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EUROPEAN MATHEMATICAL SOCIETY

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NOTICE FOR MATHEMATICAL SOCIETIES

Labels for the next issue will be prepared during the second half of February 2000. Please send your updated lists before then to Ms Tuulikki Mäkeläinen, Department of Mathematics, P.O. Box 4, FIN-00014 University of Helsinki, Finland; e-mail: makelain@cc.helsinki.fi

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EMS News: Committee and Agenda

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EMS Agenda 2000

31 January
Nominations to the Secretariat for delegates of individual members
contact: EMS Secretariat, *e-mail: makelain@cc.helsinki.fi*

February – March
Voting for delegates of individual members
contact: EMS Secretariat, *e-mail: makelain@cc.helsinki.fi*

15 February
Deadline for submission of material for the March issue of the *EMS Newsletter*
contact: Robin Wilson, *e-mail: r.j.wilson@open.ac.uk*

1 March
Deadline for submission of nominations for the Felix Klein prize
contact: EMS Secretariat, *e-mail: makelain@cc.helsinki.fi*

24 – 25 March
Executive Committee Meeting, hosted by the Polish Mathematical Society and the Institute of Mathematics of the Polish Academy of Sciences, Bedlevo, near Poz□an (Poland)

15 May
Deadline for submission of material for the June issue of the *EMS Newsletter*
contact: Robin Wilson, *e-mail: r.j.wilson@open.ac.uk*

13 – 20 June
EMS lectures by Prof. Dr. George Papanicolaou (Stanford, USA)
13–16 June: ETH, Zurich (Switzerland): *Financial mathematics*
18–20 June: University of Crete, Herakleion, Crete (Greece): *Time reversed acoustics*
contact: David Brannan, *e-mail: d.a.brannan@open.ac.uk*

17 – 22 June
EURESCO Conference in Mathematical Analysis at Castelvecchio Pascoli (Italy):
Partial Differential Equations and their Applications to Geometry and Physics
Organiser: J. Eichhorn, Greifswald (Germany), *e-mail: euresco@esf.org*
[This series of conferences is financed by ESF.]

3 – 7 July
ALHAMBRA 2000: a joint mathematical European–Arabic conference in Granada (Spain), promoted by the European Mathematical Society and the Spanish Royal Mathematical Society
contact: Ceferino Ruiz, *e-mail: ruiz@ugr.es website: www.ugr.es/~ruiz/*

6 July
Executive Committee Meeting in Barcelona (Spain)

7 – 8 July
Council Meeting in Barcelona (Spain)
contact: EMS Secretariat, *e-mail: makelain@cc.helsinki.fi*

10 – 14 July
Third European Congress of Mathematics (3ecm) in Barcelona (Spain)
contact: S. Xambó–Descamps, *e-mail: sxd@grec.upc.es website: www.iec.es/3ecm/*

24 July – 3 August
EMS Summer School in Edinburgh (Scotland): *New analytic and geometric methods in inverse problems*
Organiser: Erkki Somersalo (Otaniemo, Finland), *e-mail: Erkki.Somersalo@hut.fi*

15 August
Deadline for submission of material for the September issue of the *EMS Newsletter*
contact: Robin Wilson, *e-mail: r.j.wilson@open.ac.uk*

17 August – 2 September
EMS Summer School at Saint–Flour, Cantal (France): *Probability theory*
Organiser: Pierre Bernard (Clermont–Ferrand, France), *e-mail: bernard@ucfma.univ–bpclermont.fr*

Autumn
Fifth Diderot Mathematical Forum, on Mathematics and Telecommunication.
Date and programme to be announced.
contact: Jean-Pierre Bourguignon, *e–mail: jpb@ihes.fr*

22 – 27 September
EURESCO Conference at Obernai, near Strasbourg (France):
Number Theory and Arithmetical Geometry: Motives and Arithmetic
Organiser: U. Jannsen, Regensburg, *e-mail: euresco@esf.org*
EURESCO Conference at San Feliu de Guixols (Spain):
Geometry, Analysis and Mathematical Physics: Analysis and Spectral Theory
Organiser: J. Sjöstrand, Palaiseau (France), *e-mail: euresco@esf.org*

30 September
Deadline for proposals for the 2001 EMS Lectures
contact: David Brannan, *e-mail: d.a.brannan@open.ac.uk*

14 – 15 October
Executive Committee Meeting in the UK, hosted by the London Mathematical Society

15 November
Deadline for submission of material for the December issue of the EMS Newsletter
contact: Robin Wilson, *e-mail: r.j.wilson@open.ac.uk*

Summer 2001
In the summer of 2001 there will be an EMS Summer School on Fluids at Charles University, Prague. Details to be announced.

Editorial

by
EMS Secretary
David Brannan
(Milton Keynes, UK)

It all happened like this ...

The start of my interest in publications
After gaining my PhD in London, I spent 1967-68 in the USA. There I spent a lot of time talking to a friend, Walter Schneider, about classical potential theory, approximation, Vietnam, the state of the world, and other important matters – one of which was the benefits to a Mathematics Department of a good mathematics library. From there it was a short step to just how one could build a good mathematics library even when university money was short.

Then in 1970 I was at a college in London whose library lacked some important journals for my interests. I thought of the idea of starting up a new mathematics journal, and using 'exchange' copies to build up our library. Talking to mathematicians elsewhere in London, one told me that it wasn't that easy to do so and I should forget the idea, but that the London Mathematical Society was looking for a new Secretary if I was interested in burning off excess energy. I thought this sounded worth exploring, and six months later was elected Secretary. Two years later the job was divided into two – into a *Council and General Secretary* and a *Meetings and Membership Secretary* – since the LMS had entered an expansionary phase in its activities.

What did the LMS publish?
The LMS was founded in 1865, and began to publish its Proceedings immediately with the firm C. F. Hodgson in north London. Things must have been difficult financially for a small society, and in 1874 Lord Rayleigh gave the LMS £1,000 to support the printing bills. In 1926, at the urging of G. H. Hardy, the society started publishing its *Journal*. During the second world war, the *Proceedings* was moved from Hodgson's in London to Oxford University Press. As recently as 1953 the LMS Council was having anguished debates over the projected large annual deficit on its two journals and considering approach industry for support.

Post Sputnik, the 1960s were a period of major expansion in science: new universities were founded world-wide, and their libraries needed long runs of journals. The LMS launched a major reprinting programme over ten years or so to reprint the *Proceedings* and *Journal*; the income from this and the money that it received from G. H. Hardy on the death of his sister completely transformed the Society's financial position, so that covering printing costs was no longer a serious problem. In 1961 the LMS started to translate *Uspekhi Matematicheskii Nauk* (as *Russian Mathematical Surveys*) in conjunction with the British Library; in 1964 it was a founding co-sponsor of the *Journal of Applied Probability*; and in the late 1960s it began translation of the *Transactions of the Moscow Mathematical Societies*, in conjunction with the AMS. Then in 1968 it started two book series, the *Monographs* (originally with Academic Press, and then Oxford University Press when Academic Press moved most of its UK activities to USA) and the *Lecture Notes* (with Cambridge University Press) – which in 1982 spawned a third series, the *Student Texts*. And in 1969 the LMS started the *Bulletin*.

At first the Society had two Secretaries, who edited the journals. Then in 1937 a separate office of Editor was created; since a reorganisation in 1969, the journals have each had two Editors. For many years till the early 1970s, one Editor per journal had an automatic seat on the Council; and Publications Committee consisted of a 15-minute meeting before the monthly Council meeting; a list of all the papers accepted but not yet published was laid on the Council table at each meeting. Things are so much more professional now! – but the system matched the needs of the time.

The 1970s
I was on LMS Council from 1971 to 1981. During this time the LMS operated from a shared office in the Royal Astronomical Society in Burlington House in Piccadilly, London. For most of these years it had one 0.8-time employee, Mrs Shalit, who did all the routine administration that the Society needed; in 1981 Susan Oakes took up this post as full-time *LMS Administrator*, and has been a wonderful ambassador for the Society in addition. I spent most of my time as Council Secretary dealing with Council meetings and the dozens of 'little things' that needed to be done to keep the Council affairs smooth.

These were the last days of the 'hot metal' printing process at Hodgson's, and Council spent time wondering about the future of its publishing. It agonised over what was going to be the medium for its journals in future – would it be Microfiche or would it be Microfilm? Fortunately Council never decided to switch from the printed page, since both media turned out not to be the future after all.

In late 1973 there was one of a series of 'oil crises', together with a collapse in the UK stock market and an increase in the UK inflation rate to 28%. LMS Council discussed the fact that if it paid off its bills and printed all the journal issues for which it had taken advance subscriptions, its net worth was only around £75,000; so as an emergency measure it cut the sizes of the *Proceedings*, *Journal* and *Bulletin* by one-third immediately. (Over the next 20 years they increased in size again, but it took many years before they fully regained their 'lost pages'.)

Council also wrung its hands at intervals over the losses being made by its new *Bulletin*. Its format of review articles and book reviews as well as research articles meant that while mathematicians would subscribe personally or would read a lot of pages in each issue, they had trouble persuading libraries to subscribe – even at its very low price. It also began to appear later and later, encouraging libraries who subscribed not to pay on time! But after a period of problems, its losses were stabilised, the Editor got it back on schedule, and Council decided that the losses were affordable – they would be covered by the profits on the *Proceedings* and *Bulletin*, and ascribed to the furtherance of the Society's mission in its Royal Charter to publish and disseminate mathematics.

In 1973 the Society decided that it needed to advertise to members the 1974 International Congress of Mathematicians in Vancouver. (This was the first ICM at which the Society had a reception for members, to enable members to meet each other and for foreign members to sign the LMS Membership Book – the original book, still in use since 1865). For many years the Society had posted to members a monthly postcard listing the monthly meeting of the Society in London. But now it decided to launch a 'proper' *LMS Newsletter*. I took a sheet of A4 paper from my desk, folded it over into A5 size, pencilled a page layout design on it, and sent this off to Pat Hodgson asking him to print the new *Newsletter* "like this". The *Newsletter* has appeared every month


THE LONDON MATHEMATICAL SOCIETY NEWSLETTER

No. 278 January 2000

FORTHCOMING SOCIETY MEETINGS

Friday 31 March-Saturday 1 April 2000 - Oxford
Modelling Dynamics in the Life Sciences

Friday 19 May-Saturday 20 May 2000 - Oxford
Hilbert's Problems: Past and Future
Joint meeting with the
British Society for the History of Mathematics

Friday 23 June 2000 - London
M. Rubinstein, M.J.D. Powell

COUNCIL DIARY
19 November 1999

(except August) since October 1973, and goes from strength to strength – it is a good size so that you can sit and read it cover to cover easily, and it has a lot of interesting digestible information. Nowadays it is of course the main benefit that LMS members receive for their subscription.

In 1979 I moved from London to the Open University in Milton Keynes. I was pretty busy with a new job, organising a

NATO Instructional Conference in Durham, and as LMS Secretary. Shortly before my period of office ended I was the Acting Meetings and Membership Secretary as well as the Council and General Secretary for six months, so during this heavy load I looked forward to 'release' in summer 1981!

My first LMS Council meeting in June 1971 was the last Council meeting attended by J. A. Todd who had served a continuous 20-year period. But in the mid-1970s, Council was alarmed by the fact that if its whole membership was elected annually by the small number of members who bothered to vote, it would be quite easy for a small group of members acting in concert to elect their own nominees unrepresentative of the wishes of the members generally. So it had introduced a system of a mixture of one-year and two-year terms for 'ordinary' Council members, with a 6-year continuous office maximum; and a 10-year maximum period for Officers, who continued to be elected annually to make sure that the Officers did not begin to behave undemocratically!

Back again!

In summer 1982 I was approached about the possibility of taking on joint Editorship of the *Proceedings*. Having had a year's break, I agreed readily, and enjoyed a really interesting period of four years (1983-86) as Editor with Don Collins. Editing a large research journal is a really varied and interesting role, not fully understood by anyone who has not tried to do the impossible themselves!

We had all the usual problems:
– authors complaining that their wonderful papers had not been understood by the referee
– referees doing superficial work
– referees failing to respond to appeals to referee papers sent to them
– agonising over which papers each month we would be forced to reject simply because we did not have sufficient space to publish them
– trying to explain to authors and Editorial Advisers why really good papers had been rejected in spite of a glowing referee's report
– at other times wondering how to fill the pages in an issue
– wondering whether recently we had quite enough of area X and so we should positively try to cut back a bit on papers in X in the next few issues;
and so on.

In 1985 I had a view from Publications Committee of the LMS Treasurer and Publications Secretary coping with the very difficult problems of the bankruptcy of Hodgson's who had worked for the Society since 1865. As subscription income was received by Hodgson's on behalf of the Society, the LMS found itself with significant publishing commitments to subscribers but without the corresponding income. In the event the two Officers extricated the LMS from this extremely difficult situation brilliantly, with a relatively small financial loss to the Society. The *Bulletin* and *Journal* went to Cambridge University Press, and the *Newsletter* to Armstrong Press in Southampton. Unfortunately there was considerable disruption to subscribers, since in the chaos the journal subscription lists were only recovered incomplete by the Society to pass to CUP; this took two years to return to normal. However around this time the *Bulletin* reached break-even point, and never made a deficit again!

From the frying pan into the fire

In 1986 I rejoined LMS Council as Publications Secretary when my predecessor John Pym went abroad on leave. Council had become much more business-like since 1981, meetings much longer, and business involved a much more outward-looking approach than in the 1970s. A completely new period of my life had in fact started!

Nonlinearity

The incoming President was Christopher Zeeman. He had the idea of the LMS trying to increase its membership in the Applied Mathematics community and covering all mathematics, recognising the inherent unity of the subject (even today a rather too radical approach in some quarters!). One component in his strategy was to launch a new journal in applied mathematics, tentatively titled *Transactions of the LMS*. He did a lot of work on this; but at the point of contacting possible Editors to help in the planning, he discovered that the Institute of Physics was planning to launch a new journal with some of the same putative Editors! After preliminary discussions, it was decided that LMS and IOP should join forces, to harness the joint energies of the mathematics and physics communities; and that non-linear mathematics and related areas should its subject area. The title *Nonlinearity* was adopted as its title on the suggestion of Mike Berry.

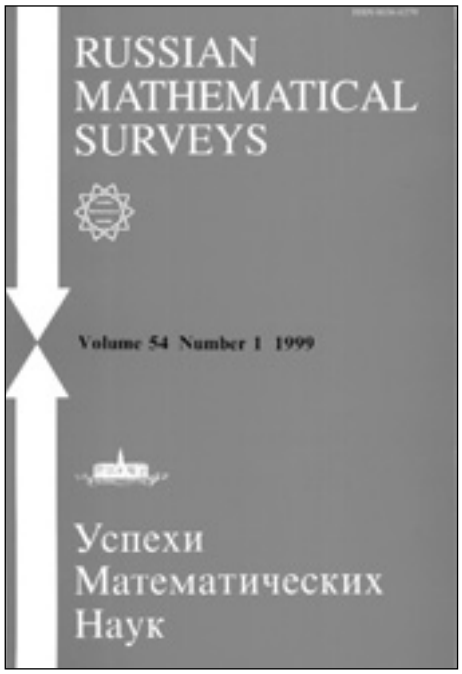
Nonlinearity was a baptism of fire for an incoming Publications Secretary! I took over in July 1986 and the first issue appeared in March 1988. Meantime we had to reach agreement with IOP over the differing refereeing arrangements standard in mathematics journals and in physics journals (e.g. was timeliness more important than complete accuracy? how many referees? should the academic Editors-in-Chief see all papers that were to be accepted? and so on). The LMS still had just one employee, whereas IOP had over 150 (and 24 journals!); how could we ensure that the venture would be fully equal? and that financially each side would not be 'ripped off' by its new unfamiliar partner? I had the job of buying a small company 'off the shelf', changing its name to *LMS Publishing Ltd*., changing its Articles of Association, and writing a contract between LMSPL and IOP that ensured fair and equal liabilities and assets to each partner; I was the Company Secretary of LMSPL, responsible for its only business – handling the business affairs of *Nonlinearity*, together with the LMS Treasurer (who was also the LMSPL Treasurer, of course). The LMS felt that the whole venture was extremely risky, and that it was not in the business of starting a new journal often whereas IOP started, sold and bought journals just like a commercial publisher; so LMSPL was to be used to insulate general LMS financial resources from this very uncertain threat. The contract between LMS and IOP was signed after the first issue had appeared, things were happening so quickly at that time!

In the event, things went brilliantly. We had chosen a subject area that was growing explosively quickly, with much interest from the two subject communities. IOP handled the practical publishing and distribution arrangements extremely smoothly, the Managing Editors nominated by the two owners worked together like a dream, the Editorial Advisers formed a good coherent group meeting once a year but gelling by e-mail discussions, and the supply of excellent papers from both areas picked up very quickly – causing LMSPL and IOP regular problems over how quickly to expand the journal from quarterly to bimonthly! After two years the journal had covered its launch costs for the LMS, and had an excellent subscription list base for the future. The business side continued to give the owners an annual headache in view of their different pricing structures and philosophies; and I regularly worried whether I would go to prison for not submitting the LMS annual accounts on time to Companies House! But all this was minor – overall the launch of this great new journal had gone like a dream. The journal is instantly recognised on library shelves from its green and orange cover, and even non-readers look at the superb front-cover designs; both the LMS and IOP should justifiably be proud of this collaboration.

From the USSR to the Russian Federation

One of the first things I had to do when becoming LMS Publications Secretary in July 1986 was to find a successor to Kurt

Hirsch as editor of *Russian Mathematical Surveys*, as he died abroad quite unexpectedly. Having taken advice but without having ever met him, I rang up Eric Primrose (Hirsch's deputy) and asked him to take it on. Eric was a great Editor, and had a wonderful relationship with his authors and translators; for example, long before



e-mail made communications with Russia easy, Eric used to return helpful comments on translating Russian into English to his panel of translators within Russia; several of them have told me how much they appreciated and learned from his wise suggestions.

Then in 1987 there was a problem over the renewal of the contract for RMS – negotiations (handled by the British Library, our joint partners in RMS) had collapsed. The Russian 'non-governmental body' VAAP [Soviet Copyright Agency] that handled contractual matters in Moscow planned to transfer translation rights to some 14 translation journals in which BL had a share to someone else. This was a severe crisis, rescued only by a speedily arranged visit by Edwin Shelock (Royal Society of Chemistry) and others to Moscow. But it meant that I knew I needed to adopt a more active role in RMS affairs than the LMS had traditionally taken in the past.

In 1989, Edwin Shelock, now Chairman of ALPSP (see below), set up a visit for 17 British publishers to visit VAAP in Moscow to discuss problems in existing collaborations or opportunities for future collaborations. Eric and I went, learned a lot about the Soviet publishing and mathematical set-ups, and made useful contacts in VAAP, the Academy of Sciences of the USSR, and the Steklov Institute in Moscow.

Around the same time, John Coates (LMS President) was involved with Ludwig Faddeev in the setting up of the Euler International Institute of Mathematics in Leningrad (now St Petersburg), and I was fortunate enough to be invited to visit the EIIM and then in 1992 to attend its formal opening ceremony. That was a great occasion with much deserved celebration! (I do regret that we were never able to set up a series of publications jointly between the EIIM and the LMS.)

I made a point of visiting Moscow each year to keep an eye on possible future developments, and in 1992 was able to agree a new contract for RMS on behalf of the LMS and BL in Moscow. But things had now changed – the contract was not with VAAP but with the Russian Academy of Sciences and its Department of Mathematics. I believe strongly in the benefits of personal contact, and continued to visit Moscow. Then in 1994 I heard that the Academy was interested in discussing with the LMS the possibility of some form of joint ownership of the translation journals *Izvestiya: Mathematics and Sbornik: Mathematics*; the Academy had decided to move from its previous arrangement with the AMS. In the event, a multi-partnership arrangement was arranged, involving the Academy, its Department of Mathematics, the Editorial Board of each, the LMS, and Turpion – a body set up in both London and Moscow to enable such international scientific publishing collaborations. In 1997 a similar ownership arrangement was agreed for RMS as well.

This collaboration features the mathematicians in the UK and Russia being in full academic and financial control of the venture, on a partnership model that is most successful; I think that each side is really happy with it; a key ingredient is the arrangements for regular face-to-face meetings of they key people at each level. It must be a model for future collaborations. I have to say that the UK editors (Eric Primrose on RMS, Gerald Gould on *Sbornik* and Dave Johnson on *Izvestiya*) were a brilliant team of Editors to work with – as were their Russian counterparts.

After my 10-year term as LMS Publications Secretary ended, I was asked to stay on a while as Deputy to the incoming Publications Secretary, Chris Lance; I stayed on for 18 months, with the principal task of handling the Russian translation programme. I was very sad when Eric died shortly after that, in late 1998: he left many friends in Britain and Russia.

I did not agree with every view put at LMS Council of the LMS Russian ventures! – but Council was tremendously supportive of these complex international collaborations, often giving me significant authority to conduct negotiations in Moscow and sign a contract without having to refer things back to London (they must have had strong nerves!). The ventures did not make large profits for the LMS; but Council supported them since they covered their costs and represented a significant contribution to disseminating mathematical research and to supporting Russian colleagues. Council also backed up its commitment by setting up a travel fund to enable mathematicians in the UK and Russia to visit each other for short research visits.

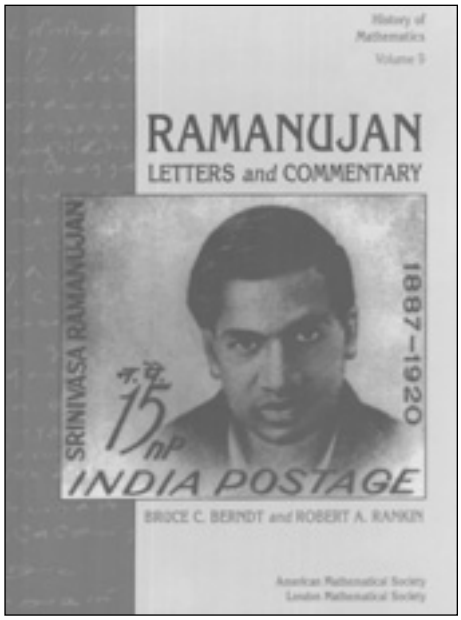
Nonlinearity and the Russian translation programme were the main visible fruits of my ten-year stint as LMS Publications Secretary!

Money

A major part of the Publications Secretary's job was to handle the annual debate on the pricing of the journals. As the Treasurer used to say, this had to be 'got right' - but nobody ever knew what the right decision was until about two years later when they saw its effect! How could you predict major international financial crises that affected university funding across the globe? or currency fluctuations (after all, financial professionals cannot predict this reliably!)? or the cost of paper? or the costs in the printing industry? or postage costs?

Given that universities were 'rationalising' their journal subscriptions, circulation of virtually all journals was declining. What strategy should the LMS adopt? Should the LMS each year increase prices by $X\%$ to compensate for its anticipated decline in subscription + $Y\%$ to allow for production and distribution cost increases $\pm$ $Z\%$ to allow for the variation in the exchange rates of the pound and the US dollar (North America being the largest single market)? In the case of *Nonlinearity*, should it increase the price to match the increase in size of the journal? Every May and June I used to talk to our printers and publishers about their anticipated costs for the year ahead, talk informally to commercial publishers about their pricing plans (a carefully guarded strategic commercial decision to them, of course), agree with the Treasurer a strategy for what we thought the LMS should do, then negotiate the detail of this through LMS Publications Committee, LMS Finance Committee and LMS Council – and then finalise negotiations with our various partners! This was a really interesting and testing experience annually, to say the least.

Overall the LMS tried to increase prices less than commercial publishers, mindful of its learned society obligations to the



One of the books in the LMS-AMS History of Mathematics series.

mathematics community. We cannot have got our pricing decisions too far wrong because, in spite of our cautious approach, our subscription levels declined less quickly than most mathematics journals and our surpluses rarely declined. These surpluses were fed back into general LMS funds; and were used to support its meetings, conferences, visiting fellowships, and general running costs.

Innovation

In spite of my tendency to conservatism, every so often an obvious development or innovation came along. Thus in the early 1990s a member suggested that the LMS launch a series of books in the *History of Mathematics*. It turned out that the AMS was thinking along similar lines, and in due course we launched a joint LMS-AMS series in the area. Its objective is to publish books in which the working mathematician will have an interest and at a price that (s)he can afford. And I had to create a contract with the AMS. . .

A major development was on the technical side of journals. In the 1970s printers stopped using 'conventional' hot-metal handsetting and moved to computer-driven typesetting. This was more economical, but still had the problem that items could fall on the floor from the fonts or from the glue on the printer's film failing. Then along came TeX, followed by LaTeX, followed by a whole range of versions of each and so-called improved variants from many sources! The enthusiasts for these developments being adopted at once by the LMS were vocal, but our printers were certainly less skilled in it than our authors!

It took many years before we were able (with CUP) to introduce the option of LaTeX files being submitted to the LMS for the *Bulletin* and the *Journal*, and it took even longer for the *Proceedings*. The continuing problems of incompatibility between versions and dialects plague every mathematics journal – TeX developers please note!

And other things besides!

What else did I do? Well, trouble-shoot generally – the job was effectively that of Director of a small publishing house – or so it seemed! (No doubt that is why the LMS now has a full-time Publications Manager, rather an academic doing it in the corners of his time.) I was responsible for identifying and appointing Editors, Technical Editors and Editorial Advisers for the journals and book series, subject to Council approval. This was sometimes quite difficult, to get a good balance between efficiency and academic standing! – and sometimes I had to 'thank various people for their services' (non-native English speakers should replace this phrase by 'fire various people for not doing their job').

I also became involved in the *Association of Learned and Professional Society Publishers* [ALPSP], an interesting body that celebrated its 25th birthday last year. It runs a series of courses, seminars and conferences of value to 'small learned societies' like the LMS (that is, as well as the big commercial publishers, the big Engineering Institutes, etc.). My two-year spell on the ALPSP Council taught me a lot about publishing and publishers! Amongst other things I learned that the 'amateur' LMS approach to journal pricing was in fact generally at least as successful as the 'professional' approach of the commercial publishers; and I grew to believe (and to tell Council colleagues) that the LMS should itself expand its publishing activities in a major way, though of course it is up to my successors to decide what they will actually do!

Since then

Over the decade 1986-96 LMS assets increased from £2M to £6M, with publishing profits rising from £200K to £500K per year. The Society had expanded to two full-time staff, and did a large amount of business in relation to mathematics in UK; it became simply too cramped, even though it had moved in the early 1990s into a large office of its own in the Royal Astronomical Society building. LMS Council decided to seek more appropriate premises, both for the work of the Society and as an investment.

It purchased two adjacent properties in Russell Square, near Euston Station, in 1998 (see *EMS Newsletter 31*); in the new premises it now has around seven staff – from an Executive Director through a Publications Manager to a receptionist. How did the LMS ever cope in the past?

Also, in 1997 the LMS launched a new purely electronic journal – the *LMS Journal of Computation and Mathematics*. This exciting new venture had been in planning for some years, but its launch was delayed until we had the right academic objectives and technical systems in place to start a new journal that the LMS would continue to publish indefinitely – its objective with all its publishing ventures. Rumour has it that most electronic journals find it difficult to attract authors, particularly authors of papers of sufficient quality to publish. Universities continue to regard printed journals in many subjects (including mathematics) as more authoritative, as better refereed, and as a better guide to the quality of existing and prospective staff. While appointments and promotions are affected by this view, electronic journals will find it hard to break the mould of conventional publishing.

The fratricidal debate over the cost or non-cost of electronic journals seems to me to be a dead-end debate. (Interesting contributions to the question appear in 'Electronic publishing and electronic publications in mathematics', *Progress in Mathematics* **169** (1998), 315-337.) There are real costs involved in producing a quality mathematics research journal, whether paper or electronic; and, in my view, there are a number of myths around that support the flawed view that electronic journals should be free or priced at minimal cost:

myth 1: all authors write clearly in good grammatical English with proper spelling and punctuation, so that even readers new to the field or readers whose native language is not English can read and understand the mathematics without difficulty or ambiguity arising

myth 2: authors will do the TeX typesetting work for a journal, so the journal typesetting costs will be nil or negligible

myth 3: individual journals will be available indefinitely on the Editor's server or his/her University server and can be accessed at any time

myth 4: editors do their work at zero cost, as their universities absorb the cost.

In fact, quality costs money:

– to 'technically edit' manuscripts into a version (fit to publish) that readers can understand

– to prepare the electronic files, whether for paper, server, or both

– to create accessibility of the material (that is, its distribution in the short term)

– to maintain its accessibility in the long term

so that publishers (whether commercial, learned societies or universities) will continue to have to charge for mathematics journals. Nevertheless, the mathematical community owes it to itself, and to its successors, to agree a 'system' that will make mathematics research literature available now and into the indefinite future at a price that enables as many as possible research libraries to afford to buy the key journals. The community does not seem to be succeeding in this goal, yet.

I suspect that there will continue to be a market for both paper and electronic versions of journals for years to come, as each format has its own role – mathematicians like to read papers slowly and carefully! – and that paper (backed up, admittedly, by secondary, regularly-refreshed electronic files) will continue to be the principal archiving format for some centuries yet. But neither I nor my 1999 readers know whether I'm right or wrong.

"Would you be interested . . . ?"

Then out of the blue in 1998 I was asked if I'd be willing to be nominated for the post of EMS Secretary. Though I had been an EMS member for years, I was not entirely clear what the EMS actually did, but thought it seemed like an interesting challenge and I agreed.

My first EMS Executive Committee meeting in late 1998 in Copenhagen, as a visitor before taking office in January 1999, showed how different was the nature of the EMS from the LMS – the EMS has a coordinating role for nations across Europe totally unlike what the LMS does. But what was a major agenda item at that Executive Committee meeting? – the first issue of, and the contract for *JEMS*, the new *Journal of the EMS*! This business seemed strangely familiar . . .

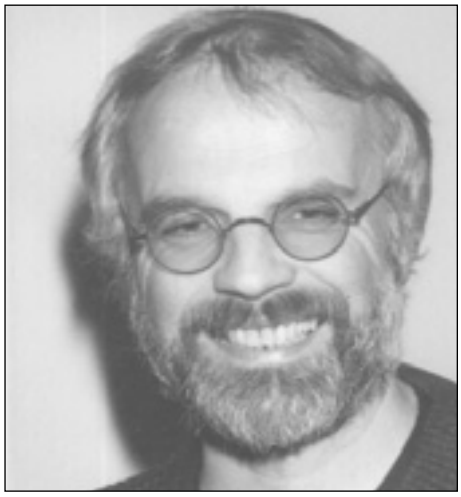
And finally

Do I yet know how my EMS role will work out? – not really! Do I look forward to finding out? – very much indeed. *Good luck to the European Mathematical Society in the coming millennium! Ad multos annos!*

Introducing the Editorial Team : part 2

Ivan Netuka (*Recent books editor*) received (the equivalent of) a Ph. D. in Mathematics in 1972 at Charles University, Prague, Czech Republic, where he has taught at the Faculty of Mathematics and Physics and is now Professor in the Mathematical Institute of Charles University. His mathematical interests lie in analysis, both classical and abstract and in the history of mathematics. He has made contributions to the field of potential-theoretic methods applied to boundary value problems for partial differential equations, and particularly in classical and abstract potential theory.

Vladimír Souček (*Recent books editor*) graduated at Charles University, Prague, in 1968 and has worked at the Faculty of Mathematics and Physics, Charles University since 1969. He received here (the equivalent of) a Ph. D. in 1974, and is currently Professor in the Mathematical Institute of Charles University. His research interests lie in global analysis and differential geometry, with connections to mathematical physics. They are centred around an investigation of properties of invariant differential operators on homogenous spaces and their curved analogues. In particular, he has contributed to the development of Clifford analysis (function theory for solutions of the Dirac equation).



