



European Mathematical Society

NEWSLETTER No. 6

1st December 1992

SAVE EXISTING VALUES!

(Mathematics in Eastern and Central Europe)

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Editors

Ivan Netuka
Mathematical Institute
Charles University
Sokolovská 83
18600 PRAGUE, CZECHOSLOVAKIA

David Singerman
Faculty of Mathematical Studies
The University
Highfield
SOUTHAMPTON SO9 5NH, ENGLAND

Editorial Team Southampton:
D. Singerman, D.R.J. Chillingworth
G.A. Jones, J.A. Vickers

Editorial Team Prague:
Ivan Netuka, Jiří Rákosník
Vladimír Souček

Editor - Mathematics Education
W. Dörfler, Institut für Mathematik
Universität Klagenfurt, Universitätsstraße 65-57
A-9022 Klagenfurt, AUSTRIA

Editor - History of Mathematics
J. Gray, Faculty of Mathematics
The Open University
Milton Keynes, MK7 6AA, UK

USEFUL ADDRESSES

President Professor F. Hirzebruch, Max Planck Institut für Mathematik, Gottfried Claren Str 26,
D-5300 Bonn 3, GERMANY

Secretary Professor D.A.R Wallace, Department of Mathematics, University of Strathclyde,
Glasgow G1 1XH, Scotland, UK.

Treasurer Professor A. Lahtinen, Department of Mathematics, University of Helsinki, Hallituskatu 15,
SF-00100 Helsinki, FINLAND

EMS Secretariat Ms. T. Mäkeläinen, University of Helsinki (address above) e-mail makelainen@cc.helsinki.fi

Newsletter editors D. Singerman, Southampton (address above) e-mail ds@maths.soton.ac.uk
I. Netuka, Prague (address above) e-mail netuka@cspguk11.bitnet

Newsletter advertising officer D.R.J. Chillingworth, Southampton (address above) e-mail drjc@maths.soton.ac.uk

Council Meeting Paris 4-5 July 1992

The following is a digest of some of the main business conducted (Editor).

Present: About 55 delegates, together with Ms. T. Mäkeläinen (secretariat), several observers and certain members of the Executive Committee and its Sub-Committees.

Election of corporate members

Class 2 Israel Mathematical Union

Class 1 Catalan Mathematical Society
Croatian Mathematical Society
Mathematical Society of Kharkov
St Petersburg Mathematical Society
Society of Mathematicians, Physicists and Astronomers of the Republic of Slovenia
Ukrainian Mathematical Association

The following Societies were admitted to associate membership:

Gesellschaft für Informatik

Gesellschaft für mathematische Forschung

Elections to Executive Committee

Vacancies on the Executive Committee for 1993-96 for one Vice-President and three other members of the Committee, to replace C. Olech, E. Bayer, A. Kufner and A. St. Aubyn were filled as follows, after a ballot of delegates. (All retiring members were eligible for reelection, but only one exercised this option.) After discussion, four candidates were declared elected to the Executive Committee.

Vice-President: L. Märki

Executive Committee members: E. Bayer, I. Labouriau, A. Pelczar and V.A. Solonnikov.

The council also discussed the work of the Society over the past two years, and its plans for future activities. These will be covered individually in Newsletter articles, covering budgetary matters, EC Liaison and East-West relations, Publications, Euro-conferences and Summer Schools, Women and Mathematics, Applications of Mathematics, Mathematics Education, Euromath, etc...

European Congress of Mathematics, 1996

It was decided to accept an invitation from the János Bolyai Mathematical Society to hold ECM 1996 in Budapest.

The Council will meet next on 12 and 13 August 1994 in Zürich, immediately following the ICM.

INTERNATIONAL CENTRE FOR MATHEMATICAL SCIENCES

DIRECTOR

The ICMS based in Edinburgh is concerned with the promotion of mathematics and its applications. Its aim is to consolidate its position as an internationally recognised centre of excellence for research in all fields of the mathematical sciences and to support mathematics in the developing countries.

ISMS is now ready to appoint a Director to drive it forward in achieving these objectives.

This unique post will carry responsibilities for the scientific leadership of ICMS, its administrative and financial well being and its promotion all over the world. Applicants should have a record of research at the highest level and the ability to develop scientific programmes in an academic/industrial environment.

Salary, terms and tenure will be at least comparable to those of a professor and dependent on experience and professional stature.

Well qualified applicants of any age, sex and nationality are welcomed.

Applications should be sent to the Director of Personnel, Heriot-Watt University, Edinburgh EH14 4AS, quoting reference 71/92/EMS before 15th December 1992.

Further particulars can be obtained by telephoning Frank Donald on 031 451 3256 or fax 031 451 3249.

Executive Committee Meeting

Helsinki 24 - 25 October 1992

The Committee is mindful of the criticisms expressed in Paris concerning the flow of information and has agreed that after each Council and Executive Committee meeting there should be an article in the Newsletter. It is hoped that this article will improve the flow!

As is now well-known, Professor Jacques-Louis Lions, President of the Mathematical Union, declared in May 92 in Rio de Janeiro that the Year 2000 would be World Mathematical Year and that there would be three aims:

1. The great challenges of the 21st Century. 2. Mathematics, keys for development, and 3. The image of mathematics.

The Committee intends to give further consideration to the matter - but what would European mathematicians like to take place in the Year 2000 - mathematically speaking of course?

The Human Capital and Mobility Programme of the European Community is of concern. Information on success in the programme seems not to be easily accessible. Would publication of the successful networks etc. (if Brussels agrees) be of advantage? Does mathematics receive its fair share of funding? Funding seems to be in proportion to total applications made - the message is clear, more applications by mathematicians!

Problems in East European and former Soviet Union countries are looming large. At one extreme, a letter had been received intimating the dissolution of the Union of the Societies of Mathematicians, Physicists & Astronomers of Yugoslavia. How best can the European Mathematical Society help colleagues in Russia and other countries? Should an effort be made to inaugurate an East European Fund and to collect monies through the corporate members? The Finnish Mathematical Society has made a generous donation to help Estonian mathematicians - would other corporate members care to follow this example perhaps?

A fairly spirited discussion took place on the issue of publications beyond that of the Newsletter. What should the EMS try to do in this regard or, indeed, should the EMS try to do anything? Would members appreciate further publications and of what sort?

The Committee is promoting applications to the European Science Foundation to run more than one series of Euroconferences on mathematics. The EMS should keep up with the physicists!

D.A.R. Wallace - Acting Secretary

Letter from the EMS Summer School Committee

Recognizing the importance of summer schools, the Executive Committee of the European Mathematical Society has set up a Summer School Committee. The "summer schools" this committee is concerned with are concentrated courses on a not too advanced level, intended mainly for beginners in a subject. For practical reasons, such courses usually take place in summer (whence the name), but the timing is of course not important for us.

From a geographical point of view, summer schools in Europe can be classified as national, regional or all-European. Understandably, even in the last of these categories a relatively high percentage of participants is from the country which hosts the summer school. Organizers in all categories generally dispose of grants available from some or all participants.

The first task of our Summer School Committee is to collect information on existing summer schools, especially on those which go beyond the national level. We are not able to do this without the help of the mathematical community. Therefore we ask you to forward our request to organizers of summer schools:

Please provide us with information on your summer school(s).

We would like to get the following data: subject, place and dates, geographical area where participants may come from, expected level of participants (e.g. lower or higher, graduate or postgraduate), prerequisites, costs of participation, possibility of obtaining financial support, name and address of organizer, deadline for applications. (of course, an information leaflet is also welcome.)

We are particularly interested in getting appropriate information on series of summer schools. For such series, condensed information/documentation on activities in the past three years (including number of participants) would help us a lot in getting an idea of what is going on in this important field.

Please send all this information to the address of L. Márki (see below).

Furthermore, we offer cooperation of the EMS in two respects.

Firstly, for summer schools which are intended to be broader than national, the EMS is willing to help to spread information in the area where participants may come from.

Secondly, the EMS may give its name to summer schools. This kind of moral support can be accorded by the Executive Committee upon suggestion of the Summer School Committee. In such a case participation should be possible from all over Europe, costs of participation be kept low, and grants be available at least for Eastern European participants. Requests for getting this EMS label should be sent to the Summer School Committee to the address of L. Márki.

Finally, we ask the national societies to communicate to us a small number of addresses ("small" may depend on the size of the country but in no case should exceed 10) where condensed information on summer schools shall be sent to in order to make it available for interested young mathematicians.

Thank you in advance for your kind cooperation.

László Márki

Chairman of the EMS Summer School Committee
Mathematical Institute
Hungarian Academy of Sciences
H - 1364 Budapest, Pf. 127, HUNGARY

SAVE EXISTING VALUES

Mathematics in Eastern and Central Europe

László Babai Department of Algebra and Number Theory, Eötvös University Múzeum krt. 6-8. Budapest, Hungary H-1088

László Márki Mathematical Institute of the Hungarian Academy of Sciences H-1364 Budapest, PF. 127, Hungary

This note intends to focus attention on the fate of the *deeply rooted* and hitherto very successful *tradition* of mathematics education and research in Eastern and Central Europe.

A combination of circumstances is *menacing* this invaluable tradition. Something of immense value is at risk; much of it could be saved at relatively little cost.

1. A tradition. Contrary to the belief of the general public and maybe also to the situation in some other sciences, mathematics education and research was performed on a high level during the decades of communism in Eastern and Central Europe. Deeply rooted traditions continued to flourish and expand in this area. Here are some of the cornerstones of this tradition:

- Talent search at high school level;
- Successful undergraduate education;
- Research centres;
- International cooperation, including exchange programs with research centers in the Soviet Union.

A national system of talent search has existed in Hungary for nearly a century. Undergraduate mathematics education at many universities in Eastern and Central Europe is above Western standards. World class research institutes have been established in several of these countries. East-East exchange programs existed; and the Banach Center in Warsaw served as an international research center for visiting mathematicians with thematic semesters and workshops.

2. The menace comes from several factors, including:

- Collapse of financing systems;
- Short-sighted drive to copy the West;
- Brain drain.

The collapse of financing systems has been coupled with a perception among many East European politicians that research institutes are remnants of Stalinism and should not be supported.

While East-West cooperation has been greatly facilitated by various programs of the European Community, the formerly existing regional cooperation has virtually vanished for the lack of funding. The uncertain future of the Banach Centre in Warsaw is a warning sign.

All these factors contribute to a greatly increased "brain drain". It should be emphasized that personal finances are only one of the causes; the official pessimism which fails to recognize the importance of existing values weighs at least as heavily.

Indiscriminate copying of the West may transform top East European universities with respectable output of internationally successful graduates into mediocre universities believed (by politicians) to "follow the advanced Western model" (whatever that means).

