geometric problems for partial differential equations; special attention is paid to the Monge - Ampère equations. Investigations of the boundary value problem for weak and generalized solutions of the Monge - Ampère equations are given in the second part (Chapters 3 - 6) of the book. The solutions of such problems are convex and concave functions. Questions of C^m - smoothness for $m \geq 2$ of the weak and generalized solutions are studied. A priori bounds and geometric maximum principles for generalized and smooth solutions of the Dirichlet problem for quasilinear elliptic equations are presented together with applications (calculus of variations, differential geometry and applied mathematics) in the third part (Chapters 7 and 8) of the book. The introductory first part of the book contains a survey of elements of convex analysis. This survey is self-contained and represents a nice account of the fundamental knowledge

concerning convex bodies and hypersurfaces in the first chapter and on Minkowski's mixed volumes and some global problems concerning geometric partial differential equations in the second chapter. The book is a nice graduate text as well as a good reference source for convex analysis and its applications in the theory of partial differential equations. (ss)

P.N.Hoffman, J.F.Humphreys: Projective Representations of the Symmetric Groups. Q-Functions and Shifted Tableaux, Oxford Mathematical Monographs, Clarendon Press, Oxford, 1992, ix+304 pp., GBP 40.00, ISBN 0-198-53556-2

The main theme of the book is a systematic discussion of the projective representations of finite groups. Attention is concentrated mostly on the symmetric and alternating groups. After five preparatory chapters, the principal results on the classification of representations of these groups (going back to Schur) are explained in the next three chapters. The last part of the book describes the algebraic theory of Q -functions including that part of combinatorics connected with them and an explicit computation of characters. Almost half the chapters have appendices which are not used in the main text. Four of them describe an alternative way of proving Schur's basic results. The other two describe relations among Q -functions, Schur and Hall-Littlewood functions and some recent results in modular theory. Useful comments at the end of each chapter describe the evolution of the topic and contain further references. A very nice and systematic book recommended to everybody interested in the topic. (vs)

The Uncertainty Principle in Harmonic Analysis, Ergebnisse der Math.und ihrer Grenzgebiete 3.Folge. A Series of Modern Surveys in Math., vol.28, Springer-Verlag, Berlin, 1994, vii+543 pp., 45 fig., DM 188.00, ISBN 3-540-56991-X, ISBN 0-387-56991-X

The book consists of two parts. The first and shorter part is entitled 'The Uncertainty Principle Without Complex Variables' (approx. 100 pages) and the second part 'Complex Methods' (approx. 400 pages). The authors present the book as a collection of variations on the theme: It is impossible for a non-zero function and its Fourier transform to be simultaneously very small. The first part contains a thorough discussion of the F. and M. Riesz theorem (with various proofs and generalizations), the Ivashev - Musatov theorem giving the necessary condition being zero on a charge which is singular with a finite l^2 norm of its Fourier transform and some functional analytic approach to the Uncertainty Principle problem. The second part starts with a complex view of the Uncertainty Principle. The considerations are based on the fact that a function of a real variable with bounded spectrum coincides on \mathbf{R} with an entire function of a complex variable. If the spectrum of a function is semibounded then this function can be analytically extended to the upper (or lower) complex halfplane. The introductory chapter of the second part of the book concludes with some

information on the Cartwright class of entire functions which includes the Fourier image of any charge with compact support. The further considerations are split into two cases when the logarithmic integral converges or diverges. Missing frequencies and the diameter of the support are studied in the next chapter together with the Beurling - Malliavin theorem and the Fabry theorem. The final chapter of the second part of the book is devoted to the study of local and non-local convolution operators. The present book is a very good advanced textbook in Fourier analysis and can be helpful also for experts. (ss)

C.C.Yang, G.C.Wen, K.Y.Li, Y.M.Chiang (Eds.): Complex Analysis and its Applications, Pitman Research Notes in Mathematics Series, vol.305, Longman Scientific & Technical, Harlow, 1994, 359 pp., GBP 39.00, ISBN 0-582-23181-7