Paul Jainta (*Problems Corner editor*) teaches mathematics and physics at Adam-Kraft Gymnasium, Schwabach, Bavaria. He has been involved with various mathematical competitions in Germany, and last year was appointed manager and secretary of the 'Landeswettbewerb Mathematik Bayern e.V'. In February 1998 he was elected Vice-President of the association 'Begabtenförderung Mathematik e.V' (Fostering mathematically gifted youngsters). Another of his fields of activity is popularising mathematics. Apart from the Problem Corner in this *Newsletter*, he writes a column called 'Werkstatt Mathematik' in the German mathematics journal 'Wurzel'.

Jeremy Gray (*Anniversaries editor*) has a BA in mathematics from Oxford University, and obtained his PhD in mathematics from the University of Warwick in 1981. He is presently a Senior Lecturer in Mathematics at the Open University, UK. His main area of research is the history of mathematics in the nineteenth century, particularly the growth of complex function theory and algebraic geometry. In 1998 he was an invited plenary speaker for the History of mathematics section of the International Congress of Mathematicians in Berlin.

Vinicio Villani (*Education editor*) is Professor of Mathematics Education in the Department of Mathematics, University of Pisa, Italy. He has been President of the Italian Mathematical Union.
He has worked in the theory of functions of several complex variables. Currently his interests are mainly devoted to mathematics education, and specifically to aspects concerning the teaching-learning process of geometry at secondary and tertiary level, as well as teacher preparation. He has been Chairman of the International Programme Committee appointed for the ICMI Study 'Perspectives on the Teaching of Geometry for the 21st Century' and editor of the resulting book with the same title, published in 1998.

EMS
Executive Committee meeting

Zurich (Switzerland), 9 – 10 October 1999

Officers' reports
The President reported briefly on recent contacts with SIAM, GAMM and CICIAM. The Treasurer proposed the investment of 60000 euro of the Society's reserves in a Finnish financial fund, and this was agreed by the Committee. The Committee agreed to invite the Council meeting in July 2000 to reconsider the level of membership fees.

Report of the former President (J.-P. Bourguignon)
Plans for an exciting conference on the *Mathematics of the Alhambra* in Granada as a satellite meeting for *3ecm* in July 2000 are almost complete.

Projects
The EU has funded *LIMES* (Large Infrastructure in Mathematics – Enhanced Services) within its Fifth Framework Programme with the aim of improving the service of *Zentralblatt-MATH* and establishing it as a widely used infrastructure in mathematics. The project will probably start in April 2000. The partners in the project are likely to be FIZ Karlsruhe, MathDocCell Grenoble, TU Berlin, Eidetica (Amsterdam), DTV (Copenhagen), SIBA (Lecce), USC/CESGA (Santiago de Compostela), HMS (Athens) and the EMS.

The Committee discussed a proposed project *Euclid* designed to help independent mathematics publishers make the transition to the electronic scene, and to act as a catalyst for the mathematics publishing community to arrive at a commitment to use a common metadata standard. It decided that the Society should be involved in this project.

There was some preliminary discussion of the possibility that the Society become a mathematics publishing house in its own right. It was agreed that the Society should organise a meeting of the non-commercial publishers of mathematics journals produced in Europe during *3ecm* in Barcelona in July 2000.

It was agreed to provide a front-page link on EMIS to COMPUSCIENCE, a database produced by FIZ Karlsruhe in close co-operation with *Zentralblatt-MATH*. This covers a part of computer science which is closely related to area 68 of MATH, complements the offer in computer science provided by INSPEC, and has its users mainly near the borderline between mathematics and informatics. This will complement the data base access already provided by EMIS.

Committees
R. Piccinini was elected chair of the *EMS Summer Schools Committee* for 2000–03, and D. Cioranescu was appointed a member of this committee. Emilia Mezzetti, University of Trieste, was elected to chair the Committee on *Women and Mathematics*. O. Barndorff Nielsen was elected to chair ERCOM for the years 1999-2002. Claude Lobry has agreed to chair the *Committee on Developing Countries*, and A. Henault, M. S. Narasimhan, A. Pelczar and M. Roberts were elected members of the committee. J. Bruening, M. Chaleyat-Maurel, J. Davenport, I. Diaz, A. Quarteroni and K.-O. Widman were elected members of the *Committee on Special Events*, chaired by J.-P. Bourguignon. The Committee for the *Support of Eastern European Mathematicians* was granted an additional sum of 5000 euro for the year 2000.

The *4th Diderot Mathematical Forum* on 'Mathematics and Music' will be held on 3–4 December 1999, in Lisbon, Paris and Vienna. It is hoped that the *5th Diderot Mathematical Forum* will be on Telecommunications.

It was agreed to change the name of the *Committee on Applications of Mathematics* to the *Committee for Applied Mathematics*. Its mission statement was accepted as follows: "Applied Mathematics and Pure Mathematics are two sides of the same coin, they need each other. The Committee sees its role in promoting Applied Mathematics as a whole through and within EMS, since applications cannot be separated from the mathematical methods. The Committee, instead of competing, wants to cooperate with other, sometimes more specialised, societies on the European and international level and with applications-oriented member societies especially in further improving the public and political awareness about the importance of mathematics to cultural, economic and social development."

It was agreed to establish a four-yearly prize, the *Felix Klein Prize*, in conjunction between the EMS and the Institute for Industrial Mathematics in Kaiserslautern, to be financed by the latter. The intention is to award the prize to a young scientist (normally under the age of 38) or to a small group of young persons (each under 38 years), for using sophisticated methods for solving a concrete industrial problem to the industry's satisfaction. The detailed rules for the Prize and mode of operation of the Prize Committee will be publicised separately. The first Klein Prize will be awarded at the *3ecm* in July 2000.

The *Group on Relations with European Institutions* intends to form a strategy towards both DGXII and DGXIII of the EU, and to establish contacts with appropriate new EU commissioners. V. Capasso, J.-P. Pier and O. Martio were added to the Group's membership. The Group was asked to campaign against plans to cancel the network programmes in the 6th Framework Programme. The Executive Committee agreed to invite *ERCOM*, as a committee of EMS, to send a letter opposing the cancellation of network programmes.

World Mathematical Year 2000
It was reported that a new resolution on World Mathematical Year 2000 was to be presented to the November meeting of UNESCO. The EMS was heavily involved in the international preparation for this, via the activities of its Publicity Officer Mireille Chaleyat-Maurel – for example, via the WMY calendar of events, the Alhambra conference in July 2000, and its support for a pan-European campaign to raise public awareness of Mathematics by a poster campaign in European cities and related actions during the European Science and Technology Week

The EMS ran a poster competition for use for WMY2000. The Prize Committee of M. Chaleyat-Maurel, R. Brown, B. Branner and V. L. Hansen had decided on the following awards. The posters will be forwarded to professional designers for use in the WMY2000 campaign, and the names of the original designers will be visible in the final version of each poster.

Summer schools
The Society had held two summer schools in 1999: the EMS-CIME summer school in Martina-Franca, Italy, and the EMS-WiR summer school in Heidelberg, Germany. Both had been very successful, and had received financial support from UNESCO-Roste as well as the EMS; ESF had also given financial support to Heidelberg.

The EMS was planning two summer schools in 2000, one of which had already received EU financial support. (For information on these, see the EMS Agenda, page 2.) One application to hold a 2001 summer school, from Charles University in Prague, was approved. It was hoped that another 2001 proposal was in the pipeline. The Committee expressed the wish to have the EMS summer schools move around Europe.

STOA Subcommittee of the European Parliament
STOA (Scientific and Technological Options Assessment), a group in the European Parliament, has invited expressions of interest in membership of a panel for research into science/mathematics policy questions. R. Jeltsch, J.-P. Bourguignon, H. Engl and L. Lemaire were appointed to an *ad hoc* EMS group to investigate this idea.

Cooperation between EMS and other mathematical societies
Plans for joint events of EMS and SIAM are under discussion. R. Jeltsch, H. Engl, O. Martio and D. Cioranescu were appointed to an *ad hoc* committee to progress a possible joint meeting in 2001.

The Executive Committee discussed the possibility of cooperation and/or a reciprocity agreement between the EMS and the American Mathematical Society, and between the EMS and the Australian Mathematical Society. The Committee also discussed possible future cooperation with the European Regional Committee of the Bernoulli Society.

European Mathematical Congresses
The Committee received a progress report on *3ecm*, describing the scientific programme, financial matters and social programme. Everything seems to be progressing well, and the Committee believed that the Congress should be a mathematically exciting event that should attract very wide participation.

Bids for holding *4ecm* in summer 2004 were discussed by the Committee, and a recommendation will be made to the Council meeting in July 2000.

EMS Council meeting in Barcelona in July 2000
The Catalan Mathematical Society has offered its help with the local arrangements.

Executive Committee elections
The terms of office of one Vice-President (A. Pelczar) and of three ordinary members (B. Branner, M. Sanz-Solé and A. Vershik) terminate in 2000. A. Pelczar will have served 8 years, and cannot be re-elected. The ordinary members can be re-elected, and have expressed their willingness to continue in service.

It was agreed that the composition of the Executive Committee is important, in order to ensure a proper balance of areas of mathematics and geography. This will be discussed again at the next Executive Committee meeting in March 2000.

EMS Council meeting in 2002
The ICM 2002 will be held in Beijing. The Committee discussed whether to identify a site in Europe to be presented to members as an alternative to a meeting in Beijing; this will also be discussed again in March 2000.

Future Executive Committee meetings
Likely dates for meetings in 2000 are: 23-26 March in Poland; 6 July in Barcelona; and 13–15 October in the UK.

JEMS, Journal of the EMS
It was agreed to appoint a number of additional associate editors to widen the fields covered by *JEMS*. Member societies will be asked if they are willing to collect payments for *JEMS* with their subscriptions; and as a promotional measure, the EMS *Newsletter* should continue to print the contents list of *JEMS*.

EMS *Newsletter*
It was agreed to offer institutions that are not EMS members to subscribe to the Newsletter; the arrangements for this will be publicised shortly.

EMS Lectures
It was reported that the three sets of EMS 1999 Lectures had been very successful.

Publicity material
It was agreed to print a new brochure for the Society in time for *3ecm* at Barcelona. (The current brochure was printed in 1996.) A poster with the Society's Agenda for the year 2000 will also be prepared.

The Committee felt that the 'visibility' of the EMS is enhanced by having booths at mathematics meetings. The EMS will have booths at various meetings in 2000, including the AMS Annual Meeting in Washington, and at *3ecm*.

And finally . . .
The Committee expressed their heartfelt thanks to the Swiss Mathematical Society for supporting its meeting in Zurich, and to R. Jeltsch and A. Rast for making such efficient arrangements for the accommodation, preparation of papers, social programme, transport and other arrangements for the meeting. Things had been just perfect.

David A Brannan

Anatoly Vershik (left) & Renzo Piccinni (right)

David Brannan & Doina Cioranescu

Carles Casacuberta & Tuulikki Mäkeläinen

Some of the Executive Committee relax after a busy weekend

Felix Klein Prize

The idea of a Felix Klein prize was born on the first day of the *ICIAM99* meeting in Edinburgh (see *EMS Newsletter 33*) during a discussion between the winner of the 1999 Pioneer prize, Helmut Neunzert, and the president of the EMS. Two days later, Heinz Engl, Chair of EMS's Applied Mathematics Committee, joined in and a first draft of the specifications was completed. The executive committee approved the wording of the draft at its meeting in Zurich on 9–10 October. Renate Tobies's article shows why the name Felix Klein was chosen. The first call for nominations can be found below.

Why a Felix Klein Prize?

Nowadays, mathematics plays an ever-greater role – often the decisive role – in finding solutions to numerous technical, economical and organisational problems. In order to encourage such solutions and to reward exceptional research in the area of applied mathematics, the EMS decided, in October 1999, to establish the Felix Klein Prize.

The mathematician Felix Klein (1849–1925) is generally acknowledged as a pioneer with regard to the close connection between mathematics and applications that lead to solutions to technical problems. Klein's success in his efforts to open up modern mathematical methods and theories to wider circles was based on his international reputation as a renowned mathematician. His contributions to pure mathematics include not only the well-known systematisation of geometrical fields in his *Erlanger Programm* (1872), but covered nearly all fields of mathematics. These contributions were collected in three volumes in his *Gesammelte Mathematische Abhandlungen* (1921–23). David Hilbert (1862–1943), whom Klein supported and whose call to Göttingen he arranged in 1895, was impressed with Klein's striking geometrical perception. Hilbert emphasised Klein's outstanding results in the area of automorphic functions and the scientific vision that was evident in the undertaking *Encyklopädie der mathematischen Wissenschaften mit Einschluss ihrer Anwendungen* (1895–1935), a comprehensive work of international authorship. When the Berlin mathematicians – who over a long period had remained sceptical of Klein's application-oriented endeavours – elected him as corresponding member to the Berlin Academy of Science in 1913, their election recommendation stated: 'Klein [is] one of the few mathematicians who is still capable of an overall view of mathematics' (full citation in Tobies, 1999).

Klein was aware that abstract-oriented pure mathematics was in danger of becoming isolated. In the 1890s engineers and technicians, who lamented a mathematical education that was remote from practicality, set in motion an anti-mathematics movement. In order to change the public image of mathematics and create greater awareness for the usefulness of modern mathematical methods, Klein not only turned his own research to applied mathematics and application-oriented themes, but also smoothed the way for others with diverse measures. His valuable results on the application of mathematics were aptly described by Richard von Mises (1883–1953), founder of the journal *Zeitschrift für angewandte Mathematik und Mechanik*, thus:

"A good part of [Klein's] work on linear differential equations must be counted here . . . for the main part they are concerned with so-called oscillation theories, which are crucial to problems of stability and eigenfrequencies of mechanical (and other) systems. A few treatises deal with questions relating to geometrical optics, [such as] the theory of refraction in optical instruments. It is within various areas of mechanics, however, that Klein has ventured deepest into applied areas. He succeeded in promoting the kinematics of rigid bodies by developing English research which was virtually unknown in Germany at the time (Robert Ball, definition of spiral or 'dyname') . . . and he searched for related areas in 'technical mechanics', i.e. direct solutions to real-world problems. . . The outstanding teaching material originating from the lectures in Göttingen by Klein and Sommerfeld on the theory of rigid bodies reaches . . . into technical problems dealing with gyroscopes and gyro-compasses, yawing of vessels, etc. Together with K. Wieghardt, Klein published a theory of stresses in plane-truss assemblies based on an imaginative combination of Maxwellian reciprocal figures and Airy stress functions – a theory which has proved its fruitfulness up until the present time for dealing with problems occurring in the statics of structures" (Richard von Mises, 'Felix Klein', *ZAMM* **4** (1924), 87–88).

However, in order to bring about change, it was not sufficient for Klein alone to yield up research results. Numerous and diverse scientific measures were necessary to activate the long-neglected (in Germany) areas of applied mathematics. Around the turn of the century, Klein succeeded, together with many allies, in bringing about much improved conditions for the development of applied mathematics.

One of these developments was a new examination curriculum which was passed in 1898 and which introduced and regulated – for the first time at a Prussian university – the teaching of applied mathematics. The course programme included a choice of core subjects in descriptive geometry, geodesy, and technical mechanics (kinematics, graphical statics). The number of subjects was extended in following years to include numerical and graphical methods, insurance mathematics and statistics, hydrodynamics and aerodynamics. The advent of such specialised teaching in applied mathematics made the establishment of corresponding subject areas necessary, and eventually led to the creation of the first professorships in Germany in applied mathematics. Not only was Klein successful in convincing government ministries, he also gained support for his plans from heads of industry. Within the framework of the 'Göttinger Vereinigung zur Förderung der angewandten Physik und Mathematik', affluent circles supported Klein's endeavours with over 2 million *Goldmarks* between 1898 and 1920.

The decision to produce a journal devoted to applied mathematics was a further element of Klein's programme. For this, in 1900 the already-existing *Zeitschrift für Mathematik und Physik* was transformed and became what is acclaimed as the precursor of the *Zeitschrift für angewandte Mathematik und Mechanik*. In order to change the public image of mathematics it was not sufficient to limit activities to the universities. Klein strove in an international context – in 1908 at the Fourth International Congress of Mathematicians in Rome, he was elected as Chairman of the International Commission of Mathematical Instruction – for a reform of the teaching of mathematics 'from primary school to university'. Special emphasis was placed on nurturing close relations between high-level science and perspicuous applications-oriented mathematics. The fact that the group of Göttingen's mathematicians achieved international renown was due, in a great measure, to Klein's programme to develop mathematics in all directions and enable results of pure mathematical research to flow into applied areas combining the interests of academe and industry. Klein implemented an adroit appointment policy (David Hilbert, Ludwig Prandtl and Carl Runge) to achieve an ideal balance in the combination of theory, application and numerical mathematics. Close cooperation between scientists and their students produced valuable contributions for the development of mathematics and its applications.

Scientists who can prove, in a prominent and commendable way, that mathematical theory and mathematical models lead to practical solutions of problems, and who thereby contribute to and influence the future growth of the mutual stimulation of theory and practice, are following in the footsteps of Felix Klein and are worthy candidates and eligible for the award of the Felix Klein Prize.

The above was written by Renate Tobies, from the Department of Mathematics, University of Kaiserslautern, who is habilitated in the History of Mathematics and has published five books, three of which include material on Felix Klein, and a number of essays. [English translation by A. Rast-Margerison]

Felix Klein Prize Specifications

Principal guidelines
The prize, established in 1999 by the EMS and the endowing organisation, the Institute for Industrial Mathematics in Kaiserslautern, is awarded to a young scientist or a small group of young scientists (normally under the age of 38) for using sophisticated methods to give an outstanding solution, which meets with the complete satisfaction of industry, to a concrete and difficult industrial problem.

Selection procedures for composing the prize committee
The prize committee consists of six members, with one designated as "Chair". The prize committee is composed of the following people.

Three committee members are chosen by unanimous agreement of the president of EMS and the chair of the Applied Committee of the EMS. The endowing Institute for Industrial Mathematics in Kaiserslautern elects two members to the prize committee, at least one of whom should be a representative from industry. The European Consortium for Mathematics in Industry, ECMI, elects one member to the prize committee. The prize committee constitutes itself.

Appointments to the prize committee should be made at least eighteen months before the prize award date.

Tenure of the Prize Committee
From the date of appointment to the Prize Committee, the members serve until the prize is awarded. If no prizewinner is chosen, the duties of the committee are completed.

Rules of Operations
A prize committee will be appointed every four years. If no prize is awarded, the award date moves ahead four years.
The prize committee determines its own procedures and rules of operations.

Nomination of the Award
There are no restrictions on eligibility other than those specified in the Principal Guidelines.

The prize committee is responsible for solicitation and evaluation of nominations. Nominations may be made by anyone, including members of the prize committee or by candidates themselves. It is the responsibility of the nominator to provide all relevant information to the prize committee, including a resumé and documentation of the benefit to industry and the mathematical method used.

The nomination for the award should be reported by the prize committee to the EMS president at least three months before the date of the award. The nomination for the award must be accompanied by a written justification and a citation of about 100 words that can be read at the award date.

The prize is awarded to a single person or to a small group and cannot be split.

Description of the award
The award comprises a certificate containing the citation and a cash prize, the amount of which is to be determined by the endowing Institute for Industrial Mathematics in Kaiserslautern in consultation with the presidents of EMS and ECMI. Normally, the prize sum will be approximately 5000 euro.

Award presentation
The prize is presented every four years at the European Congress of Mathematics. A representative of the endowing Institute for Industrial Mathematics in Kaiserslautern or the president of EMS presents the award. The recipient is invited to present his or her work at the conference.

Prize history
The first prize will be awarded in the year 2000.

Prize fund
The endowing Institute for Industrial Mathematics in Kaiserslautern is responsible for managing the prize fund as well as its administration, should such a fund be established.

Changes to these specifications
All changes to these specifications must have the approval of the EMS Executive Committee and the endowing Institute for Industrial Mathematics in Kaiserslautern.

Approved by the EMS Executive Committee at its meeting in Zurich, 9–10 October 1999.

2000 : World Mathematical Year

Mireille Chaleyat-Maurel

The year 2000 will be a crucial year for mathematics and mathematicians. For eight years the mathematical community has known that this year, the first (or last) of the century and the millennium, has been declared World Mathematical Year by the International Union of Mathematics. This decision, taken under the presidency of Prof. J.-L. Lions, is supported by UNESCO, whose support has been confirmed by a vote in General Assembly. A solemn declaration, called 'Déclaration de Rio' proposes three main lines of actions centred on mathematics:
– the major challenges in mathematics for the 21st century;
– mathematics and development;
– the image of mathematics among the general public.

The first theme is mostly directed toward the mathematics community that wants its conjectures turned into theorems with simple proofs – short, elegant and accessible to all. This past century has witnessed the establishment of Fermat's last theorem, that had baffled people for over 300 years. Hopefully, at the end of the next century, people will speak of 'Riemann's theorem' no longer as a hypothesis! During 2000 a committee, directed by Prof. V. -I. Arnold, is assessing the work accomplished during the 20th century and prospecting for the coming century; a synthetic work is in preparation on these topics.

The second theme involves the applications of mathematics and problems raised by teaching mathematics. This point will be emphasised at the 2000 International Congress of ICMI in Tokyo.

The third theme is aimed at teaching mathematics to a general public not always willing to learn. This calls for great creativity and originality from mathematicians, in the domain of communication and media such as: introducing mathematical sections and exhibitions in science museums, developing movies, videos and books, and organising conferences that popularise mathematics; all initiatives are welcome. In this direction, an idea proposed some years ago by the European Mathematical Society is already under way: posters on mathematical topics in subway stations and in cars and other forms of public transportation. A similar campaign has already been developed for poetry. Many European cities are willing to participate in this campaign, and some have already started to do so. The EMS has sponsored a poster contest for this mathematical metro campaign – see page 14.

The year 2000 is also very important for the European Mathematical Society, because its third Congress 3ecm will be held in Barcelona in July. The announced programme shows that it should be as successful as the Congresses of Paris and Budapest. We hope that, for this event, many mathematicians will join the EMS.

There is still time to propose mathematical congresses, workshops, conferences and exhibitions. World-wide events can be announced in the WMY 2000 newsletter: just ask the Editorial Committee at WMY 2000, Institut Poincaré, 11, rue Pierre et Marie Curie, 75005 Paris, France. For European events, please contact the author of this note [*e-mail: mcm@ccr.jussieu.fr*] or the *EMS Newsletter* editor. For national events, we urge national societies to create a Year 2000 Committee and to publish information in their newsletters.

In conclusion, all European mathematicians should become involved with World Mathematical Year 2000, and should participate, actively and at all levels, to everything that may contribute to the development of mathematics and its impact on world-wide problems of education, society and economy.

3rd European Congress of Mathematics

Shaping the 21st Century
Barcelona, 10 – 14 July 2000
Second announcement

The Second Announcement of the **3ecm** will soon be mailed to those who have pre-registered through the Congress web site. It will contain detailed instructions for registration, grant requests, information on accommodation, and other features of the Congress. Here we present a summary of the relevant information that is currently available.

Plenary Lectures
- **Robbert Dijkgraaf** (Universiteit van Amsterdam)
- **Hans Föllmer** (Humboldt-Universität zu Berlin)
- **Hendrik W. Lenstra, Jr**. (University of California at Berkeley and Universiteit Leiden)
- **Yuri I. Manin** (MPI für Mathematik, Bonn)
- **Yves Meyer** (École Normale Supérieure de Cachan)
- **Carles Simó** (Universitat de Barcelona)
- **Marie-France Vignéras** (Université Paris 7 Denis Diderot)
- **Oleg Viro** (Uppsala Universitet and POMI St Petersburg)
- **Andrew J. Wiles** (Princeton University)

Parallel Lectures
- **Rudolf Ahlswede** (Universität Bielefeld)
- **François Baccelli** (INRIA and École Normale Supérieure, Paris)
- **Volker Bach** (Universität Mainz)
- **Viviane Baladi** (Université Paris-Sud XI)
- **Joaquim Bruna** (Universitat Autònoma de Barcelona)
- **Xavier Cabré** (Universitat Politècnica de Catalunya, Barcelona)
- **Peter J. Cameron** (Queen Mary and Westfield College, London)
- **Ciro Ciliberto** (Università degli Studi di Roma 'Tor Vergata')
- **Zoé Chatzidakis** (CNRS and Université Paris 7 Denis Diderot)
- **Gianni Dal Maso** (SISSA, Trieste)
- **Jan Denef** (Katholieke Universiteit Leuven)
- **Barbara Fantechi** (Università degli Studi di Udine)
- **Alexander B. Givental** (University of California at Berkeley and Caltech)
- **Alexander Goncharov** (Brown University, Providence)
- **Alexander Grigor'yan** (Imperial College, London)
- **Michael Harris** (Université Paris 7 Denis Diderot)
- **Kurt Johansson** (Kungl Tekniska Högskolan, Stockholm)
- **Konstantin M. Khanin** (Heriot-Watt University, Edinburgh, Isaac Newton Institute, Cambridge, and Landau Institute, Moscow)
- **Pekka Koskela** (Jyväskylän Yliopisto)
- **Steffen L. Lauritzen** (Aalborg Universitet)
- **Gilles Lebeau** (École Polytechnique, Palaiseau)
- **Nicholas S. Manton** (University of Cambridge)
- **Ieke Moerdijk** (Universiteit Utrecht)
- **Eric M. Opdam** (Universiteit Leiden)
- **Thomas Peternell** (Universität Bayreuth)
- **Alexander Reznikov** (University of Durham)
- **Henrik Schlichtkrull** (Københavns Universitet)
- **Bernhard Schmidt** (Universität Augsburg)
- **Klaus Schmidt** (Universität Wien)
- **Bálint Tóth** (Budapesti Müszaki Egyetem)

Mini-Symposia
The following list of topics was chosen by the Scientific Committee.
The speakers at each mini-symposium will be selected by the corresponding Chair (listed in brackets below).
- **Quantum chaology** [Sir Michael Berry, University of Bristol]
- **Computer algebra** [Wolfram Decker, Universität des Saarlandes]
- **Mathematics in modern genetics** [Peter Donnelly, University of Oxford]
- **String theory and M-theory** [Michael Douglas, Rutgers University]
- **Mathematical finance: theory and practice** [Hélyette Geman, Université de Paris IX and ESSEC]
- **Quantum computing** [Sandu Popescu, University of Cambridge]
- **Free boundary problems** [José Francisco Rodrigues, Universidade de Lisboa]
- **Symplectic and contact geometry and Hamiltonian dynamics** [Mikhail B. Sevryuk, Russian Academy of Sciences]
- **Curves over finite fields and codes** [Gerard van der Geer, Universiteit van Amsterdam]
- **Wavelet applications in signal processing** [Andrew T. Walden, University of London]

Round Tables
The following list of topics has been agreed by the Round Table Committee.
- Mathematics teaching at the tertiary level
- What is mathematics today?
- The impact of mathematical research on industry and vice versa
- The impact of new technologies on mathematical research
- Building networks of cooperation in mathematics
- How to increase public awareness of mathematics
- Shaping the 21st century

Call for Software, Video and Multi-media
As has already been announced, a session on mathematical software will take place during the Congress. In this session, mathematical software systems relating to all fields of mathematics, and applicable to a variety of purposes, will be presented. The scheduled length of a presentation (including discussion) is 30 minutes. Submissions must be received by the organisers before **1 February**. They may be made electronically by using the form provided on the web site **http://www.iec.es/3ecm/mathsoft.htm**, or by e-mail to **mathsoft.3ecm@upc.es** with the single word *mathsoft* in the Subject field.

The organisers also plan to produce a DVD containing both short videos and

multi-media with mathematical content. This DVD will be exhibited in general public sessions. Submissions of contributions for this DVD may be made from all areas of mathematics, and must be received by the organisers before **1 February**. Submission forms are available at **http://www.iec.es/3ecm/video.htm**, where additional detailed information can be found. The address **video.3ecm@upc.es** may be used to contact the organisers of this complementary activity or to ask any related questions.

Call for Posters

All registered participants will have the opportunity to present their mathematical work in the form of a poster. Decisions on acceptance will be made by the Organising Committee on the basis of an abstract which should reach the organisers before **1 March**. Abstracts submitted after this date will not be considered. Acceptance will be confirmed before 20 March.

Abstracts should conform with the following instructions. It is strongly recommended that abstracts be submitted electronically by using the form provided in the web site **http://www.iec.es/3ecm/posters.htm.** Abstracts may also be sent by e-mail to **posters.3ecm@upc.es**, with the Subject field containing exclusively the relevant section number (see the list of sections at the web site). Abstracts should preferably be written in English, and prepared in LaTeX using only standard commands and AMS macros, symbols and fonts.

Grants

The organisers of the **3ecm** will award grants of either partial or full support to attend the Congress. The aim of these grants is to promote the participation of young researchers in mathematics, with special attention to their professional situation and their country of origin. Financial support will be offered in the following ways.

A. Grants of 25,000 PTA covering the registration fee.
B. Grants of 30,000 PTA covering accommodation expenses at university residences.
C. Grants up to 35,000 PTA for travel expenses.

Mathematicians working in Catalonia can apply only for type A grants. Mathematicians working in Spain but outside Catalonia can apply for type A and/or type B grants. Mathematicians working abroad can apply for all types.

People interested in obtaining financial support are requested to fill in an application form which can be found at the **3ecm** web site **http://www.iec.es/3ecm**. Applications should be submitted before **31 January**. Decisions will be taken before 10 March. Grant holders should confirm their registration before 1 April. The registration fees of people with type A grants will be paid by the organisers. Grants of type B and C will be paid to their holders on arrival at the Congress.

Satellite Activities

The following list of satellite activities has been acknowledged by the Executive Committee by October 1999. Proposals for further satellite congresses or other mathematical events will be welcome until **1 February**.

26 June – 1 July: Summer School on Interactions between Algebraic Topology and Invariant Theory, Ioannina, Greece
Contact: Nondas Kechagias (University of Ioannina), nkechag@cc.uoi.gr.
Web site: http://www.uoi.gr/conf_sem/topology2000/.

29 June – 1 July: 2nd International Conference on Symmetry and Antisymmetry in Mathematics, Formal Languages and Computer Science, Brasov, Romania
Contact: Gabriel V. Orman (Transylvania University), ogabriel@unitbv.ro.

29 June – 4 July: Workshop on Bifurcation, Symmetry and Patterns, Porto, Portugal.
Contact: Jorge Buescu (IST, Lisboa), jbuescu@math.ist.utl.pt.

3 – 7 July: Functional Analysis Valencia 2000, an international functional analysis meeting on the occasion of the 70th Birthday of Professor Manuel Valdivia. Valencia, Spain.
Contact: José Bonet (Universidad Politécnica de Valencia), vlc2000@mat.upv.es or Klaus D. Bierstedt (Universität Paderborn), vlc2000@uni-paderborn.de.
Web site: http://www.upv.es/VLC2000/.

3 – 7 July: 6th International Conference on Harmonic Analysis and Partial Differential Equations, El Escorial, Madrid, Spain.
Contact: Eugenio Hernández (Universidad Autónoma de Madrid), eugenio.hernandez@uam.es.

3 – 7 July: Alhambra 2000, a Joint Mathematical European-Arabic Conference, Granada, Spain
Contact: Ceferino Ruiz (Universidad de Granada), alhambra2000@ugr.es.
Web site: http://www.ugr.es/∼alhambra2000/.

3– 7 July: EVEQ 2000, International Summer School on Evolution Equations, Prague, Czech Republic
Contact: Hana Petzeltová (Academy of Sciences, Prague), petzelt@math.cas.cz.

3 – 7 July: Colloquium on Number Theory, Debrecen, Hungary
Contact: Attila Pethö (Lajos Kossuth University), nt2000@math.klte.hu.

3 – 7 July: Conference on Algebraic K-Theory and Homotopy Theory of Schemes, Toulouse, France
Contact: Max Karoubi (Université Paris 7 Denis Diderot), karoubi@math.jussieu.fr.

3 – 9 July: Summer School on Mathematical Aspects of Evolving Interfaces, Funchal, Portugal
Contact: Pierluigi Colli (Università di Pavia), pier@dragon.ian.pv.cnr.it.
Web site: http://maei.lmc.fc.ul.pt.

4 – 6 July: Catop 2000, a Conference on Categorical Topological Methods, Fribourg, Switzerland
Contact: H.-P. Künzi (Universität Bern), catop2000@unifr.ch.