3. Why should the West care? The mathematical tradition of Eastern Europe has been developed over a long period of time and nurtured by sizable communities through continued selfless effort and sacrifice of the kind hardly known in the West. Driven by the love of mathematics, math clubs are formed in abundance, many teachers volunteer to grade solutions of creative problems. Workshops are held with no funding (austere housing, expensive trips often paid for out of meagre family budgets). It is not in the interest of the West to let this tradition go down the drain. *The West has traditionally benefited from the overproduction of research mathematicians in the "Eastern Bloc"*. If East European universities begin to look like poorly equipped versions of their Western counterparts and with the added handicap that their best professors work full time in the West, the hitherto remarkable East European output of excellently trained graduates will diminish.

4. Some possible remedies. First and foremost, the mathematics community of Eastern and Central Europe should be treated as an *intellectual equal*, which it is. Help should be given to *maintain the mathematical authority of the region*. Cooperation across the borders should not be considered a "development aid", but rather a service with great mutual benefits.

Here are some corollaries to these principles.

5. Go East! In mathematics it is totally wrong to assume that East to West visitors are there just to learn and West to East visitors just to teach. (But this *is* the implicit assumption in most existing programs!)

Western scholars and students working in fields with leading authorities and schools in Eastern and Central Europe should be encouraged to visit those places *for extended periods of time*. One side-benefit of such a movement would be that East European institutions with a sizable number of Western visitors will be able to use their demonstrated status as a *weapon in their struggle for survival* in their own country. Another important effect would be on the young who might feel less inclined to leave their country if they see how their institution attracts Western scholars. It would therefore be highly desirable to make E.C. funds available for West to East programs of study and scholarly cooperation.

6. Include the countries of the former Soviet Union and Yugoslavia in European scholarly programs.

7. Travel from the former Soviet Union. It has become virtually impossible for mathematicians from the former Soviet Union to obtain funds locally for *travel expenses*. (The train or air fares are exorbitant compared to their monthly salaries of \$30 or so; and must be paid in inaccessible Western currencies.) E.C. funding of the travel expenses of ex-Soviet mathematicians would make European conferences more exciting to all participants.

8. Help East-East cooperation. In recognition of the stake of Western Europe in the best use of the tremendous intellectual resources of mathematics in Eastern Europe and especially in the former Soviet Union, existing E.C. programs (graduate and postdoctoral fellowships, scientific networks, workshops, etc.) should be extended to include some East-East cooperation.

9. The Banach Centre in Warsaw. Under a somewhat modified charter, this centre could provide valuable services to mathematicians *on a European scale*, unless it is allowed to perish for the lack of funding.

10. Libraries. Even well funded Western university libraries face tough choices these days. Their East European counterparts are nearly helpless. Some (too few) publishers offer *steep discounts* to economically disadvantaged countries. Those of us involved in publishing journals and book series should try to influence their publishers in this direction. The E.M.S. could coordinate such an effort. In addition, as the E.M.S. begins to take a role in publishing, it should incorporate this point in its policies from the very beginning.

11. Small language communities. High school students and undergraduates should have access to mathematical literature of their own level in their mother tongue. In a small language community it is virtually impossible to publish such specialized literature profitably. With government subsidies gone, we should seek E.C. subsidies for such publications.

12. Equipment donation. Especially in Romania, Bulgaria, and the former Soviet Union, equipment such as photocopiers, computers, printers, fax machines are badly needed. If your department plans to upgrade some equipment, please think of your colleagues who would gladly accept the older pieces (assuming they are in good working condition and won't generate substantial maintenance costs). The E.M.S. could establish a clearing house to match Western donors with prospective East European recipients.

WOMEN AND MATHEMATICS

Reflections on the Round Table - Eva Bayer

At the European Congress of Mathematics in Paris, there was a round table session on Women and Mathematics. The moderator was Capi Corrales (Madrid). Short talks were given by Christine Bessenrodt (Essen), Laura Tedeschini Lalli (Rome), Mary Gray (Washington), Barbara Roskowska (Warsaw) and Marie-Françoise Roy (Rennes). Ina Kersten (Bielefeld) also took part in the round table. After the talks, there was a long and lively discussion. Many interesting questions and remarks arose. I was particularly impressed to see how many people realized for the first time how seriously women were underrepresented in some European countries - including in certain cases their own country!

The round table was supported by the Commission of the European Community's Equal Opportunities Unit of DGV.

Concrete proposals. During and after the round table discussion, several people made interesting suggestions as to how to improve the situation of women mathematicians in Europe. On the other hand, it also became clear that there is a need for concrete proposals in this direction. This demand comes from Mathematical Societies as well as from individual colleagues who would like to help.

None of the propositions below involves affirmative action. As a matter of fact, proposition 1. is just as useful for men as for women.

1. Information about vacancies. Many people - women and men - pointed out that they did not always get the information they needed concerning available positions. This probably does not concern all countries, but has been observed (at least) in Germany and Switzerland. Particularly in the countries where there have been very few job openings in mathematical departments in the last 10 to 15 years, it would be profitable for everybody to have an efficient network for this type of information.

The national Mathematical Societies could help very efficiently on this issue. They could collect information about job openings at all universities. They could establish an e-mail net to distribute this information to all the interested members of the society. This would also make membership more attractive to young mathematicians. A similar network could also be created for scholarships and fellowships, if there is a need for it.

2. Gender related information in statistical data. In all sociological studies about mathematicians, it would be important to take gender into account. This is also an issue on which Mathematical Societies can help.

3. Encouragement. It has been observed that women are less often encouraged than men to do postgraduate work, and that the teachers are often surprised to see how well some women students do. This is natural enough, considering that Mathematics has been regarded as an 'unfeminine' subject for such a long time. It is important to know that many of us tend to react in this way, and to make the necessary adjustments.

4. Change of attitude in making appointments. In the countries where the proportion of women among the mathematicians is very low, it is very important to find a way to increase this number fairly rapidly. It is not enough to encourage women students, if they have no role models among the professors. Therefore, the first step would be to significantly increase the number of women professors. It is not difficult to find good women candidates. Hiring women mathematicians does not involve lowering standards! But it may involve some changes of policy and attitude. If the department wants to hire someone in a specific subject, and perhaps insist on giving promotions to those who 'have been around for a long time', then this may be incompatible with hiring women. The real change of attitude would be to change the order of priorities by (for example) hiring a woman who is perhaps in a different field. The department may need a professor in a given field - but it needs a woman professor even more!

Call for Questions. In order to continue the work started at the round table, it would be interesting to collect more questions - for instance, from those who were unable to attend the round table. If you have a question, please send it to the committee on Women and Mathematics, at the following address: Eva Bayer, Université de Franche-Comté, Faculté des Sciences. Laboratoire de Mathématiques, 16, route de Gray, 25030 Besançon, France. It is preferable to send short questions: 2-3 lines at most. The committee will then select the most frequent questions, publish them in the Newsletter, and try to find answers.

Editorial Note Readers' attention is drawn to the article "Gender and Mathematics Education" on page 14.

Nikolaj Lobachevskij

On the occasion of his 200th anniversary

E.B. Vinberg - Moscow University

There are few purely mathematical discoveries whose influence on our world outlook is comparable to those of the greatest discoveries of the natural sciences such as Copernicus's heliocentric system or Darwin's theory of evolution. The discovery of non-Euclidean Geometry no doubt belongs to them.

One of its discoverers Nikolaj I. Lobachevskij was born in a poor family of a petty official in Nizhnij Novgorod on 1st December, 1792. His youth coincided with a happy period for the Russian enlightenment. In 1805, universities in Kazan and Kharkov were opened by a decree of Alexander I. In 1807, on leaving the Kazan gymnasium Lobachevskij was admitted to the Department of Physics and Mathematics of the Kazan University at government expense. From that time all his life was related to the Kazan University.

In the first years the atmosphere of the Department was quite favourable. The students were full of enthusiasm. They studied day and night to compensate for lack of knowledge. The professors, mainly invited from Germany, turned out to be excellent teachers, which was not common. Lobachevskij was highly successful in all courses he took, and he graduated from the University quite well educated.

His upright and independent character brought him some difficulties with promotion. Nevertheless he became a full (ordinary) professor in 1822. At different times he held the chairs of mathematics, physics and astronomy and gave courses in almost all subjects pertaining to these sciences. His lectures were detailed and clear, so they could be understood even by poorly prepared students.

At the same time he performed a lot of important administrative duties. In 1827, at the age of 35 years, Lobachevskij was elected as the Rector of the Kazan University. He occupied this post for 19 years and was maybe the best rector that Russian universities have ever had.

One example of his activity is the construction of most of the university buildings. Attaching great importance to their architecture, he studied architecture and went into details personally.

Two dramatic events happened in Kazan during his rectorship - a cholera epidemic in 1830 and a big fire in 1842. Owing to resolute and reasonable measures taken by Lobachevskij the damage to the University was reduced to a minimum. For his activity during the cholera epidemic Lobachevskij received a message of thanks from the Emperor.

In the same years his main works on non-Euclidean geometry were published. The first of them appeared in the Kazan Messenger in 1829-30. In contrast with his lectures it was quite brief and unclear, so that only a well-prepared reader could understand it. There were two such readers at that time - Gauss and J. Bolyai, but they scarcely could get that local issue.

The West got to know about Lobachevskij's ideas through his pamphlet "Geometrische Untersuchungen zur Theorie der Parallellinien" published in Germany in 1840. It contained the clearest account on his "imaginary" geometry and served as a reason for Gauss to recommend Lobachevskij as a member of the Göttingen Scientific Society. The election took place in 1842. It was the only acknowledgement of Lobachevskij's contribution to geometry during his life.

In Russia, the geometric works of Lobachevskij were not understood and were even derided at that time. They were regarded as an eccentricity of a respected professor and Rector of the Kazan University. The first favourable opinion of these works was heard in Russia in 1868. Inadequate comprehension of the foundations of Euclidean geometry (namely, the absence of the concept of the group of motions) made it impossible for Lobachevskij, as well as for Gauss and Bolyai, to prove the consistency of non-Euclidean geometry. This prompted him to develop it further and further, in order

to get a stronger conviction of its consistency. In this respect he surpassed Bolyai, to say nothing of the cautious Gauss. For example, in a work of 1836 he deduced a remarkable formula for the volume of a birectangular non-Euclidean tetrahedron in terms of its dihedral angles. It seems that this formula was not noticed by contemporaries and was restored to life by Coxeter 100 years later.

In his youth, Lobachevskij was lively, jolly and sociable. However strenuous work and trouble changed him. In his middle age, he became thoughtful and even gloomy. His speech was low and sober. But he still remained well-wishing and sympathetic.