This book contains contributions presented at the international conference on complex analysis and its applications held in Hong Kong, January, 1993. Four plenary addresses (H.Begehr, C. H. Fitzgerald, R. P. Gilbert and Zhenyuan Xu, Yum-Tong Siu) and 34 contributions in the following areas of complex analysis: Value Distribution Theory (11); Complex Dynamical Systems and Geometric Function Theory (15); Applications of Complex Analysis (8). Eight pages of open problems. The chairman of the conference was Chung-Chun Yang. (bn)

J.Brüning, V.W.Guillemin (Eds.): Mathematics Past and Present. Fourier Integral Operators, Springer-Verlag, Berlin, 1994, 284 pp., DM 98.00, ISBN 0-540-56741-0, ISBN 0-387-56741-0

The study of integral operators went through several important steps: singular operators of Calderón and Zygmund, pseudodifferential operators introduced by Kohn and Nirenberg and finally the Fourier integral operators studied first by Hörmander 25 years ago. The book consists of the reprints of four classical papers on the topics written by Hörmander, Duistermaat and Guillemin together with a short and very nicely written introduction to the topic by Guillemin. The book appears in a new series "Mathematics, Past and Present" introduced by Springer-Verlag. The idea of editing such books is excellent and hopefully there will be further volumes in the series. Highly recommended to anybody willing to learn quickly and efficiently basic facts on an important topic and to add a piece to his (her) mathematical culture. (vs)

L.Schneps (Ed.): The Grothedieck Theory of Dessins d'Enfants, London Mathematical Society Lecture Note Series 200, Cambridge University Press, Cambridge, 1994, 368 pp., GBP 24.95, ISBN 0-521-47821-9

In an unpublished manuscript "Esquisse d'un Programme", dating from 1984, A.Grothendieck sketched a remarkable relation between the Galois group $G(\overline{\mathbf{Q}}/\mathbf{Q})$ and certain combinatorial objects ("dessins"). The link

between the two is provided by a theorem of Belyi which characterizes algebraic curves defined over $\bar{\mathbb{Q}}$ in purely "topological" terms. This book (proceedings of a conference held in Luminy in April 1993) collects 14 articles explaining and/or developing Grothendieck's programme. It offers a comprehensive introduction to this fascinating subject that brings together as diverse topics as explicit Galois theory, non-congruence subgroups of $SL_2(\mathbb{Z})$, braid groups, Teichmüller spaces and conformal field theory. (jnek)

O.Gloor, B.Amrhein, R.E.Maeder: Illustrierte Mathematik. Visualisierung von mathematischen Gegenständen, BirCom, Birkhäuser, Basel, 1994, 64 pp., DM 148.00, ISBN 3-764-35100-4

The publication (in German) consists of a booklet (64pp.) and a CD-ROM (about 360 MB) containing programs for Mathematica. The booklet describes the contents of the CD-ROM, its installation for different types of machines and systems, and gives a short introduction to Mathematica. Contents of the CD-ROM: geometry (polyhedra, minimal surfaces, surfaces of revolution, various curves), linear mappings, calculus (sequences, series, function theory, differentiation, integration, differential equations, iterated functions), complex functions (graphing, conformal maps). The programs may be very useful for teaching mathematics in the first two years at universities. Many results are prepared for animation (e.g., differentiation, integration, fields of solutions of differential equations). For those who do not have the program Mathematica and who do not want to create their own programs, a program Mathread is included allowing one to view and animate the prepared output. (mh)

G.W.Mackey: The Scope and History of Commutative and Noncommutative Harmonic Analysis, History of Mathematics, vol.5, American Mathematical Society, London Mathematical Society, Washington, D.C., 1992, xi+370 pp., GBP 36.00 ISBN 0-821-89903-1