4 – 7 July: First Euro-Mediterranean Topology Meeting, Bellaterra, Barcelona, Spain
Contact: Carlos Broto (Universitat Autònoma de Barcelona), euro-mtm@mat.uab.es.
Web site: http://mat.uab.es/euro-mtm.

3 – 5 or 5 – 7 July: cem 2000, Congrés d'Educació Matemàtica, I Jornades d'Educació Matemàtica a Catalunya. Mataró, Barcelona, Spain
Contact: Xavier Vilella (FEEMCAT), vilella@pie.xtec.es.

5 – 8 July: 6BLM, 6th Barcelona Logic Meeting, Barcelona, Spain
Contact: Josep Maria Font (Universitat de Barcelona), font@mat.ub.es.

6 – 8 July: IX Fall Workshop on Geometry and Physics (Special Session), Vilanova i la Geltrú, Spain
Contact: Miguel C. Muñoz-Lecanda (Universitat Politècnica de Catalunya), geomphys2000@mat.upc.es.
Web site: http://www-mat.upc.es/dgdsa/geomphys2000.html.

6 – 8 July: New Women in Mathematics: an International Forum for Women Starting in Mathematical Research, Barcelona, Spain
Contact: Laura Fainsilber (University of Gothenburg), laura@math.chalmers.se.
Web site: http://www.math.helsinki.fi/EWM/.

17 – 19 July: Distributions with Given Marginals and Statistical Modelling, Barcelona, Spain
Contact: Carles M. Cuadras (Universitat de Barcelona), carlesm@bio.ub.es.

17 – 22 July: Colloquium on Lie Theory and Applications, Vigo, Spain
Contact: Ignacio Bajo, Esperanza Sanmartín (Universidad de Vigo), clieta@dma.uvigo.es.
Web site: http://www.dma.uvigo.es/∼clieta/index.

Contact Addresses

Congress e-mail: 3ecm@iec.es
Congress web site: http://www.iec.es/3ecm/ or http://www.si.upc.es/3ecm/
Mailing address: Societat Catalana de Matemàtiques, Institut d'Estudis Catalans Carrer del Carme, 47 E-08001 Barcelona, Spain
Phone: (+34)-93-270-16-20
Fax: (+34)-93-270-11-80

EMS Poster Competition results

Vagn Lundsgaard Hansen

In the spring of 1999, the European Mathematical Society announced a competition to encourage the idea of creating posters with a mathematical theme that would catch the eye and be representative of mathematics and its uses. Such ideas can prove valuable in many situations as a way of presenting mathematics to the public. The direct reason for the competition was, however, to get ideas for suitable posters to be displayed in subways and other public places, as one of the events during the World Mathematical Year 2000. In the announcement of the competition, the EMS offered prizes for the three best proposals, but naturally the hope was to get more good proposals than those that would finally be selected for a prize . . . and the EMS was not disappointed!

The deadline for submission of proposals was 1 May 1999. Twenty-six proposals were received, many containing multiple suggestions for posters. Altogether the jury appointed by the Executive Committee of the EMS to evaluate the proposals had about 100 posters to consider.

The jury consisted of Bodil Branner from the Executive Committee, and Ronnie Brown, Mireille Chaleyat-Maurel and Vagn Lundsgaard Hansen (Chair) from the EMS committee on WMY 2000.

It was a difficult task for the jury to come up with a decision. If a poster is to be both instantly attractive to a lay person, and also signal an important mathematical message to a person reflecting on the poster, fruitful ideas are not particularly easy to come by. In several proposals, the graphics were attractive but the mathematical message was too simple. In other proposals the mathematical content was substantial, but the graphics were not sufficiently appealing to the general public. In the end, the jury selected three proposals that satisfied both expectations, being attractive as well as carrying an important mathematical message. The recommendations by the jury were approved by the Executive Committee of the EMS at its October meeting in Zurich. The Executive Committee expressed its satisfaction with the diversity in the submissions and by the high degree of creativity shown by the proposers.

The winners are:

First prize: Stéphane Durand, Centre de Recherches Mathématiques, Université de Montréal, C.P. 6128, Succ. Centre-Ville, Montréal, Qc, H3C 3J7, Canada

[Durand receives the first prize for a series of seven posters that deal with Sunflower seeds and Fibonacci sequences, Animals with a spotted body, The Nautilus shell and the golden mean, Viruses and knots, Escher's Circle Limit III (hyperbolic plane) and the Big Bang, Fractal geometry in many situations, and Snowflakes and chaos theory.]

Second prize: Andreas Frommer, Stefanie Krivsky and Petra Zöllner, Bergische Universität, Gesamthochschule Wuppertal, Fachbereich 7 (Mathematik), Gauss-Strasse 20, 42097 Wuppertal, Germany

[Frommer, Krivsky and Zöllner receive the second prize for a series of five posters divided into two concepts: three posters on Mathematical thinking, which deal with The bridges of Königsberg, Primes and twin primes, The Four Colour Theorem, and two posters on Advertising mathematics as being the foundation of high tech in everyday life, which deal with Tomography: the brain, Mathematical car crash test.]

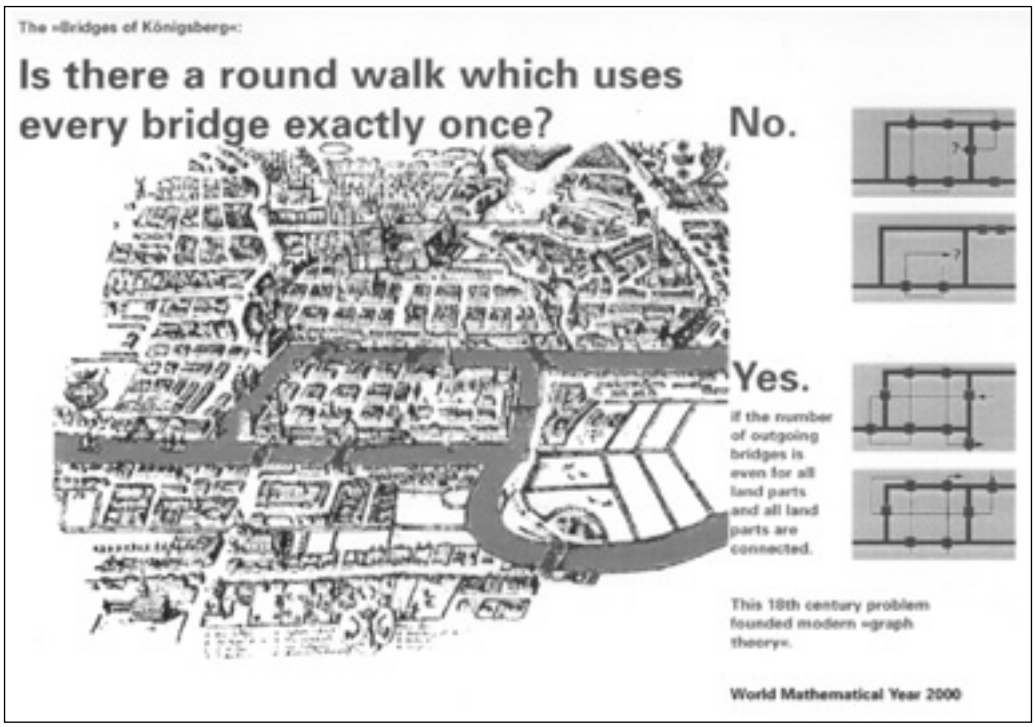
Third prize: Nadja Kutz, Fachbereich Mathematik, Sekr. MA 8-5, Technische Universität Berlin, Str. des 17. Juni 136, 10623 Berlin, Germany

[Kutz receives the third prize for a series of posters with short slogans. She submitted three posters: Play with Mathematics (a baby holding a model of a doubly discrete smoke ring flow in her hand), Grow with Mathematics (a flower picture which is actually a rotational invariant Willmore surface), The World is different with Mathematics (a 'world pretzel', in the form of a double torus, that exhibits the various continents).]

Runner-up: *Wolfgang Joppich, Institute for Algorithms and Scientific Computing-GMD-SCAI, Sankt Augustin, Germany*, for an applied mathematics poster on numerical weather forecasting.

Many of the ideas for posters are suitable for use in other contexts as well, such as postcards, mugs, T-shirts etc. The European Mathematical Society hopes to obtain permission from the proposers to make all such uses of their ideas as may be of benefit to mathematics and may enhance the public understanding of our subject. If permissions are granted, the EMS will allow the use of the ideas in all worthy contexts.

It was an unusual and exiting experience for the jury in the competition. We feel certain that we selected some very good proposals, but we also know that there are other very valuable ideas in the total collection. Early in the evaluation procedure, the jury realised that it is difficult for mathematicians to judge what will catch the attention of the general public in connection with mathematics. But nevertheless, it is important to try, for the future of mathematics.



One of the prize-winning entries. Others will appear in future issues

Meeting of the EMS Council

7 – 8 July 2000, Barcelona
Second announcement

The EMS Council meets every second year. The next meeting will be held in Barcelona on 7-8 July 2000, before the 3rd European Congress of Mathematics. The exact location will be announced later.

Delegates to the Council will be elected by the following categories of members, as per the Statutes.

(a) *Full Members*: Full Members are national mathematical societies, which elect 1, 2 or 3 delegates according to their size and resources. Each society is responsible for the election of its delegates. Each society should notify the Secretariat of the EMS in Helsinki of the names and addresses of its delegate(s) no later than 10 March 2000. As of 1 July 1999, there were 47 such societies – which could designate a maximum of 69 delegates.

(b) *Associate Members*: There are two associate members, namely the Gesellschaft für Mathematische Forschung and the European Mathematical Trust. Their current common delegate is elected until 1999, so their delegate has to be elected in 2000. According to the Statutes, 'delegates representing associate members shall be elected by a ballot organised by the Executive Committee from a list of candidates who have been nominated and seconded, and have agreed to serve.'

(c) *Institutional Members*: There are three institutional members, Institut Non-Lineare de Nice, the Moldovian Academy of Sciences and the Mathematical Institute of the Serbian Academy of Sciences and Arts. Their common delegate is elected till 1999, so their delegate has to be elected in 2000. According to the Statutes, 'delegates representing institutional members shall be elected by a ballot organised by the Executive Committee from a list of candidates who have been nominated and seconded, and have agreed to serve.'

(d) *Individual Members*: A person becomes an individual member either through a corporate member, by paying an extra fee, or by direct membership. On 30 June 1999, there were some 1900 individual members and, according to our statutes, these members will be represented by 19–20 delegates. The final count of individual members for these elections was made on 1 November 1999.

The mandates of 11 of the present 17 delegates ended on 31 December 1999, and so elections must be held for their positions. They are: G. Anichini, G. Bolondi, B. Branner, J.-M. Deshouillers, K. Habetha, M. Karoubi, T. Kuusalo, A. Lahtinen, L. Màrki, R. Piccinini, and D. Puppe. Of the eleven, B. Branner, J.-M. Deshouillers and M. Karoubi cannot be re-elected because they have served in this capacity for 8 years.

The Executive Committee is responsible for preparing the matters to be discussed at Council meetings. Items for the agenda of this meeting of the Council should be sent as soon as possible – and no later than 10 March – to the EMS Secretariat in Helsinki.

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

President
Professor Rolf Jeltsch (1999–2002)
Vice-Presidents
Professor Andrzej Pelczar (1997–2000)
Professor Luc Lemaire (1999–2002)
Secretary
Professor David Brannan (1999–2002)
Treasurer
Professor Olli Martio (1999–2002)
Members
Professor Bodil Branner (1997–2000)
Professor Marta Sanz-Solé (1997–2000)
Professor Anatoly Vershik (1997–2000)
Professor Doina Cioranescu (1999–2002)
Professor Renzo Piccinini (1999–2002)

Under Article 7 of the Statutes, members of the Executive Committee shall be elected for a period of 4 years. Committee members may be re-elected, provided that consecutive service shall not exceed 8 years. Andrzej Pelczar has served on the Executive Committee for 8 years, so he cannot be re-elected.

It would be convenient if potential nominations for office in the Executive Committee, duly signed and seconded, could reach the Secretariat by 10 March. It is strongly recommended that a statement of intention or policy is enclosed with each nomination. If the nomination comes from the floor during the Council meeting there must be a written declaration of the willingness of the person to serve, or his/her oral statement must be secured by the Chair of the Nominating Committee (if there is such) or by the President. It is recommended that a statement of policy of the candidates nominated from the floor should be available.

The Council may, at its meeting, add to the nominations received and set up a Nominations Committee, disjoint from the Executive Committee, to consider all candidates. After hearing the report by the Chair of the Nominations Committee (if one has been set up), the Council will proceed to the elections to the Executive Committee posts.

Delegates to the Council meeting, who are planning to attend the European Congress of Mathematics, are advised that their accommodation arrangements should be made through the ECM. For delegates to the Council who are not attending the ECM, an address for accommodation arrangements will be provided later.

Secretariat:
Ms. Tuulikki Mäkeläinen
Secretary of the EMS
P.O. Box 4
FIN-00014 University of Helsinki
Finland

Annex: 2000 timetable for the Council Meeting

31 January: Deadline for nominations for delegates of individual members.
February: The ballots for delegates of individual members are sent to individual members.
March: Candidates for delegates of individual members are announced in the *EMS Newsletter*. The venue and meeting times of the Council meeting are repeated.
April: A letter is sent to each delegate, containing the agenda of the Council meeting.
June: The results of the elections for delegates of individual members are announced in the EMS Newsletter. The venue, the meeting times, and the agenda of the Council meeting are given. Material for the Council meeting is sent to the delegates.

EMS Country Representatives

The following have become Country representatives for the EMS Newsletter. If you would like to become a Country Representative, please contact your country's mathematical society and then contact the EMS Secretariat in Finland (see page 2).

Catalonia:
Agusti Reventos
[agusti@manwe.mat.uab.es]

Czech Republic:
Lubos Pick
[pick@karlin.mff.cuni.cz]

Finland:
Mikko Pere
[mikko.pere@helsinki.fi]

Germany:
Ehrhard Behrends
[behrends@math.tu-berlin.de]

Italy:
Giuseppe Anichini
[anichini@dma.unifi.it]

Luxembourg:
Jean-Paul Pier
[pier@cu.lu]

Norway:
Erik Bedos
[bedos@math.uio.no]

United Kingdom:
Susan Oakes
[lms@lms.ac.uk]

Interview with Jan van Maanen (Groningen)

Chair of HPM

interviewer: John Fauvel, Open University, UK

Jan van Maanen graduated in mathematics from the University of Utrecht in 1977, and took his PhD in 1987 with a thesis on 'Facets of seventeenth-century mathematics in the Netherlands'. For fifteen years a teacher at the Christelijk Gymnasium, Utrecht, he now teaches at the University of Groningen and is chair of the national exam board for 'Mathematics B' (the pre-university school-leaving examination in calculus and geometry). Jan van Maanen is co-chair of an international study on the relations between history of mathematics and the teaching and learning of mathematics, as well as chair of HPM, the International Study Group on the Relations between History and Pedagogy of Mathematics, which provides the context for the opening question.

First, Jan, could you explain what 'HPM' is?

You can look at HPM in two ways. I could reply by saying that it is an official study group of ICMI – the International Commission on Mathematics Instruction – which is itself a committee of the IMU (International Mathematical Union). It was established in the early 1970s, at the second ICME (International Congress on Mathematics Education). From that perspective it is a cog in the international machinery of mathematical and educational interests. But I could reply in another way too: HPM is a collection of teachers and academics from around the world united in a common enthusiasm for the role of history in mathematics teaching, people who want to absorb the lessons of the past in order to improve the mathematics education of the future.

How is the HPM group organised?

Interestingly, it more or less works without administration or finances – which is rare among such international organisations! The group runs through communications between people, through conferences. It has had a newsletter for the past 20 years, thanks to the hard work of a number of individuals, both in editing it and distributing it, and thanks, too, to the support of institutions who have provided assistance with reprographic and postage costs. To be an HPM member has been, in effect, to be on the mailing list of a distributor; the world is covered with a network of distributors. But the newsletter is in a fallow period at the moment, I hope temporarily, so membership is even less formally pinned down than usual. Nonetheless a great number of activities take place.

In Europe, for example, how does that work?

There is a lot of enthusiasm in many European countries for developing historical contexts for mathematics teaching and incorporating historical insights in a whole range of ways, into everything from national curricula, as in Denmark and Norway, to the work of individual teachers. This enthusiasm is fostered and shared by the organisation of meetings which attract participants from across Europe: I remember especially one in Braga, Portugal, in 1996 which attracted roughly equal numbers of Portuguese mathematics teachers, and mathematicians and mathematics educators from the rest of Europe and elsewhere, some 550 people in total from around thirty countries.

What kind of people are we talking about? – teachers? researchers?

The HPM movement is very interesting – and important in an exemplary way, I think – for its mix between teachers, academics, generators and users of research: an environment where people who are professionally engaged in mathematics, in its teaching and in history of mathematics come together to learn from each other, exchange insights and move forward together. You can see this in the annual HIMED ('History in Mathematics Education') meetings in the UK, in the *Université d'été* in history and epistemology of mathematics which is an annual event in France, and which, since 1993, is organised at a European level every three years, this July in Belgium. And there are numerous sessions devoted to the topic within broader conferences such as ICMs, ICMEs and national mathematical conferences.

So we've established that there is a lively and wide-ranging social structure for people with common interests, but – if I may act as devil's advocate for a moment – just what is the point?

The point is that mathematics teaching can be better if the teacher is aware of the added dimension of where the mathematics has come from, and has a range of insights and resources to share with students as is appropriate for their needs and difficulties at any moment. In my own case, I was doing research into the history of mathematics for my PhD at the same time as teaching mathematics at a Dutch gymnasium (a six-years grammar school that gives direct entrance to university). I began to find that sharing with my pupils the historical insights I was gaining through my researches was a good strategy with several benefits for the lessons. Pupils learned that great mathematicians made mistakes just as we do and they do – that problems were solved with different methods – that things taken for granted in some period were open questions at other periods. Overall they gained a quite different perspective on mathematics – much better than only learning by doing problems from a textbook, and often with more pleasure too! . . . though I had them do many sums as well.

I think people would be interested in having this pinned down a bit: can you give an example?

One of my pupils, Janneke, comes to my mind. She was not at ease with the quadratic equation formula which she found extremely hard to remember; she felt it as an alien collection of characters and other signs. One day I came back to class, full of enthusiasm for just having read one of my ancient texts, Johan Stampioen's Algebra of 1639, and got the students to read and work through the way he solved a quadratic problem, with a geometric diagram (literally 'completing a square'), then to compare his process with our formula. Stampioen described his solution rhetorically, in a 'first do this, then do that' kind of style. Janneke was spellbound, asked "why don't we solve these equations the way Stampioen did it?" We then compared the rhetorical solution with the quadratic equation formula, and found out that you can also remember that formula as a series of actions, instead of having to store a static formula in your photographic memory. Here the comparison with the past helped to clarify the present procedures. Janneke, by the way, later on went to university and studied econometrics: I feel history helped her at a crucial stage in her mathematical development. But maybe that is a biased impression!

Another example – I have read Euler with my class. I like Euler very much, because he has a very clear and open style, which is such a wonderful example of how to write and do mathematics. When my class came to learn logarithms the students

Jan van Maanen (in check shirt) discussing strategy with international colleagues in the HPM movement

read Euler's marvellous exposition as homework (some helping by translating it out of Latin) then checked his reasoning and calculations. They seemed to me to understand logarithms, as a result, much more clearly than the way I myself was taught the subject thirty years ago. Also my colleague teachers of classical languages profited, since this Euler passage was the first text these students read for another sake than just learning Latin.

Is history only or most useful, then, for a school such as Christelijk Gymnasium whose pupils study Latin as well, and most of whose students go on to university?
No, I do not think so. In fact, teachers working with a range of disadvantaged or low attaining or unconfident students report considerable success in exploring mathematics from a historical perspective. My colleague Marjolein Kool, for example, has done just this kind of thing with low-attaining teenagers, and found old Dutch mathematics texts an ideal source of stimulation and reassurance. Part of the reason for the success, of course, is that this kind of historical material enthuses and motivates us, the teacher, so the teaching is bound to have an infectious spark, and that's so much of the battle. The difficult point is whether it transfers: take a school at random, a teacher at random – would history also be interesting for such a teacher? For the pupils? How would you reach this teacher? That's the challenge. It's true that other mathematics teachers might find they can inspire pupils through their involvement in something like sailing or sundials or football, so it's tempting to say that enthusiasm is the main quality needed. But history has a whole range of further benefits too, as our ICMI Study is showing.

So tell me about the ICMI Study.
You could easily answer this yourself, since we are co-chairing this event, but I appreciate that answers are to come from me in this interview. Last year there was a conference at the French Mathematical Society's retreat in Luminy, near Marseilles, at which 75 mathematics teachers, educators and historians from around the world came together for a week to exchange experiences and perceptions. There they made a systematic and comparative survey of the improvements in mathematics teaching and learning through historical dimensions and resources – and also of the problems connected with this approach. The results are being written up in a book which should be published in time for the next ICME to be held in Tokyo in August 2000.

What kind of results have you got, or do you expect, from the ICMI Study?
I've hinted at the main thing, which is the great range of students – across ages, across abilities, across subjects, across countries – whose mathematical learning and understanding is helped by having historically resourced teachers. The second main finding is the enormous range of ways in which such teachers can make use of history, from telling stories to setting projects and designing curricula.

Should history of mathematics itself be taught in schools?
Mathematics should be taught as a living, dynamic subject, and history can contribute to that. If history is taught as such, it is only as a means of evoking mathematical understanding. A teacher who monotonously reads from a history book will hardly be helping pupils! But suitably chosen history can be really beneficial. The teacher who is teaching L'Hôpital's Rule, for example, can bring a good and memorable kind of pathos into the classroom by talking about Johann Bernoulli who – as a young man with advanced knowledge about the new field of differential calculus - taught the rich nobleman L'Hôpital, who made a contract that Bernoulli would send letters about his mathematical discoveries. L'Hôpital sent money in return, and could do with Bernoulli's findings what he wanted. So L'Hôpital wrote, in 1696, the first textbook about differentiation, in which he included Bernoulli's method for calculating limits, which is still known under L'Hôpital's name – and Bernoulli could do nothing about it (although he tried, after L'Hôpital's death). For some pupils this is just a rule, one of many. Pupils who know the story behind the rule will not easily forget it. The story gives the rule a profile, and in this manner supports the memory.

Is there any particular reason for your interest in Johann Bernoulli?
Since you ask, he was one of the early stars of the University of Groningen, where I teach. Bernoulli's Groningen was the second university in the world (after his brother Jakob's Basel University) to teach calculus – that was in 1698 – and we're rather proud of that. In fact in 1996 the University commissioned a sculpture to commemorate Bernoulli's association with Groningen, and in particular his celebrated work on the brachistochrone problem, showing the curve of quickest descent to be a cycloid. Bernoulli's solution is represented in a great steel sculpture by the generating circle of the cycloid and two vast cycloidal arcs. It's quite eye-catching.

And has much of mathematical interest happened in Groningen since Bernoulli's day?
Not different from many other academic institutions, I guess. But let me tell you about just one episode. In 1914 Alicia Boole, the daughter of George Boole, was awarded an honorary degree at Groningen, which was rather revolutionary at that time, for her work on polytopes (her word for four-dimensional regular polyhedra). A few years ago Dirk Struik, the great Dutch historian of mathematics now in his 105th year, asked me if there were still any traces of Alicia Boole at Groningen; I found that indeed her own wonderfully colourful drawings of polytopes are still kept at our department, and that a set of models of three-dimensional sections of them is in the university museum.

How does the presence of so much history of mathematics influence or benefit today's Groningen students?
I have no firm evidence for that. The history of maths course is fairly popular, and some of my colleagues do integrate history in their lectures. The clearest thing I notice is that students use the Bernoulli sculpture as a backdrop for taking photographs of each other! Maybe also business administration students who have their own fantasy with the statue. The big circle as a symbol for generating money instead of cycloids?

The cycloidal lines of Henk Ovink's Bernoulli sculpture (1996) are seen against the buildings of the University of Groningen.

Interview with Olavi Nevanlinna

President of ICIAM

interviewer: Rolf Jeltsch, EMS President

Olavi, let me congratulate you on your election as President of ICIAM. The applied mathematics community always associated this name with the conferences like ICIAM99 in Edinburgh. Why did your organisation change its name from the nearly unpronounceable CICIAM?
CICIAM was the abbreviation of 'Committee for International Conferences on Industrial and Applied Mathematics'. It was felt that the new name describes more accurately the aims of the organisation as set out in its bylaws. The congresses will be advertised in the old way; for example, the next international congress on industrial and applied mathematics, will take place in Sydney, 7–11 July 2003, and will be called ICIAM2003.

What are the aims of ICIAM?
To promote industrial and applied mathematics internationally, to promote interactions between member societies and their goals, and to coordinate planning for regularly occurring international meetings on industrial and applied mathematics.

What do you personally want to achieve as president of ICIAM over the next four years?
If one thinks of the ICIAM congresses as an emerging process, it has surely started well. These congresses answer a strong need and this positive development must continue. CICIAM acted mainly as a standing committee for these congresses. Now, however, it is time to focus also on other aims of the organisation. With this shift of focus, we have seen that the operational mode followed by CICIAM is no longer sufficient.

In Edinburgh we changed our bylaws and from now on we have four elected permanent officers: a President, a former President/President elect, a Secretary and a Treasurer. My intention is to get the officers to work as a team which prepares and executes those decisions reached by the ICIAM Board at its annual meeting. Our vision of ICIAM is, I think, shared by all involved: to become a truly globally operating organisation in its field. I think we will achieve this goal in an organic way, by building on the tradition of applied mathematics where many important societies and are – and have been – multinational by nature.

How do you position ICIAM in the societies in the world? Some of your member societies are also corporate members of EMS. Would it still make sense for EMS to join ICIAM associate member?
ICIAM has only scientific societies as members. In Edinburgh our by-laws were changed so that societies significantly – but not primarily – dedicated to applied or industrial mathematics can be associate members of ICIAM. I am convinced that EMS becoming an associate member would benefit both ICIAM and EMS.

If I remember correctly, the ICIAM conference series was started in 1987 in Paris out of protest to the ICM congresses of IMU. What is the relation nowadays between ICIAM and IMU?
It is true there has been some frustration over the minor role accorded to applied mathematics at ICM congresses, but the main motivation was undoubtedly the need for international congresses dedicated to applied mathematics. The community had grown large and strong enough to emerge in its own right. At present there are no formal links between ICIAM and IMU, but in Edinburgh a decision was reached to establish contacts.

I've noticed that the applied mathematics community has grown in size and the number of mathematicians in this area is surely almost equal to the number of the mathematicians in areas outside applied mathematics. Can you confirm this?
Yes, I think we can say that their size is of the same magnitude.

Do you think that one should adapt the subject classification used at ICM and ECM congresses to reflect this change?
Well, yes, I think the classification used at ICM congresses surely has a strong subconscious influence on what is viewed as valuable within mathematics. And from this perspective the situation is far from satisfactory. It is interesting to look back on the history of IMU. There have been a number of attempts to increase connections to applications. However, these have rather been attempts to reach out to such fields as theoretical mechanics or theoretical computer science, instead of supporting the existing applied mathematics community within mathematics.

The acronym ICIAM comprises 'Industrial and Applied Mathematics'. Where do you position this type of mathematics within the whole of mathematics?
Perhaps the customary way of thinking is to put it at the periphery, where it lives closely connected with its neighbouring fields within other sciences. However, if we ask ourselves why mathematics exists in the first place, in this socio-economic world, it is at the very centre.

Is Industrial Mathematics not simply one aspect of Applied Mathematics?
Not really. To me, applied mathematics refers to a certain, specific area within the science of mathematics, whereas industrial mathematics relates more to its application in industry. For example, a smaller conference within some field of applied mathematics would typically take a slice of applied mathematics following some classification as in science, while a reasonable slice of industrial mathematics might collect different types of mathematical tools vital to one fixed industrial area.

For the newest arrival on the scene, Computational Science and Engineering, or CSE, many centres have been created and new curricula set up. Is CSE a science? Should it be taught?
It is true, CSE is arriving in many places now. I know you have a programme at ETH and we are starting a program at Helsinki University of Technology as well. I think the name of this discipline, CSE, is very honest in that it emphasises computa-

Olavi Nevanlinna (right) and Rolf Jeltsch during a working break in Helsinki, summer 1978.

Celebrating the election of Prof. Olavi Nevanlinna (right) as President of ICIAM at Rolf Jeltsch's house in Zurich, autumn 1999.

tion as a tool to obtain new scientific results and to propose new or develop existing engineering practices. Naturally it has to be taught. The fact that it is an interdisciplinary subject makes teaching more difficult, but no less important.

You were elected just a few days ago and hence I feel very flattered that your first trip, directly after the visit to your predecessor, Reinhard Mennicken, should be to me.
Mister President. I am flattered that you are flattered. I like this city. Zurich is surely one of the centres of mathematics. For example, it has hosted the ICM no less than three times – no other venue was chosen more than once. Maybe we should tell the readers that we used to work together, quite a lot actually, in the late 1970s and early 1980s, and I am aware that we think along similar lines: that applied mathematics really does need a push and that this push will eventually benefit pure mathematics.

This occasion* [*raising their glasses to drink to their close co-operation*] *reminds me of an old photo of the two of us, taken in Helsinki in 1978 where we celebrated something, although I don't remember what.
It must have been the fair number of beautiful theorems we proved during the two months on the beach at our summer place.

May I ask you a more personal question? You come from a very famous family of five generations of mathematicians. When I used to lecture on our joint work, people always wanted to know about your family connection with Rolf Nevanlinna. I assume that our readers would like to know this too.
Well, Rolf, I have been asked this question a few times too. Rolf Nevanlinna was my grandfather's brother. When I decided to study mathematics I entered the Helsinki University of Technology in order to gain distance from the function theory school which dominated mathematics at the University of Helsinki at that time. I wanted to pursue my own career in applied mathematics.

Only after a dozen years as full professor did I allow myself to work in that area. Actually, while lecturing here at ETH during the summer term in 1992 I noticed a link between value distribution theory of meromorphic functions and perturbation theory of linear operators. Bearing in mind applications to iterative methods in large-scale computation, I wanted to be able to estimate the growth of a resolvent in such a way that small rank perturbations would be seen as small perturbations. Let me remind you that value distribution theory is often called Nevanlinna theory.

I am looking forward to an excellent cooperation between our two societies.
So am I, but should we say organisations rather than societies?

Yes, that might be more appropriate. Thank you very much for this interview.

Interview with Ian Frigaard

Schlumberger Dowell, Paris

interviewer: Heinz W Engl

The EMS Committee on Applications of Mathematics plans to conduct a series of interviews with recent mathematics graduates who now work in industry. These interviews with applied mathematicians will continue in future issues.

What kind of work do you currently do in your company?
The technical work involves solving practical engineering problems, usually involving continuum mechanics and more specifically, fluid mechanics of non-Newtonian fluids. The background to this is that Schlumberger Dowell are involved in providing cementing and drilling fluid services to the oil industry.

How much does it relate to mathematics?
The content of the work that I do is largely mathematical. However, this does not mean that I spend my time 'doing mathematics'. Significant proportions of my time are spent writing reports and papers, presenting and explaining my work, directing and helping others, programming, training, travelling, e-mail and bureaucratic activity. I think this is common in any large multinational company.

Tell us about your mathematical education and prior experience before your current employment.
I have a B.Sc. in Mathematics from University of Wales, which is a general 3-year UK mathematics degree. Following this I specialised in applied mathematics with an M.Sc. in Mathematical Modelling and Numerical Analysis at the University of Oxford. Finally I studied for my D.Phil. at Oxford. Although this was within the Department of Engineering Science, it was largely industrial mathematical modelling.