At the age of 40, he married a young girl from a rich noble family. The couple lived in a big three-storey house and received a lot of guests with lavish hospitality. However Lobachevskij was not lucky in his marriage.

His retirement from the University in 1846 was a severe blow for him. Soon his favourite eldest son died. The family experienced financial hardship. Lobachevskij became senile in a short time and began to lose his sight. His death followed in 1856. A year before, he dictated his last work "Pangéométrie ou précis de géométrie fondée sur une théorie générale et rigoureuse de parallèles", published in a collection of papers on the occasion of the 50th anniversary of the Kazan University.

On the history of non-Euclidean geometry -4*

Jeremy Gray

Faculty of Mathematics, The Open University, Milton Keynes, UK

Non-Euclidean geometry now leads such a vigorous life in so many parts of mathematics (group theory, ergodic theory, the theory of 3-manifolds, algebraic number theory, to name only four) that it seems inappropriate to pursue its history further here. In any case, after 1918 it became international, and no longer a European subject, whatever that may mean. So it seems more reasonable to reflect here upon what its remarkable history might signify.

It is often noted that the discovery, and certainly the initial publications of non-Euclidean geometry came from the periphery of Europe. Despite the attentions of Lambert, Legendre and even Gauss, it was Bolyai and Lobachevskii who (in Bolyai's own phrase) created a whole new world out of nothing. Kasan, even Budapest, were not part of the mathematical heartland, although Bolyai's father had studied in Göttingen - Gauss had been a fellow student. Now that mathematics is international, but for as long as significant differences remain, this example alone would suggest that the export of mathematics and the support of mathematicians otherwise distant from the 'centres of excellence' would benefit everyone. The example of Ramanujan does not suggest that granting Bolyai a visiting fellowship in Paris would necessarily have worked smoothly, but it would surely have done better than consigning him to what he saw as unjust neglect, causing him to abandon research altogether.

The choice of non-Euclidean geometry for both Lobachevskii and Bolyai of course tells us that the subject was more immediately accessible in 1825 than, say, Fourier analysis. This has been repeated many times in the later history of mathematics, as one national school after another has had to strike a balance between catching up and finding new topics to do. How such decisions are made today is a matter of some importance for the growth of the subject and the profession, but historians can only offer limited advice. That is because of the greatly reduced time lag in responding to new results.

* The earlier parts appeared in the last three editions of the newsletter.

HISTORY

For reasons which are still not clear, Poincaré did not affect mathematics as quickly as one might believe. He had no students, and French mathematicians of the next generation, such as Hadamard, speak gingerly of their attitudes to his work. Nor did he inspire mathematicians abroad for a number of years. In contrast, Hilbert did. Göttingen was set up to attract students around him, and very often foreign mathematicians were willing to join in at once, as was notably the case with his work on axiomatising geometry. Now the time lag between publication and response is even shorter.....

The notoriety surrounding non-Euclidean geometry derived from its association with elementary Euclidean geometry. Such interactions with popular perceptions of mathematics are rare, but not unique. Their study would make a fascinating book, which someone should write. Other examples would include Einstein's theory of special relativity, as is well known, but also the rise (and fall?) of the new maths, with its emphasis on structural reasoning and the advent of statistics on people's ideas about randomness. When, for example, did it become natural to look at the night sky and see a random distribution of the nearby stars, as opposed to a meaningful constellations? How much of fate can now be random, rather than destiny? The image of mathematics in literature has surely changed, not entirely but somewhat because mathematics has - as a reading of Pynchon's marvellous book *Gravity's Rainbow* makes clear.

One is also driven, on the other hand, to speculate on the poor response of philosophers to non-Euclidean geometry. Ever since Kant the example of non-Euclidean geometry has contributed to a sense that philosophers and mathematicians speak different languages. If there is to be a new direction to the philosophy of mathematics, as its practitioners sometimes claim, it will have to do better than Kant, Frege and Wittgenstein managed - which is no small order. One way forward would be to acknowledge that reflection on the nature of mathematics (rather than say cognition) requires a grasp of contemporary mathematics, which would make philosophers of Lambert, Lobachevskii, Poincaré and Hilbert. So much for a cherished academic division, but thinking about what mathematics is (or ought?) to be about should make philosophers of some of us. Or, perhaps, historians.

Last but not least, one is struck by the remarkable life there proved to be in the new, non-Euclidean geometry. It was not the *other* geometry for long; Riemann's ideas when finally accepted included infinitely many geometries that are not Euclidean. But it is nonetheless striking how profoundly it turns up in seemingly disconnected parts of the subject. Why should non-Euclidean two-dimensional space be the universal covering space of most Riemann surfaces? Why should the largest of Thurston's families of 3-manifolds likewise carry a three-dimensional non-Euclidean structure? This richness was unexpected. Perhaps it will continue, perhaps, for a while at least, it will seem exhausted and some other connections will spring up. But it is part of mathematics, and gives us cause to celebrate Lobachevskii in this, his bicentennial year.

Note

This concludes this series of four articles. I hope in future to give a summary of historical work in progress across Europe, and to that end invite readers to submit details of projects under way and, especially, stimulating discoveries, however short. Gems from correspondence and diaries, requests for interesting information, brief advertisements for thought-provoking work only obscurely in existence - all are welcome. Please send them to Jeremy Gray, Faculty of Mathematics, Open University, Milton Keynes, MK7 6AA, England.

MATHEMATICS AS AN ECONOMIC RESOURCE

The working group "Mathematics in Research and Practice" at the Centre for Arts and Sciences North Rhine-Westphalia would like to introduce itself.

Subject matter

Mathematics is an essential resource in our high-technology society. A great deal of scientific and technological success is based on mathematical theories and models. The increasing application of mathematics concerns not only the physical sciences and engineering, but also the natural and social sciences. Mathematics is in this regard a mutual and versatile language used to formulate and solve problems.

In the industrial sector, a growing trend towards the application of science and scientific methodology has become recognizable in recent years. This is demonstrated by, for instance, a rising need for transferring mathematical methods to specific applications in many technical and economic areas. Topics as varied as environmental and systems research, process control technology, computer-integrated production, and modelling "intelligent" processes with artificial intelligence or neural nets can be associated with mathematics. The common denominator of these new technologies is that they are all founded on the most modern mathematics. Ever more complex problems can be solved on modern computers by using information technology; however, the potential for the application of mathematics is often overshadowed by the computer sciences.

Application-oriented mathematical research far exceeds tackling routine problems. More importantly, it is faced with identifying and addressing new and interesting issues from real-life practice (be it in economy, science, or other areas). First, a mathematical model is created, and often a theory is formulated. From the theory, then, algorithms must be developed which allow efficient and practice-oriented implementation.

Goals

In reality, the close relation between of theory and practice - including computer science and other fields of science and technology - often falls short of the ideal: considerable dialogue deficits not only among mathematical subdisciplines but also between mathematical research and its areas of application characterize the current situation. As such, the prospects of finding a place for mathematics in the dynamics of an industrial and information-oriented society do not seem hopeful. This is also reflected in the bad public image mathematics (and mathematicians!) have in society. This state of affairs means that there is often a lack of qualified young professionals, financial support is insufficient, and mathematics is being displaced by competition from the related disciplines.

An analysis of these deficits led the Centre for Arts and Sciences North Rhine-Westphalia to found the working group "Mathematics in Research and Practice." Specialists in various disciplines use this forum to exchange information, explore development and application options, initiate cooperation, and discuss the changes in mathematics as a science. Here, an interdisciplinary discussion takes place, one that includes science, economics, administration, institutes which promote research, and the media.

One of the working group's top priorities is to look into the conceptional difficulties of this dialogue and discuss proposals for its improvement in the future. In this respect, the working group's activities diverge from the usual in that the "metamathematical" issues mentioned above are also considered.

The working group "Mathematics in Research and Practice" operates on the border area between scientific knowledge and practical application. At the group's symposia, areas of application and their problems as well as

which tools are available are represented from the point of view of the "suppliers". On the other hand, "users" report on their "mathematical needs" and unsolved problems. In this way, matches can be made between those with a particular problem and those with a solution.

Activities and Results

At their first meeting (June 1990), the working group undertook an assessment of the situation in applied mathematics in the Federal Republic of Germany and discussed trends. It was decided that at subsequent meetings, in addition to setting interdisciplinary mathematical tasks, problems of research strategy would also be addressed.

At a symposium in October 1990, scientists and representatives from industry used examples to demonstrate the rôle of mathematics in their respective professional fields and discussed suggestions for improving communications between the fields of research and practice.

The following symposium in March 1991 was conducted on "Optimization" and "Control Theory"; the presentations covered a wide range of applications.

In October 1991, the working group held an information day, "Professional Mathematics - Academic and Career Opportunities", in which career counselors from all state employment offices in North Rhine-Westphalia and academic counselors from the colleges and universities took part. The press also attended.

In November 1991, the working group organized a symposium on "Mathematics in Environmental Research".

A symposium was held in March 1992 on "Pattern Recognition and Image Processing."

In cooperation with the Ministry of Economics of North Rhine-Westphalia, the working group took over the thematic organization of North Rhine-Westphalia's exhibition at the Hanover Trade Fair '92 (April 1 - 8, 1992) in the North Rhine-Westphalia pavillion, under the title "Formulas from North Rhine-Westphalia - Mathematics in Industrial Practice". The exhibition illustrated the importance of modern mathematics in practice (for small and medium-sized companies) by means of its manifold areas of application. The press was invited to this exhibition, as it was to several other of the working group's events. Numerous journalists accepted the invitation, and reported on the events on television, radio, and in magazines and newspapers. (The response of the press to the exhibition is documented in a press report, which can be obtained from the Centre for Arts and Sciences North Rhine-Westphalia.)

In the first two years of its existence, the working group "Mathematics in Research and Practice" has grown to over 350 members from all over Germany and elsewhere. Two symposia (among other events) are held annually on changing topics; the number of participants is limited to approx. 75. A symposium on "Mathematics in Medicine, Biology, and Agriculture" is planned for the 9th and 10th of November, 1992, at which the emphasis will be placed on statistical and stochastic methods. Here, the relevance of mathematical methods and their implementation by admissions/registration offices (such as the Federal Health Office) are to be discussed as well.

In the meantime, the "Duisburg Working Group for Mathematics in Research and Practice" has been formed, which pursues goals similar to those of the nation-wide group "Mathematics in Research and Practice" from the Centre for Arts and Sciences North Rhine-Westphalia. It is hoped that further regional activities will be initiated.