The theory of representations of groups is only 100 years old, nevertheless it is one of the most beautiful and most important chapters in mathematics as well as in physics. The book presents a historical account of this theory together with its main applications in number theory, ergodic theory, quantum physics, probability theory and the theory of automorphic functions. The book consists of reprints of six survey articles written by G. Mackey during the last 20 years and an additional paper describing changes brought in by recent progress in Kac-Moody algebras, strong interaction models, exactly solvable nonlinear equations and two-dimensional lattice models in statistical physics. It can be felt that the book was written with a sense of beauty and enthusiasm in mind. A careful reading of the book brings a good reward to the reader. The book requires no prerequisites in mathematics or physics. The review papers are rare but very useful for general education and this one can be warmly recommended. (vs)

A.Kostrikin, I.R.Shafarevich (Eds.): Algebra V. Homological Algebra, Encyclopaedia of Mathematical Sciences, vol.38, Springer-Verlag, Berlin, 1994, 222 pp., DM 144.00, ISBN 3-540-53373-7, ISBN 0-387-53373-7

This volume of the Encyclopaedia of Mathematical Sciences, written by S.I.Gelfand and Yu.I.Manin, is devoted to homological algebra. The first three chapters (Complexes and Cohomology, The Language of Categories, Homology Groups in Algebra and in Geometry) contain the most classical aspects of the theory. The next two chapters describe derived and triangulated categories. The last three chapters (Mixed Hodge Structures, Perverse Sheaves, D-Modules) are devoted to geometrical applications of homological algebra to Hodge theory, to the theory of sheaves of topological spaces and to the theory of modules over rings of algebraic differential operators, emphasizing the categorical and homological aspects of these theories. The book is written in a very concise style without proofs and is sometimes difficult to read. In one small volume of 222 pages, it presents a survey of modern homological algebra with emphasis on geometrical applications and it can serve as a valuable reference. (pn)

A.N.Parshin, I.R.Shafarevich (Eds.): Algebraic Geometry IV. Linear Algebraic Groups. Invariant Theory, Encyclopaedia of Mathematical Sciences, vol.55, Springer-Verlag, Berlin, 1994, 284 pp., DM 144.00, ISBN 3-540-54682-0, ISBN 0-387-54682-0

This volume contains two expository articles: "Linear Algebraic Groups" by T.A.Springer and "Invariant Theory" by V.L.Popov and E.B.Vinberg. The first article has three chapters which give a survey of the theory of linear algebraic groups (including the structure theory of reductive groups) over, respectively, algebraically closed fields, arbitrary fields and special types of fields (finite, local, global). The second article presents the main concepts and results of geometric invariant theory: algebraic groups actions, structure of orbits, invariants of reductive groups, existence of quotients, Hilbert-Mumford theory, existence of slices, invariants of classical groups. The clear and concise style of both surveys (written by leading experts in the respective fields) and a detailed bibliography will make the book a valuable reference guide for students and practitioners of algebraic geometry alike. (jnek)

F.Borceux: Handbook of Categorical Algebra 2. Categories and Structures, Encyclopedia of Mathematics and its Applications, vol.51, Cambridge University Press, Cambridge, 1994, xvii+443 pp., GBP 50.00, ISBN 0-521-44179-X

This is the second volume of the Handbook of Categorical Algebra. The objective of these three volumes is "to give an integrated presentation of what (in author's opinion) a graduate student should ideally know of category theory before starting research on one precise topic in this domain". After having

presented the general theory of limits, adjoint functors and Kan extensions in the first volume, in this second volume the author presents a selection of the most famous classes of "structured categories", with the exception of toposes which appear in volume 3. The topics covered in this volume are abelian categories, regular categories, algebraic theories, monads, accessible categories, enriched category theory, topological categories and fibred categories. The book is well organized, easy to read and it contains a substantial amount of material, including many examples, counterexamples and exercises. (pn)