My current position is my fourth job. I spent three years working at Alcan International's Banbury Research Laboratory (UK), during and after my D.Phil. The work here coincided largely with my D.Phil. thesis work and was involved with modelling a novel Aluminium spray process. Following this I spent two years as an ECMI post-doctoral research fellow at the Institute for Industrial Mathematics, University of Linz, Austria. Here I did some feasibility type research for Voest Alpine Industreanlagenbau, on a Steel continuous casting process. I spent some time involved in activities with the ECMI research network active at the time and some time publishing work from my thesis. I also lectured in fluid mechanics at the university. I joined Schlumberger Cambridge Research after this and spent eighteen months there before starting my current job. My experience there was quite varied, with much learnt about the oil industry and oilfield-type engineering, rather than undertaking any particular or significant mathematical work.

How do you view all this in view of your current work? What was especially important, what was missing and should have been emphasised more?
Most of my work in the past seven or eight years has been in the area of industrial/applied mathematics. I think I was fortunate to do the M.Sc. course, which gave me enough confidence (and a toolbox of skills) to go out and tackle some real problems. After this, every experience has helped to build my problem-solving abilities. I've changed industry two or three times now and each time I find the learning curve of 'what the problems are' is easier to climb. Two important things from my perspective are:
– in an applied mathematician's education 'modelling' and 'problem-solving' are essential, but if they want to work in industry the first thing to recognise is that the 'problem' is not a mathematical one, at least at first. This is hard to put into a conventional maths education and should not be at the expense of learning mathematics.
– once working in industry as a mathematician, the opportunities to stay in touch and work with academic mathematicians become very important intellectually.

How much of your work needs numerics?
Nearly all, but the numerical mathematics is rarely used or useful when I don't already understand the problem or its solution, at least partly, through analysis or intuition.

What skills in addition to mathematical ones do you need most?
Diplomacy, communication and presentation skills. The ability to see through business bullshit.

Dr. Frigaard also expressed his view that in his experience, companies rarely hire mathematicians as such, but they are looking for people with expertise in a specific problem area, so that mathematicians have usually to compete with engineers.

Heinz W. Engl is Chairman of the EMS Committee on Applications of Mathematics.

1999 Anniversaries

There are many mathematical anniversaries in 2000. If you are interested in writing a column on any of the following, please contact either of the column editors, June Barrow-Green and Jeremy Gray, in the first instance: Niccolo Tartaglia (b.1500), John Napier (b.1550), John Maior (b.1550), Adrian Vlacq (b.1600), René Descartes (d. 1650), Daniel Bernoulli (d. 1700), Simon L'Huilier (b. 1750), Abraham Kaestner (d.1800), Lorenzo Mascheroni (d.1800), Karl Feuerbach (b. 1800), Sonya Kowalewskaya (b.1850), Alfred Pringsheim (b.1850), Bernt Holmboe (d.1850), Eugenio Beltrami (d.1900), Joseph Bertrand (d.1900), Elwin Christoffel (d.1900), Jean-Frédéric Frenet (d.1900), Mary Cartwright (b.1900), Constantin Carathéodory (d.1950), Ernst Hellinger (d.1950), Aleksandr Khinchin (d.1950) and Nikolai Luzin (d.1950).

A century of celestial mechanics: Laplace (1799) to Poincaré (1899)

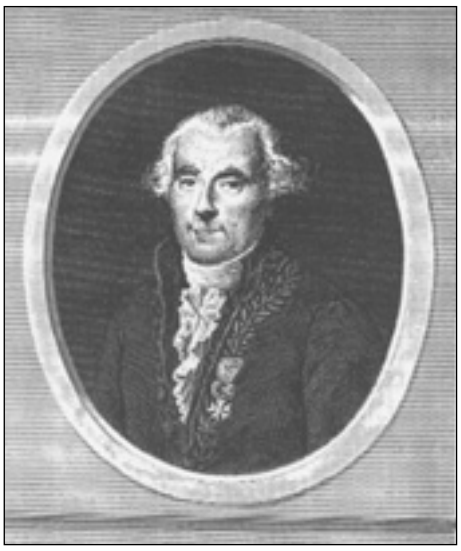
June Barrow-Green

Of the myriad of subjects that feature in 19th-century mathematical research, none more completely embraces the period than celestial mechanics. The century both opened and closed with seminal works of monumental proportion. When it began, the first two volumes of Laplace's *Traité de Mécanique Céleste* were barely a few months old – they were published in October 1799 – and when it ended, the final volume of Poincaré's *Les Méthodes Nouvelles de la Mécanique Céleste* had just appeared. There was of course a substantial quantity of work produced in between, initially prompted by Laplace's work which became the springboard for research in both theoretical and practical astronomy. His followers focused themselves on extending the results, improving the methods of investigation, and illustrating the more obscure points of the theory. But research into celestial mechanics was not done only by those, such as Delaunay, Le Verrier, Newcomb, Hill and Tisserand, who specialised in the subject. Such was the subject's appeal that it frequently engaged the attention of mathematicians whose reputations resided elsewhere. Arthur Cayley, for example, was renowned as a pure mathematician, but wrote almost forty papers for the Royal Astronomical Society.

Considered together, the treatises of Laplace and Poincaré provide a remarkable example of the expansion and evolution of mathematical thought during the century. At the end of the eighteenth century, research into celestial mechanics was sufficiently limited that it was realistic for Laplace to aim to set down all there was to know about the subject. Furthermore, it was also a time of great faith in the ability of mathematics to quantify the world. In keeping with such a belief, Laplace, who was 'always less enamoured with the beauty of mathematical speculation than he was anxious to unfold the system of the world' [7, p.111], actively pursued methods that could be used to yield quantitative information. But by the end of the century a significant change had taken place. Not only had the subject grown well beyond the scope of a single researcher, but the general thrust of the activity had changed. No longer dominated by a single methodology, a split had emerged between the quantitative and the qualitative approaches. There were those, such as George Darwin, who calculated orbits using numerical analysis [3], but the innovative theoretical development lay with the qualitative analysis of Poincaré. In contrast to the methods of Laplace, the methods of Poincaré, which relied heavily on geometric intuition and reasoning, were quite unsuitable for use in quantitative analysis at the time when they were conceived.

Pierre-Simon Laplace (1749-1827)

Laplace began his career as professor of mathematics at the École Militaire in Paris where he taught from 1769-76. His first published paper, on the integral calculus, was published in 1771, and he was elected to the Académie des Sciences in 1773. During the 1770s he established his mathematical reputation, embarking on a programme of research in celestial mechanics and in probability, the two subjects for which he would become most famous. With regard to celestial mechanics, he was particularly fascinated by the problem of the stability of the solar system. He was convinced that stability could be proved by Newton's laws and his quest for a resolution of the problem was to prove a fertile ground for his ideas, most notably in his introduction of perturbation methods.



Pierre-Simon Laplace

In the 1780s Laplace pushed forward his earlier work and achieved many of his most important results. These included his discovery of the long period inequality occurring in the mutual perturbations of Jupiter and Saturn, and the cause of the secular variation of the mean motion of the moon. These discoveries added further conviction to his belief in stability, and by 1788 he had become certain that stability was beyond doubt. It was also the time during which he engaged in experimental physics, most notably in the chemical physics of heat, in active collaboration with Lavoisier. In the early 1790s he was also heavily involved in the preparation of the metric system.

By 1795 Laplace had begun to compile material for *Mécanique Céleste* and in that year embarked on giving his first and only lecture course at the École Normale. The course was never completed, due to the closure of the École, and for the missing lectures the students were referred to a book that Laplace was in the process of writing. The book, *Exposition du Système du Monde*, which was published the following year, contains a non-mathematical account of planetary motion, rational mechanics and gravitational theory, as well as a summary of the history of astronomy. It proved a resounding success. Although a work in its own right, it also acts as an outline or prospectus for the *Mécanique Céleste*, and Laplace arranged for the second edition to be published specifically to accompany the launch of the treatise.

Laplace was also involved in politics, although not to great effect. When Napoleon seized power in 1799 Laplace became Minister of the Interior but after only six weeks he was replaced by Napoleon's brother. He was later appointed to the Senate and in 1803 became chancellor of the Senate, a position of little power but of substantial salary. Napoleon, having realised the limits of Laplace's capabilities, described him as having 'carried the spirit of the infinitesimal into administration' [5, p.176].

Traité de Mécanique Céleste (1799-1825)

In October 1799 Laplace presented Napoleon with copies of the first two volumes of *Mécanique Céleste*. Napoleon's response is legendary. He accepted the gift with the promise that he would read them 'in the first six months I have free'. He also invited Laplace and his wife to dine the following day 'if you have nothing better to do' [5, p.176]. The third volume, which was dedicated to Napoleon, appeared in 1802, the fourth in 1805, and the final volume in 1825. Although immediately recognised as a masterpiece, its mathematical difficulty combined with its broad range of subject matter meant that only a very few were able to read it all with any degree of facility [8, I, p.62].

The whole was conceived as two parts: the first, consisting of Volumes I and II,

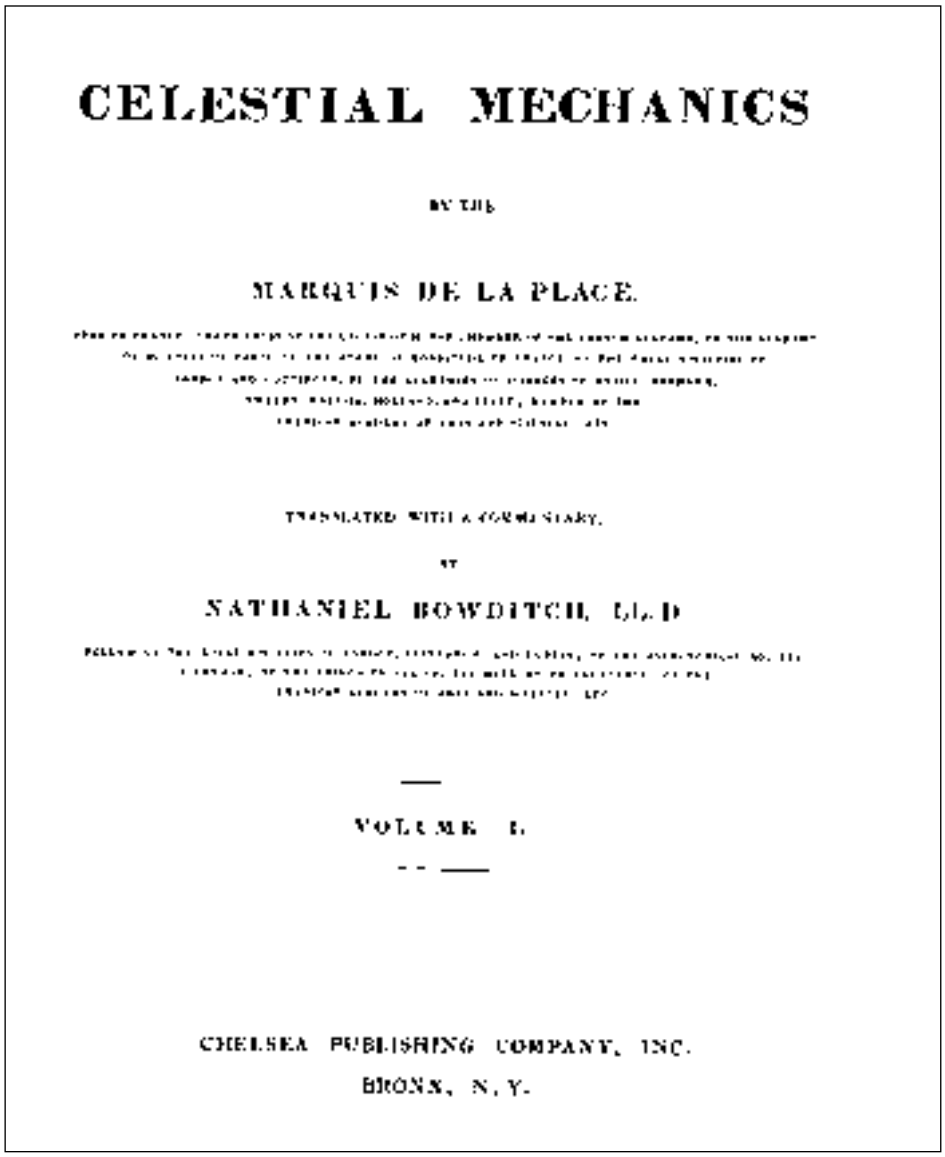
deals with the methods and formulae necessary to determine the different types of motion, while the second is concerned with the application of the formulae to planets, satellites and comets. As Laplace himself declared, he had dual objectives in writing the treatise. First, to provide a connected view of all the existing theories of celestial bodies which derive from the law of gravity, and, second, to improve the precision of astronomical tables. Much of the work is derived from Laplace's earlier research. In some cases he used almost complete publications, while in others he made revisions to the papers so that they fitted in with his overall schema. He also included extensive applications of techniques he had previously developed [5, Chapter 21].

The treatise opens with a mathematical exposition of the general principles of statics and dynamics as applied to material points, systems of bodies and fluids. The law of gravity is deduced from observation, the differential equations of gravitational attraction are derived, and there are discussions of the theory of elliptical motion and of perturbation theory, with specific techniques – such as approximating periodic inequalities – illustrated using particular examples.

Volume II covers the shape of celestial bodies, and the oscillations of the sea and the atmosphere. It begins with an examination of the attraction of spheroids and includes a comparison of spheroidal attraction theory with the results of geodetic surveys of meridional arcs. The latter, which draws on previously unanalysed data from the survey of the terrestrial meridian from Dunkirk to Barcelona (on which the metric system was based), also contains the application of error theory. Further discussions include the shape of Saturn's rings, and the shape of the atmosphere of celestial bodies. These are followed by chapters on the ebb and flow of tides, the stability of equilibrium of the sea, the influence of local conditions, and a comparison with observation. The volume concludes with an analysis of the rotation of celestial bodies, with examples drawn from the earth, the moon, and the rings of Saturn.

In Volume III Laplace deals with both planetary and lunar theory with a view to providing a tool for accurate positional astronomy. In order to obtain the necessary degree of precision he had to extend the methods he had developed in Volume I since these encompassed only those inequalities independent of the eccentricities or inclinations of the orbits, or those dependent on the first power of these quantities. Here he carried the approximations to higher powers, and applied to all the planets the method he had previously used on Saturn in his work on Jupiter and Saturn. Having derived the formulae, he then employed the calculator Alexis Bouvard to substitute in the values of the elements according to each planet, in order to get numerical expressions for each radius vector and its motions in longitude and latitude.

The first part of Volume IV is mostly taken up with the theory applied to the



CELESTIAL MECHANICS

BY THE

MARQUIS DE LA PLACE.

TRANSLATED WITH A COMMENTARY,

BY

NATHANIEL BOWDITCH, LL.D

VOLUME I.

CHELSEA PUBLISHING COMPANY, INC.

BRONX, N. Y.

Jovian satellites, but it also includes short chapters on the satellites of Saturn and of Uranus, as well as a brief discussion of the theory as applied to comets. The second part of the volume, which contains mostly new material and moves into a quite different mode, examines 'several questions relative to the system of the world'. These include astronomical and terrestrial refractions, barometric measurements of altitude, and the influence of the earth's rotation on the descent of bodies falling from a great height.

The fifth volume, originally intended to provide a history of the subject together with an account of the work of his contemporaries, ended up rather differently. It had been delayed due to Laplace's change in priorities – probability and physics had overtaken celestial mechanics in his interests – and by the time he came to publish the final volume he was in the twilight of his career and felt unable to carry out the task he had promised. Instead he took recourse in the papers on celestial mechanics he had published in the early 1820s (which consisted mostly of corrections and improvements to theory he had previously covered in Volumes I to IV) and reconceived Volume V as a unification of these researches accompanied by historical summaries.

The early parts of Laplace's work were rapidly translated into English by several authors, but these were supplanted by the masterful translation of the first four volumes by the American mathematician Nathaniel Bowditch (1773-1838). In recognition of the difficulty of the mathematics, Bowditch provided an extensive commentary, including many diagrams, which was of a similar length to the treatise itself. He also corrected some calculating errors. An estimate of the remarkably high standard of Bowditch's commentary can be gauged from the fact that Legendre considered it equivalent to a new edition, and that requests were made for it to be translated into both French and Italian. Although Bowditch completed his translation between 1814 and 1817, his insistence upon publishing it at his own expense meant that it did not appear until several years later (1829-39). He wrote several notes on the fifth volume but died before he was able to complete the translation. Laplace's material was also reworked by other authors for different audiences, as in the edition that brought Mary Somerville to fame, *The Mechanism of the Heavens* (1831).

Activity in the rest of the century strong-

ly reflected the influence of Laplace and it was not until the end of the century that a major new development took place.

Henri Poincaré (1854-1912)
Poincaré was awarded his doctorate from

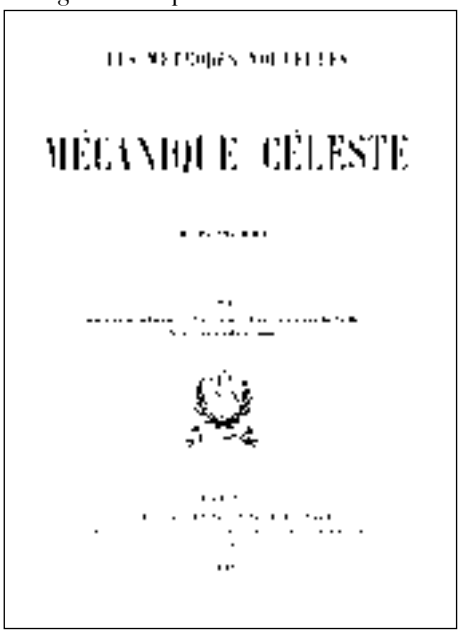
Henri Poincaré, 1872

the University of Paris in 1879, and after a brief appointment at the University of Caen, returned to the University of Paris where he remained for the rest of his life. In 1886 he became Professor of Mathematical Physics and Probability, and in 1889 Professor of Mathematical Astronomy and Celestial Mechanics.

Almost from the beginning of his academic career, Poincaré had been concerned with the fundamental problems of celestial mechanics – in particular the three-body problem and the stability of the solar system – and many of the papers he published during the 1880s relate to his interest in the subject. These include many of a broad theoretical nature, such as those on the qualitative theory of differential equations, as well as those in which he responded to explicit questions of dynamical astronomy.

In 1890 Poincaré's celebrated Oscar prize-winning memoir on the three-body problem was published, although the story of its conception and publication had begun some five years earlier [1]. Today the memoir is famous for providing the foundations for his *Les Méthodes Nouvelles de la Mécanique Céleste*, and for containing the first mathematical description of chaos. The memoir, which is centred on the restricted three-body problem, introduced several new ideas into the study of dynamical problems, including the use of variational equations and the use of invariant integrals. But above all the memoir is dominated by his theory of periodic solutions. By taking a reductionist view and studying the periodic solutions of a system with two degrees of freedom, Poincaré's global qualitative perspective led him to the brilliant discovery of asymptotic solutions. His analysis of the complex nature of these solutions then resulted in his discovery of *homoclinic* points and the beginnings of the mathematical theory of chaos.

***Les Méthodes Nouvelles de la Mécanique Céleste* (1892-99)**
The three volumes of *Les Méthodes Nouvelles de la Mécanique Céleste* were published in 1892, 1893 and 1899. When George Darwin presented the medal of the

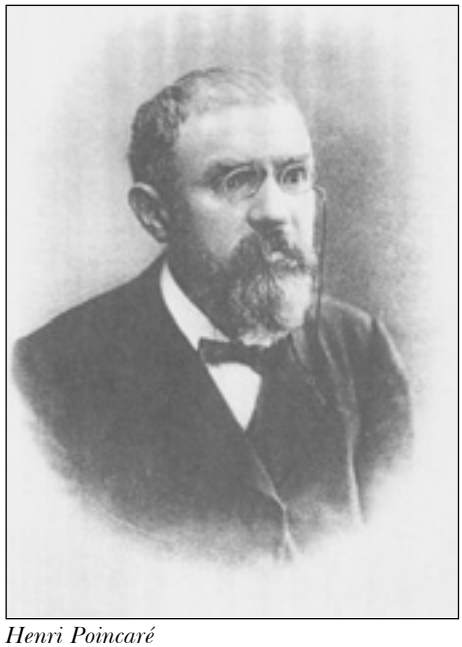


Royal Astronomical Society to Poincaré in 1900, he said, 'It is probable that for half a century to come [*Les Méthodes Nouvelles*] will be the mine from which humbler investigators will excavate their materials' [4]. With the benefit of hindsight it is possible to say that had Darwin omitted the word "half", his prediction would still have been fulfilled. Nevertheless, although highly acclaimed, *Les Méthodes Nouvelles* received relatively few reviews, and almost none engaged critically with the content, indicating the difficulty of the subject matter. (In recognition of the work's general inaccessibility, Poincaré produced another three volume set, *Leçons de Mécanique Céleste*, which covered similar topics but which was aimed at a mathematically less sophisticated audience. The *Leçons*, which were based on lectures given at the Sorbonne, appeared between 1905 and 1910 and is an altogether more practical work.) *Les Méthodes Nouvelles* contain the principal ideas from the 1890 memoir but in a more fully explained and developed form. Further applications of the theory are included besides a substantial amount of new material, and the focus of attention is more on the general three-body problem than on the restricted problem.

Volume I covers the analytical part of the theory with many of the topics discussed in the 1890 memoir revisited, but with a greater emphasis on the role of the Hamiltonian form of the equations. There is an amplified treatment of periodic solutions, with a stronger affirmation of the conjecture about the denseness of the periodic solutions, and, as in the memoir, there are chapters on characteristic exponents, asymptotic solutions and the nonexistence of new single-valued integrals. The one completely new chapter is on the expansion of the perturbation function.

In Volume II Poincaré concentrated on the methods of contemporary dynamical astronomers – namely, Newcomb, Gyldén, Lindstedt and Bohlin. Throughout his researches he had become increasingly aware of the differences that had evolved between the perceptions of mathematicians and of astronomers as to what constituted a solution to a problem in celestial mechanics, and that these differences often led to what appeared to be inconsistent results. In this volume he attempted to clarify the situation and to explain the discrepancies. In particular, he forcefully demonstrates the importance of understanding the nature of the convergence of the different series used in the expressions for the co-ordinates of the planets. Most of the material is completely new, apart from the discussion of the divergence of Lindstedt's series. In the latter Poincaré reaches fundamentally the same conclusion with regard to divergence as he had earlier but, displaying more caution than before, he now casts doubt over the case where the frequencies are chosen in advance. (Almost seventy years later it was shown by Kolmogorov, Arnold and Moser that Poincaré had been right to be guarded about his conclusions.)

The final volume is characterised by Poincaré's geometrical ideas. Here Poincaré returned to the subjects of invariant integrals, stability, periodic solutions of the second class – periodic solutions that make more than one orbit around the primary – and doubly asymptotic solutions. The volume also included a discussion of what he now called periodic solutions of the second species. These are solutions which arise from a system involving two



Henri Poincaré

very small bodies orbiting one large one and which narrowly avoid collisions at definite intervals, the existence of which he had conjectured at the end of the 1890 memoir.

Poincaré's discussion of doubly asymptotic solutions contained essentially the same analysis as the memoir but with one important addition. In the memoir

Poincaré had shown that corresponding to each unstable periodic solution there was a system of asymptotic solutions. However, he had only considered the possibility of doubly asymptotic solutions arising from different families of asymptotic solutions associated with the same unstable periodic solutions. These are what he called *homoclinic* solutions. Now he proposed that a doubly asymptotic solution of a different type could arise from asymptotic solutions associated with two different unstable periodic solutions, and these he called *heteroclinic* solutions. In both cases he showed that the existence of one of these solutions is sufficient to prove the existence of an infinite number, and, in contrast to the memoir, he is absolutely explicit about their bewildering complexity.

The difference a century makes

Although the aims of the two authors were fundamentally the same – to determine whether Newton's law of gravity explains all astronomical phenomena – their methodologies were palpably different. Laplace developed the theory and then, combining observation and calculation, demonstrated its usefulness, while Poincaré, mindful of the shortcomings of both observation and calculation, focused almost entirely on the theoretical development. Nevertheless there are similarities between the two treatises. They both owe their genesis to an abiding interest in the problem of the stability of the solar system. They both rely heavily on previously published work and both are showcases for exciting results: Laplace's discovery of the long period inequality of Jupiter and Saturn, and Poincaré's discovery of homoclinic point to name but two. Both works are extremely mathematical and virtually impossible for all but the specialist to assimilate, but in each case the author did provide a simplified counterpart: Laplace with the *Systéme du Monde* and Poincaré with the *Leçons de Mécanique Céleste*. Both treatises are characterised by a conspicuous lack of diagrams. Laplace, who did not include any, assumed his audience sufficiently well versed in analysis not to need them. Poincaré, who included a few, relied little on pictorial representation himself – he was renowned for his inability to draw – and was probably oblivious to the needs of others not blessed with his gift of geometric visualisation.

Another way in which the two works differ is in the speed and type of response they received with respect to translation. Poincaré's treatise, unlike that of Laplace, did not receive immediate attention. The first English translation of *Méthodes Nouvelles*, which was published in 1967 by NASA, appeared more than sixty years after the original and contained little by way of commentary. The different rates of response with respect to translation reflect the perceived utility of the two works. Laplace's treatise is not a homogeneous whole but rather 'a textbook, a collection of research papers, a reference book, and an almanac' [5, p.184] rolled into one. It has an obvious practical dimension – there are techniques and results that people wanted to use and indeed Laplace expected them to use – and it was clearly a tool for further research. Poincaré's work on the other hand was deeply theoretical and fiercely difficult, and while it contained mathematical techniques of great interest to mathematicians, the inability of researchers to engage in a quantitative analysis due to inadequate computing techniques meant that it had only specialised appeal. The demand for translation was generated when, with improved computing power and the stimulus of a developing space programme, Poincaré's methods could actually be applied. More recently, with the advent of the modern digital computer and the explosion of research into non-linear systems resulting in the unfolding of the mathematical theory of chaos, interest in Poincaré's work has intensified and in 1993 a second translation was published [6].

Both Laplace's *Traité de Mécanique Céleste* and Poincaré's *Les Méthodes Nouvelles de la Mécanique Céleste* opened a new era in the study of celestial mechanics. Each work stands as a testament to the genius of its author. Poincaré did not supersede Laplace, he launched out in a different direction. In the words of Gaston Darboux, each merits a place alongside the other [2].

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Otto Neugebauer (b. 1899)

Jeremy Gray

Otto Neugebauer was one of the few great historians of mathematics there has ever been. Born in Innsbruck, Austria, on 26 May 1899, he was attracted to mathematics at school but joined the Austrian Army in 1917 in order to be excused the school leaving examination in Greek, which he claimed he had no chance of passing. He was taken prisoner at the armistice and spent almost a year in a prisoner of war camp; Ludwig Wittgenstein was a fellow prisoner.

By 1922 he had made his way to

This Babylonian tablet, described by Neugebauer, illustrates a knowledge of Pythagorean triples 1000 years before Pythagoras.

Göttingen, where he struck up life-long friendships with Richard Courant, Harald Bohr, and the Russian mathematician Alexandroff. His only publication in pure mathematics is a joint paper with Bohr on almost periodic functions. Bohr had already asked him to review T. E. Peet's new edition of the Rhind papyrus, knowing that Neugebauer had embarked on a serious study of Egyptian; his Göttingen dissertation, on the vexed topic of Egyptian unit fractions, was conducted with the approval of Courant and Hilbert. In 1927 he began lecturing on ancient mathematics, and it was these lectures that brought van der Waerden to the subject.

In 1927 Neugebauer began to learn Akkadian, the language of Babylonian mathematics, and embarked on his greatest contribution to the history of mathematics. Whereas Egyptian sources were well known and often well studied, Babylonian sources hidden away in numerous museums were seldom read and standards were very low. Neugebauer was to publish his 3-volume collection on mathematical tablets in the mid-1930s. They established the great richness of Babylonian mathematics, far exceeding anything one could have guessed from Greek or Egyptian sources. The ramifications of this discovery continue to animate the study of ancient mathematics to this day, and as Neugebauer's own estimation of Babylonian mathematics and astronomy continued to deepen he refused any longer to consider them as 'pre-Greek'; indeed he found their level of mathematical abstraction and power exceeded Ptolemy's.

Neugebauer was also active in the design of the new Mathematics Institute at Göttingen, completed with money from the Rockefeller Foundation in 1929. He was the driving force behind the creation of *Zentralblatt für Mathematik und ihre Grenzgebiete*, which came out for the first time in 1931. When the Nazis came to power students attacked him for being politically unreliable (he was very liberal in his views) and he refused to sign the loyalty oath. Bohr was able to arrange for Neugebauer to move to Copenhagen in January 1934 on a three-year appointment, and he was able to bring *Zentralblatt* with him. He fought a long struggle to protect the journal from the Nazis and their supporters, Blaschke in particular, and eventually resigned as part of an organised protest at the dismissal of Levi-Civita from the editorial board.

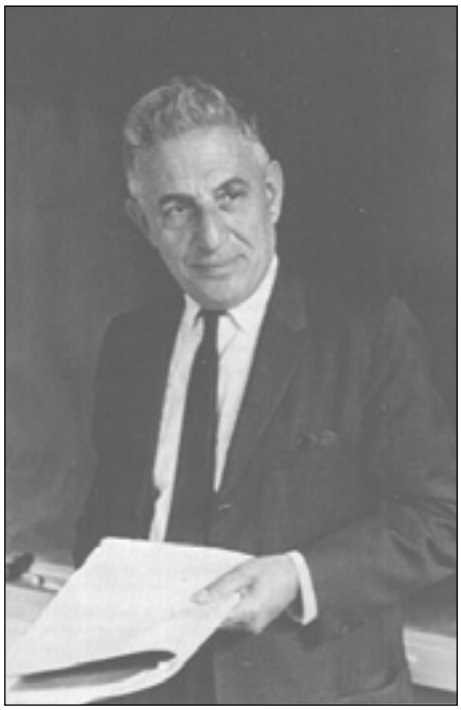
In 1939 Neugebauer sailed to America, where Brown University was offering him a professorship, and threw himself into the creation of *Mathematical Reviews*. The first edition appeared on time in January 1940, and Neugebauer is recognised as the founding editor (as he is of *Zentralblatt*, as the revived journal proudly says). At Brown he built up what became the leading institution in the world for the study of the history of the exact sciences, especially of the ancient world. It was a magnet for scholars around the world, and capable of drawing people in, despite the narrow-minded traditionalism of their home universities. Neugebauer published profusely, and much of our knowledge of ancient astronomy and chronology is due to him.

He received numerous honours and was elected to many learned societies, but it may be supposed that his greatest pleasure was in entirely reshaping and extending our knowledge of the history of science. Indeed, the message that Babylonians knew more (and, as he impishly insisted, the Egyptians knew less) than most people believe still needs amplification today. The high level of scholarship that now prevails in the subject gives every prospect that received opinion will change, and that high level is largely due to the standards he set himself, his organisational skills, and the support he was able to attract.

Oscar Zariski (b. 1899)

Jeremy Gray

Ascher Zaritsky was born in Kobrin in White Russia on 24 April 1899, the sixth child of Bezalel and Hannah Zaritsky, and spent his first eleven years there. His resourceful mother was able to afford a tutor for him in Russian and arithmetic from the age of seven. Oscar learned these subjects quickly and they proved his passport out of the Pale. The family fled the war to Chernigov in Ukraine, and Oscar returned briefly in 1918 before enrolling in the philosophy department at the University of Kiev in 1921 (there was no room in the mathematics faculty). Political upheaval eventually soon him to Rome, where he enrolled under Castelnuovo and



Oscar Zariski

the more sociable Enriques. They were among the great figures of algebraic geometry and this was the subject that Zariski was to work on more than any other. It was Enriques who suggested that he Italianise his name to Oscar Zariski, when they came to prepare their first joint paper for publication. It was also in Rome that Zariski met Yole Cagli. He married her on a visit to his home town of Kobrin in September 1924.