Head of the working group "Mathematics in Research and Practice": Dr. Simon Golin, M.Sc.
Centre for Arts and Sciences North Rhine-Westphalia, Reichsstr. 45, D-4000 Düsseldorf 1, Federal Republic of Germany

Phone: + 49 / 2 11 / 37 05 81

Fax: + 49 / 2 11 / 37 05 86

Editorial

I am glad to announce that CME has a new member from France:

ROUCHIER André
 I.U.F.M.
 72, rue du Faubourg de Bourgogne
 F-45044 ORLEANS Cédex
 Tel: 38 79 8401 Fax: 38 42 04 60

Once again I ask all colleagues interested in educational questions, problems and solutions to send short reports to any of the members of CME (see Newsletter 5). Also highly welcome are presentations of scientific societies concerned with maths education at any level. Further, we are interested in announcements of meetings and conferences of a European or international character.

W. Dörfler

Technology in Mathematics Teaching

17 - 20 September 1993

A bridge between teaching and learning

This is the sixth annual international conference in the series Technology in Collegiate Mathematics and the first time it has come to Europe.

The structure of the programme provides for those involved in the teaching of mathematics at every level. There will be a diversity of themes, both educational and technological, and opportunities for talks, workshops, research reports, symposia and discussion groups.

It is being hosted by the School of Education, in conjunction with CTICMS, and will take place at The University of Birmingham, UK.

Call for Papers and Presentations

The three strands running throughout the Conference are:

- Strand 1:** The mathematical content of teaching and learning environments
- Strand 2:** Technology as a resource for the teacher
- Strand 3:** Hands-on interaction between learners and technology

Delegates are invited to make a contribution under one of the following headings by 31 January 1993:

- A)** A 30 minute presentation, concerned with theory, research or practice, followed by 15 minutes for questions. An 8 page (maximum) paper is required, which will be refereed by the Programme Committee. Accepted papers will appear in the Conference Proceedings provided that they are legible, e.g. 12 point text and 1.5 spacing on A4 paper.
- B)** A 15 minute presentation, concerned with theory, research or practice, followed by 5 minutes for questions. A 500 word abstract is required.
- C)** To chair a 90-minute symposium around a particular issue. A 500 word abstract indicating content, focus and organisation is required.
- D)** To lead a 90 minute hands-on workshop. A 500 word outline indicating purpose is required, with an indication of necessary hardware and possible frequency of repeat.
- E)** To display a poster and participate in a discussion together with other poster presenters in a 90-minute session. A statement of the poster's theme is required.

The University of Birmingham, School of Education, Edgbaston, Birmingham B15 2TT, UK

Tel: (outside UK +44 21)414 4800

Fax: (+44 21)414 4865

Email: tmt93@bham.ac.uk

(Also see conference announcement on page 19)

GENDER AND MATHEMATICS EDUCATION

Key issues and questions

Discussion Document for an ICMI Study

1. Rationale for the study

The study proposed in this discussion paper is based on a simple premise: there is no physical or intellectual barrier to the participation of women in mathematics, science, or technology. Having said this, we must ask ourselves: why don't they participate more? Here there is no simple explanation. For if there are no physical or intellectual barriers, there must be social and cultural barriers that account for their under-representation. For the most part, these barriers have not been raised intentionally. They are an integral part of a social order that carries with it discrimination. The perspective of this study is that discrimination on the basis of gender is no longer acceptable. Judge Rosalie S. Abella, an advisor to the Ontario government, has posed the problem as follows:

Systematic discrimination requires systemic remedies. Rather than approaching discrimination from the perspective of the perpetrator and the single victim, the systemic approach acknowledges that by the large the systems and practices we customarily and often unwittingly adopt may have an unjustifiably negative effect on certain groups of society. The effect of the system on the individual or group, rather than its attitudinal sources, governs whether or not a remedy is justified.

Remedial measures of a systemic and systematic kind are meant to improve the situation for individuals who, by virtue of belonging to and being identified with a particular group, find themselves unfairly and adversely affected by certain systems of practices (CAUT, 1991, p.12)

Statistics on the participation of women at the tertiary level in general and in mathematics, science, and technology in particular strengthen the case for a social, systemic viewpoint. We have to ask why women specifically avoid mathematics and sciences. Taking Canadian data as an example, we note that while women are attending universities in unprecedented numbers (and earning more than 50% of all bachelor's degrees in Canada), they are over-represented in the humanities and under-represented in mathematics and science. The proportion of women undergraduate students in the mathematical and physical sciences increased from 19.4% to 28.5% in the years 1971-1987, and in the engineering and applied sciences it increased from 1.2% to 12.2%. This constitutes very modest progress, when one compares it to the progress women have made as students in other traditionally male-dominated professions. Over the same period (1971-87), the proportion of women among those obtaining a bachelor's degree in law increased from 9.4% to 46.7%, while the proportion in medicine went from 12.8% to 41.7%. At the doctoral level, though women have increased their participation they are still under-represented in mathematics and science.

Two decades of research on the problem of gender imbalance in higher mathematics and in mathematics-related carriers, have consistently found that when gender-related differences in achievements are present they are rather small. Or put in other terms, achievement *per se* does not account for the large discrepancies in enrolment in higher level mathematics courses and in the election of mathematics-related carriers. This finding is perplexing in light of what we find in the media on girls and mathematics and science.

In the United States and Canada, and in other countries as well, a lot of publicity has been given to girls' supposed inferiority in these subjects. Articles have appeared in popular magazines claiming that women are inferior in what they have referred to as "cognitive abilities", "spatial skills", or "aptitude for mathematics". It has also been claimed that women are incapable of grasping mathematics or science because they are "emotionally minded". It is hardly surprising that such messages in the popular press influence girls to believe in their inherent inability to succeed in mathematics, and thus discourage them from taking up mathematics or other branches of science.

Such claims are usually based upon studies of achievement. Yet, as stated above, most studies that have found achievement differences in favour of boys have found very small differences that are not educationally significant. The more important point is that the popular press, and indeed many of the researchers, have confounded achievement with aptitude, ignoring other factors. The truth is that we do not really know how to measure aptitude, or even whether aptitude alone is a determining factor in achievement. Some research suggests that learner's attitudes towards learning and their career aspirations are powerful determinants of achievement.

While studies that show lower achievement for girls often receive wide publicity, studies that show the opposite may not. Research on the International Educational Association (IEA) mathematics results from 20 countries at the Grade 8 level (age 13) shows that boys and girls are about equal in achievement, and that the differences among countries are much larger than any differences within countries (Hanna, 1989).

Another study which challenges the popular notion of girls and lower mathematics achievement is one by Alan Feingold (1988). In reviewing the research results on cognitive gender differences for a period of 30 years in the United States, Feingold shows that differences had actually declined over the three decades preceding his study. Clearly the research message is that the problem of gender differences and mathematics achievement, and on gender-based inequities in mathematics-related careers, is a socially constructed one.

At the same time numerous studies have been done which indicate what can be done at the level of societies and of education systems to counteract the development of gender inequities. This discussion paper is an attempt to summarize key questions in one segment of the literature on retaining girls and women in mathematics and science—namely, analyses of gender issues in mathematics education. It is hoped that the identification of the relevant questions will focus attention on key gender-related issues in mathematics education for the 1990s and beyond.

2. Factors generating gender inequities in mathematics

Attitudes

Feminity and masculinity are socially developed constructs which are reinforced by the interactions of children with each other and with adults. Implicit and explicit assumptions and messages about female and male intelligence, needs, and inclinations seem to affect attainment in mathematics. To a certain extent, gender differences in mathematics performance might be a reflection of differences in attitudes towards mathematics.

Girls tend to avoid mathematics courses when they are no longer compulsory. It appears that the attitudes females have towards mathematics, their feelings as learners of the subject, and the values that shape their attitudes determine whether or not they persist in mathematics course-taking. Girls who are aware that mathematics will be relevant to their lives and useful in their future careers are far more likely to remain in mathematics courses.

The larger question in this context pertains to socialization. What is its role in the observed differences in attitudes towards mathematics? More specifically, the following questions are helpful:

- Is there an implicit message in society that competence in mathematics is more important for the attainment of boys' career ambitions than it is for girls?
- How can we increase the confidence of females in their ability to do mathematics?
- Do specific teaching approaches and learning modes lead to more positive attitudes to mathematics?
- How does understanding the similarities between male and female achievement and attitudes help practitioners establish a basis for resolving inequities?

Culture

Ethnomathematics recognizes the influence of sociocultural factors on the teaching and learning of mathematics. Documentation exists that emphasis placed within schools on the application of mathematics differ markedly within countries and from country to country and that this emphasis affects student performance. We have much to learn from this research, especially if we include consideration of the following additional questions:

- How informative are, or what do we have to learn from, international performance comparisons?
- Are there cultural patterns, such as social customs, family customs, customs in our educational system, and customs specific to mathematics, that discourage girls and women from pursuing mathematics?
- What difficulties in mathematics do males and females from minority groups face?
- What methods of encouraging, recruiting, and retaining women and minorities are used by different cultural and national groups?

Mathematics as a discipline

Recently, the existence of gender biases in the practice of mathematics has been studied extensively from several different perspectives including a feminist one. The questions emanating from this line of research are worth examining. Some essential questions are:

- What are the consequences in the theory and discourse of mathematics of the fact that it was constructed in predominantly patriarchal societies?
- Does the nature/structure/language of mathematics have a bias that promotes gender imbalances?
- What is the nature of the different areas of mathematics that appears to encourage (or not, as the case may be) students to persevere?
- What features of mathematics as a discipline (e.g. the contribution it can make to developing creativity and enjoyment, and its value in developing reasoning powers) can be emphasized to make it more relevant to both genders?

3. Manifestations of gender inequities

Jobs and careers

Historically woman have been seriously under-represented in mathematics and related fields. This does not appear to be due to lower levels of achievement. Gender-related differences in mathematics achievement, when they are found, are very small and thus do not account for these large participation discrepancies. Even though more women have chosen to pursue careers in mathematics and science in the last decade, there is still a concern over their low representation in mathematics, engineering, and the natural sciences.

Educators need to pursue an understanding of the factors that account for the discrepancies in involvement in higher level mathematics courses and to develop strategies that will help both genders stay in mathematics courses and thus keep open the full spectrum of career and job options. Research still needs to be done around the following questions:

- Do social perceptions (media, publicity, etc.) discourage girls from choosing careers that require mathematical skills?
- How can (female) students be helped to see that mathematics can also contribute to the solution of problems which they will meet out of school and to job opportunities?
- Should the privileged position of mathematics as a screening device for professions be challenged?
- Why hasn't the preparation in mathematics translated into greater numbers of female science and engineering majors?
- How can the visible proportion of women in mathematics and related fields be increased so that these options and occupations become part of female students' accepted range of choices?
- How can women's opportunities for careers in scientific and technical professions be expanded? Conversely, should women go into mathematics-related fields given the nature of the present system?