M.Auslander, I.Reiten, S.O.Smalø: Representation Theory of Artin Algebras, Cambridge Studies in Advanced Mathematics, vol. 36, Cambridge University Press, Cambridge, 1995, xiv+423 pp., GBP 50.00, ISBN 0-521-41134-3

This book gives an account of the representation theory of Artin algebras, i.e. algebras over a commutative Artin ring R which are finitely generated R -modules. In simplest terms, the central problem of the book is to describe how a finite number of linear transformations can act simultaneously on a finite dimensional vector space. Here the language of linear algebra fails and it is necessary to use a more abstract approach involving the study of modules over finite dimensional algebras over fields or, slightly more generally, over Artin algebras. The authors concentrate on the part of the theory built around almost split sequences which presents a theoretical framework enabling a more systematic approach to the subject. The book is divided into eleven chapters. The first two chapters contain the basic material on Artin rings and algebras, chapter III provides many examples. The next four chapters (The Transpose and the Dual, Almost Split Sequences, Finite Representation Type, The Auslander-Reiten Quiver) contain basic material on almost split sequences. The last four chapters (Hereditary Algebras, Short Chains and Cycles, Stable Equivalence, Modules Determining Morphisms) are more or less independent of each other. All chapters are equipped with exercises of various degrees of complexity; at the end of the book, conjectures and open problems are listed. The book is written in a clear comprehensive style with full proofs. It can very well serve as an excellent reference as well as a textbook for graduate students. (pn)

R.F.Bass: Probabilistic Techniques in Analysis, Probability and its Applications. A Series of the Applied Probability Trust, Springer-Verlag, New York, 1995, xii+392 pp., 12 fig., 82.00, ISBN 0-387-94387-0

As the author says, the book is concerned with the flow of ideas from probability theory to analysis. It covers those branches of analysis to which probability has contributed new results, new proofs, or new insights. Chapter I is a minicourse in stochastic analysis: Brownian motion, martingales, stochastic calculus. Chapter II is an introduction to classical potential theory from the probability theory point

of view (the Dirichlet problem, Choquet capacities, Newtonian potentials, Newtonian capacity, excessive functions, Martin boundary). The last three chapters cover results obtained mainly during the last 15-20 years and not included in monographic literature. Chapter III is devoted to the behaviour of harmonic functions in Lipschitz domains. Two proofs of the boundary Harnack principle are presented. As a consequence, the equivalence of the Martin and Euclidean boundaries is shown. Fatou theorems for Lipschitz domains are also proved and the support of harmonic measure is studied. Chapter IV deals with singular integrals (maximal functions, Hilbert and Riesz transforms, Littlewood-Paley functions, singular integral operators and Fourier multipliers, the spaces H^1 and BMO). The last chapter is on analytic functions: L'evy's theorem is e.g. applied to prove Phragmén-Lindelöf theorem and the Riemann mapping theorem. Probabilistic proofs of Picard's little theorem, the Koebe distortion theorems, Beurling's projection theorems, the corona theorem and other results are given. Boundary behaviour of analytic functions is studied, Makarov's description of the Hausdorff dimension of the support of harmonic measure is presented, also the angular derivative problem is discussed. The book will be appreciated by both analysts as well as probabilists. It contains important results and also exercises and open problems. (in)

Khoan Vo Khac: Intégration et espaces de Lebesgue. Exercices et problèmes corrigés, Livrets d'exercices, Hermann, éditeurs des sciences et des arts, Paris, 1994, vi+131 pp., Ffrs 58.00, ISBN 2-705-66238-3

Khoan Vo Khac: Théorie de la mesure. Exercices et problèmes corrigés, Livrets d'exercices, Hermann, éditeurs des sciences et des arts, Paris, 1993, vi+96 pp., Ffrs 58.00, ISBN 2-705-66133-5