When the Fascists took power in Italy life became increasingly difficult for Jews, and with Lefschetz's help Zariski obtained a postgraduate fellowship at Johns Hopkins University. Lefschetz's work in topology was just one sign that Zariski was moving beyond his Italian mentors: Castelnuovo once said to him 'You are here with us but you are not one of us', referring to his algebraic inclinations and his insistence on rigour. In 1935 Zariski was to write an account that satisfied him of the algebraic theory of surfaces, which Castelnuovo and Enriques had done so much to start, but, as he put it, 'The price was my own personal loss of the geometric paradise in which I had so happily been living'.

By then Zariski had become a professor at Johns Hopkins, and in 1937 he became a full professor. He embarked on a programme of adapting and creating concepts in commutative ring theory to formulate and solve problems in algebraic geometry. He introduced the integral closure of a ring in 1937 and in 1939 applied it to the resolution of singular points on curves and surfaces. It was also in this context that he introduced the topology on an algebraic variety that now bears his name: the Zariski topology. He did this in 1944 to facilitate the study of what he called at the time the Riemann surface associated to a field, and by then he was thoroughly committed to developing algebraic geometry over arbitrary fields.

In 1945 Zariski was in Sao Paolo for a year. His duties included giving one lecture course of three hours a week; his audience consisted of one student, André Weil. They had already met at the Institute for Advanced Study in Princeton in 1937 and in Harvard in 1941, and the year they spent together was a stimulating one for each of them, despite, or perhaps because of, their often heated disagreements.

In 1947 Zariski made his final move, to Harvard, where he was to stay for the rest of his life and greatly influence the progress of algebraic geometry. Among his students there were Michael Artin, Robin Hartshorne, Heisuke Hironaka, Steven Kleiman, and David Mumford. Zariski's high standards and ambition for the subject, coupled with his urge to generalise beyond the familiar complex case, were instrumental in bringing Grothendieck's new vision of algebraic geometry to America, a transition in which all of his students played major roles. He stayed on at Harvard for five years after the usual retirement age, becoming a professor emeritus in 1969, but in the late 1970s his health began to fail and Alzheimer's disease was eventually diagnosed. He died on 4 July 1986.

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C.I.M.E. Summer Courses 2000

The Fondazione CIME will hold five courses in 2000: two courses will be held at Martina Franca (Taranto, Italy), two will be held at Cetraro (Cosenza, Italy), and one will be held at Funchal (Portugal), jointly organised by CIME and CIM (Centro Internacional de Matematica, Portugal).

Brief information concerning these courses is presented below. Further information can be found on the Web server of the CIME,
http: //www.math.unifi.it/CIME

If you are interested, please contact:
Fondazione C.I.M.E. c/o Dipartimento di Matematica 'U. Dini', Viale Morgagni, 67, A-50134 Firenze, Italy
tel: (+39)-55-434975 / (+39)-55-4237123
fax: (+39)-55-434975 / (+39)-55-4222695
e-mail: cime@math.unifi.it
Director: Prof. Arrigo Cellina [cellina@mat.unimi.it]
Secretary: Prof. Vincenzo Vespri [vespri@dma.unifi.it]

If you wish to attend, you should send an application to the C.I.M.E Foundation at the address above, one month before the beginning of each course (not later than 20 July for courses starting in September). In the application your field of current research must be specified.

An important consideration in the acceptance of applications is the scientific relevance of the Session to the field of interest of the applicant. Participation will be allowed only to persons who have applied in due time and have had their application accepted. CIME will be able partially to support some of the youngest participants. Those who plan to apply for support must mention this explicitly in the application form.

Sites and Lodging
Martina Franca is a charming, beautifully preserved ancient city on the hills of Puglia (South Italy), an architectural jewel. Participants are lodged at the Park Hotel S. Michele, a nice hotel with a well-kept garden and a large swimming pool. The Lectures will be at the Palazzo Ducale (City Hall), within short walking distance, at the Sala Arcadia. Cetraro is a beatiful location on the Tirrenian coast of Calabria (South Italy). The nearest train station is Paola on the line Roma-Salerno-Reggio-Calabria, easily reached even by fast trains (Eurostar trains stop in Paola).

CIME activities are made possible thanks to the generous support received from The European Commission, Division XII, TMR Programme 'Summer Schools'; Consiglio Nazionale delle Ricerche; Ministero dell' Università e della Ricerca Scientifica e Tecnologica; UNESCO-ROSTE, Venice Office.

Course 1: Dynamical Systems, Cetraro (Cosenza), 19–26 June

Jack Macki (Alberta)
Pietro Zecca (Florence) [pzecca@ingfi1.ing.unifi.it]
Stability and entropy in spatially discrete dynamical systems (6 lectures in English)
Shui-Nee Chow, Singapore
Planar dynamical systems (3 lectures in English)
Roberto Conti, Florence
Non-autonomous dynamical systems (6 lectures in English)
Russell Johnson, Florence
Waves in spatially discrete dynamical systems (6 lectures in English)
John Mallet Paret, Providence
Recent trends in the theory of non-linear delay equations (6 lectures in English)
Roger Nussbaum, Rutgers

Course 2: Diophantine Approximation, Cetraro (Cosenza), 28 June – 6 July
Scientific Direction:
Francesco Amoroso (Caen) [amoroso@math.unicaen.fr]
Umberto Zannier (Venice) [zannier@brezza.iuav.unive.it]
(6 lectures in English for each course)
Diophantine Approximation on Commutative Groups Varieties
David Masser, Basel
The Absolute Subspace Theorem
Hans Peter Schlikewei, Marpurg
Zeros of linear recurrence sequences
Wolfgang Schmidt, Colorado
Linear Independence measures for Logarithms of algebraic numbers
Michel Waldschmidt, Paris

Course 3: Mathematical Aspects of Evolving Interfaces, Funchal (Portugal), 3 – 9 July
Organised by CIME and CIM (Centro Internacional de Matematica, Portugal)
Scientific Direction:
Pierluigi Colli (Pavia)[pier@dragon.ian.pv.cnr.it]
Jose-Francisco Rodrigues (Lisbon) [rodrigues@lmc.fc.ul.pt]
(3 lectures (90 minutes) in English for each course)
Distance function and evolution of fronts by implicit time discretisation
Luigi Ambrosio, Pisa
Numerical approximation of mean curvature flow of graphs
G.Dziuk, Freiburg
Dynamics of patterns and interfaces in reaction-diffusion systems from chemical and biological viewpoints.
Masayasu Mimura, Hiroshima
Evolution free boundary problem for parabolic and Navier-Stokes equations
V. A. Solonnikov, St Petersburg
Variational and dynamic Problems for the Ginzburg-Land Functional.
H. M. Soner, Princeton

Course 4: Mathematical Methods for Protein Structures Analysis and Design, Martina Franca (Taranto), 9 – 15 July
Scientific Direction:
Concettina Guerra (Padua) [guerra@dei.unipd.it]
Sorin Istrail (Sandia) [scistra@frodo2.cs.sandia.gov]
(4 lectures in English for each course)
Mathematical protein Structure Analysis.
Arthur Lesk, Cambridge
(Title to be announced)
Michael Levitt, Stanford
High Speed Computations for the Design of Proteins.
John Moult, Maryland
Geometric Computing in Structural Molecular Biology.
Haim Wolfson, Tel Aviv

Course 5: Noncommutative Geometry, Martina Franca (Taranto), 3–10 September
Scientific Direction:
Sergio Doplicher (Rome) [dopliche@mat.uniroma1.it]
Roberto Longo (Rome) [longo@mat.uniroma2.it]
(6 lectures in English for each course)
Noncommutative Geometry
Alain Connes, Paris
K-Theory and Cyclic Cohomology
Joachim Cuntz, Munster
Group C-algebras and K-Theory*
Nigel Higson, Pennsylvania
The Algebraic Approach to Quantum Field Theory.
John E. Roberts, Rome

Journal of the European Mathematical Society (JEMS)

The contents list of the fourth issue of the JEMS is as follows:
Volume 1, Number 4

Edson de Faria and Welington de Melo, Rigidity of critical circle mappings I

Stefan Müller and Vladimir Sverák, Convex integration with constraints and applications to phase transitions and partial differential equations

Societies Corner

Societies corner is a column concerning the mathematical societies in European countries. The articles in this column could describe the history of a particular society or discuss some event connected with the society. If you feel that your society would interest others, please contact the column editor, Krzysztof Ciesielski (e-mail: ciesiels@im.uj.edu.pl) in the first instance.

Luxembourg Mathematical Society

Jean-Paul Pier

In Luxembourg organised mathematical activities, other than pedagogical ones, started around 1970, under the name of 'Séminaire de Mathématique de Luxembourg'. In 1988, the members of that group created the Société Mathématique du Luxembourg (SML), which became a founding member of the European Mathematical Society. Currently the Luxembourg Mathematical Society has 35 members, of whom 21 belong to the EMS. The regular activities of the SML consist of weekly seminars. The topics vary, but usually relate to harmonic analysis or differential geometry.

The SML endeavours to popularise mathematics in a small country, and from time to time organises conferences for the general public. Among the symposia on general mathematical subjects, each attended by about one hundred people, we mention: 'Mathematics and Reality' (1974), 'Mathematical Language and Mathematical Thought' (1976), and 'Poincaré's Philosophy of Science' (1986). The speakers have included J. Dieudonné and R. Thom.

A regular congress of GMEL (Groupement des Mathématiciens d'Expression Latine) was held in Luxembourg in 1981. It involved mainly mathematicians from neo-Latin speaking countries (French, Spanish, Italian, Portuguese and Romanian). The SML is much concerned with cooperation in the 'Grande Région' centred in Luxembourg, and regional meetings have included Université de Liège, Centre universitaire de Luxembourg, Université de Metz, FUNDP Namur, Université Henri Poincaré Nancy, Universität des Saarlandes and Universität Trier. Specialised symposia have also taken place, such as 'Harmonic Analysis' (1987), with the participation of G. Mackey (Springer Lecture Notes 1359). Besides the publication of symposia proceedings, the SML has for ten years edited a yearly issue of 'Travaux mathématiques', which should now be expanded further.

In the context of World Mathematical Year 2000 (WMY2000), the SML has given much consideration to understanding the evolution of mathematical ideas during the now-ending century. Two symposia have already been organised:
– 'The Development of mathematics 1900-1950', at Bourglinster Castle in 1992; foreign speakers were J. L. Doob, G. Fichera, I. Gelfand, M. Guillaume, W. K. Hayman, C. Houzel, A. Lichnerowicz, L. Nirenberg and W. Schwarz (see picture);
– 'Developments in mathematics at the eve of 2000', at Centre universitaire de Luxembourg in 1998; foreign speakers were J. P. Bourguignon, C. Houzel, V. Kac, J.-P. Kahane, J. Mawhin, N. Nikolskii, R. Penrose and R. Remmert.

At the end of 1997 UNESCO unanimously adopted a motion introduced by Luxembourg, declaring its sponsorship for WMY2000 (draft resolution 29C/DR126). A new motion has recently been proposed by Luxembourg, asking UNESCO to increase its support for mathematical projects during WMY2000.

Jean-Paul Pier is President of the Société Mathématique de Luxembourg.

Kharkov Mathematical Society

I. V. Ostrovskii

In this note, we give a short history and some general information on the Kharkov Mathematical Society (KMS) and the mathematicians who have played an important role in its activities.

The KMS was founded in 1879 on the initiative of V. G. Imshenetskii (1832-92). He was a professor at Kharkov University and worked in partial differential equations. According to the Charter of the

KMS, 'the goal of the mathematical society is support of development of pure scientific and pedagogical questions in the field of mathematics'. Meetings with scientific reports were held monthly, as a rule. Starting from 1880, the KMS has published *Communications of KMS*, first as a supplement to the Transactions of Kharkov University, and then as a separate journal.

In 1885, A. M. Lyapunov (1857-1918), a former student of P. L. Chebyshev, moved from St Petersburg to Kharkov and played a leading role in the KMS. During his years in Kharkov (1885-1902) Lyapunov carried out research in stability theory, potential theory and probability theory, gaining him a world-wide reputation. He gave 27 reports on this work at the meetings of the KMS. Because of Lyapunov, mathematical research and reports at KMS meetings reached a much deeper level. In the next period (1902-06), the chairman of KMS was V. A. Steklov (1863-1926), a former student of Lyapunov. Steklov is well known for his work in mathematical physics and analysis, and also as one of the organisers of scientific research in the Soviet Union. In particular, he founded the Institute of Mathematics in Moscow named after him.

During the forty-year period 1906-46, the chairman of KMS was D. M. Sintsov (1876-1946), who worked in geometry and in the geometrical theory of Pfaff and Monge equations. Sintsov was an active participant of the movement for the reform of school education in mathematics, and worked on the international committee for the promotion of these reforms, headed by F. Klein. Through Sintsov's initiative, the KMS was deeply involved in the improvement of mathematical education in the schools of the Kharkov region. Sintsov also put considerable effort into maintaining the KMS mathematical library which is still one of the most complete mathematical libraries in the Ukraine.

From 1908 to 1933, S. N. Bernstein (1880-1968), one of the leading mathematicians of the 20th century, worked in Kharkov. Scientific activity, and all other kinds of KMS activity, were under his strong influence during these years. Many of his famous results were first reported at KMS meetings and then published in the Communications of KMS. Among his students were V. L. Goncharov (1896-1955) and Ya. L. Geronimus (1898-1984), both of whom became well-known mathematicians. After 1917, S. N. Bernstein used his great international reputation to maintain and promote further development of mathematics in Kharkov. In 1929, he organised the Institute of Mathematics at Kharkov which provided an opportunity for scientific research for many mathematicians. Due to Bernstein's world-wide reputation, the First All-Union Mathematical Congress took place in 1930 at Kharkov (rather than in the capital of the USSR, as one would expect according to the traditions of that time). A number of mathematicians from the West participated in this Congress, among them being Hadamard, Denjoy and Montel.

Soon, after a conflict with the Kharkov Communist party leaders, Bernstein had to leave Kharkov. But before doing so, he invited N. I. Akhiezer (1901-80) to move to Kharkov. In 1933, Akhiezer became the Director of the Institute of Mathematics, and in 1947, the chairman of the KMS. Akhiezer's work on approximation theory, the moment problem and operator theory are well known today. His books on these and other topics are outstanding pieces of mathematical literature. Akhiezer managed to create a strong mathematical community in Kharkov. We mention here a few names that should be of interest today to specialists in related fields: Ya. P. Blank (1903-87), A. M. Danilevskii (1906-41), G. I. Drinfeld (b. 1908), A. M. Efros (1906-41), I. M. Glazman (1916-68), M. I. Kadets (b. 1923), N. S. Landkof (b. 1915), B. Ya. Levin (1906-93), B. M. Levitan (b. 1914), M. S. Livshic (b. 1917), V. A. Marchenko (b. 1922), A. D. Myshkis (b. 1920), A. Ya. Povzner (b. 1915), A. V. Pogorelov (b. 1919), A. K. Sushkevich (1889-1961) and E. M. Zhmud' (b. 1918).

In 1950, the Institute of Mathematics in Kharkov was closed by a decision of the Soviet Government. Conditions for scientific work started to deteriorate. In this connection, an important event was the foundation in Kharkov, in 1960, of the Institute for Low Temperature Physics and Engineering (ILTPE). The founder and first Director of the Institute was the physicist B. I. Verkin (1919-91). A broad-minded person with great respect for pure mathematics, he invited the leading Kharkov mathematicians, Akhiezer, Glazman, Levin, Marchenko, Myshkis and Pogorelov, to join the Institute with a group of their former students and to continue their mathematical research in the Institute. The scientific activity of Levin, Marchenko, Myshkis and Pogorelov led to the further flourishing of mathematical studies in Kharkov which lasted till the beginning of the 1990s. An important honour for the KMS was when V. G. Drinfeld (b. 1954), a member of the Mathematical Division of ILTPE, was awarded a Fields Medal in 1990.

A Russian postage stamp featuring A. M. Lyapunov.

Until 1992, the KMS usually held monthly scientific meetings with talks by Kharkov mathematicians and others from all over the Soviet Union. Publication of *Communications of KMS* was stopped in the 1960s by officials, in spite of the energetic protests of N. I. Akhiezer. However, he succeeded in starting a new journal, *Function theory, functional analysis and their applications*, which was published till 1992. From 1994 to 1999, the KMS participated in the publication of the journal *Mathematical Physics, Analysis and Geometry*, and in 2000 a new journal, *Mathematical Analysis and Geometry*, will be published.

After the break-up of the Soviet Union and the cut-off of finance for scientific research, many Kharkov mathematicians have found positions abroad. Certainly, this has caused serious damage to the work of the KMS. Nevertheless, the KMS continues to hold scientific meetings and to supplement its mathematical library with new mathematical literature. The KMS also participates in the distribution of urgent support that comes from other mathematical societies to the Kharkov mathematicians.

I. V. Ostrovskii is Chairman of the Kharkov Mathematical Society.

The four Fields Medalists in 1990, V. G. Drinfeld is on the right.

EMS-WiR Summer School

Numerical Simulation of Flows

6 - 21 September 1999

Rolf Jeltsch

Sixty mathematicians, computer scientists, physicists and engineers from twelve countries took part in the EMS-WiR Summer School, *Numerical Simulation of Flows*, held in September 1999 at the chair of Technical Simulation, IWR, of the University of Heidelberg, Germany. The summer school was organised in cooperation with the European Mathematical Society (EMS), the research association WiR Ba-Wu (Wissenschaftliches Rechnen Baden-Wurttemberg), ESF-AMIF (European Science Foundation – Applied Mathematics for Industrial Flow Problems), and SFB 359 (Reactive Flow, Diffusion and Transport) of Heidelberg University. The members of the EMS-WiR Summer School Scientific Committee were Dr. P. Bastian (Heidelberg), Prof. G. Dziuk (Freiburg), Prof. W. Hackbusch (Leipzig), Prof. R. Jeltsch (Zurich), Prof. D. Kroener (Freiburg), Prof. C.-D. Munz (Stuttgart), Prof. R. Rannacher (Heidelberg), Prof. W. Rodi (Karlsruhe), Prof. S. Sauter (Zurich), Prof. S. Wagner (Stuttgart), Prof. G. Wittum (Heidelberg) and Prof. H. Yserentant (Tubingen).

The numerical simulation of flows is one of the central problems in scientific computing. The complexity of flow simulations is so great that a realistic description requires sophisticated mathematical methods and models. In particular, the modelling and simulation of turbulent flows, as well as nearly incompressible flows, are challenging problems for mathematical models and numerical methods. The numerical simulation of flows requires the co-operation of several mathematical disciplines such as analysis, numerics, mathematical physics, and computational science.

The programme comprised a theoretical and a practical part. The first week (in Heidelberg) consisted of basic instruction. During this week mathematical models and methods were presented in lectures by specialists. In particular, Prof. Yserentant presented a survey of the mathematical description of flows and Prof. Jeltsch gave a talk on the modelling of compressible flows and the method of transport for simulation. The lectures by Prof. Kinzelbach and Prof. Helmig, focused on the modelling of groundwater flows and transport, and the theoretical basis of multi-phase flows in porous media. Prof. Wagner presented a survey on turbulent flows. Prof. Quarteroni spoke on flows in biosystems. Surveys of finite element and finite volume methods were presented by Prof. Rannacher and Prof. Kroener.

Further topics were interface flows, low mach number flows, conjugate gradient and other Lanczos-type methods for large linear systems, multi-grid methods, and algebraic multi-level methods. Dr. Bastian gave an overview on software concepts and tools suited to the solution of flow problems. Further lectures on grid generation and methods for the visualisation of flows were presented. An evening reception at the chair of Technical Simulation, IWR, and an excursion to Heidelberg Castle and the Königstuhl in bright seasonable weather completed the first week.

During the second week the participants worked on different flow problems formulated by the lecturers in different places (Heidelberg, Freiburg, Stuttgart and Zurich). Finally the results of the practical work were presented in a plenary meeting in Heidelberg. The summer school ended with a dinner in a restaurant in Heidelberg. The financial support of European Mathematical Society (EMS), ESF-AMIF (European Science Foundation – Applied Mathematics for Industrial Flow Problems) and SFB 359 of Heidelberg University is gratefully acknowledged.

European Mathematical Society
Summer School

24 July – 2 August 2000

Edinburgh, Scotland

New Analytic and Geometric Methods in inverse problems

LECTURERS and TOPICS
Dima Burago – *Topics in Riemannian geometry*
Gilles Lebeau – *Carleman estimates and boundary control of differential equations*
Vladimir Sharafutinov – *Topics in intergral geometry*
Gunter Uhlmann – *Anisotropic inverse geometry*
Anders Melin – *Intertwining operator methods and inverse scatterring*
Alexander Katchalov & **Matti Lassas** – *Boundary control methods for Gel'fand inverse problem*
Lassi Päiärinta – *Analytic techniques in inverse scattering*

REGISTRATION
Deadline – 15 May 2000
Contact – Erkki Somersalo, Summer School Edinburgh 2000, Helsinki University of Technology.
Fax: +358-94 51 30 16 www.math.hut.fi/projects/inverse

European Mathematical Society
Summer School

17 August – 3 September 2000

St Flour, Cantal, France

Probability Theory

LECTURERS and TOPICS
Sergio Albeverio – *Dirichlet forms and infinite dimensional processes*
Walter Schachermayer – *Mathematical Finance*
Michel Talagrand – *Spin Glasses*

REGISTRATION
Deadline – 15 April 2000
Contact – Danièlle Courageot, St Flour Summer School on "Probability Theory", Laboratoire de Mathématiques Appliquées, Les Cézeaux, F–63177 Aubiere
Fax: +33-4 73 40 70 64
wwwlma.univ-bpclermont.fr/stflour

Education Section

Reference levels in school education in mathematics
A project of the EMS

Antoine Bodin (Besancon) and Vinicio Villani (Pisa)

Presentation

The differing structure of school systems in various European countries presents remarkable heterogeneity, but also noteworthy similarities, concerning the overall goals for the education of young generations.

With the increasing mobility of students and workers at all levels throughout Europe, it is urgent to identify common reference levels concerning general abilities, as well as knowledge of specific topics related to specific age groups.

Regarding mathematics, more than a year ago the European Mathematical Society promoted an international study involving all E.C. countries and some selected non-E.C. countries. The Education Committee of the EMS has agreed to take responsibility in the study.

A first two-year project, concerning the 16-year-old age group has been submitted to the E.C., under the Socrates programme. It has been accepted and was funded for 1999. Besides the E.C. countries, the following non-E.C. countries are involved: the Czech Republic, Hungary, Poland, Russia and Switzerland.

In future, other age groups may also be considered. The choice to start with the 16-year age group is because this age coincides, at least *de facto*, with the end of full-time compulsory education in most E.C. Countries.

However, already at age 16, three distinct sub-populations must be considered:
– those who are going to quit school
– those who will use mathematics mainly as a tool
– those who plan to enrol in a scientific faculty.

A possible structure of the study, including its main goals is illustrated in the figure below.

What is it about?

A first task of the working team has been to specify and delimit the meaning of 'reference levels'.

Two main aspects have been identified:

1. References concerning the general mathematical curriculum

As a starting point the working team is collecting 'national references', general information about mathematics education in all countries involved, along with specific questions to be asked at country level. The 'European reference' will be a synthesis from these national references.

2. References concerning students' abilities and knowledge

These 'references' will consist of statements concerning the students' mathematical behaviour and in samples of tasks that can be submitted to 16-year-old students. Some of these statements and tasks may concern students' achievement, either observed or expected. They will obviously vary across countries, and according to the different aims of mathematics education, as highlighted in the national curriculum reference levels.

We do not claim that the whole set of statements and tasks can (or should) be ranked in order. It seems more meaningful to organise specific subsets, giving rise to several distinct 'reference scales'; each statement from a reference scale will define one reference level, relative to the appropriate field.

Until now, priority has been given to aspect 1, since aspect 2 should be seen in the light of the outcomes of aspect 1. The working team plans to consider aspect 2 during the second year of the project.

To help gathering, selecting, disseminating (and where appropriate, translating) relevant background information, a resource centre devoted to Mathematics Curriculum and Evaluation (both examinations and large-scale assessments) in Europe, as well as in other places (U.S.A., Japan), is currently being developed at the Institute of Mathematical Research and Education (IREM) in the Mathematics Department of the University of Franche-Compté in France. For the moment, the Centre focuses mainly on ages 14-16, to keep with the reference levels project, but it is planned to extend its scope up to the first university years.

What is peculiar about this project?

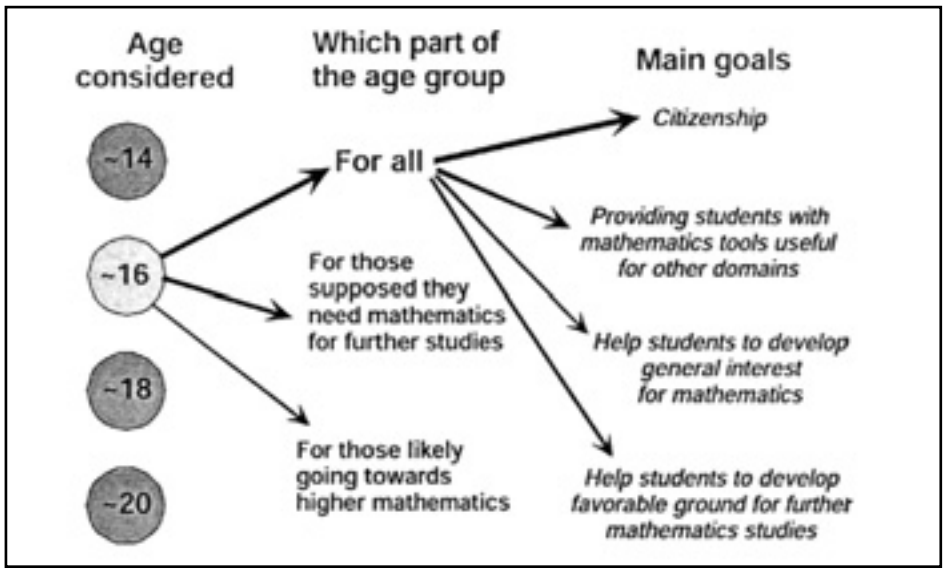
Several international large-scale studies have been already performed in the past (IEA, TIMSS). They provide us with useful information about curricula and achievement, although not specifically mirrored at age 16. Meanwhile, it is well acknowledged that those studies were largely driven by governments and psychometricians, and that their influence on the mathematical community has been dramatically low. In addition, those studies have not adequately taken into account the specific needs and sensitivities of European countries.

Moreover, any information concerning educational systems rapidly becomes obsolescent. Part of the information released today already belong to history!

Our project will have to cope with the same problem. We are thus already planning to put on track a continuous updating of the outcomes of our study, via an interactive involvement of the mathematical community at large, through the EMS website.

We plan to present a preliminary report on the project at the EMS Congress in Barcelona in July.

Antoine Bodin is at the Institute of Mathematical Research and Education (IREM) at the Université de Franche-Compté in Besancon, France.
Vinicio Villani is in the Department of Mathematics at the Università di Pisa, Italy.



Position of the study

Width of the arrows relate to the relative importance as seen at 16. This relative importance would not be the same if the age were 14, 18 or 20.

Editor's note: We regret that the Problem Corner, due for publication in this issue, has had to be held over to the March issue.

Forthcoming conferences

compiled by
Kathleen Quinn

Please e-mail announcements of European conferences, workshops and mathematical meetings of interest to EMS members, to k.a.s.quinn@open.ac.uk. Announcements should be written in a style similar to those below, and sent as Microsoft Word files or as text files (but not as TeX input files). Space permitting, each announcement will appear in detail in the next issue of the Newsletter to go to press, and thereafter will be briefly noted in each new issue until the meeting takes place, with a reference to the issue in which the detailed announcement appeared.