Girls and technology

The technological environment can, and does, affect student attitudes and their conceptions of what comprises desirable knowledge and understanding. In 1990, Ursula Franklin noted that the practices used in technology define its content and "when certain technologies and tools are predominately used by men, then maleness becomes part of the definitions of those technologies". As a result, many female students do not appear to hold a worldview which includes technology as relevant to their lives or as appropriate for them.

Few educators would disagree that schools must be more responsive to the science/technology thrust of our contemporary world and to the related educational needs of all students. However, international investigations have noted consistent gender inequalities in the technological education. Important questions for educators to discuss include:

- How does the considerable and growing impact of technology on schools and its changing role affect the education of females?
- How can we foresee and influence how technology changes their education?

- Can we influence the designers and producers of technology, and hence how girls are educated, by setting technological goals (e.g. development of technical hardware for educational purposes)?
- How are the areas of computer studies and mathematics to be made more relevant/accessible to girls?
- How can the computer be used as a learning and teaching aid? What are the effects of certain implementations on the cognitive development of the learner?
- What are the epistemological changes due to the use of computers?

4. Foci for change

Curriculum

To achieve gender equality in mathematics education, educators need to look at the development, content, and presentation of the mathematics curriculum within its general educational context.

In this regard it is helpful to find examples of success in teaching mathematics to all students (and to be aware of criteria used to denote the term "success") and to learn from these successes. Some worthwhile questions for consideration are:

- Given the pattern of lower rates of female participation in elective mathematics courses, and the fact that mathematics is critical to careers at technical, professional and managerial levels, to what extent would it be appropriate to make mathematics a compulsory subject in schools?
- What would a gender neutral curriculum and pedagogy look like?
- Would single-sex education benefit students who tend to opt out of mathematics?
- Should different mathematics curricula be provided for different groups of students?
- Does the mathematics curriculum fail to deal with topics of particular concern to girls and women?
- Why do specific mathematics topics seem easier to one group of students than another?
- What are the essentials which must be contained in mathematics curricula?
- How can different components of curriculum - instructional methods, assessment programs, and resources produced by teachers and by publishers - be designed so that the development of mathematics skills and knowledge becomes a prime aim for all children?
- How can the pace and range of work in the mathematics classroom be adapted to allow for increased understanding by all students?
- Does the mathematics curriculum necessarily have to be so overloaded that the quantity tends to control the pedagogy?

Assessment

Assessment is a crucial component of mathematics education. It generally functions to provide information to assist in decision making about individual students, classes, teachers, programs, or institutions. The kind of information sought, how it is gathered, and the form in which it is reported, all have a bearing on mathematics education.

Major challenges and questions exist within the realm of assessment as it relates to gender issues. A critical question, for example, is whether mathematics is taught equally well to different groups of learners. Important queries within this larger question include:

- What is mathematical ability and how can it be measured?
- What kinds of mathematical tasks are being assessed (short technical exercises, long tasks, extended problems, etc.)?
- Are the methods of assessment used more favourable to certain groups of students?
- How can we ensure that classroom materials and exam questions properly reflect gender equity? Should they include a wider range of human activities and interests than traditional materials and examinations?
- Is the range of experiences provided in the mathematics classroom (or elsewhere in the school) biased in favour of one group of students to the possible detriment of others?
- Are there examples of assessment practices which are known to have a positive or negative influence on instruction? What aspects should be maintained and encouraged?

MATHEMATICS EDUCATION

- Are there examples of assessment practices which negatively influence instruction; for example, by focusing instruction on assessment and tests rather than on more general goals?
- How do different assessment modes influence the social environment in the classroom?

Teachers and the school

Teachers are one of the most important educational influences on students' learning of mathematics. The school environment or social context in which students learn mathematics is another critical factor, influencing how they learn, their expectations, their perceptions and misapprehension of mathematics and of schooling in general. More research is needed on how the ethos of the school and individual teachers shape or alter student attitudes towards mathematics.

With respect to teacher education, the general question remains of how to make teachers at all levels aware of, and hence how to eliminate, any gender bias in their current practices. More specifically, we need to ask the following questions:

- Do we need to improve in-service training? Should we increase incentives to groups to participate and the amount of time we spend on the topic of gender awareness?
- Should more research be focussed on teachers - their conceptions of their roles both in the classroom and in society, their understanding of the educational process, their methods and teaching aids?

Research has been done on the critical factors in the school environment which reduce retention of females in mathematics courses. We need to continue to ask:

- How can pupils' (particularly girls') self-confidence in mathematics be increased?
- How can the learning climate for girls be improved?
- Does the learning climate for girls improve within single-sex settings?
- How can modes of classroom organization and teacher-pupil interactions be encouraged and developed which would benefit all children?

Working with parents

Sex-role stereotyping begins at birth, a fact alluded to in the earlier discussion of attitudes and the different socialization patterns of girls and boys in our culture. This stereotyping is reinforced as the child progresses through school by the differential expectations and treatment of boys and girls by teachers, counsellors, parents, peers, and also through instructional materials and the media. It is known that parents and educators can intervene to modify the influence of sex-role stereotyping and to provide an equitable education for all students.

As well as working at the gender factor, researchers have studied how parental educational and occupational level effects their children's mathematics learning. And so the basic public and community issues pertain to how the dual disadvantage of sex-role stereotyping and social class can be overcome. More specific questions include:

- How can parents be sensitized to ways they can encourage and support their children in mathematics/science fields?
- How can public awareness be increased, especially among parents, teachers, counsellors, of the advantages of mathematics-related careers for women and their achievements in mathematics?
- How can schools take responsibility for informing the community about the importance of girls' participation in mathematics?
- How can the commitment of national and local governments to supporting mathematics education for girls and women be increased?

5. Call for papers

The ICMI Study on Gender and Mathematics Education will consist of two components, a conference, and a publication to appear in the ICMI Study series and based on the contributions to and the outcomes of the conference.

The exact site and dates of the conference have not been finally determined yet, but it will almost certainly take place in the Southern part of Sweden in October 1993.

Against the background presented above, the International Program Committee for this study invites individuals and groups to propose or submit contributions to the study for consideration by the Committee no later than **1 February 1993**. Contributions should be related to the problems and issues identified in this document but are not required to be limited to addressing these only. Participation in the conference is *only by invitation* of the Program Committee, but those who submit a contribution are encouraged to apply for an invitation.

Contributions and suggestions concerning to content of the study and the conference program should be sent to

Professor Gila Hanna

MECA, Ontario Institute for Studies in Education
252 Bloor Street West, Toronto, Ontario M5S 1V6, CANADA

tel: +1 416 923 6641

fax: +1 416 926 4725

e-mail: g_hanna@utoroise.bitnet

The International Program Committee consists of:

Gila Hanna	CANADA (Chair)
Carlos Bosch	MEXICO
Barbra Grevholm	SWEDEN
Geoffrey Howson	UNITED KINGDOM
Christine Keitel	GERMANY
Gilah Leder	AUSTRALIA

The Secretary of ICMI, Mogens Niss, Roskilde University, Postbox 260, DK4000 Roskilde, DENMARK, is a member ex-officio.

6. References

CAUT (Canadian Association of University Teachers) (1991): *Status of Women Supplement*

Feingold, Alan (1988): Cognitive gender differences are disappearing. *American Psychologist* 23 (2), 95-103

Franklin, Ursula (1990): *The Real World of Technology CBC Massey Lectures*. CBC Enterprises, Toronto and New York

Hanna, Gila (1989): Mathematics achievements of girls and boys in grade 8: Results from twenty countries. *Educational Studies in Mathematics* 20 225-232

FIRST ANNOUNCEMENT

ICTMA 6

Teaching of Mathematical Modelling and Applications

UNIVERSITY OF DELAWARE, NEWARK; DELAWARE, U.S.A.

August 15-19, 1993

Organizing Committee: Werner Blum, Germany; David Burghes, United Kingdom;
Ian Huntley, United Kingdom; Jan de Lange, The Netherlands;
Mogens Niss, Denmark;

The main purpose of the conference is to provide a forum for the presentation and exchange of information, experiences, views and ideas between people engaged in research on, or practice in, the teaching of mathematical modelling, models and applications. The focus of this conference will be on the teaching of mathematical modelling. Middle school, high school, and college levels will be included.

The second announcement of ICTMA 6 is estimated to appear in December 1992. For additional information, please contact:

Cliff Sloyer
Director ICTMA 6, Department of Mathematics
University of Delaware, USA - Newark, DE 19716

Tel: 1-302-831-1866

Fax: 1-302-831-8000

Email Klonowsk@brahms.udel.edu

Self-Tutor for Computer Calculus Using Mathematica 2.0

D.C.M. Burbulla and C.T.J. Dodson

[310 pages, with 150 figures and full function listing; ISBN 0130152803 \$21CDN Prentice-Hall Canada Inc.]

This book is intended for self-study support of first year calculus students and as a self-tutor for anyone wishing to introduce themselves to Mathematica while reviewing some basic calculus.

The book is primarily a self-instructional companion to a computer-assisted first university calculus course but can serve also as a quick introduction to Mathematica while reviewing calculus. We avoided repeating standard material found in typical Calculus books. Our intention is that the student will use any designated course text as primary reference and this Self-Tutor in two ways:

1. As an initial prop to gain confidence quickly in using the computer as a study aid for new concepts in mathematics by exploiting graphics effectively
2. Later as a source of ideas for exploring the theory and examples in their calculus courses and in all subsequent studies that use mathematics.

We have incorporated maximum exploitation of graphics features.

We have presumed only basic familiarity with computer terminals, no experience with programming, and that students will not have easy access to expert humans. An Appendix gives a listing of functions in the Mathematica packages we introduce. These are also available on disk in DOS or UNIX format. Additionally, Notebook versions of our packages are available for NeXT computers and will be available for XWindows on UNIX platforms.

There is an edition available for Mathematica 1.2 (ISBN 0138037841)

A parallel book using Maple V is in preparation. Further volumes will cover multivariable calculus, using Mathematica and Maple.

Inquiries to: Professor C T J Dodson, University of Toronto, 200 College St, Toronto M5S1A4,
email: dodson@ecf.toronto.edu

MATHEMATICAL INSTITUTES

Euler Institute St. Petersburg

Professor Dr. R. Seiler

(Technische Universität, Berlin)

The recently renovated building of the International Euler Institute in St. Petersburg was officially inaugurated on September 11. The two-storey building, which was constructed 1913 and owned by a merchant family, has been restored very diligently and tastefully. It contains work rooms for scientists, a lecture hall and a library. Fifteen flats and a café for guest scientists in the north of the town belong to the Euler Institute. They can be reached by the institute minibus or alternatively by underground or tramway. It is planned to hold a few workshops every year about topical issues in mathematics and related fields. Ten to fifteen scientists from the West and a corresponding number from the countries of the Commonwealth of Independent States will be invited to these projects.