The first booklet includes 90 exercises and problems from measure theory usually presented in standard courses. Set systems used in measure theory, elementary properties of measures, constructions of measures, the Lebesgue-Stieltjes measure and measurable mappings are covered. The second booklet includes 92 exercises and problems from integration: abstract Lebesgue integral, Lebesgue spaces, convergence of measurable functions, dual spaces to L^p , the Radon-Nikodym theorem, the Fubini theorem, stochastic independence. Each of the 8 chapters of the booklet contains the basic definitions and statements of results. There are exercises on two levels: elementary and more advanced, several problems are also added. Complete solutions are provided. These books are recommendable to students as well as to university teachers. (in)

F.Q.Gouveã, N.Yui: Arithmetic of Diagonal Hypersurfaces over Finite Fields, London Mathematical Society Lecture Note Series 209, Cambridge University Press, Cambridge, 1995, xi+168 pp., GBP 19.95, ISBN 0-521-49834-1

The authors study arithmetics of diagonal hypersurfaces $\nu = \{\sum_{i=0}^{n+1} c_i X_i^m = 0\} \subset \mathbf{P}^{n+1}$ of dimension n over finite fields. The background to this investigation is provided by a conjecture of Lichtenbaum-Milne which relates (for $n = 2d$) asymptotics of the zeta function $\zeta(\nu, s)$ at the central point $s = d$ to various (partly conjectural) arithmetic invariants of ν . Using a decomposition of the motive of X into a sum of "Fermat motives", the authors are able to compute the asymptotics quite explicitly (under certain assumptions). They also tabulate results of extensive machine computations of the zeta values. (jn)

S.J.Gardiner: Harmonic Approximation, London Mathematical Society Lecture Note Series 221, Cambridge University Press, Cambridge, 1995, ix+132 pp., GBP 19.95, ISBN 0-521-49799-X

The purpose of the book is to give an account of the theory of harmonic approximation in Euclidean space \mathbf{R}^n ($n \geq 2$) corresponding to the theory of holomorphic approximation in the complex plane connected with the names of Runge, Mergelyan, Arakelyan, Carleman and others. Harmonic approximation brings new delicate problems which attracted the attention of many researchers including the author of the book. While approximation on compact sets has a relatively long tradition, recently there has been a rapid development concerning approximation on relatively closed (not necessarily bounded) sets; the book includes many of these new results. The reader is assumed to be familiar with basic notions from potential theory; relevant facts concerning thin sets are collected in the preliminary chapter. The last chapters include applications of the subject (solubility of the Dirichlet problem on an open set in \mathbf{R}^n with non-compact boundary, existence of a non-constant harmonic function \mathbf{R}^n with identically vanishing Radon transform, and others). The exposition is careful, ample references and historical comments are provided, and the reader is successfully introduced to current research in the field. (jokr)

A.Pasini: Diagram Geometries, Oxford University Press, Oxford, 1994, vii+488 pp., ISBN 0-198-53497-3

This book is concerned with geometries determined by an incidence graph. General notions like morphisms, covers and amalgams are developed and exploited only after many examples have been presented. The principal theme of the book is the recovery of geometries from a prescribed diagram (i.e., an information on structure of rank 2 residues). The author classifies many geometries in this spirit and finally focuses on Coxeter diagrams. The book is written very carefully and presents the current state of the art. (ad)

J.J.Rotman: An Introduction to the Theory of Groups. Fourth Edition, Graduate Texts in Mathematics, vol.148, Springer-Verlag, New York, 1995, xiv+513 pp., 37 fig., DM 108.00, ISBN 3-540-94285-8, ISBN 0-387-94285-8

Rotman's book covers all the standard introductory

topics in group theory (normal series, Sylow theorems, extensions, permutation and linear groups) and also an introduction to combinatorial group theory. The latter extends to about a quarter of book's content and includes theorems of Kurosh and van Kampen, HNN extensions, and a chapter on word problems up to the Higman Imbedding Theorem. More advanced topics appear also in other sections (in particular in sections on cohomology, Abelian groups Mathieu groups and Steiner systems). Some of them did not appear in previous editions. The author gives geometrical explanations whenever available and points out many historical connections. There are many exercises and, in general, the exposition is relaxed and clear. (ad)