January 2000

5-8: Non-Fermi Liquid Effects in Metallic Systems with Strong Electronic Correlation, Cambridge, UK
Information:
Web site: http://www.newton.cam.ac.uk/programs/scew01.html

7-9: 2nd Mediterranean Conference on Mathematics Education, Nicosia, Cyprus
Information:
Web site: http://www.kutzler.com/medconf2000-mathedu/

17-22: Workshop on Computational Stochastics, Aarhus, Denmark
Information: contact Eva B. Vedel Jensen, Department of Mathematical Sciences, University of Aarhus, Ny Munkegade, DK-8000 Aarhus C, Denmark
e-mail: eva@imf.au.dk
Web site: http://www.maphysto.dk/events/CompStoc2000/
[For details, see *EMS Newsletter* 32]

27-29: Congreso RSME2000 de la Real Sociedad Matemàtica Española, Madrid, Spain
Speakers: Fernando Chamizo (Madrid), Oscar Garcìa-Prada (Madrid), Juan Josè Lòpez Velàzquez (Madrid), Rafael de la Llave (Texas), Mark Melnikov (Barcelona), Sebastiàn Montiel (Granada), Marta Sanz-Solé (Barcelona), Luis Caffarelli (Texas), John H. Conway (Princeton)
Organisers: Carlos Andradas (Univ. Complutense), Emilio Bujalance (UNED), Antonio Còrdoba (Madrid), Ildefonso Dìaz (Univ. Complutense), Alberto Ibort (Univ. Carlos III), Manuel de Leòn (CSIC), Juan Llovet (Univ. de Alcalà), Francisco Martìn (Fed. Española Soc. Profs. Matemàticas, FESPM), David Rìos (Univ. Rey Juan Carlos), Josè Manuel Vega (Madrid)
Site: Universidad Complutense de Madrid
Information:
Web site: http://www.mat.ucm.es/rsme2000

February 2000

3-5: Mathematics Today, Trondheim, Norway
Note: primarily intended for a Scandinavian audience
Information:
Web site: http://www.math.ntnu.no/talltiltusen/

28-3 March: Eighth International Conference on Hyperbolic Problems, Magdeburg, Germany
Information: contact HYP-2000 c/o Institut für Analysis und Numerik, Otto-von-Guericke-Universität, Magdeburg, PSF 4120, D-39016 Magdeburg, Germany; fax: HYP-2000 at +49-391-67-18073
e-mail: hyp2000@mathematik.uni-magdeburg.de
Web site: http://rubens.math.uni-magdeburg.de/~hyp2000
[For details, see *EMS Newsletter* 33]

March 2000

6-10: International Conference on Differential Geometry and Quantum Physics, Berlin, Germany
Scope: this will reflect a good part of the research activities of SFB 288 (see below). The conference is centred around the interests of Dirk Ferus, Ruedi Seiler and Robert Schrader, to honour their contribution to the SFB and to science in general, on the occasion of their sixtieth birthdays
Topics: differential geometry and geometric analysis: submanifolds, integrable systems, spectral geometry; partial differential equations in mathematical physics: Dirac and Schrödinger equations, transport equations, soliton equations, microlocal analysis, spectral theory; quantum mechanics and quantum field theory: semiclassical, adiabatic, perturbative and Born-Oppenheimer approximations, n-body and many-body quantum theory, algebraic quantum field theory
Speakers: J. Avron, W. Ballmann, J. Bourguignon, J. Cheeger, J.-M. Combes, L. Faddeev, J. Froehlich, E. Lieb, W. Mueller, S. Novikov, B. Simon, C.-L. Terng
Programme: plenary talks and special sessions on the above mentioned topics
Organisers and sponsors: Sonderforschungsbereich (SFB) 288 'Differential Geometry and Quantum Physics' of Deutsche Forschungsgemeinschaft, which links the Mathematics Departments of Humboldt Universität zu Berlin, Technische Universität Berlin, the Universität Potsdam, and the Physics Department of Freie Universität Berlin
Applications: titles and abstracts for special sessions should be sent (preferably by e-mail) to one of the organisers, Volker Bach and Jochen Bruening (for addresses, see below)
Site: Technische Universität (TU) Berlin
Deadlines: for submission of titles and abstracts, 31 December 1999; for registration, 31 January 2000; for payment of the fee, 6 March 2000
Information: contact Volker Bach, FB Mathematik (17), Universität Mainz, D-55099 Mainz, Germany, or Jochen Bruening, Institut für Mathematik, Humboldt-Universität zu Berlin, Unter den Linden 6, D-10117 Berlin, Germany
e-mail: bach@math.tu-berlin.de, vbach@mathematik.uni-mainz.de, bruening@mathematik.huberlin.de
Web site: http://www.math.TU-Berlin.DE/~bach/FSS.html

11-12: School Mathematics 2000, Helsinki, Finland
Information:
e-mail: petri.graeffe@maol.fi

13-16: Geometry and Applications, Novosibirsk, Russia
[on the 70th anniversary of the birthday of Victor Andreevich Toponogov]
Topics: geometry, geometrical questions of analysis (including differential equations), topology, applications (mathematical methods of chemistry in particular)
Organisers: The Sobolev Institute of Mathematics of the Siberian Branch of the Russian Academy of Sciences, Novosibirsk State University
Programme committee: Yu. G. Rushetnyak (chair) (Novosibirsk), A. A. Borisenko (Kharkov), Yu. D. Burago (St Petersburg), V. M. Goldshtein (Beer-Sheva), M. L. Gromov (Paris), I. G. Nikolaev (Urbana-Champaign), S. P. Novikov (Maryland)
Information:
e-mail: geomap@math.nsc.ru

27-31: ICMS Instructional Course: Quantum Computing, Edinburgh, UK
Theme: in the past five years the new subject of quantum computing has emerged; this offers the potential of immense practical computing power and also suggests deep links between the well-established disciplines of quantum theory and information theory and computer science. A notable feature of the subject is its interdisciplinary nature with contributions from physicists, mathematicians and computer scientists
Aim: to provide a comprehensive introduction to current developments in quantum computation/quantum information theory
Lecturers: Charles Bennett (tbc), quantum communication; Harry Buhrman, complexity/communication complexity; Chris Fuchs, quantum communication; David DiVincenzo, implementations; Richard Jozsa, algorithms and complexity; Noah Linden, introduction to quantum mechanics and entanglement; Hoi-Kwong Lo, cryptography; Sandu Popescu, quantum information; Andrew Steane, error correction/fault tolerance/decoherence
Scientific organising committee: Richard Jozsa (Bristol), Noah Linden (Bristol), Angus Macintyre (Edinburgh), Andrew M. Pitts (Cambridge)
Audience: accessible to computer scientists as well as graduate students and post-Docs from other relevant disciplines
Sponsor: the course is an activity of UK Quantum Computing Network, funded by the EPSRC
Information:
Web site: http://www.ma.hw.ac.uk/icms/current

31-1 April: LMS Two-Day Meeting: Modelling Spatiotemporal Dynamics in Interacting Systems, Oxford, UK

April 2000

5-14: ICMS Instructional Conference: Operator Algebras and Operator Spaces, Edinburgh, Scotland
Scientific organising committee: V. Jones (UC Berkeley), C. Lance (Leeds), G. Pedersen (Copenhagen), G. Pisier (Paris), S. Popa (UCLA), A. Sinclair (local organiser, Edinburgh),

G. Skandalis (Paris)
Aim: to introduce this active field of mathematics to younger scientists and to provide an opportunity for specialists to exchange ideas
Topics: operator spaces, free probability, exact C*-algebras, subfactors and related areas of operator algebras
Programme: several series of lectures (each series consisting of 2 or 3 one-hour lectures) designed to introduce and elaborate upon a particular field. These series will be complemented by more specialised talks examining current trends. In addition to the formal lectures, there will be ample opportunity for informal tutorials and discussions
Speakers: include C. Anantharamam-de la Roche (Orleans), D. Bisch (Santa Barbara), K. Dykema (Texas), U. Haagerup (Odense), V. Jones (Berkeley), E. Kirchberg (Berlin), V. Paulsen (Houston, Texas), G. Pisier (Paris), S. Popa (UCLA), M. Rieffel (Berkeley), D. Voiculsecu (Berkeley)
Sponsor: supported by the European Commission
Information: contact Allan M. Sinclair, Department of Maths and Statistics, JCMB, KB, Edinburgh EH9 2DE, Scotland
e-mail: allan@maths.ed.ac.uk
Web site: http://www.ma.hw.ac.uk/icms/current

10-20: NATO Advanced Study Institute/EC Summer School, New Theoretical Approaches to Strongly Correlated Systems, Cambridge, UK
Information:
Web site: http://www.newton.cam.ac.uk/programs/scew.html

11-14: Workshop on Harmonic Maps and Curvature Properties of Submanifolds 2, Leeds, UK
Information: contact J. C. Wood, School of Mathematics, University of Leeds, Leeds LS2 9JT, UK
e-mail: j.c.wood@leeds.ac.uk
Web site: http://www.amsta.leeds.ac.uk/pure/geometry/leeds2000.html
[For details, see *EMS Newsletter* 33]

17-20: 52nd British Mathematical Colloquium, Leeds, UK
Information:
e-mail: h.d.macpherson@leeds.ac.uk
Web site: http://www.amsta.leeds.ac.uk/bmc/
[For details, see *EMS Newsletter* 33]

23-29: Spring School on Functional Analysis: (Non)smooth Analysis in Banach Spaces, Paseky nad Jizerou, Czech Republic
Aim: to bring together adepts with an interest in the field
Speakers: Alexander Ioffe (Haifa), Terry Rockafellar (Seattle), Philip Loewen (Vancouver), Robert Deville (Bordeaux)
Programme: a series of lectures on the above topic
Organiser: Faculty of Mathematics and Physics of Charles University
Notes: there will be opportunities for informal discussions. Graduate students and others beginning their mathematical careers are encouraged to participate
Site: Paseky nad Jizerou, in a chalet in the Krkonose Mountains
Information: contact Katedra matematickè analýzy, Matematicko-fyzikàln fakulta UK, Sokolovskà 83, 186 75 Praha 8, Czech Republic, tel./fax: +420 - 2 - 232 3390
e-mail: paseky@karlin.mff.cuni.cz
Web site: http://www.karlin.mff.cuni.cz/katedry/kma/ss/

26-28: Mathematical Education of Engineers, Loughborough, UK
Information:
Web site: http://www.ima.org.uk/mathematics/conferences.htm
[For details, see *EMS Newsletter* 33]

25-6 May: NATO Advanced Study Institute, Nonlinear Dynamics in Life and Social Sciences, Moscow, Russia
Information:
Web site:
http://www.cas.mcmaster.ca/~sulisw/asi.html

May 2000

20-25: MaPhySto and StocLab Summer School on Stereology and Geometric Tomography, Sandbjerg Manor, Denmark
Aim: to give an overview of modern stereology and its relation to geometric tomography, including both the mathematical and statistical theory and the practical applications
Scope: stereology is the area of stochastics dealing with statistical inference about spatial structures from geometric samples of the structure such as two-dimensional sections and one-dimensional probes. The development of stereological methods involve the use of advanced mathematical tools, especially from geometric measure theory and integral geometry. Stereology is now in world-wide use in many areas of biology and medicine, most importantly in neuroscience and cancer grading. Other areas of application are geology, metallography and mineralogy. Geometric tomography is closely related to stereology, as is apparent from its definition: 'geometric tomography is the area of mathematics dealing with the retrieval of information about a geometric object from data about its sections, or projections, or both'. Geometric tomography has connections with convex geometry, geometric probing in robotics, computerized tomography, and other areas
Teaching team: includes Adrian Baddeley (Australia), Richard Gardner (Washington), Hans Jørgen G. Gundersen (Aarhus), Eva B. Vedel Jensen (Aarhus), Kiên Kiêu (Versailles)
Programme: lectures by invited researchers in related fields such as convex geometry, stochastic geometry and spatial statistics are also planned, as well as lectures by the participants of the summer school
Organisers: StocLab (Laboratory for Computational Stochastics) and MaPhySto (Centre for Mathematical Physics and Stochastics), both Department of Mathematical Sciences, University of Aarhus
Audience: PhDs, post-Docs and other researchers in mathematics. Scientists from the natural sciences with a strong background and interest in mathematics are also welcome. The number of participants is limited to 50
Site: Sandbjerg Manor, a conference centre owned by University of Aarhus, situated in the southern part of Jutland, Denmark
Grants: a limited number available for students
Deadline: for application, 1 March 2000
Information:
e-mail: maphysto@maphysto.dk
Web site: http://www.maphysto.dk/events/S-and-GT2000/

28-3 June: Spring School on Analysis: Some Recent Techniques in Harmonic Analysis, Paseky nad Jizerou, Czech Republic
Aim: to bring together adepts with an interest in the field
Speakers: Sergei Treil (Michigan), title to be announced; Igor Verbitsky (Missouri), Best constant inequalities for some classical Fourier multiplier operators; Alexander Volberg (Michigan), Bellman function and some sharp estimates in harmonic analysis
Programme: a series of lectures on the above topic
Organizer: Faculty of Mathematics and Physics, Charles University
Notes: there will be opportunities for informal discussions. Graduate students and others beginning their mathematical careers are encouraged to participate
Site: Paseky nad Jizerou, in a chalet in the Krkonose Mountains
Information: contact Katedra matematickè analýzy, Matematicko-fyzikàln fakulta UK, Sokolovskà 83, 186 75 Praha 8, Czech Republic, tel/fax: +420-2-232 3390
e-mail: pasejune@karlin.mff.cuni.cz
Web site: http://www.karlin.mff.cuni.cz/katedry/kma/

29-2 June: Deuxième Rencontre Internationale sur les Polynomes à valeurs entières CIRM, Luminy, France
Main themes: integer-valued polynomials, multiplicative ideal theory, dimension theory, factorisation properties, commutative monoids
Organisers: P. J. Cahen (Aix-Marseille III), J. L. Chabert (Picardie)
Information:
e-mail: paul-jean.cahen@math.u-3mrs.fr

29-9 June: Foliations: Geometry and Dynamics Revisited, Banach Centre, Warsaw, Poland
Information:
Web site: http://fol2000.math.uni.lodz.pl/

June 2000

5-9: Sixth International Conference on Probability, Poraj (near Czestochowa), Poland
[dedicated to Professor Kazimierz Urbanik]
Topics: the latest scientific output of people working creatively in the field of probability theory
Organisers: the Institute of Mathematics of Polish Academy of Sciences, the Faculty of Mathematics and Information Science of Warsaw University of Technology, the Institute of Mathematics of Wroclaw University and the University of Commerce in Kielce
Programme committee: Dobieslaw Bobrowski, Krzysztof Burdzy, Zbigniew Ciesielski, Wieslaw Dziubdziela, Ryszard Jajte, Michal Karonski, Boleslaw Kopocinski, Stanislaw Kwapien, Zbigniew Morawiecki, Agnieszka Plucinska, Tomasz Rolski, Jan Rosinski, Zdzislaw Rychlik, Lukasz Stettner, Jan Suwala, Dominik Szynal, Kazimierz Urbanik, Jan Waluszewski, Aleksander Weron, Wojbor A. Woyczynski, Jerzy Zabczyk, Ryszard Zielinski
Information:
e-mail: probab@wsh-kielce.edu.pl

7-11: PhD Euroconference on Complex

Analysis and Holomorphic Dynamics, Catalonia, Spain
Focus: complex analysis and holomorphic dynamics are classical domains of the mathematical sciences which are now going through an exciting phase of fruitful interplay
Aim: to bring together young researchers in order to expose and discuss work in progress and recent advances on these fields
Main speakers: Xavier Buff (Toulouse), Gregery Buzzard (Cornell), Mattias Jonsson (Michigan), Ricardo Perez Marco (UCLA & Paris), Stephen Rohde (Seattle)
Programme: lectures given by the main speakers, shorter talks and one session of exposition and discussion of open problems
Organising committee: Nuria Fagella (Barcelona), Xavier Jarque (Barcelona), Xavier Massaneda (Barcelona), Joaquim Ortega Cerda (Barcelona)
Organising institution: Centre de Recerca Matematica (CRM)
Site: Platja d'Aro (Costa Brava), Catalonia, Spain
Note: the conference is restricted to young researchers (normally those aged up to 35)
Information:
e-mail: cad2000@crm.es
Web site: http://crm.es/cad2000 (from 1 January 2000)

13-16: First AMS-Scandinavian International Mathematics Meeting, XXIII Scandinavian Congress of Mathematicians, Odense, Denmark
Information: contact Hans J. Munkholm, Odense University, Campusvej 55, DK 5230 Odense M, Denmark, tel: +45-65572309/+45-65932691
e-mail: hjm@imada.ou.dk
Web site: http://www.imada.ou.dk/~hjm/AMS.Scand.2000.html
[For details, see *EMS Newsletter* 33]

14-17: International Workshop for Operator Theory and Applications (IWOTA), Bordeaux, France
Information:
e-mail: iwota@math.u-bordeaux.fr
Web site: http://www.math.u-bordeaux.fr/~iwota/
[For details, see *EMS Newsletter* 33]

18-21: International Conference on Monte Carlo Simulation, Monte Carlo, Monaco
Information:
Web site: http://www.uibk.ac.at/c/c8/c810/conf/mcs_2000.html
[For details, see *EMS Newsletter* 33]

18-24: Perspectives of Mathematics, Goslar, Germany
Information: contact K. Hulek, Institut für Mathematik, Universität Hannover, Postfach 6009, D-30060 Hannover, Germany
e-mail: Hulek@math.uni-hannover.de
Web site: http://www-ifm.math.uni-hannover.de/info/perspectives.html
[For details, see *EMS Newsletter* 33]

20-25: Mathematical Physics in Mathematics and in Physics: Quantum and Operator Algebraic Aspects, Siena, Italy
[dedicated to Sergio Doplicher and John E. Roberts on the occasion of their 60th birthdays]
Scope: the conference is centred around the interplay between mathematics and physics, mainly with reference to operator algebras and quantum field theory, but there will be talks on other subjects in mathematical physics
Invited speakers: include J. Boeckenhauer, D. Buchholz, A. Connes, K. Fredenhagen, G. Gallavotti, U. Haagerup, M. Izumi, A. Jaffe, V. Jones, Y. Kawahigashi, M. Mueger, G. Pedersen, S. Popa, H.-K. Rehren, M. Rieffel, I. Singer, R. Stora, E. Stoermer, M. Takesaki, D. Voiculescu, R. Verch, S. Woronowicz
Social event: dinner on 22 June
Site: the Certosa di Pontignano, a splendid 15th-century building in the countryside near Siena (pictures at http://www.unisi.it/servizi/certosa/Certosa.html)
Deadline: for registration, 15 April 2000
Information : contact Roberto Longo Dipartimento di Matematica, Università di Roma 'Tor Vergata', I-00133 Roma, Italy, fax: +39-0672594699
e-mail: mp@mat.uniroma2.it
web site: http://mat.uniroma2.it/~mp/siena2000.html

25-28: IMACS-ACA'2000 6th International Conference on Applications of Computer Algebra, St Petersburg, Russia
Scope: actual or possible applications of nontrivial computer algebra techniques to other fields and substantial interactions of computer algebra with other fields
General chair: Nikolay Vassiliev, vasiliev@pdmi.ras.ru
Programme chairs: Victor Edneral, edneral@theory.npi.msu.su, Richard Liska, liska@siduri.fjfi.cvut.cz, Michael Wester, wester@math.unm.edu
Meeting format: standard IMACS format; individuals are invited to organise a special session. Individuals can propose a special session by contacting the program chairs. All paper submissions must be directed to an organiser of an appropriate special session
Sponsors: Steklov Institute of Mathematics at St Petersburg, Euler International Mathematical Institute, St Petersburg Mathematical Society, St Petersburg State University
Information:
web site: http://www.pdmi.ras.ru/EIMI/2000/imacs/

26-28: Sixth International Conference on Advanced Computational Methods in Heat Transfer, Madrid, Spain
Aim: to provide a forum for the presentation of new approaches to the numerical solutions of heat transfer problems. Methods of interest include all well-established and efficient numerical techniques such as finite differences, finite volume, finite elements and boundary elements. Special attention will be paid to complex thermal problems from engineering practice. Heat Transfer 2000 is of importance to all scientists and engineers who are actively involved in developing innovative approaches, as well as in solving a variety of industrial problems
Topics: conduction including non-linear problems, diffusion-convection, natural and forced convection, thermal radiation, fire and combustion simulation, phase change, thermal problems in porous media fibres and composites, metal casting, welding, forging and other processes, energy power systems, inverse problems and other ill-posed problems, combined heat and mass transfer, advances in heat transfer software, coupling different numerical methods, hot spots and thermal shocks, heat exchangers, heat transfer in manufacturing, cooling of electric and electrical equipment, gas turbine heat transfer, heat transfer enhancement, modelling and experiments in heat transfer
Organizer: Wessex Institute of Technology, Southampton, UK
Sponsor: Developments in Heat Transfer Book Series
Conference proceedings: will be published to a high standard by WIT Press
Information: contact Conference Secretariat, Heat Transfer 2000, Wessex Institute of Technology, Ashurst Lodge, Ashurst, Southampton SO40 7AA,UK tel: 44-(0)-23-80-293223, fax: 44-(0)-23-80-292853
e-mail: wit@wessex.ac.uk
web site: http://www.wessex.ac.uk/conferences/2000

26-30: Formal Power Series and Algebraic Combinatorics (FPSAC '00), Moscow, Russia
Topics: algebraic and bijective combinatorics and their relations with other parts of mathematics, combinatorial and computer algebra, computer science and physics
Programme: invited lectures, contributed presentations, poster sessions, problem sessions and software demonstrations
Chairmen, program committee: Daniel Krob (LIAFA), Alexander A. Mikhalev (MSU, Russia and Hong Kong)
Chairman, organizing committee: Alexander V. Mikhalev (MSU, Russia)
Site: Moscow State University
Information:
web site: http://www.liafa.jussieu.fr/~fpsac00/

26-30: POISSON 2000, France
Information:
e-mail: dufourj@darboux.math.univ-montp2.fr

28-1 July: First World Congress of the Bachelier Finance Society, Paris, France
Information:
e-mail: geman@dauphine.fr

29-3 July: International Workshop on Nonlinear Spectral Theory, Würzburg, Germany
Information: contact Jurgen Appell, Department of Mathematics, University of Würzburg, Am Hubland, D-97074 Würzburg, Germany; tel: +49-931-8885017; fax: +49-931-8885599
e-mail: appell@mathematik.uni-wuerzburg.de
web site: www.mathematik.uni-wuerzburg.de/~appell/nlst.html
[For details, see *EMS Newsletter* 33]

July 2000

2-7: Sixth International Conference on p-Adic Analysis, Ioannina, Greece
Scope: analysis over valued fields other than the fields of real or complex numbers (such as the field of p-adic numbers)
Topics: Banach spaces, Hilbert spaces, locally convex spaces and modules, operators, spaces of continuous functions, distributions and measures, function theory, classical and harmonic analysis, applications in mathematical physics
Speakers: (preliminary list) Shavgat Ayupov (Uzbekistan), Jesus Araujo (Spain), Jose Manuel Bayod (Spain), Kamal Boussaf (France), Abdelbaki Boutabaa (France), Gilles Christol (France), N. De Grande-De Kimpe (Belgium), Bertin Diarra (France), B. Dragovich (Yugoslavia), Alain Escassut (France), Jose

Aguayo Garrido (Chile), Thomas Gilsdorf (USA), L. Van Hamme (Belgium), Jerzy Kakol (Poland), A. K. Katsaras (Greece), Hans A. Keller (Switzerland), Andrei Khrenikov (Sweden), Anatoly Kochubei (Ukraine), Sara Krantz (Sweden), Nicolas Mainetti (France), M. S. Moslehian (Iran), L. Narici (USA), P. N. Natarajan (India), S. Navarro (Chile), Robert Nyqvist (Sweden), H. Ochsenius (Chile), C. Perez-Garcia (Spain), C. G. Petalas (Greece), Marie-Claude Sarmant (France), W. H. Schikhof (The Netherlands), Stany De Smedt (Belgium), V. K. Srinivasan (USA), Susana Vega (Spain), Ann Verdoodt (Belgium), T. Vidalis (Greece)
Scientific committee: A. K. Katsaras (Ioannina), W. H. Schikhof (Nijmegen), L. Van Hamme (Brussels)
Organising committee: A. K. Katsaras (Ioannina), C. G. Petalas (Ioannina), T. Vidalis (Ioannina)
Site: University of Ioannina
Information: contact A. K. Katsaras, Dept. of Math., Univ. of Ioannina, 45110, Ioannina, Greece, tel: +30-651-98289, fax: +30-651-46361
e-mail: akatsar@cc.u0i.gr
web site: http://www.uoi.gr/conf_sem/p-adic

2-15: NATO Advanced Study Institute 20th Century Harmonic Analysis-a Celebration, Tuscany, Italy
Information:
web site: http://www.cs.umb.edu/~asi/analysis2000

3-7: ALHAMBRA 2000, Granada, Spain
[joint European-Arabic conference]
Scope: (morning sessions) historical perspectives on contributions of both cultures to the present mathematical knowledge, the state of the more relevant mathematical concepts over the centuries and the way they have evolved; (afternoon sessions) current mathematical subjects from the list below
Topics: computational mathematics, geometry of submanifolds, mathematical demography, nonlinear problems, orthogonal polynomials, public mathematics, representation theory of algebras, symmetry
Programme: plenary lectures on the above subjects, short communications
Information: contact ALHAMBRA 2000 Conference eurocongres Avda. Constitución, 18 - Blq.4 E-18012 - Granada, Spain, tel: +34-958-209-361, fax: +34-958-209-400
e-mail: alhambra2000@ugr.es, eurocongres@mx3.redestb.es
web site: http://www.ugr.es/local/alhambra2000

3-7: ANTS IV Algorithmic Number Theory Symposium, Leiden, The Netherlands
Invited speakers: include Frits Beukers, Peter Borwein, Jin-Yi Cai, Noam Elkies, Victor Flynn, Jacques Stern
Topics: algorithmic aspects of number theory, including elementary number theory, algebraic number theory, analytic number theory, geometry of numbers, algebraic geometry, finite fields, cryptography and computational complexity
Deadline: for submission of contributed papers, 1 January 2000
Proceedings: to appear in the series of Lecture Notes in Computer Science of Springer-Verlag
Organising committee: Bart de Smit (Leiden), Herman te Riele (CWI), Jaap Top (Gronigen), Peter Stevenhagen (chair, Amsterdam); Wieb Bosma (Nijmegen)
Information:
e-mail: ants4@wins.uva.nl
web site: http://www.math.leidenuniv.nl/ants4/

3-7: Functional Analysis Valencia 2000, Spain
Information: contact: K. D. Bierstedt or J. Bonet, Univ. Paderborn, FB 17, Math., D-33095 Paderborn, Germany or Universidad Politècnica de Valencia, Departamento de Matemática Aplicada, E-46071 Valencia, Spain
e-mail: VLC2000@uni-paderborn.de
web site: http://math-www.uni-paderborn.de/VLC2000
[For details, see *EMS Newsletter* 32]

3-9: Euro-Summer School on Mathematical Aspects of Evolving Interfaces, Madeira, Portugal
[Joint school of CIM (Centro Internacional de Matematica, Portugal) and CIME (Centro Internazionale Matematico Estivo, Italy), Satellite Activity of the Third European Congress of Mathematics in Barcelona, Spain, 10-14 July]
Aims: interfaces are geometrical objects modelling free or moving boundaries which arise in a wide range of phase change problems in continuum physics, in particular in material sciences. Recent mathematical advances in the theory of geometric evolution problems will be presented in a set of lectures with an interdisplinary perspective, covering several aspects from theory to applications
Programme: a series of five complementary courses each consisting of three 90-minute lectures plus tutorials; a limited number of selected talks of 20-30 minutes each by young researchers or post-Docs
Speakers and course titles: Luigi Ambrosio (Pisa), Distance function and evolution of fronts by implicit time discretization; Gerhard Dziuk (Freiburg), Numerical approximation of mean curvature flow of graphs; Masayasu Mimura (Hiroshima), Dynamics of patterns and interfaces in reaction-diffusion systems from chemical and biological viewpoints; Vsvolod A. Solonnikov (St Petersburg), Evolution free boundary problems for parabolic and Navier-Stokes equations; Halil M. Soner (Princeton), Variational and Dynamic Problems for the Ginzburg-Landau Functional
Organisers: Pierluigi Colli, Jose-Francisco Rodrigues
Audience: the school is mainly intended for European postgraduate students, including recent PhDs, but selected participants from outside Europe and senior scientists wishing to learn about the subject are not excluded
Lecture notes: expected to be published
Financial support: some grants for younger researchers are available. Applications should be made to the organising committee
Site: University of Madeira, Funchal, Portugal
Information:
e-mail: maei2000@lmc.fc.ul.pt
web site: http://maei.lmc.fc.ul.pt

4-6: Catop 2000, Fribourg, Switzerland
Scope: categorical topological methods
Aim: to discuss categorical topological methods that are likely to be mathematically important in the next century. Furthermore, on Thursday, we celebrate the 70th birthday of Prof. Heinrich Kleisli (Fribourg)
Programme committee: Hans-Peter A. Kuenzi (Bern), Ernst A. Ruh (Fribourg)
Information:
web site: http://www.unifr.ch/math/catop2000/

4-7: Second International Conference on Mathematical Methods in Reliability, Bordeaux, France
Aims: to serve as a forum for discussing fundamental issues of reliability mathematical methods with respect to its applications; to assemble researchers in probability, statistics and applied mathematics, working in the field of reliability, from university laboratories and research institutions in Europe and elsewhere
Scope: common methods and models used in survival analysis and reliability will be considered from a general point of view. Theoretical, modelling, computational and case study contributions will be presented, ranging from academic considerations to industrial approaches
Programme: invited talks, plenary sessions, parallel sessions and posters
Information: contact Dr Valentina Nikoulina, Université Victor Segalen, Bordeaux 2, Statistique Mathematique, UFR MI2S, B.P. 69 33076 Bordeaux Cedex, France; tel: +33-(0)-5-57-57-10-70/(0)-5-57-57-14-25; fax: +33-(0)-5-56-98-57-36/+33-(0)-5-57-57-12-63
e-mail: vnikou@mi2s.u-bordeaux2.fr, Nikolaos.Limnios@utc.fr
web site: http://www.mass.u-bordeaux2.fr/MI2S/MMR2000/

5-7: Scandinavian Workshop on Algorithm Theory, Bergen, Norway
Information:
e-mail: telle@ii.uib.no
web site: http://www.ii.uib.no/swat2000

6-8: 6th Barcelona Logic Meeting, Barcelona, Spain
Invited speakers: Jose Luis Balcazar (Catalunya), Pilar Dellunde (Barcelona), Peter Koepke (Bonn), Anand Pillay (Urbana-Champaign), Yde Venema (Amsterdam), Michael Zakharyaschev (Moscow)
Scientific and organising committee: Joan Bagaria (Barcelona), Enrique Casanovas (Barcelona), Rafel Farre (Catalunya), Josep Maria Font (Barcelona), Juan Carlos Martinez (Barcelona), Hiroakira Ono (Japan), Margarita Otero (Madrid), Stevo Todorcevic (Paris)
Information:
e-mail: 6blm@crm.es
web site: http://www.mat.ub.es/~logica/news.html or http://www.crm.es/

10-14: IUTAM Symposium on Free Surface Flows, Birmingham, UK
Information:
web site: http://www.mat.bham.ac.uk/research/iutam.htm
[For details, see *EMS Newsletter* 33]

10-14: Third European Congress of Mathematics, Barcelona, Spain
Information: contact Societat Catalana de Matemátiques, Carrer del Carme, 47, E-08001 Barcelona;
tel: (34 3) 270 16 26; fax (34 3) 270 11 80
e-mail: 3ecm@iec.es
web site: http://www.iec.es/3ecm/
[For details, see page 13]

13-14: Computational Challenges for the Millenium, Cambridge, UK
Information:

web site: http://www.ima.org.uk

17-20: IUTAM Symposium 2000/10 Diffraction and Scattering in Fluid Mechanics and Elasticity, Manchester, UK
Information: contact Professor David Abrahams, Department of Mathematics, University of Manchester, Oxford Road, Manchester M13 9PL, UK, tel: +44-(0)-161-275-5901, fax: +44-(0)-161-275-5819
e-mail: i.d.abrahams@ma.man.ac.uk
web site: http://www.keele.ac.uk/depts/ma/iutam/
[For details, see *EMS Newsletter* 33]

17-21: Ninth International Conference on Fibonacci Numbers and their Applications, Luxembourg-City, Luxembourg
Information:
e-mail: howard@mthcsc.wfu.edu
17-22: Colloquium on Lie Theory and Applications, Vigo, Spain
Information: contact I Colloquium on Lie Theory and Applications, E. T. S. I. Telecomunicación, Universidad de Vigo, 36280 Vigo, Spain; tel: +86-81-21-52/+86-81-24-45; fax: +86-81-21-16/+86-81-2- 01
e-mail: clieta@dma.uvigo.es
web site: http://www.dma.uvigo.es/~clieta/
[For details, see *EMS Newsletter* 33]

17-22: International Congress of Mathematical Physics, London, UK
Information:
web site: http://icmp2000.ma.ic.ac.uk/
19-26: Third World Congress of Non-linear Analysts (WCNA-2000), Catania, Italy
23-31: ASL European Summer Meeting (Logic Colloquium 2000), Paris, France
Information:
e-mail: asl@math.uiuc.edu
web site: http://lc2000.logique.jussieu.fr
[For details, see *EMS Newsletter* 33]

24-3 August: EMS Summer School, New analytic and geometric methods in inverse problems, Edinburgh, Scotland
Organisers: Prof. Erkki Somersalo, Prof. Yaroslav V. Kurylev, Prof. Brian Sleeman
Note: in collaboration with the International Centre for Mathematical Sciences (ICMS; www.ma.hw.ac.uk/icms/)
Information: contact Erkki Somersalo, Helsinki University of Technology, Finland
e-mail: esomersa@dopey.hut.fi

31-3 August: Third Conference of Balkan Society of Geometers, Bucharest, Romania
Information: contact V. Balan, University Politehnica of Bucharest, Department Mathematics I, Splaiul Independentei 313, RO-77206, Bucharest, Romania; fax: (401) 411.53.65
e-mail: vbalan@mathem.pub.ro
[For details, see *EMS Newsletter* 33]

August 2000

2-9: Summer School on Mathematical Physics (emphasis on Quantum Field Theory), Sandbjerg Manor, Denmark
Information:
web site: http://www.maphysto.dk/events/

8-12: XVIII Nevanlinna Colloquium, Helsinki, Finland
Information:
e-mail: pekka.tukia@helsinki.fi
web site: http://www.math.helsinki.fi/~analysis/NevanlinnaColloquium/
[For details, see *EMS Newsletter* 33]

17-3 September: EMS Summer School in Probability Theory, Saint-Flour, Cantal, France
Programme: short courses of 10 lectures each, on the topics below
Speakers: Sergio Albeverio (Germany), Dirichlet forms and infinite-dimensional theory; Walter Schachermayer (Vienna), Mathematics and finance; Michel Talagrand (France), Spin glasses
Organiser: Prof. Pierre Bernard
Programme committee: Martin Barlow, Gerard Benarous, Pierre Bernard, Lucien Birge, Michel Emery, Hans Follmer, Jean-Francois Le Gall, Michel Ledoux, David Nualart, Etienne Pardoux, Jean Picard, Alain-Sol Sznitman, Liming Wu
Information: contact: P. Bernard, Laboratoire de Mathématiques Appliquées, Univ. Blaise Pascal, F-63177 Aubière, tel/fax: +33-4 73-40-70-64
e-mail: bernard@ucfma.univ-bpclermint.fr

21-25: IMACS 2000, Lausanne, Switzerland
[International Association for Mathematics and Computers World Congress]
Information: contact Prof. Robert Owens, IMACS Congress 2000, DGM-IMHEF-LMF, Swiss Federal Institute of Technology, CH-1015 Lausanne, Switzerland; tel: +41-21-693-35-89; fax: +41-21-693-36-46
e-mail: robert.owens@epfl.ch
web site: http://imacs2000.epfl.ch
[For details, see *EMS Newsletter* 32]

30-2 September: Innovations in Higher Education 2000, Helsinki, Finland
Information:
e-mail: sari.lindblom-ylanne@helsinki.fi
web site: http://www.helsinki.fi/inno2000

September 2000

4-6: Mathematics of Surfaces, Cambridge, UK
Information:
web site: http://www.ima.org.uk