In October a conference about geometry in honour of Lobachevsky was held. It consisted of three separate sessions. The first conference in autumn 1989 was still held in external rooms.

The inauguration ceremony of the renovated building was opened by the director of the Euler Institute Professor L.D. Faddeev. He related the rather adventurous story of the building and gave his thanks for the aid of the former Soviet and now Russian Academy, for the foreign aid from Japan, Germany and for the support by Unesco. This aid in hard currency was used to buy modern computer equipment and to upgrade the flats for guest scientists. After Professor Faddeev, Dr. Semenjov Tian Shansky spoke about the impressive history of mathematics in St. Petersburg (Petrograd- Leningrad -St. Petersburg) starting with the mathematician Leonhard Euler from Basel.

The mathematicians from St. Petersburg are very interested in a scientific exchange with the West and in particular with Western Europe. It is the special quest of the Euler Centre to organize such a program. Evidently, this institution urgently needs help from the West, because the Rubel is a soft currency with a high inflation rate. The aid from Germany for the Euler Centre is presently organized by the Max-Planck-Institute in Bonn and the Leonhard Euler Verein e. V. in Berlin (contributions to the Verein are tax deductible, account No. 476 6606, bank identity No. 100 700 00, Deutsche Bank Berlin).

Erwin Schroedinger International Institute of Mathematical Physics

Peter W. Michor

Addresses: Walter Thirring, Institut fuer Theoretische Physik, Universitaet in Wien, Boltzmann-gasse 9, A-1090 Wien, Austria bitnet: fwagner@awirap internet: fwagner@pap.univie.ac.at
 Peter W. Michor, Institut fuer Mathematik der Universitaet Wien, Strudlhofgasse 4, A-1090 Wien, Austria. bitnet: michor@awirap internet: michor@pap.univie.ac.at

Administrative developments In the aftermath of the political reorganization of Europe, the Russian mathematician, Alexander M. Vinogradov, suggested in the autumn of 1990 the creation of a research institute for mathematics and physics in Austria and he collected letters of support from well-known scientists. Encouraged by their response we proposed to the Austrian Minister of Science the creation of an institute for Mathematical Physics. This suggestion was well received and the ministry sponsored the workshop 'Interfaces between Mathematics and Physics' which took place in Vienna, May 22-23, 1991.

Based on an evaluation of the new situation in Central Europe the discussion resulted in overwhelming support for the project. The members of the workshop constituted themselves as the first scientific council of ESI, together with V. Drinfeld who was elected (he subsequently accepted). Thirring was elected as the first director. On the suggestion of Faddeev, a scientific workshop to be called again 'Interfaces between Mathematics and Physics' was planned.

A further study on the feasibility of such an institute led the minister to decide at the end of 1991 that we should go ahead with the foundation of the ESI.

The society 'Erwin Schroedinger International Institute of Mathematical Physics' was founded under Austrian law on May 20, 1992. The President of this society is Walter Thirring (Wien), vice presidents are Julius Wess (Munich), Peter Michor (Wien), Wolfgang Reiter (Austrian Ministry of Science and Research). Foreign institutions may become institutional members of this society; their membership fees are subject to negotiations with the governing board of the society.

The society voted ESI into existence, the Austrian Minister of Science agreed with its foundation. For 1993 the Austrian Ministry of Sciences will support ESI by contributing AS 9.500.000. This is roughly US\$ 900.000.--. It is promised that the same amount will be available in the future. There were negotiations to rent a suitable house in Berggasse 7, but this was found to be too expensive. Now the society will rent 2 flats near the Institutes of Mathematics and of Theoretical Physics of the University, in Pasteurgasse 4 and 6, 1090 Wien. The first flat is just below the last residence of Erwin Schroedinger in Vienna. It will be available at the beginning of November, the second one in February 1993. ESI will be opened in January 1993.

Activities till September 1992

The workshop 'Interfaces between Mathematics and Physics' This took place at the University of Vienna, March 2-6, 1992. The program included nine survey lectures of two hours each:

As a sign of Austrian solidarity the presence of 52 participants from former communist countries was supported. There were roughly 150 participants.

The Conference '75 Years of Radon Transform' It was organized by S. Gindikin and P. Michor in Vienna in the week August 31-September 4 to celebrate the anniversary of the publication of Radon's paper on the integral transform which today bears his name and which provides the mathematical basis for computer tomography. During this conference the 'Oesterreichische Akademie der Wissenschaften' (Austrian Academy of Sciences) awarded the first Radon medal to Fritz John, emeritus of the Courant Institute in New York. The Radon medal will be given irregularly to mathematicians for contributions to fields in which Johann Radon (1887-1956) worked. John received the medal for his contributions to the integral transform which today is called the Radon transform and its use in the fields of partial differential equations and elasticity.

Activities for 1993

1. Two-dimensional Quantum Field Theory. Local organizer: H. Grosse. Many scientists are invited in 1993. In particular a conference is to be held from March 8-12 1993.
2. Schroedinger Operators. Local organizer: Th. Hoffman-Ostenhof. Again, there are many invited scientists.
3. Waldhausen Algebraic K-Theory. A small program, centred around D. Burghlea (Department of Mathematics, University of Ohio, Columbus OH 43210, USA) and centred around his wishes.
4. Geometry of Nonlinear Partial Differential Equations. Organizer: A. Vinogradov, (Dipartimento di Matematica Applicata, Università di Salerno, Italy)
5. Differential Geometry. Local Organizer: P. Michor. This program is aimed towards infinite dimensional differential geometry

EUROPEAN NEWS: Country by Country

AUSTRIA

Austrian Mathematical Society

XIII. Austrian Congress of Mathematicians

20 - 24 September 1993

Linz, Austria

The Austrian Mathematical Society invites you to the XIII. Austrian Congress of Mathematicians, which takes place at the Johannes Kepler Universität, Linz between September 20 and 24, 1993 (arrival of participants: September 19, 1993).

Invited lecturers:

M. Aigner (Berlin), R. Bulirsch (München), G. Frey (Essen), J. Globevnik (Ljubljana), P. Mani (Bern), D. Preiss (London), M. Primicerio (Firenze).

A historical talk about

"Historical and cross-cultural perspectives on women in mathematics"

will be given by Ann Hibner-Koblitz (USA).

A Day on Mathematical Education will be held on September 23 with invited talks by the following speakers: H. Bauersfeld (Bielefeld), A. Bergmann (Düsseldorf), H. Heuser (Karlsruhe).

Contributed talks of 20 minutes can be submitted for the following sections:

- | | |
|------------------------------------|---|
| 1. Algebra | 8. Functional analysis |
| 2. Number theory | 9. Differential equations |
| 3. Discrete mathematics | 10. Applied and industrial mathematics |
| 4. Logic, theoretical informatics | 11. Numerical mathematics |
| 5. Geometry | 12. Probability and statistics |
| 6. Topology, differential geometry | 13. Elementary mathematics, mathematics education, history of mathematics |
| 7. Real and complex analysis | |

Social program:

20 September: Reception by the Governor of Upper Austria and the Mayor of Linz

22 September: opportunity for excursions (several variants).

Excursions for accompanying persons will be offered.

Congress fees:

Members of ÖMG, DMV, AMS, UMI:	700,- Austrian Schillings
other participants:	900,- Austrian Schillings
accompanying persons:	300,- Austrian Schillings
late payment (after June 20, 1993):	add 200,- Austrian Schillings

If you want to receive the second announcement, which will be mailed in March 1993, please write to: Dr. Walter Zulehner, ÖMG-Kongreß, Universität, A-4040 Linz, Austria, also indicating if you plan to give a talk (in which section?).

For the local organizers:

Heinz W. Engl

CZECHOSLOVAKIA**SUMMER SCHOOLS UNDER THE AUSPICES OF THE EMS**

Following a tradition lasting more than 16 years, we offer the European Mathematical Community our regular

Summer School/Seminar on Partial Differential Equations

It is a one-week event, organized every year at the end of May or beginning of June, and has primarily the character of a school with a small number of lecture series mostly giving a survey of or introducing into a new topic. The school is organized by the Department of Mathematics of the University of West Bohemia (formerly the Technical University) in Pilsen from 1976.

The 18th seminar will take place from May 31 to June 4, 1993, in Vyškov near Brno.

The following lecture series will be delivered:

Solvability and properties of solutions on nonlinear elliptic boundary value problems by I.V. Skrypnik (Donetsk, Ukraine)

and

The Schrödinger equation by H. Leinfelder (Nürnberg, Germany)

The seminar is a suitable supplement to the study programmes of postgraduate students.

Further information and application forms can be obtained from the organizers mentioned below. Note that the number of participants is limited!

Pavel Drábek and Alois Kufner, Department of Mathematics, Faculty of Applied Sciences, University of West Bohemia, Americká 41, 306 14 Plzeň, CZECHOSLOVAKIA.

EQUADIFF

is a series of comprehensive conferences on differential equations and their applications that have been organized by turns in Prague, Bratislava and Brno since 1962. Following the tradition, **EQUADIFF** will be organized on August 24 - 28, 1993 in Bratislava.

Scientific Committee: S.N. Chow, W.J. Jäger, J. Kačur, I. Kirguradze, K. Kirchgässner, T. Kusano, J. Mawhin, J. Nevcas, F. Neumann, C. Olech, V. Pliss, P.A. Raviart, I. Skrypnik, A. Vanderbauwhede.

Chair: Pavol Brunovský

Confirmed invited speakers by October 23): I. Babuška, P. Constantin, O. Dovslý, G. Dziuk, E. Feireisl, B. Fiedler, M. Golubitsky, M. Günther, J. Hale, J. Hofbauer, J. Jaroš, R. Koplatadze, X.B. Lin, H. Matano, A. Mielke, K. Mischaikow, M. Mrozek, R. Niezgodka, Y. Nishiura, P. Poláčik, S. Schecter, M. Šilavý, J. Solá-Morales, J. Souček, V. Sverák and J.L. Vázquez.

Information: EQUADIFF 8

Faculty of Mathematics and Physics, Comenius University
Mlynská dolina
842 15 Bratislava
Czecho-Slovakia.

Tel: 0042 7 725 741

Fax: 0042 7 725 882

e-mail: equadiff @ mff.uniba.cs

CZECHOSLOVAKIA continued

The following meetings are to be organized by the Faculty of Mathematics and Physics of Charles University, Prague. They are to be held in Paseky.

Paseky

The village of Paseky lies on the slopes of the Krkonose Mountains in Northern Bohemia. Accommodation consists of rooms for two or three people. There are excellent facilities for sporting activities: hiking, soccer, mini-golf and sauna.