S.A.Huggett, K.P.Tod: An Introduction to Twistor Theory. Second Edition, London Mathematical Society Students Texts 4, Cambridge University Press, Cambridge, 1994, xii+178 pp., GBP 35 00, ISBN 0-521-45157-4, ISBN 0-521-45689-4

The book is the second edition of notes coming from graduate lectures on twistor theory. The style of the book is informal and easy to read. It covers the most important topics coming from twistor theory - the twistor description of the most important linear invariant equations on Minkowski space, the description of selfdual solutions of Yang-Mills field equation, the construction of non-linear gravitons and the Penrose's definition of quasi-local momentum and angular momentum. Spinor calculus and basic facts of space-time geometry are described in the introductory chapters. A lot of useful exercises of different types (with solutions, resp. hints) are scattered throughout the book. New developments in the field and suggestions for further reading are contained in the last chapter. The book is designed both for mathematicians and physicists. It is a difficult task to write for both because they use a different language for the same things. The authors keep the balance very well and the book will be very useful as an introduction to the field for anybody interested. (vs)

C.M.Cambell, T.C.Hurley, E.F.Robertson, S.J.Tobin, J.J.Ward (Eds.): Groups '93 Galway/St Andrews, volume 1, London Mathematical Society Lecture Note Series 211, Cambridge University Press, Cambridge, 1995, xii+303 pp., ISBN 0-521-47749-2

The Proceedings of Groups'93 Galway/St Andrews appear in two volumes. This first volume contains 23 papers written by authors with the name of the first author starting with a letter in the first half of alphabet. Papers are of different lengths and the longer papers include several valuable surveys (e.g. Reflections on virtually one-relator groups by K. Bencsath and B. Fine, Rickard equivalence and block theory by M. Broué, Computing the conjugacy classes of elements of a finite group by G. Butler, Automorphisms of nilpotent and related groups by M. R. Dixon, Lifting automorphisms by C. K. Gupta and V. Shpilrain, and Cohomological finiteness conditions by P. H. Kropholler). (ad)

K.Hulek, C.Kahn, S.H.Weintraub: Moduli Spaces of Abelian Surfaces: Compactification, Degenerations, and Theta Functions, de Gruyter Expositions in Mathematics, vol.12, Walter de Gruyter, Berlin, 1993, xii+347 pp., 24 fig., DM 168.00, ISBN 3-110-13851-4

The subject of the book is a study of compactifications of moduli spaces of abelian surfaces with polarizations of type $(1, p)$. In the first part, the authors construct a toroidal compactification of the moduli space of surfaces with a certain level structure and describe the character of singularities of its boundary components. A discussion of degenerations of abelian surfaces in the second part is based on the Mumford construction of degenerating abelian varieties over complete rings. The Horrocks-Mumford bundle on the four-dimensional projective space is a quite important example of rank 2 indecomposable bundle, the zero sets of its sections being called Horrocks-Mumford surfaces. In the last part of the book, the authors compare degenerations of abelian surfaces with degenerations of Horrocks-Mumford surfaces. The book is well written, nicely organized and will be useful for mathematicians interested in the subject. (vs)

M.Lawson, S.Hubbard, P.Pugh: Maths and Statistics for Business, Essential Math for Students, Longman Scientific & Technical, Harlow, 1995, x+293 pp., GBP 12.99, ISBN 0-582-23817-6