4-8: FGI2000 French-German-Italian Conference on Optimisation, Montpellier, France
Aim: to enable the exchange of results and ideas about the state of the art in mathematical optimisation in a broad sense
Topics: continuous and discrete (scalar and vector) optimisation, calculus of variations, optimal control, games, non-smooth analysis, critical point theory, equilibria. Analytical as well as numerical aspects are of interest, along with applications
Scientific committee: H. Attouch (Montpellier), G. Buttazzo (Pisa), G. Di Pillo (Rome), F. Giannessi (Pisa), C. Lemaréchal (Grenoble), W. Oettli (Mannheim), J.-J. Strodiot (Namur), M. Théra (Limoges), R. Tichatschke (Trier), J. Zowe (Erlangen-Nuernberg)
Organising committee Laboratoire d'Analyse, de Calcul Scientifique et Industriel et d'Optimisation de Montpellier (ACSIOM)
Programme: invited lectures and contributed talks
Information: contact: Bernard Lemaire, Mathématiques, Université de Montpellier II, Place Eugène Bataillon, 34095 Montpellier cedex 05
e-mail: fgi2000@math.univ-montp2.fr
web site: http://www.math.univ-montp2.fr/

5-7: Quantitative Modelling in the Management of Health Care, Salford, UK
Participants: conference delegates will include those involved in quantitative policy, evaluation and decision making in health care relating to the British National Health Service, private sector, and overseas experience. The first conference in 1994 attracted medical practitioners working in hospitals and general practice; health service managers; and operational research specialists, economists, statisticians and mathematicians employed in health care and universities
Themes: the conference will focus on practical methodologies in budgeting, financing, setting of priorities, and allocation of resources for the provision of services, and the formulation and measurement of performance indicators. Papers covering experience with established methodologies and issues relating to their implementation are welcome together with those describing new methodologies
Programme: keynote speeches, contributed papers and an exhibition of software
Invited speakers: (confirmed) Sandy Macara (BMA), Peter Millard (St George's Hospital Medical School, London), Jonathan Rosenhead (London), Tom Treasure (St George's Hospital Medical School, London)
Organising committee: Rose Baker (Salford, chair), Sally Brailsford (Southampton), Peter Millard (St George's Hospital Medical School), Patrick Rivett (Cumbria), Alison Round (North & East Devon Health Authority)
Proceedings: selected papers to be published
Site: University of Salford
Call for papers: abstracts of 300-500 words should be sent to Pamela Bye, Institute of Mathematics and its Applications, Catherine Richards House, 16 Nelson Street, Southend-on-Sea, Essex SS1 1EF, UK, by 1 May 2000
Information:
web site: http://www.ima.org.uk/mathematics/conferences.htm

5-16: Advanced Course on Algebraic Quantum Groups, Bellaterra, Spain
Speakers: Kenneth Brown (Glasgow), Kenneth Goodearl (Santa Barbara)
Site: Centre de Recerca Matemàtica, Campus of the Universitat Autònoma de Barcelona, Bellaterra, Spain
Information:
e-mail: quantum@crm.es
web site: http://crm.es/quantum

10-17: Summer School on Geometry of Quiver-Representations and Preprojective Algebras, Isle of Thorn, UK
Topics: degenerations of modules, theorem of Kac, moduli spaces, preprojective algebras, semi-invariants of quivers, Young tableaux and Schubert calculus
Programme: the meeting is in two parts: in the first part the participants will lecture on introductory topics; the second part is a workshop where specialists in the area will lecture on recent results
Organisers: W. W. Crawley-Boevey (Leeds), K. Erdmann (Oxford), Ch. Geiss (at present UNAM, Mexico)
Support: provided by the TMR scheme of the EC
Information: contact Karin Erdmann, Mathematical Institute, University of Oxford, Oxford OX1 3LB, UK

e-mail: erdmann@maths.ox.ac.uk
web site: http://www.mathematik.uni-bielefeld.de/~sek/summerseries.html

11-15: Boundary Integral Methods: Theory and Applications, Bath, UK
Aim: to provide a forum for the exchange of ideas between academic and industrial researchers in different disciplines whose common interest is boundary integral methods
Scope: as well as discussing recent developments in the theory and numerical analysis of boundary integral equations, the conference will strive to encompass applications of contemporary relevance such as direct and inverse (medium and high frequency) scattering, electromagnetics and moving boundary problems in hydrodynamics. Continuing progress in key computational techniques such as multipole, wavelets and panel clustering, together with innovative algorithm design will be an additional theme
Speakers: W. C. Chew (Illinois), C. Constanda (Strathclyde), T. Hou (California), A. Kirsch (Karlsruhe), A. Rathsfeld (Berlin), S. A. Sauter (Leipzig), I. H. Sloan (Sydney), W. L. Wendland (Stuttgart), L. Wrobel (London)
Organising committee: Ivan Graham (Chair) (Bath), Sia Amini (Salford), Simon Chandler-Wilde (Brunel), Ke Chen (Liverpool), Penny Davies (Strathclyde)
Site: University of Bath
Information:
web site: http://www.ima.org.uk/mathematics/conferences.htm

12-15: Imaging and Digital Image Processing: Mathematical Methods, Algorithms and Applications, Leicester, UK
Aim: to provide a forum for discussing the mathematical modelling of imaging systems, the design and implementation of specialised image processing algorithms and novel applications of image processing software in industry and commerce
Topics: inverse problems in imaging, statistical methods in image processing, image compression techniques, fuzzy systems theory, artificial neural networks, multi-fractals and wavelets, colour image processing, 3D imaging and image processing, real-time image processing and systems modelling
Invited speakers: presentations on state of the art research will be given by a number of invited speakers who are internationally recognised for their contribution to the field
Organising committee: J. M. Blackledge (Leicester, chair), P. Andrews (Leicester), B. Carroll (GEC Marconi), M. McCormick (Leicester), N. Phillips (Leicester), M. Rycroft (Cambridge), P. Smith (Loughborough), Dr. H. Tassignon (Belgium), M. Turner (Leicester)
Short course: a one-day short course, Introduction to Imaging and Digital Image Processing, will precede the conference on 12 September
Site: De Montfort University, Leicester
Call for papers: abstracts of 300-500 words should be sent to Pamela Bye, Institute of Mathematics and its Applications, Catherine Richards House, 16 Nelson Street, Southend-on-Sea, Essex SS1 1EF, UK, by 31 January 2000. Notification to authors will be mid-March 2000. Final papers should be submitted by late-December 2000 for inclusion in the conference proceedings
Proceedings: to be published
Information:
web site: http://www.ima.org.uk/mathematics/conferences.htm

12-15: IWOTA-Portugal 2000 International Workshop on Operator Theory and Applications, Faro, Portugal
Main topics: factorisation theory, factorisation and integrable systems, operator theoretical methods in diffraction theory, algebraic techniques in operator theory, related topics and applications to mathematical physics
Steering committee: T. Ando, H. Bart, H. Berovici, R. Dijksma, H. Dym, C. Foias, I. Gohberg, J. W. Helton, M. A. Kaashoek, H. Langer, R. Mennicken, L. Rodman, J. G. Stampfli
Registration: use IWOTA web-page or e-mail to receive second announcement
Information: contact N.Manojlovic, U. C. E. H., Universidade do Algarve, Campus de Gambelas, 8000 Faro, Portugal, tel: +351-89-800914 ext 7637, fax: +351-89-818560
e-mail: nmanoj@ualg.pt,
web site: http://www.ualg.pt/cma/iwota/

18-22: International Data Analysis Conference, Innsbruck, Austria
Scope: all aspects of data-analysis will be considered, ranging from applied aspects to fundamental questions on the description and analysis of real data
Topics: exploratory, fuzzy, statistical data analysis
Organizer: Prof. Reinhard Viertl
Information:
e-mail: viertl@tuwien.ac.at
web site: http://www.statistik.tuwien.ac.at/ida2000/

18-23: International Congress on Differential Geometry, in Memory of Alfred Gray, Bilbao, Spain
Programme committee: Th. Banchoff, J. P. Bourguignon, E. Calabi, S. Donaldson, J. Eells, S. Gindikin, M. Gromov, O. Kowalski, M. Mezzino, S. Novikov, M. Pinsky, A. Ros, S. Salamon, L. Vanhecke, J. Wolf
Organisers: M. Fernandez (chairman), L. C. de Andres, L. A. Cordero, A. Ferrandez, R. Iba-ez, M. de Leon, M. Macho-Stadler, A. Martinez Naveira, L. Ugarte
Information:
e-mail: mtpibtor@lg.ehu.es or mtpmastm@lg.ehu.es
web site: http://www.ehu.es/Gray

18-27: 8th Workshop on Stochastic and Related Fields, G. Magusa, Famagusta, North Cyprus
Speakers: include P. Malliavin, D. W. Stroock
Programme committee: U. Capar, L. Decreusefond, A. S. Ustunel, M. Zakai
Organisers: U. Capar, A. S. Ustunel
Information: contact A. S. Ustunel, ENST, 46, rue Barrault, 75634 Paris Cedex 13, France, tel/fax: +33-1-45-81-31-19
e-mail: ustunel@enst.fr
web site: http://mozart.emu.edu.tr/workshop

19-22: Fractal Geometry: Mathematical Techniques, Algorithms and Applications, Leicester, UK
Aim: to provide a forum for discussing the mathematical basis of fractal geometry, the computer implementation of fractal algorithms and their applications to modelling and analysing complex processes and patterns
Themes: measure theory and fractal measures, multi-fractal measures, novel iteration function sequences, statistically self-affine functions and Lévy statistics, fractional dynamics, stochastic modelling with fractals, inverse problems in fractal geometry, efficient algorithms for computing fractals, applications to time-series modelling (e.g. financial forecasting), applications to computer graphics (e.g. fractal surfaces), applications to simulation (e.g. L-systems), applications to data compression, applications to chaotic dynamical systems analysis
Invited speakers: presentations on state of the art research will be given by a number of invited speakers who are internationally recognised for their contribution to the field
Organising committee: Prof. J. M. Blackledge (Leicester, chairman), Prof. K. Cevik (Fachhochschule Bielefeld), Dr. A. Evans (Leicester), Prof. M. Goman (Moscow), Dr. K. Hopcraft (Nottingham), Dr. S. Mikhailov (Moscow), Dr. M. Turner (Leicester)
Proceedings: to be published
Short course: a one-day short course, Introduction to Fractal Geometry and its Applications, will precede the conference on 19 September
Site: De Montfort University, Leicester
Call for papers: abstracts of 300-500 words should be sent to Pamela Bye, Institute of Mathematics and its Applications, Catherine Richards House, 16 Nelson Street, Southend-on-Sea, Essex SS1 1EF, UK, by 31 January 2000. Notification to authors will be mid-March 2000. Final papers should be submitted by late-December 2000 for inclusion in the conference proceedings
Information:
web site: http://www.ima.org.uk/mathematics/confractalgeometry.htm

December 2000

18-20: Fifth International Conference on Mathematics in Signal Processing, Coventry, UK
Scope: signal processing constitutes an important area for the application of mathematical concepts and techniques fuelled, for example, by recent developments in mobile communications, multimedia systems and digital TV. The last IMA conference on this subject was held in December 1996 and the intervening years have witnessed significant developments in many topics such as non-linear/non-Gaussian signal processing, multi-rate signal processing, blind deconvolution/signal separation and broadband systems
Aim: the aim of this conference is to bring together mathematicians and engineers with a view to exploring recent developments and identifying fruitful avenues for further research. It is hoped that the meeting will also help to attract more mathematicians into this important and challenging field
Programme committee: Prof. J. G. McWhirter (chairman) (DERA, Malvern), Prof. O. R. Hinton (Newcastle)
Site: University of Warwick
Information: contact Mrs. Pamela Bye, Institute of Mathematics and its Applications, Catherine Richards House, 16 Nelson Street, Southend-on-Sea, Essex SS1 1EF, UK, fax: +44-(0)-1702-354111, *e-mail*: conferences@ima.org.ac.uk

Recent books

edited by Ivan Netuka and Vladimír Souček

Books submitted for review should be sent to the following address: Ivan Netuka, MÚUK, Sokolovská 83, 186 75 Praha 8, Czech Republic.

D. Alpay, *Algorithme de Schur, espaces à noyau reproduisant et théorie des systèmes*, *Panoramas et Synthèses 6, Société Mathématique de France, Paris, 1998, 189 pp., ISBN 2-85629-067-1*
The aim of the book is to describe applications of the theory of spaces with reproducing kernels in various fields of mathematics. Principal examples of such spaces are spaces of analytic functions of L. de Branges and J. Rovnyak. An important property of reproducing kernels used in the book is their positivity. The main part of the book contains a discussion of the Schur algorithm, the mathematical scattering theory, function models in the theory of operators and interpolation problems for holomorphic functions. Similar methods are used in the last several chapters in more general cases (e.g., for non-positive metrics and non-stationary systems). The book contains an extended and detailed bibliography of the field (360 items). (vs)

T. Aubin, *Some Nonlinear Problems in Riemannian Geometry*, *Springer Monographs in Mathematics, Springer, Berlin, 1998, 395 pp., DM168, ISBN 3-540-60752-8*
This is an extended and updated version of the author's earlier book 'Non-linear Analysis on Manifolds, Monge-Ampère Equations, Grundlehren 252, Springer, 1982'. Many important geometrical problems are explained there, together with their history, up-to-date results and recent methods of proofs. All presented problems are related to non-linear partial differential equations arising in geometry and physics.

The first part of the book is a nice introduction to Riemannian geometry, the theory of Sobolev spaces and the theory of partial differential equations on Riemannian manifolds. One interesting topic treated in the book is the famous Yamabe problem, which is described here in detail. Several proofs are presented using several different methods (variational, topological, etc.). Another topic discussed extensively in the book is the problem of prescribed scalar curvature (both cases of positive and negative functions on compact and non-compact manifolds are treated). There is a nice overview of results and methods for the solution of the problem. Solutions of the existence problems for a Kaehler-Einstein metric or a metric with prescribed Ricci curvature can also be found in the book.

This book can be strongly recommended to all those interested in contemporary Riemannian geometry and non-linear PDE's on manifolds. (jbu)

K. M. Ball and V. Milman, *Convex Geometric Analysis*, *Mathematical Sciences Research Institute Publications 34, Cambridge University Press, Cambridge, 1999, 236 pp., £30, ISBN 0-521-64259-0*
This book collects articles on convex geometry reflecting the research presented in lectures or completed at the Mathematical Sciences Research Institute within the framework of the programme 'Convex Geometry and Geometric Analysis' in 1996.

An incomplete list of topics and authors follows. J. Bourgain and G. Zhang give a negative answer to the generalised Busemann-Petty problem. V. Milman and G. Schechtman prove an extension of the Dvoretzky theorem. New results on polytope approximations are presented by W. T. Gowers and C. Schütt. A. Pajor estimates the metric entropy of the Grassmann manifold and M. Schmückenschlager defines curvature for graphs. The inverse Brunn-Minkowski inequality is improved by A. E. Litvak. Further new results on geometric functional analysis are achieved by S. Alekser, A. E. Litvak and B. Maurey. Advanced probability techniques with application in option pricing are developed by C. Borell. The whole collection provides a useful source of inspiration for mathematicians working in convex geometry and functional analysis. (jrat)

H.-J. Baues, *Combinatorial Foundation of Homology and Homotopy*, *Springer Monographs in Mathematics, Springer, Berlin, 1999, 362 pp., DM 159, ISBN 3-540-64984-0*
This book is devoted to a new categorical formulation of homology and homotopy theories. Quite naturally, such an approach leads to a general view of these theories, unifies many notions, presents a deeper understanding of the subject, and reveals new fields of investigation and applications. In this book a *theory* is a category with an initial object and with finite sums, and a *theory of coactions* is a theory in which each object X is endowed with a cogroup object X' and a coaction $X \to X \vee X'$. The notion of a theory of coactions is of fundamental importance for the constructions performed in the book. This is because each homotopy theory contains theories of coactions.

The book is divided into two parts, chapters A, B, C, D, and chapters I-VIII. The first part describes 'classical' examples of homology and homotopy theories, presented in such a way that their common and fundamental features come to light. The second part is then devoted to general categorical constructions. In principle, one might consider it possible to read only the second part, but practically this is impossible, and in fact would make no sense. It seems that it is quite profitable to read both parts more or less simultaneously. The book is not directly designed for beginners in topology, but nevertheless they can understand and learn from it. They can find here even the definition of homotopy groups – of course, in a more abstract setting, but I think that it is natural for young mathematicians to start on a higher level of abstraction than their teachers started. For specialists in topology the book presents a higher viewpoint and a more profound understanding of homology and homotopy theories and opens new perspectives. It can be strongly recommended. (jiva)

J. A. Beachy, *Introductory Lectures on Rings and Modules*, *London Mathematical Society Student Texts 47, Cambridge University Press, Cambridge, 1999, 238 pp., £15.95, ISBN 0-521-64340-6 and 0-521-64407-0*
The first three chapters of this text cover basic results on (non-commutative) associative rings and modules over them. The final chapter consists of an introduction to the representation theory of finite groups. All results are presented with full proofs, and are illustrated by a great variety of examples and exercises.

Among other things, the Gauss theorem on UFDs is presented in Section 1.4, Maschke's theorem in Section 2.3, the Krull-Schmidt theorem for indecomposable finite length modules in Section 2.5, the Wedderburn-Artin and Hopkins' theorems in Section 3.3, and the orthogonality relations for irreducible characters in Section 4.3. Moreover, each chapter ends with a section on more advanced related material, such as Weyl algebras and Goldie theorems.

The text is aimed at advanced undergraduate or beginning graduate students, as a complement to Sharp's book on commutative algebra (Volume 19 in the LMS student text series). Thus it was possible to skip over some of the basic notions of module theory that appear more frequently in a commutative setting, such as flat modules and pure submodules. The text provides an excellent introduction to the Goodearl-Warfield text on non-commutative noetherian rings (Volume 16 in the series). (jtrl)

N. L. Biggs, E. K. Lloyd and R. J. Wilson, *Graph Theory 1736-1936*, *Clarendon Press, Oxford, 1998, 239 pp., ISBN 0-19-853916-9*
This is a new edition of the successful book originally written in 1976. As the authors claim (and as the reviewer can certify), this is a corrected and complemented (but fortunately not expanded) edition which presents the vivid origins of a popular field.

One cannot overlook that again the references are incomplete. For example, the first paper initiating a study of the Steiner Tree Problem (V. Jarník and M. Kössler, About minimal graphs containing n given points, *Èas. Pìst. Mat.* **63** (1934), 223-235)

is omitted.

This is a useful and general purpose book. (jnes)

N. Bouleau, *Philosophies des mathématiques et de la modélisation*, *L'Harmattan, Paris, 1999, 363 pp., ISBN 2-7384-8125-6*
The author, an active mathematician in the field of probability and mathematical analysis, and the head of an institute of applied mathematics, discusses a large spectrum of topics: philosophy of science and contemporary mathematics, the impact of computer science and modelling to philosophy of mathematics, comparison of the work of a computer with that of a creative mathematician, pure and applied mathematics, teaching of mathematics, the role of abstraction in education, etc.

The introductory chapter brings a contemporary view to a philosophical characterisation of mathematics and its face under the influence of the computer age and the extensive use of modelling.
The first part of the book summarises the most important moments and ideas in the development of philosophy of mathematics (crises in foundation of mathematics, failure of Hilbert's programme, mathematics from a logical point of view, impact of the work of (among others) Bachelardi, Bourbaki, Carnap, Desanti, Feyerabend, Gödel, Heyting, Husserl, Lakatos, Lautman, Mill, Popper, Quine, Russell, etc.).

The second part deals with mathematics: the nature of research, universality of mathematical language, a role of simplifications. The notion of 'polysémie et dictionnaire' in mathematics is explained by means of several examples: geometrical transformations, non-Euclidean geometry, intuitionistic logic, symbolic calculus, various aspects of potential theory, non-standard analysis, etc. Creative processes, rigour and abstraction in mathematics are analysed and pedagogical aspects are also discussed.

The third part deals with the use of mathematics – the author does not speak of applied mathematics, but coins the term 'les mathématiques mixtes': representation and communication by means of semi-artificial ways of description. Various examples of modelling are offered: car traffic, environment, finance, change of climate, symbolic description of dancing, etc. The central notion here is that of a model and modelling, which enables engineers to use mathematics directly, not necessarily in the framework of traditional disciplines. The author also expresses his opinion on what mathematics should be taught future engineers. The concluding chapter deals with modernity and post-modernity in mathematics.

This book can be recommended to anybody who is interested in general and philosophical aspects of mathematics. Mathematicians surely appreciate that various philosophical concepts are documented and explained by means of well-chosen examples from mathematics. (in)

D. Bump, *Automorphic Forms and Representations*, *Cambridge Studies in Advanced Mathematics 55, Cambridge University Press, Cambridge, 1998, 574 pp., £24.95, ISBN 0-521-65818-7*
This is a paperback edition of the book published in 1997; for a review, see *EMS Newsletter* 29, September 1998, p.39) (vs)

J. H. Conway and N. J. A. Sloane, *Sphere Packings, Lattices and Groups*, *A Series of Comprehensive Studies in Mathematics 290, Springer, New York, 1999, 703 pp., DM139, ISBN 0-387-98585-9*
The third edition of this famous book continues to pursue the question of determining the most efficient way to pack a large number of equal spheres into n-dimensional Euclidean space. Related problems, such as the classification of lattices and quadratic forms, the covering and kissing numbers and quantising problems, are also examined, and connections with coding theory, digital communication, group theory, data compression, n-dimensional crystallography and number theory are studied. A supplementary biography since 1988 containing over 800 items is of special interest. (jtu)

K. R. Coombes, B. R. Hunt, R. L. Lipsman, J. E. Osborn, and G. J. Stuck, *The Mathematica Primer*, *Cambridge University Press, Cambridge, 1998, 214 pp., hardback £50, paperback £16.95, ISBN 0-521-63130-0 and 0-521-63715-5*
This book provides an introductory course for Mathematica, version 3, but even users of an earlier version may learn a lot. It covers the most important parts of the system, the front end, numerical and symbolic calculations, graphics, and Web. The book consists of eight chapters:

1. Getting started (how to work with Mathematica on different platforms),
2. Mathematica basics,
3. Mathematica notebooks,
4. Beyond basics,
5. Mathematica graphics,
6. Applications (illuminating a room, mortgage payments, cryptography, Fibonacci numbers, Monte Carlo simulation, population dynamics, chemical reactions, the 360° pendulum),
7. Mathematica and the Web,
8. Trouble-shooting (common problems, common mistakes).

At the end there are two appendices: Solutions to the practice sets and Glossary of commands, options, built-in functions and selected standard packages. The style of explanation is learning by carefully chosen examples. Chapter 6, in particular, demonstrates the power of Mathematica in various fields. The book is strongly recommended for beginners and also for intermediate or experienced users who may discover new features of Mathematica. (jh)

R. Curtis and R. A. Wilson (eds.), *The Atlas of Finite Groups: Ten Years On*, *London Mathematical Society Lecture Note Series 249, Cambridge University Press, Cambridge, 1998, 293 pp., £27.95, ISBN 0-521-57587-7*
This book is the proceedings of a conference organised in Birmingham in July 1995, to mark the tenth anniversary of the *Atlas of Finite Groups*. It contains twenty articles by leading experts in the field. Besides research papers we note a historical article on the development of the Atlas project since 1970 by three of its authors, J. H. Conway, R. T. Curtis and R. A. Wilson. Of particular interest are also survey papers on applications of character theory to surfaces by G. A. Jones, on recent advances in the representation theory by G. Hiss, and on Zassenhaus conjectures on integral group rings by W. Kimmerle. (jtu)

S. Donkin, *The q-Schur Algebra*, *London Mathematical Society, Lecture Note Series 253, Cambridge University Press, Cambridge, 1998, 179 pp., £24.95, ISBN 0-521-64558-1*
These notes relate the representation theory of quantum linear groups $G_q(n)$, of the q-Schur algebras $S_q(n, r)$ and of the Hecke algebras $H(r)$ defined by the symmetric group Sym(r). This generalizes the classical theory which is recovered as the case $q = 1$. There are two main tools employed. First, the Schur functor F from $S_q(n, r)$-mod to $H(r)$-mod: for $r \leq n$, one has $H(r) \cong eS_q(n, r)e$ for an idempotent e, and F is defined simply as the 'descent', $F(V) = eV$. Second, the identification of $S_q(n, r)$-mod with a full subcategory of $G_q(n)$-mod consisting of modules that are polynomial of degree r.

Donkin's approach is homological rather than combinatorial. Among other things, the character formula for irreducible $S_q(n, r)$-modules at $q = 0$ is proved in 2.2, and the Steinberg's tensor product theorem in 3.2. There is an explicit computation of tilting modules for the quantum GL_2 in 3.4, and an explicit description of the graded Grothendieck ring $\oplus_{d\geq 0}\, Grot(H(d))$ in 4.4. In 4.8, the global dimension of $S_q(n, r)$ for $r \leq n$ is determined.

The main part of the notes is written in article style. This is compensated for by a long expository Chapter 0, and by an appendix on quasi-hereditary algebras. The book is an important addition to the literature on the highly topical quantum version of the classical representation theory. (jtrl)

H. M. Enzensberger, *Zugbrücke ausser Betrieb*, *Drawbridge Up, A. K. Peters, Ltd., Natick, 1999, 47 pp., £4, ISBN 1-56881-099-7*
This booklet is written by the distinguished German poet and essayist Hans Magnus Enzensberger. His first book for children (and for other thinking beings) called 'The Number Devil' (Metropolitan Books, N.Y. 1998 – translation from the German 'Der Zahlenteufel: Ein Kopfkissenbuch für alle, die Angst vor der Mathematik haben', Carl Hanser Verlag, München 1997) is quite well known. Professional mathematicians are accustomed to live surrounded by people who declare with an odd sort of pride that they are mathematically illiterate. Enzensberger wishes to build a drawbridge between these two groups and believes that progress in teaching is possi-

ble and that mathematics can be made exciting to young minds. Public attitudes toward mathematics can be improved as mathematics is a part of the cultural sphere. Drawbridge up is a 'beautiful essay and a great delight for a mathematician to read' says David Mumford in the preface. (lbo)

G. Farin, *NURBS: From Projective Geometry to Practical Use*, *A. K. Peters, Ltd., Natick, 1999, 267 pp., £30, ISBN 1-56881-084-9*

Today's design technologies use sophisticated mathematical methods. Modelling complex objects such as ships, car bodies, or airplane fuselages has given rise to techniques known as Bézier curves and Coons methods. If we want to deal with the problem of how we see things, the Euclidean viewpoint is no more advantageous. A new tool called NURBS (non-uniform rational *B*-splines) appeared in 1975. A natural setting for it is projective geometry.

The book starts with a general outline of projective geometry. Conics are introduced through the classical projective definition, first as line conics and then as point conics. After Pascal's and Brianchon's theorems, the author presents conics in parametric form, conic splines and rational Bézier curves. Further chapters are devoted (e.g.) to rational cubics, NURBS curves and surfaces, rectangular patches and Gregory patches. A chapter on Pythagorean curves is incorporated in this second edition. The reader is assumed to know linear algebra, calculus and basic computer graphics. A significant feature of the book is a large collection of exercises, both practical and theoretical, at the end of each chapter. (lbo)

G. Farin and D. Hansford, *The Geometry Toolbox for Graphics and Modeling*, *A. K. Peters, Ltd., Natick, 1998, 288 pp., £34, ISBN 1-56881-074-1*

The subject of this book is an investigation of basic concepts of analytic geometry in the plane and three-dimensional space. It approaches linear algebra from a geometric viewpoint. Many figures and hand-drawn sketches help to explain linear analytic geometry (dot and cross product, barycentric coordinates, affine maps, eigenvectors, etc.). Only the last chapter is devoted to non-linear geometry, namely as an introduction to the theory of curves (parametric curves, Bézier curves, curvature and the Frenet frame). As an application, the authors mention curves used to design cars (computer-aided geometric design). The theoretical level is kept to a minimum, and the emphasis of the book is not on abstract proofs but rather on examples and algorithms. The book can be recommended to students, and can serve also as a general introduction to geometry and to applications of linear algebra (e.g. matrix theory) in geometry. (lbo)

H. O. Fattorini, *Infinite Dimensional Optimization and Control Theory*, *Encyclopedia of Mathematics and its Applications 62, Cambridge University Press, Cambridge, 1999, 798 pp., £70, ISBN 0-521-45125-6*

This extensive monograph is a fundamental contribution to optimal control theory of evolution of finite- or infinite-dimensional systems, and summarises and extends the author's many decades of lasting intensive research in this area.

The first part (Chapters 1-4) deals with 'finite-dimensional control problems', optimisation problems governed by initial-value problems for systems of (possibly non-linear) ordinary differential equations. Chapter 1 'Calculus of variations and control theory' contains motivating examples. Chapter 2 deals with 'Optimal control problems without target conditions', starting from measure and integration theory and functional analysis, and then continuing with (non-)existence in classical optimal control problems, spike variations, minimum principle, Hamiltonian formalism, and linear-quadratic problems, including the feedback Riccati equation. Then Chapters 3 and 4 deal with (time-)optimal control problems, both on an abstract level and on the level of concrete examples. Here Ekeland's variational principle and the Kuhn-Tucker theorem are the main tools used on the abstract level.

The second part (Chapters 5-11) is devoted to 'Infinite dimensional control problems'. Chapter 5, 'Differential equations in Banach spaces and semigroup theory' includes elements of functional analysis, the theory of the Lebesgue-Bochner integral, and (semi-)linear parabolic and hyperbolic partial differential equations as abstract Cauchy problems using the semigroup approach. Chapters 6 and 7 treat abstract minimisation problems in Hilbert and Banach spaces, with various applications to linear or semi-linear hyperbolic and parabolic control problems, respectively, deriving always the minimum principle of Pontryagin's type. Chapter 8 deals with interpolations and domains of fractional power with application to Sobolev-Slobodeckii spaces and parabolic equations, including Navier-Stokes equations. 'Linear control systems' forms Chapter 9, including such special topics as bang-bang theorems and controllability. Chapters 10 and 11 address 'Optimal control problems with state constraints', admitting (possibly only finitely additive) vector-valued measures as the respective Lagrange multipliers. Suboptimal controls and their convergence are studied in detail.

The third part (Chapters 12-14) deals with 'Relaxed controls' which come into consideration if an original optimal control problem lacks solutions. A unique theory of 'Spaces of relaxed controls' forms Chapter 12. Classical Young measures (i.e., parametrised probability Radon measures) are only a particular case arising if controls range a metrisable compact. In non-compact cases, a generalisation to certain finitely-additive probability measures is made. Chapter 13 applies relaxed controls to finite-dimensional evolution systems. Original controls range a compact set so that the relaxed controls are classical Young measures here, except the last section where unbounded R^k-valued controls are admitted, too. Finally, Chapter 14 develops a relaxation theory both for abstract infinite dimensional systems and for concrete semi-linear parabolic or hyperbolic partial differential equations, where often the controls range naturally a non-compact set, so that the generalised (i.e., finitely-additive) Young measures appear.

Bibliographical comments accompany each part. This outstanding monograph will be a great source both for experts and for graduate students interested in calculus of variations, non-linear programming, optimisation theory, optimal control, and relaxation theory. (trou)

D. Fowler, *The Mathematics of Plato's Academy*, *Clarendon Press, Oxford, 1999, 441 pp., £60, ISBN 0-19-850258-3*

'The Mathematics of Plato's Academy' is an updated second edition of a well-known book devoted to early Greek mathematics. The book is divided into three parts: *Interpretation*, *Evidence* and *Later developments*.

The first part (Chapters 1-5) presents a new interpretation of some mathematical ideas and topics found in the works of Plato, Aristotle, Euclid, Archimedes, etc. The author shows that the methods, algorithms and procedures derived from their works had a great influence on the development of early Greek mathematics. Chapter 5 has been rewritten, while other chapters have many smaller additions, modifications and corrections.

The second part (Chapters 6-7) describes the evidence forour knowledge of Plato's Academy, describing the transmission of Greek texts to our time and looking at the treatment of numbers and fractions.