Functional Analysis

The program will consist of a series of lectures on *Recent trends in Banach spaces* by Richard Haydon (Université Paris VI and University of Oxford) and also a series of lectures on *Isoperimetric Inequalities for Product measures and their applications* by Michel Talagrand (Université Paris VI).

There will be a special seminar on related topics supervised by Gilles Godefroy (Université Paris VI). **The meeting will take place at Paseky.**

Potential Theory and Analysis

The program will consist of a series of lectures on *Fine Regularity of Solutions of Elliptic PDE's* by William P. Ziemer (Indiana University, Bloomington USA) and a series of lectures on *Elliptic PDE's with Measure Data* by Jan Maly (Charles University, Prague, CSFR).

The purpose of the first set of lectures is to survey the development of the regularity theory of both equations and variational inequalities involving elliptic operators of the form

$$\operatorname{div} A(x,u,Du) - B(x,u,Du)$$

In the second set of lectures solutions of

$$-\operatorname{div} A(x,Du) = m ,$$

where m is a positive Radon measure are investigated. **The meeting will take place at Paseky.**

For both conferences the fee is 240 US dollars. A reduced rate of 210 dollars will be offered, provided a letter guaranteeing one's participation reaches the organisers before February 15, 1993 (for the first conference) or March 15 (for the second conference). The fee includes all local expenses and transport between Prague and Paseky.

First announcement of the Summer School in Functional Analysis organized by Erasmus and Tempus Programme.

This is to be held in Prague and Paseky from 15-28 August 1993. Lectures by R.R. Phelps (Monotone Operators) L. Tzafriri (The Kadison-Singer Extension property, The paving property in ℓ^p) and S. Negrepointis.

For further information about these conferences contact

Jaroslav Lukes and Jiri Kottas
Katedra matematicke analyzy
Matematicko-fyzikalni fakulta UK
Sokolovska 83, 186 00 Praha 8
CZECHOSLOVAKIA

Phone/Fax 42-2-231 76 62

E-mail: UMZJL@CSEARN.BITNET or JLUKES@CSPGUK11.BITNET

FRANCE

18-èmes Journées Arithmétiques

13 - 17 September 1993

Bordeaux - Talence

First announcement

The next Journées Arithmétiques will take place in Bordeaux from Monday 13 to Friday 17th of September 1993. As at previous Journées Arithmétiques, the mornings will be given over to (about) one hour conferences presenting an up-do-date view of different topics. In the afternoons there will be parallel sessions devoted to short papers (approximately 20 minutes each).

Applications can be made as of September 1992 to:

I.S.C. 133, cours de l'Argonne, 33000 BORDEAUX

A second announcement and further details will then be sent to you.

Organizer: J. MARTINET e-mail: jarith93@alioth.greco-prog.fr

GEORGIA

Conference: Enlarged sessions of the Seminar of I. Vekua Institute of Applied Mathematics

Sections: Partial differential equations (Head - Professor A. Bitsadze)
Mechanics of Solids (Head - Professor M. Bashaleishvili)
Computational Mathematics (Head - Professor D. Gordeziani)

These enlarged sessions that have taken place every year since 1984 are arranged for the birthday of the founder and first director of the Institute Academician Ilya Vekua. In 1992 there were sections on complex analysis and its applications, theory of functions of a real variable and ordinary differential equations. Such an alternation of sections is a tradition of this conference as is the publication of a collection of reports.

The organizing committee plans to give a fellowship (with the exception of travel expenses) to 6 young mathematicians from abroad.

Deadline for registration, sending an abstract (1 page) is February 15, 1993

Contact: Professor D. Gordeziani
I. Vekua Institute of Applied Mathematics of Tbilisi State University
2 University str., Tbilisi 380043, REPUBLIC OF GEORGIA
Phone: (007 8832)30 30 40 Fax: (007 8832)30 46 97

Note: There are planes Frankfurt-Tbilisi and Vienna-Tbilisi

UKRAINE**A message from the President of the Kharkov Mathematical Society**

On behalf of the Kharkov Mathematical Society (Kharkov, Ukraine) I would like to express my deepest gratitude to Professor F Hirzebruch and Professor N H Kuiper for their generous gift to the library of our Society and University. They gave us many year substitutions of "Bulletin de la Société Mathématique de France", "Communications in Mathematical Physics", "Inventiones Mathematicae", "Journal of Differential Geometry" and "Mathematische Annalen". These journals are very important for us. On the other hand our present financial state does not allow us to subscribe to them. Therefore the gift of Professor F Hirzebruch and Professor N H Kuiper is an important support for the mathematical community of Kharkov.

We really highly appreciate the gift.

I V Ostrovsky

The President of the Kharkov Mathematical Society

UNITED KINGDOM

The LMS annually organises a series of 10 expository lectures by an outstanding mathematician, given over the space of one week. The lecturer for 1993 will be

PROFESSOR L. de BRANGES

who will speak on

FACTORIZATION AND INVARIANT SUBSPACES

The series will start at 2 pm on Monday, 22nd March and finish at mid-day on Friday, 26 March 1993, and will take place in the Department of Mathematics, Lancaster University.

Professor de Branges is well known for his work on operator theory and function theory, and is especially renowned for having proved the long-standing Bieberbach conjecture. This success was one consequence of a far-reaching theory of matrix- and operator-valued analytic functions which he has developed. The theory concerns itself particularly with factorization questions. The functions are interpreted as transfer functions of unitary linear systems, having state spaces which are Hilbert spaces. The theory of these linear systems is a generalization of a topic which Hilbert himself regarded as a good candidate for an approach to the proof of the Riemann hypothesis - a spectral theory for second order differential operators.

The application of the theory requires the introduction of spaces with indefinite inner products, and its present formulation is influenced by the ideas of Mark Krein. A technique called complementation, which generalizes the usual orthogonal complement, is applied in Hilbert spaces and Krein spaces. Complementation is a concept which underlies the proof of the Bieberbach conjecture. It is a precise mechanism for keeping track of the energy balance in the flow of a dynamical system.

The celebrated invariant subspace problem (must a continuous linear transformation in a non-trivial Hilbert space have a non-trivial invariant subspace?) can be viewed as a factorization problem. This approach leads to a generalization of the concept of invariant subspace. One then needs to determine when the existence of non-trivial generalized invariant subspaces implies the existence of non-trivial invariant subspaces. A mechanism for obtaining this conclusion has been found, but the invariant subspace problem itself remains open.

To reserve accommodation on campus (from £24.25 + VAT per day half board)

Contact Professor N.J. Young, Department of Mathematics, Fylde College, Lancaster University,
Lancaster LA1 4YF, UK. email N.J.Young@uk.ac.lancs.cent1

Reservations need to be confirmed by 1st February.

Warwick Symposium on Analytic and Geometric Aspects of Hyperbolic Geometry 1992-93

Particular events: 15 - 22 April 1993
 4 - 11 July 1993

Workshop in Warwick
Meeting in Durham

There will also be many visitors to Warwick outside these periods, particularly from April to July 1993.

Details of the April meeting:

There will be three mini-courses, given by R.D. Canary, S.P. Kerckhoff and J.P. Otal, devoted to the general problem of putting hyperbolic structures on 3-dimensional manifolds, orbifolds and cone-manifolds. Canary and Otal will discuss methods developed by Thurston, McMullen and others. Kerckhoff will talk about his joint work with Hodgson, explaining the use of harmonic theory in this problem. There will also be lectures on other topics.

Support from the LMS is available for UK academic staff and graduate students. SERC funds are available for invited visitors. Contact mrc@maths.warwick.ac.uk.

Organizers: David Epstein and Caroline Series.

UNITED KINGDOM continued**THE INSTITUTE OF MATHEMATICS AND ITS APPLICATIONS**

Conferences and Symposia to be held in 1993 (Other conferences are listed in Newsletter 5)

1993 IMA CONFERENCE ON COMPLEX STOCHASTIC SYSTEMS AND ENGINEERING

20 - 22 September

University of Leeds

MATHEMATICS FOR ENGINEERS AND SCIENTISTS

September

Loughborough

FOURTH IMA CONFERENCE ON CRYPTOGRAPHY AND CODING

13 - 15 December

Royal Agricultural College, Cirencester

EURO-COLT

December

Royal Holloway and Bedford New College

Information:

Miss Pamela Irving, Institute of Mathematics and its applications
16 Nelson Street, Southend-on-Sea, Essex SS1 1EF

Tel: 0702 354020

Fax: 0702 354111

OTHER CONFERENCES**MADEIRA****Stochastic Analysis and Applications in Physics**

6 - 19 August 1993

The last decade saw enormous achievements in stochastic analysis and its applications in connection with analysis on infinite dimensional spaces. Especially quantum physics and dynamical systems were among the inspiring sources for these developments. The school will bring experts in these fields together for a comprehensive review in order to achieve coherence and to stimulate future research.

AIMS: Through lectures on recent developments in stochastic analysis and applications in theoretical and mathematical physics the school aims at an intense exchange of current ideas in stochastics and physics, and to create new directions of research. Among its topics are:

Markov and Quantum Fields. Dirichlet Forms. Analysis on Loop Groups. Monte Carlo Methods. Stochastic Methods in Quantum Field Theory. Quantum Probability. Stochastic (Partial) Differential Equations. Feynman Integration. Stochastic Dynamical Systems. White Noise Analysis.

LECTURERS: The list of speakers will include: S. Albeverio (*Bochum*), P. Collet (*Paris*), M. Fukushima (*Osaka*), L. Gross (*Cornell*), G. Jona-Lasinio (*Rome*), C.B. Lang* (*Graz*), R. Vilela Mendes (*Lisbon*), P.A. Meyer* (*Strasbourg*), P.K. Mitter (*Paris*), B. Oksendal (*Oslo*), E. Pardoux* (*Marseille*), J. Potthoff (*Mannheim*), R. Seneor (*Paris*), L. Streit (*Funchal, Bielefeld*). (Speakers marked with a * are not yet fully confirmed)

SCIENTIFIC COMMITTEE: A.I. Cardoso (*Funchal*), M. de Faria (*Funchal*), J. Potthoff (*Mannheim*), R. Seneor (*Paris*), L. Streit (*Funchal, Bielefeld*).