The purpose of this book is to present simple statistical and mathematical methods which can be used in business. The key areas of data presentation and statistical analysis are described in chapters 1 to 11. Here are some of them: descriptive statistics, fundamentals of probability theory, selected types of discrete and continuous probability distributions, sampling and sampling distributions, confidence intervals and hypothesis tests for a population mean, correlation and simple linear regression, time series analysis and forecasting. Chapter 12 is devoted to some types of index numbers. An introduction to linear programming is presented in chapter 13. Chapter 14 contains basic financial mathematics as simple and compound interest, effective rate of interest, present value, annuities and internal rate of return. Throughout the book, the emphasis is placed on real applications. Worked examples and many exercises are included in each chapter. The theoretical and abstract aspects of the statistical and mathematical methods are omitted. This book can be used in foundation and first year courses for the students of business, finance, accounting, economics and management. It is also suitable for self-study because of its informal and readable style. (jz)

P.J.Davis, R.Hersh, E.A.Marchisotto: The Mathematical Experience. Study Edition, Birkhäuser, Boston, 1995, xxi+487 pp., DM 78.00, ISBN 0-817-63739-7, ISBN 3-764-33739-7

This is the second edition of the book originally published in 1981, also by Birkhäuser. We can read

in the introduction written for the first edition by Gian-Carlo Rota: "Making mathematics accessible to the educated layman, while keeping high scientific standards, has always been considered a treacherous navigation between Scylla of professional contempt and the Charybdis of public misunderstanding. Davis and Hersh have sailed across the Strait under full sail. They have opened a discussion of the mathematical experience that is inevitable for survival." The book contains eight sections with titles such as: Selected Topics in Mathematics, Teaching and Learning, Mathematical Reality. These sections contain short articles on different subjects. Each section is accompanied by "Assignments and Problem Sets" in which there is a list of Topics to Explore, Essay Assignments, Problems and Suggested Readings and which contain a lot of material. Some subjects were previously treated by one of the authors (sometimes with co-author(s)) in *Scientific American* or a publication of the sort. While for a mathematician it is interesting to compare authors opinion about mathematical objects, discoveries, fields e.t.c., for a layman it is a unique chance to visit the world of mathematics. The book can be used in seminars for non-math students of Universities or teachers of mathematics at secondary schools. (jive)

R.P.Gilbert, K.Hackl (Eds.): Asymptotic Theories for Plates and Shells, Pitman Research Notes in Mathematics Series, vol.319, Longman Scientific & Technical, Harlow, 1995, 131 pp., GBP 23.00, ISBN 0-582-24875-2

This volume presents contributions to a minisymposium organized within the SIAM 40th Anniversary Meeting at Los Angeles in 1992. This minisymposium was focused on new results in the theory of plates and shells with emphasis to various advanced materials as thermoelastic, elastoplastic, anisotropic or composite ones. Typical analytical tools include therefore various asymptotic methods as formal expansion, homogenization, two-scale convergence, etc. The following contributions were included: "Constitutive equations for a hypermembrane shell" by J.L.Buchanan, "2D models of plate-like 3D elastic bodies" by D.Caillerie, "Viscosity dependent behaviour of viscoelastic porous media" by H.I.Ene and B.Vernescu, "The elastic-plastic plate" and "The two-dimensional, linear thermoelastic plate" by R.P.Gilbert and K.Hackl, "The weak solution for the generalized hyperanalytic equations of thin elastic shell theory" by R.P.Gilbert and G.-C. Wen, "On the buckling of adhesively connected von Kármán plates allowing for delamination - an eigenvalue hemivariational inequality approach" by D.Motreanu and P.D.Panagiotopoulos, and finally "Calculation of microstrains and microstresses in a thick non symmetric heterogeneous plate by homogenization" and "Calculation of microstresses in a thick heterogeneous plate by homogenization" by R.Tapiéro. The book is intended for both applied mathematicians and theoretically oriented engineers. (tr)



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H. Salzmann, D. Betten, T. Grundhöfer, H. Hähl,
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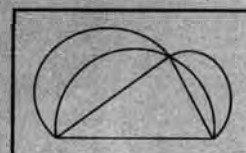
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