The third part (Chapters 8-11) describes the development of continued fractions since the seventeenth century. Chapter 10 (Appendix) introduces new material that can be considered as a modern interpretation of Greek mathematics and the mathematical topics of Plato's Academy. The new brief autobiographical Epilogue, the new significantly expanded Bibliography, the Index of cited passages, the Index of names and the General index have been added to this second edition. (mbec)

J. Glynn and T. Gray, *The Beginner's Guide to Mathematica® Version 3*, *Cambridge University Press, Cambridge, 1997, 347 pp., ISBN 0-521-62202-6 and 0-521-62734-6*

This book serves both as a tutorial and as a reference book. It is written as seventy short chapters in Question and Answer form. It covers a variety of problems like the front end, symbolic and numerical calculation, typesetting, packages, graphics, Internet environment, and programming. A lot of information contained in the book may be found in the Mathematica help topics, and the style of presentation enables the Mathematica user (both the

beginner and the advanced user) to get important pieces of information very quickly. The book is strongly recommended not only to all Mathematica users but also to those who would like to learn how to use the full capability of Mathematica. (jh)

W. M. Goldman, *Complex Hyperbolic Geometry*, *Oxford Mathematical Monographs, Clarendon Press, Oxford, 1999, 316 pp., £65, ISBN 0-19-853793-X*
This book is a very good introduction to the geometry of a complex hyperbolic space and its boundary. It is accessible even for undergraduate students. The author's motivation was the need to have a well and systematically organised introductory text on this subject - namely, it was desirable to unify and 'normalise' expositions which appeared mostly in various journals. Anyhow, this book seems to be the first one that presents such a systematic treatment. The author himself considers his book as a 'user's guide' to complex hyperbolic geometry. His exposition uses minimal possible technical tools. He tries to avoid references to general theorems exceeding the framework of the complex hyperbolic geometry, and prefers to derive results by concrete considerations and computations; this is exactly the point that will surely be appreciated by an undergraduate reader. His idea is to introduce the reader into geometry via concrete examples, and complex hyperbolic geometry suits this purpose well.

In order to motivate the reader, the author starts with a chapter that reviews the complex 1-dimensional geometries. They are presented in such a manner that they suggest generalisations to higher dimensions. The next chapter deals with the relevant linear algebra and necessary notions from differential geometry. Then we come to the main parts of the book. The author presents the complex n-dimensional hyperbolic space first in the form of the unit ball model (in C^n) and then in the form of the paraboloid (or Siegel domain) model. We remark explicitly that the author also devotes systematic attention to the geometry of the boundary of the complex hyperbolic space. It is here where the Heisenberg geometry appears. He presents old results (usually in more modern and elegant way) as well as quite recent ones. There are many interesting exercises that substantially enrich the main text, and many nice pictures. The bibliography contains 175 items and goes up to 1998. (jiva)

J. Harris and I. Morrison, *Moduli of curves*, *Graduate Texts in Mathematics 187, Springer, New York, 1998, 366 pp., DM118, ISBN 0-387-98438-0 and 0-387-98429-1*
The main topic of this book is a description of the properties of moduli spaces of algebraic curves. This subject has grown rapidly in the last few years. In the first part, there is a short summary of basic facts concerning moduli and parameter spaces of curves, Hilbert schemas, the space M_g and its geometric and topological properties. There is also an interesting chapter containing a description of Witten's conjectures and the Kontsevich theorem. Deformation theory, stable reduction and the Grothendieck-Riemann-Roch are described in the second part of the book. The rest of the book contains a selection of contemporary results on the geometry of moduli spaces.

These theories are presented here in a very nice form, with examples and many exercises. The authors' preference has been to focus on examples and applications rather than on theoretical foundations. This method seems to be very appropriate for this topic. The book ends with a rich bibliography. (jbu)

A. B. Kharazishvili, *Applications of Point Set Theory in Real Analysis*, *Mathematics and Its Applications 429, Kluwer Academic Publishers, Dordrecht, 1998, 236 pp., £66, ISBN 0-7923-4979-2*
The main goal of this book is to demonstrate the usefulness of set-theoretical methods in various questions of real analysis and classical measure theory. The book is devoted to some results from classical point-set theory and their applications to certain problems in mathematical analysis of the real line.

The author concentrates on the following topics:
(a) similarities and differences between measure and category: many non-trivial examples and facts are presented in the book;
(b) set-theoretic, topological and algebraic aspects of the measure extension problem: in particular, there are applications of Ershov's measure extension theorem to the classical property of Luzin and to the uniqueness property of invariant measures;
(c) various constructions of Lebesgue nonmeasurable sets and of sets without the Baire property: some connections between these constructions and infinite combinatorics (namely, the Ulam matrix) and the general theory of commutative groups are indicated;
(d) various singular objects in mathematical analysis from the point of view of the Kuratowski-Ulam theorem: in particular, it is established that the classical principle of condensation of singularities follows directly from the above-mentioned theorem;
(e) geometrical properties of certain subsets of an abstract space E, equipped with a group G of its transformations: first, the so-called G-thick sets, G-scattered sets, G-thin sets, G-negligible sets and absolutely G-negligible sets, and several relationships between these properties, the theory of invariant (quasi-invariant) measures and the general theory of G-equidecomposability of sets are thoroughly considered;
(f) some set-theoretical aspects of the theory of differential equations, concerning the existence and uniqueness of solutions of such equations.

The material presented in this book is essentially self-contained and is accessible to a wide audience of mathematicians. It will appeal to specialists in set theory, mathematical analysis, measure theory and general topology. It is also recommended as a textbook for postgraduate students. (pp)

Y. Kitaoka, *Arithmetic of Quadratic Forms*, *Cambridge Tracts in Mathematics **106**, Cambridge University Press, Cambridge, 1999, 270 pp., £18.95, ISBN 0-521-40475-4 and 0-521-64996-X*
The aim of this book is to provide an introduction to the arithmetic theory of quadratic forms. The book starts from the basics and proceeds to many recent results. It covers several aspects of the subject including lattice theory, Siegel's formula, and tensor products of positively definite quadratic forms. Quadratic forms are mainly considered over the rationals or the ring of rational integers and their completions.

The reader is required to have only an elementary knowledge of algebraic number fields. This makes the book ideal for graduate students and researchers from other fields interested in quadratic forms. (jtu)

P. Koosis, *Introduction to H_p spaces*, *Second Edition. Cambridge Tracts in Mathematics 115, Cambridge University Press, Cambridge, 1998, 287 pp., £45, ISBN 0-521-45521-9*
The first edition of this book was published in 1980. There is a Russian translation that is accompanied by two appendices on Jones interpolation formula and weak completness of the factor $L_1/H_1(0)$, written by V. P. Havin; these appendices are reproduced in the new edition. There are also some other changes, but they do not alter the spirit of the first edition.

The contents of the book can be divided into two parts. The first part, consisting of Chapters I-VI is devoted to basic information on the Hilbert transform and the Hardy spaces Hp for the disk and the upper half-plane. Here the author uses the so-called 'complex function methods', but some key results (such as the Riesz brothers' theorem on analytic measures and the M. Riesz theorem on L_p boundedness of the Hilbert transform) have several proofs.

The second part contains deeper results. The duals of H_p and H_p-best approximation of L_p-functions are investigated in Chapter VII. The characterisation of ReH_1 based on the Hardy-Littlewood maximal functions is discussed in Chapter VIII. Interpolation results for H_p-functions (Carleson and Shapiro-Shields theorems) and for bounded harmonic functions (Garnett theorem) are proved in Chapter IX. Chapter X is devoted to functions of bounded mean oscillation (two proofs of the Fefferman representation of the dual of $ReH_1(0)$ are presented); the main changes with respect to the first edition are in this chapter. The Wolff's proof of the Carleson corona theorem is given in the last chapter.

This book is written chiefly for graduate students with a working knowledge of real

and complex function theory, and contains many valuable comments on ideas and techniques of proofs. The use of different typographical forms also helps to clarify complicated proofs. (jmil)

M. Kracht, M. de Rijke, H. Wansing and M. Zakharyaschev (eds.), ***Advances in Modal Logic 1****, CSLI Publications, Stanford, 1998, 392 pp., £15.95, ISBN 1-575-86102-X and 1-575-86103-8*

The first conference in the Advances in Modal Logic (AiML) conference series was held at the Free University of Berlin in October 1996. AiML is also a forum, established in 1995, for scientists working in various areas of modal logic and its applications. The book contains 21 papers in the field. The book covers a large spectrum of topics, offering results on the mathematics of modal logic, proof-theoretical properties, theoretical and applied computer science, applications in knowledge representation, philosophy and linguistics. We find here contributions on terminological modal logic, hybrid languages, topological next-time logic, minimal knowledge states in non-monotonic modal logics and relations between models and parallel computations. The papers motivate the field and review basic notions and facts. A subject index is included. The book can be seen as a good and representative source of information concerning research in the subject. It is accessible to advanced students in non-classical logic. (jmlc)

K. Leichtweiss, Affine Geometry of Convex Bodies, *Johann Ambrosius Barth Verlag, Heidelberg, 1998, 310 pp., DM148, ISBN 3-335-00514-7*

The author presents a systematic equiaffine theory of convex bodies, and stresses connections and differences from the convex geometry in Euclidean spaces. Special attention is paid to the definition of the affine surface area and to a comparison of the author's definition with other ones. Some generalisations of classical inequalities from convex geometry (such as the isoperimetric inequality) to the affine case are also presented. (jrat)

B. R. Mandelbrot, ***Fractals and Scaling in Finance****, Springer-Verlag, New York, 1997, 551 pp., ISBN 0-387-98363-5*

This book presents an alternative approach to the analysis of financial data, or more generally, to any data set possessing features like financial time series. Approximately half of the book consists of the author's contributions to various problems from the last 40 years in the form of preprints from journals (together with contributions of other authors related to the topic), while the remaining half is completely new. The key concept in the book is scaling.

The first two chapters are devoted both to non-mathematical and mathematical presentations. The third chapter deals with personal incomes and firm sizes. The fourth chapter describes and illustrates the Mandelbrot 1963 model of price variation. The fifth chapter consists of some comments beyond the Mandelbrot 1963 model.

This book is recommended to any mathematician and/or financial analyst who wishes to learn more about the variety of alternative models and to avoid using just the classical methods. (jh)

P. Marage and G. Wallenborn (eds), ***The Solvay Councils and the Birth of Modern Physics****, Historical Studies, Science Networks* ***22****, Birkhäuser, Basel, 1999, 224 pp., DM118, ISBN 3-7643-5705-3 and 0-8176-5705-3*

The Solvay Councils, held in Brussels since 1911 following an initiative of the Belgian industrialist E. Solvay, played an essential role in forming the paradigm of modern physics. Organised as a series of meetings of the most distinguished physicists of that time, the Councils provided ground for the constitution of new physics beyond 'classical' mechanics and field theory, of the quantum theory of matter and radiation. Reports of the Councils, at least of those before the Second World War, can be read as a detective story on how the contemporary knowledge of atoms, atomic nuclei, and subatomic particles came into being through a brilliant stroke of experiments and seemingly bizarre hypotheses, often inspired by vivid discussions at the Councils. The book 'tells the story' of the Councils, together with short explanations of the necessary physical background, so that it is useful not only for physicists (who will find here historical facts that are often oversimplified in physics textbooks), but also for scientists of non-physical areas and the broad public seeking reliable information on the birth of quantum mechanics. The text is based on the Brussels 1995 exhibition and conference devoted to the Solvay Councils, and contains (besides a description of the most important Councils before the Second World War) contributions dealing with the role of some personalities in the science of that period and the historical and sociological background. It is worth mentioning that the book contains excellent and not commonly known photographs of the most influential Council participants. The book is recommended to all who are interested in the fascinating development of physics in the 20th century. (pc)

K. Matsuzaki and M. Taniguchi, ***Hyperbolic Manifolds and Kleinian Groups****, Oxford Mathematical Monographs, Clarendon Press, Oxford, 1998, 253 pp., £60, ISBN 0-198-50062-9*

This book is a revised and enlarged translation of a book by the same authors which appeared in 1993 in Japanese. It is devoted to the study of hyperbolic 3-manifolds and Kleinian groups, which since 1980 have attracted much attention. The book starts from the very beginning of hyperbolic geometry and leads the reader up to contemporary research. Its prerequisites are rather modest. Practically, it requires only basic knowledge of geometry, algebra and analysis, and some familiarity with hyperbolic plane geometry and hyperbolic surfaces. But for the reader's convenience, and also as motivation, the authors include Chapter 0, a summary about hyperbolic surfaces and Fuchsian groups. Then, from Chapter 1, the reader is presented with all the necessary details. This means that even 3-dimensional hyperbolic space is introduced and three of its models are carefully studied. Then hyperbolic 3-manifolds are defined and the Kleinian groups appear as the universal covering transformation groups of their universal covering, 3-dimensional hyperbolic space. Chapters 2, 3 and 4 deal directly with the Kleinian groups. Special attention is devoted to geometrically finite and finitely generated Kleinian groups. But even Chapter 5, 'The sphere at infinity', studies the actions of Kleinian groups on this sphere and describes how the hyperbolic geometry is mirrored by this sphere. Chapter 6 is about the ends of hyperbolic manifolds and the final chapter studies algebraic and geometric convergence of Kleinian groups. A short appendix is devoted to the Thurston uniformisation theorem.

The presentation of the whole theory is very nice; we find here many concrete examples and interesting remarks. Simply, the book reads well, and will be interesting and accessible for mathematicians from several branches of mathematics. The literature has 108 items and goes up to 1997. (jiva)

G. Navarro, ***Characters and Blocks of Finite Groups****, London Mathematical Society Lecture Note Series 250, Cambridge University Press, Cambridge, 1998, 287 pp., £24.95, ISBN 0-521-59513-4*

This book presents an account of the theory of Brauer (alias modular) characters and blocks for finite groups. The motivating result for the first part of the book is the Z^*-theorem of G. Glauberman which is one of the main applications of modular representation theory to finite groups. The first chapters develop the theory and include the main theorems of R. Brauer. After proving the Z^*-theorem, the author concentrates on p-solvable groups and, finally, on the groups with Sylow p-group of order p and description of their p-blocks.

This book can be used by both graduate students and researchers interested in modular representation theory of finite groups. Its style is accessible and includes some recent results. At the end of each chapter is a set of open problems. (rb)

J. A. Nohel and D. H. Sattinger (eds.), ***Selected Papers of Norman Levinson****, 2 vols., Contemporary Mathematicians, Birkhäuser, Boston, 1998, 1152 pp., DM976, ISBN 3-764-33862-8 and 3-764-33979-9*

This selection reflects Levinson's contribution to complex, harmonic and stochastic analysis, to differential and integral equations, and to analytic number theory. His list of publications contains 124 items, of which 76 are reproduced in this collection.

Each section contains a complete list of papers covering the topic of the section and commentaries written by B. Conrey, B.

Levitan, J. Moser, J. Nohel, M. Pinsky, A. Radakrishnan, R. Redheffer, D. Sattinger, H. Sussman and E. Zeidler. Photos from various periods of his life can be found in both volumes. Finally, personal tributes by H. McKean, W. T. Martin, B. Konstant and his wife Zipporah (Fagi) complete the picture about his life and personality, helping those of us who never had an opportunity to meet him.

The first volume is devoted to the following topics: stability and asymptotic behaviour of solutions of ordinary differential equations, non-linear oscillations and dynamical systems, inverse problems for Sturm-Liouville and Schrödinger operators, eigenfunction expansions and spectral theory for ordinary differential equations, singular perturbations of ordinary and partial differential equations, elliptic partial differential equations and integral equations.

The second volume treats harmonic and complex analysis, stochastic analysis, elementary number theory and the prime number theorem, the Riemann zeta-function and miscellaneous topics. (špor)

B. Novák (ed.), ***Life and Work of Vojtìch Jarník****, Society of Czech Mathematicians and Physicists, Prometheus, Praha, 1999, 197 pp., ISBN 80-7196-156-6*

Vojtìch Jarník (1897-1970) was one of leading personalities of Czechoslovak mathematics of the 20th century. His precise style of writing, both in his famous series of books on analysis and in his own research work, heavily influenced many generations of mathematicians in Czechoslovakia.

Besides biographical articles, personal recollections and articles on his pedagogical activities, the book contains a description of Jarník's research contribution to diophantine approximations (by M. Dodson), geometry of numbers (by P. Gruber), combinatorial optimisation (by B. Korte and J. Nešetøil), real analysis (by D. Preiss) and lattice theory (by B. Novák). These contributions show the continuing impact of Jarník's ideas in number theory and real analysis up to the present time. The last 85 pages contain 7 selected papers of Jarník, including his pioneering paper on Hausdorff measure and diophantine approximations and his bibliography. (vs)

G. Pisier, ***The Volume of Convex Bodies and Banach Space Geometry****, Cambridge Tracts in Mathematics 94, Cambridge University Press, Cambridge, 1999, 250 pp., £17.95, ISBN 0-521-36465-5 and 0-521-66635-X*

The classical Dvoretzky's Theorem relates the analytic properties of Banach spaces to the geometry of its finite dimensional subspaces. This book presents some recent results of a similar nature. The basic tools are various (classical and recent) inequalities for volumes of convex bodies in finite-dimensional Euclidean spaces, such as the (inverse) Brunn-Minkowski inequality or the (inverse) Santaló inequality. Besides the classical methods of convex geometry, the techniques of Gaussian processes and approximation theory are used. Consequently, important results are obtained for the geometry of (infinite-dimensional) Banach spaces. The presentation is self-contained and, due to its interdisciplinary character, should attract the attention of a wide group of mathematicians. (jrat)

B. Polster, ***A Geometrical Picture Book****, Universitext, Springer, New York, 1998, 291 pp., DM98, ISBN 0-387-98437-2*

Pictures are what this book is all about. They illustrate various kinds of geometry, such as incidence structures, affine and projective planes and spaces, linear spaces, designs, circle planes, generalised polygons, etc.

The book is divided into two parts. The first part presents pictures of finite geometries with small numbers of points, the second part contains pictures of topological geometries, mainly those that live on surfaces. Each chapter contains definitions, a minimum of theory, and references to textbooks and survey articles. The book is addressed at advanced undergraduates and graduate students. (lbo)

A. D. Polyanin and A. V. Manzhirov, ***Handbook of Integral Equations****, CRC Press, Boca Raton, 1998, 787 pp., DM228, ISBN 0-8493-2876-4*

In this book, more than 2100 integral equations with solutions are given. New exact solutions to many linear and non-linear equations are included. Special attention is paid to equations of general form that depend on arbitrary functions. Other equations contain one or more free parametrs. The number of equations described in the book is of an order of magnitude greater than in other available books. Equations considered here appear in various fields of mechanics and theoretical physics (elasticity, plasticity, hydrodynamics, heat and mass transfer, electrodynamics, etc.). The second part contains exact and approximate analytical and numerical methods for solving linear and non-linear integral equations.

The handbook has no analogue in the literature and is intended for a wide audience of researchers, college and university teachers, engineers, and students in the various fields of mathematics, mechanics, physics, chemistry, and queueing theory. (mbr)

J. Rappaz and M. Picasso, ***Introduction à l'analyse numérique****, Presses Polytechniques et Universitaires Romandes, Lausanne, 1998, 256 pp., sFr62, ISBN 2-880-74363-X*

This book is aimed at undergraduate engineering and science students who need a readable textbook on numerical mathematics. It presents a comprehensive description of the fundamental tools for numerical solutions of ordinary and partial differential equations. The text is centred around those topics that form the essentials of the finite-difference and finite-element method: polynomial interpolation, numerical differentiation and integration, solution of linear and non-linear algebraic equations. The authors use a practical approach based upon solving model elliptic, parabolic, hyperbolic and convection-diffusion problems, and all ideas are introduced from this viewpoint. The text contains solved exercises as a bridge from the theory to the applications. (jfel)

Y. B. Rudyak, ***On Thom Spectra, Orientability, and Cobordism****, Springer Monographs in Mathematics, Springer-Verlag, Berlin, 1998, 587 pp., DM198, ISBN 3-540-62043-5*

This is a fundamental monograph on the topics in the title, written by an author who has substantially contributed to the subject. It contains a relatively large amount of material, even in comparison with older books on these subjects. (This can be already seen from the number of pages.) A great deal of material cannot be found in any other monograph. The main topics here are spectra and (co)homology theories, with special emphasis on the (co)bordism theories. We note that two chapters are devoted to the (co)bordism with singularities, and that there is a chapter about the phantom maps and a chapter about orientability with respect to cohomology theories.

The book is indispensable for research workers in algebraic topology. The presentation of the material is very nice and thorough, and this makes the book convenient for students with preliminary knowledge of algebraic topology. The book is not self-contained, because this would enlarge its size still further. But whenever the author decides not to introduce a notion or present a proof, he gives an adequate reference. The beginner will especially appreciate the author's historical remarks that help one understand the origins and spirit of the theory. But even from a formal point of view the author tries to make the reading as easy as possible. The list of notations is carefully arranged into several groups, which enables quick orientation. The references extend to 18 pages. (jiva)

G. Sambin and J. Smith, ***Twenty-Five Years of Constructive Type Theory****, Oxford Logic Guides 36, Clarendon Press, Oxford, 1998, 283 pp., ISBN 0-19-850127-7*

Beginning in 1970, Per Martin-Løf has developed a constructive foundation of mathematics which he called intuitionistic type theory. On the occasion of the 25th anniversary, a special conference on the subject took place and it was decided to publish the proceedings without restricting contributions to participants of the conference. Thus, among others, it contains one of the first preprints of Martin-Løf (1971) on the subject. It is published here for the first time.

Type theory has increasing applications to a variety of fields like constructive mathematics, logic, computer science, linguistics etc. Fourteen remaining papers in the proceedings cover many of these applications. The book presents a good survey of the current state of the subject. (ak)

A. Scott, *Nonlinear Science: Emergence and Dynamics of Coherent Structures*, *Oxford Applied and Engineering Mathematics 1, Oxford University Press, Oxford, 1999, 474 pp., £39.95, ISBN 0-19-850107-2*

Originally prepared as notes for courses presented to advanced undergraduates at the Technical University of Denmark, this book is designed as an introduction to the study of non-linear partial and difference-differential equations.

It starts with a description of the historical development of non-linear models. The reader is supposed to have a basic knowledge of physical notions and of the linear theory (Fourier transform, stability, scattering theory), although the latter is briefly reviewed in an introductory chapter. In the main part of the book are presented classical soliton equations (Korteveg-de Vries, sine-Gordon, non-linear Schrödinger), non-linear diffusion equations (Fisher, Hodgkin-Huxley, Fitz-Hugh-Nagumo), non-linear lattices (here the spatial variable takes its values in a lattice of points), and their exact solutions (travelling waves, solitons) are discussed. The Bäcklund transform and the inverse scattering method are explained by means of examples, as well as being generally formulated. A discussion of perturbations and quantum lattice solitons is also included. The final chapter is a personal view on future directions of research in applied science. The presentation in the book is based on concrete equations and the formulas are often derived from physical intuition. There are no definitions and theorems. Much attention is paid to the physical, biological or chemical context. (efa)

N. N. Tarkhanov, *The Analysis of Solutions of Elliptic Equations*, *Mathematics and its Applications 406, Kluwer Academic Publishers, Dordrecht, 1997, 479 pp., £146, ISBN 0-7932-4531-1*

This book includes a broad analysis of general elliptic systems of differential equations. It starts with singularities of solutions and their removability. Several results illustrate the role of adequate capacities, as well as the Hausdorff measures and Minkowski's content, in estimating the size of singular sets. Parallels with the development of the theory of functions of complex variables are underlined. The Laurent series for solutions of homogeneous elliptic systems and an investigation of appropriate expansions of solutions may serve as an example; another such topic is the theory of uniform approximation by holomorphic functions, which stimulated the study of questions concerning uniform approximation by solutions of general systems of differential equations. While the problem of uniform approximation has a long history, investigation of the mean approximation has begun comparatively recently. There is also a chapter that includes a discussion of how approximation within BMO may be seen as intermediate between the approximation theories in uniform and in Sobolev norms. Other themes treated in the book include solvability of the Cauchy problem and the stability theory, its role in the theory of quasi-conformal mappings, and special classes of solutions of first-order elliptic systems. The reader is expected to have a good knowledge of basic functional analysis, distribution theory, function theory and partial differential equations (pseudo-differential operators). This comprehensive text (479 pp.) provides rich material that may be used in specialised seminars. (jokr)

M. Yamaguti, M. Hata and J. Kigami, *Mathematics of Fractals*, *Translations of Mathematical Monographs 167, American Mathematical Society, Providence, Rhode Island, 1997, 78 pp., £19.50, ISBN 0-821-80537-1*

The translation of the Japanese original starts with the basic concepts concerning fractals (dimension, Hausdorff measures and dimension, etc.). The self-similarity is described with many nice examples and relations to nowhere-differentiable functions and the Takagi function are presented. Some problems concerning wavelets are also treated. The final chapter is concerned with some equations of mathematical physics (Laplace's equation, Gauss-Green formula, Poisson equation, Dirichlet problem, etc.) on sets having a fractal character. The book is a good introduction to the topic. Interesting applications are presented. (ss)

List of reviewers for 1999

The Editor would like to thank the following for their reviews this year:
J. Andìl, R. Bashir, J. Beèváø, L. Beran, L. Bican, L. Boèek, M. Brzezina, J. Bureš, M. Èadek, P. Èejnar, K. Cuda, A. Drápal, E. Fašangová, M. Feistauer, J. Felcman, D. Hlubinka, P. Holický, J. Hurt, M. Hušek, J. Jelínek, O. John, J. Jureèková, T. Kepka, M. Klazar, O. Kowalski, A. Kuèera, J. Král, M. Lichá, M. Loebl, J. Lukeš, J. Malý, J. Milota, J. Mlèek, K. Najzar, M. Nìmcová-Beèváøová, J. Nešetøil, I. Netuka, S. Porubský, P. Pyrih, J. Rataj, M. Rokyta, T. Roubíèek, Š. Schwabik, J. Slovák, J. Souèek, V. Souèek, J. Štìpán, J. Trlifaj, V. Trnková, J. Troják, J. Tùma, P. Valtr, J. Vanžura, J. Veselý, M. Zahradník, L. Zajíèek, J. Zichová, V. Zizler, J. Žemlièka.

All of the above are on the staff of the Charles University, Faculty of Mathematics and Physics, Prague, except:
M. Èadek and J. Slovák (Masaryk University, Faculty of Natural Sciences, Brno), J. Král, Š. Schwabik and J. Vanžura (Mathematical Institute, Czech Academy of Sciences), Š. Porubský (Technical University, Prague).

Editor's note: We regret that the Problem Corner, due for publication in this issue, has had to be held over to the March issue.

EMS Newsletter Index for 1999

Personal Column

This is a new venture. We list below information about some appointments, awards and deaths that have occurred during 1999. Since this list is inevitably incomplete (containing mainly UK items) we invite you to send appropriate information from other countries to the Editor [r.j.wilson@open.ac.uk] or to your Country representative (see page 15) for inclusion in the next issue. Please also send items for inclusion in the 2000 Personal Columns.

Appointments

Sir Michael Atiyah and **Ioan James** have been elected to Honorary Fellowships at New College, Oxford University.

David Brannan has been re-elected Dean of Mathematics at the Open University, UK.

Terry Griggs and **Mike Grannell** have been appointed Research Fellows. **Barbara Maenhaut** (Queensland), **Toby O'Neil** (Edinburgh), **Kathleen Quinn** and **Steven Vickers** (London) have been appointed Lecturers in Mathematics.

Christopher Campbell, **Sarah Rees** and **Anvar Shukurov** have been promoted to Readerships at Newcastle University, and **A.M. Constantin**, **M.A. Dritschel** and **G. Sarson** have been appointed to lectureships.

Philip Candelas (Texas) has been appointed Rouse Ball Professor of Mathematics, Oxford University, succeeding Roger Penrose.

S. J. Chapman has been appointed to the Chair of Mathematics and its Applications, Oxford University, from 1 July 1999.

Boris Zilber (Kemerovo) has been appointed to the Chair of Mathematical Logic, Oxford University, from 1 October 1999.

David Draper has been promoted to Professor of Statistics at the University of Bath.

Noel Lloyd, Professor of Mathematics at the University of Wales (Aberystwyth) has been appointed Registrar and secretary of the University.

Terence Lyons (London) has been appointed to the Wallis Chair of Mathematics, Oxford University, from 2 April 2000, succeeding Simon Donaldson.

Roger Penrose has been appointed Gresham Professor of Geometry, in London, succeeding Ian Stewart.

Robin Wilson has been appointed a Fellow by Special Election at Keble College, Oxford University.

Awards

Sir Michael Atiyah has been awarded an Honorary Doctorate at Heriot-Watt University, Edinburgh.

Alan Baker (Cambridge) has been awarded an Honorary Doctorate in Strasbourg.

John Ball (Oxford) has been awarded a Theodore von Kármán Prize by the Society for Industrial and Applied Mathematics (SIAM).

Arrigo Bonisoli (Potenza) and **Marco Buratti** (Penigia) have been awarded the Hall Medal by the Institute of Combinatorics and its Applications.

Martin Bridson (Oxford), **Gero Friesecke** (Oxford), **Nicholas Higham** (Manchester) and **Imre Leader** (London) have been awarded Senior Whitehead Prizes by the London Mathematical Society.

David Burns (London) has been awarded the Junior Berwick Prize by the London Mathematical Society.

David Crighton (Cambridge) has been awarded an Honorary Doctorate at UMIST, Manchester.

Simon Donaldson (London) has been awarded the 1999 Polya Prize by the London Mathematical Society.

George A. Elliott (Copenhagen and Toronto) has received the John L. Synge Award for applied mathematics.

Ali Fröhlich (Cambridge) has been awarded an Honorary Doctorate at the University of Bristol.

Tim Gowers (Cambridge), John Ockendon (Oxford), William Stirling (Durham) and John Toland (Bath) have been elected Fellows of the Royal Society of London.

Stephen Hawking (Cambridge) has received the Albert Medal from the Royal Society of Arts.

Anthony Hilton (Reading) has been awarded the 1999 Euler Medal by the Institute of Combinatorics and its Applications for distinguished research in combinatorics.

Robert Hiorns (Oxford) has been elected an Honorary Fellow of the Institute of Mathematics and its Applications.

Helge Kristian Jenssen (Trondheim) has been awarded the Esso Young Researcher Prize for the best NTNU (Trondheim) Ph.D. thesis.

Christine Keltel-Kreidt (Berlin) has been awarded an Honorary Doctorate at the University of Chichester.

Adam McBride (Strathclyde) received the Order of the British Empire for services to mathematics in schools.

Sir Roger Penrose (Oxford) has been awarded an Emeritus fellowship by the Leverhulme Trust.

Mike Powell (Cambridge) has been awarded the Senior Whitehead Prize by the London Mathematical Society.

John Rognes (Oslo) has been awarded the 1999 Dals Research Prize for research in K-theory.

Tomás Roubíček (Prague) has been awarded the prize of the Minister of Education of the Czech Republic.

Caroline Series (Warwick) has been awarded an EPSRC Senior Research Fellowship.

Jaromír Šimša (Prague) has been awarded the Prize of the Czech Academy of Sciences for the popularisation of mathematics.

John Tate (Austin, Texas) has been elected an Honorary Member of the London Mathematical Society.

Andrew Wiles has been awarded an Honorary Doctorate at Oxford University.

Deaths

We regret to announce the deaths of:
Ernest Albasiny (18 July)
Jiøi Bečvár (25 January)
Roland Clark (28 July)
Sir Wilfred Cockcroft (27 September)
Walter Deuber (16 July)
Albert Green (12 August)
Jack Howlett (5 May)
Johann Leicht (14 May)
Sir William McCrea (25 April)
Josef Novák (20 August)
Vlastimil Pták (9 May)
Werner Raffke (11 May)
Gian-Carlo Rota (19 April)
Zbyñek Sidák (12 November)
Christine Shiu (16 October)
Helmut Titze (30 March)
Jürgen Weishaupt (29 July)