LOCAL COMMITTEE: L. Streit (ASI director), A.I. Cardoso, J. da Costa, M. Cunha, M. Faria, C. Rodrigues, J. Luis Silva

CONTACT: L. Streit, Universidade da Madeira, Edifício do Colégio, Praça do Município, P-9000 Funchal, MADERIA.
E-mail: STREIT@PTIFM.BITNET

OTHER CONFERENCES continued

CANADA

ANNOUNCEMENT

NATO ADVANCED STUDY INSTITUTE

POLYTOPES: ABSTRACT, CONVEX AND COMPUTATIONAL

Scarborough, Ontario, Canada

23 August - 4 September 1993

INFORMATION: Professor T. Bisztriczky
Department of Mathematics and Statistics
University of Calgary
Calgary, Alberta, T2N 1N4, CANADA

CARIBBEAN

**Announcing
FIRST CARIBBEAN SPRING SCHOOL OF
MATHEMATICS AND THEORETICAL PHYSICS**

**INFINITE DIMENSIONAL GEOMETRY NON COMMUTATIVE GEOMETRY
OPERATOR ALGEBRAS FUNDAMENTAL INTERACTIONS**

30 May - 13 June 1993

Guadeloupe (French West Indies)

Invited speakers: L. Alvarez-Gaume, H. Araki, J.P. Bourguignon, A. Connes, L. Faddeev,
R. Haag, A. Jadczyk, V. Jones, D. Kastler, G. Mack, P. Ramond,
F. Schaposnik, J. Stasheff, R. Stora, A.S. Wightman, S.L. Woronowicz.

Organizers: R. Coquereaux Centre de Physique Theorique, CNRS, Case 907
Luminy, 13288, Marseille, France.
E-mail: Coque@FRCPN11.IN2P3.FR
M. Dubois-Violette Laboratoire de Physique Theorique et Hautes Energies
Univesité Paris 11, B211, 91405, Orsay, France. FR.

An information bulletin is available as a TEX file on computer networks.

The file can be retrieved by issuing the command (for example from VM)

TELL LISTSERV AT CERNVM GET CARIB CONF

or by e-mail: MAIL LISTSERV@CERNVM.CERN.CH

with a 1 line mail body containing the command GET CARIB CONF

The file can also be perused (and retrieved) on the H E P service of WWW (the World Wide Web) by doing Telnet 128.141.201.74 or by doing Telnet info.cern.ch

Applications should be sent very early (September of October 92, cf. Information Bulletin)
Detailed information is available upon request by mail or e-mail (MARYSE@CPTVAX.IN2P3.FR)
Several fellowships are available (for Latino-American and French post-doctoral level students)

Edited by Ivan Netuka and Vladimír Souček. Books submitted for review should be sent to the following address: Ivan Netuka, MÚUK, Sokolovská 83, 18600 Praha 8, Czechoslovakia.

S.D.Chatterji, B.Fuchsteiner, U.Kulisch, R.Liedl, W.Purkert (Eds.):

Überblicke Mathematik, Jahrbuch 1992, Friedr. Vieweg & Sohn, Braunschweig, 1992, 206 pp., DM 49.00, ISBN 3-528-06465-X

It is a tradition of the series "Überblicke Mathematik" to give survey articles on various topics in pure and applied mathematics as well as its history. The 1992 volume includes a variety of diverse themes: Banach spaces (A.Pietsch), Newton's method at singular points (A.Frommer), Efficient methods for computing derivatives, gradients and Taylor coefficients (H.-Chr.Fischer), The influence of Lebesgue's integration theory on complex analysis (M. von Renteln), Computing standard elementary functions (W.Krämer), Schur analysis and its applications (B.Fritzsche and B.Kirstein), Neural networks (R.Ferber), 500th birthday of Adam Ries (H.Wussing), Mathematics in university and in industry (H.Neunzert and M.Schulz-Reese), Permanents (A.Kräuter). The volume concludes with information concerning the foundation of the European Mathematical Society (H.Holmann). The exposition is oriented towards nonspecialists and will be of interest to a broad mathematical community. (jokr)

C.Soulé, D.Abramovich, J.-F.Burnol, J.Kramer: Lectures on Arakelov geometry, Cambridge Studies in Advanced Mathematics 33, Cambridge University Press 1992, Cambridge, vii+177 pp., US \$ 44.95, ISBN 0-521-41669-8

The book offers a revised and expanded version of lectures given by the first author at Harvard University in 1989. The main result proved is an arithmetic Riemann-Roch-Grothendieck theorem and its application to the proof of an estimate for sections of powers of ample line bundles. Methods used are a combination of tools developed in modern algebraic geometry with analytic methods coming from hermitean complex geometry. The differential geometry part (Green currents, characteristic classes, the determinant of Laplace operators, Quillen's metric, family index theorem) is treated more extensively. The methods described here were recently very much discussed in connection with Vojta's proof of the Mordell conjecture and with Polyakov's approach to string theory. The book keeps the spirit of lectures and includes open problems and conjectures. Very interesting for students and research workers in number theory, complex analysis, differential geometry as well as in string theory. (vs)

A.Barlotti, A.Bichara, P.V.Ceccherini, G.Tallini (Eds.): Combinatorics '90: Recent Trends and Applications (Proceedings of the Conference on Combinatorics, Gaeta, Italy, May 20-27,1990), Annals of Discrete Mathematics 52, North Holland, Amsterdam, 1992, x+566 pp., US \$ 165.50, ISBN 0-444-89452-7

The proceedings contain 44 contributions presented at the conference, most of them dealing with combinatorial and algebraical structures, such as Steiner systems, block designs, tactical decompositions, MV-algebras, codes, partial, parabolic and Buekenhout geometries, linear, semilinear and affine spaces, fibered, Conway and Frobenius groups, near-rings etc. Graph theory is also briefly touched on (distinguishing colourings, tournaments). Most of the contributions are research articles describing most recent results in the area (some with attractive titles, e.g. "fractal-like Steiner system"). Survey papers cover the major areas: "p-primitive Semifield Planes" (M.Cordero), "Combinatorics and Cryptography" (F.Eugeni), "Recent Intrinsic Characterizations of Ovoids and Elliptic Quadrics in PG(3,K)" (G.Faina), "Translation Planes and Related Combinatorial Structures" (N.L.Johnson), "On the Characterization Problem for Finite Linear Spaces" (N.Melone), "Flagtransitive Buekenhout Geometries" (A.Pasini, S.Yoshiara), "Old and New Results on Spreads and Ovoids of Finite Classical Polar Spaces" (J.A.Thas). (jakr)

ByoungSeon Choi: ARMA Model Identification, Springer Series in Statistics, Springer-Verlag, New York, 1992, xi+200 pp., DM 78.00, ISBN 0-387-97795-3, ISBN 3-540-97795-3

This book gives an account of identification methods for univariate ARMA models: the autocorrelation methods (Box-Jenkin's method, the inverse autocorrelation method), penalty function methods (Akaike's FPE and AIC criteria, Schwarz-Rissanen's BIC criterion and Hannan-Quinn's criterion), innovation regression methods, pattern identification methods (which include R and S array method and many others) and testing hypothesis methods. Theorems are fully formulated but instead of proofs the corresponding references are (in many cases indirectly) given. The author presents fundamental ideas, historical notes, a few personal views of leading statisticians on described problems and many references - 749 items on 48 pages. The book will be appreciated by specialists since it brings a really complete review of the above methods. No numerical examples illustrating the behaviour of the present methods are introduced. Also methods for identification of multivariate models are not described here. (ja)

H.Triebel: Theory of Function Spaces II, Monographs in Mathematics, vol.84, Birkhäuser, Basel, 1992, v+370 pp., DM 188.00, ISBN 3-7643-2639-5, ISBN 0-8176-2639-5

The aim is to give the theory of the function spaces $B_{s,p,q}$ and $F_{s,p,q}$ as it stands at the end of eighties. Although the book is mainly based on the author's results obtained in the last few years it gives a comprehensive picture of these spaces and their applications. I was really delighted reading the first Chapter. In 87 pages the author gives an introduction explaining what motivated the introduction of various spaces, and which techniques were used to treat them. He emphasizes that all these techniques end up with the same classes of functions $B_{s,p,q}$ and $F_{s,p,q}$. This Chapter is an outstanding historical survey which gives the answer to many whys and hows which, met in the detailed theory, could lead to misunderstandings of various kinds. I can imagine an excellent introductory course on function spaces based on this part of Triebel's book. The other 6 chapters give the systematic exposition of $B_{s,p,q}$ and $F_{s,p,q}$ spaces. As the author says, Chapter 6 may be considered as an application of the core of the book (Chapt. 2-5 and 7) to pseudodifferential equations. (oj)

U.Cegrell: Capacities in Complex Analysis, Aspects of Mathematics, vol. E 14, Friedr. Vieweg & Sohn, Braunschweig, 1988, xi+153 pp., DM 46.00, ISBN 3-528-06335-1

The book gives a very brief but comprehensive account of capacity theory related to plurisubharmonic and analytic functions in C_n . Classical capacity theory was soon transferred from C to R_n because of the close connection with the (linear) Laplace operator. On the other hand, the construction of capacity theory in C_n was completed only in the last decade when its connection with the non-linear (n-linear) Monge-Ampère operator was discovered. The author, for the first time in the literature, presents in his book the new delicate techniques needed for the most important parts of this quickly developing theory and leads the reader up to recent research. For a more classical approach the reader can consult the book of J.Siciak: Extremal Plurisubharmonic Functions and Capacities in C_n , Sophia Kokyuroku in Mathematics 14, Sophia University, Tokyo 1982. A good knowledge of function theory in C_n is a necessary prerequisite for a proper understanding of the book. Non experts will be obstructed by many misprints. (jf)

J.Eisenstaedt, A.J.Kox (Eds.): Studies in the History of General Relativity, Einstein Studies 3, Birkhäuser, Boston 1992, xii+468 pp., sFr. 198, ISBN 0-8176-3479-7 ISBN 3-7643-3479-7

The present book is the second one dealing exclusively with the history of General Relativity. It contains, with a few exceptions, papers based on lectures presented at the 2nd International Conference on the History of General Relativity (Luminy, France, 1988). The book is divided into several parts. The first contains studies of the early reception of general relativity in Europe

(Portugal, Germany, the Netherlands, Britain) as well as papers by Goldberg, Lichnerowicz and Mercier on the development of certain ideas in general relativity after World War II. Almost half the book (the second part) is devoted to a discussion of various key concepts (Mach's principle, general covariance, "Eindeutigkeit" principle). Topics discussed in the last two parts include, amongst others, Lorentz's approach to general relativity, the Dirac operator on curved spacetimes, the Cauchy problem in general relativity, spherical coordinates and relations to cosmology. The book contains much rich material concerning the evolution of general relativity and is certainly useful for anybody interested in general relativity. (vs)

G.Karpilovsky: Group Representations, Volume 1, Part A: Background Material, Part B: Introduction to Group Representations and Characters, North-Holland Mathematics Studies, vol. 175, North-Holland, Amsterdam, 1992, xviii+1274 pp., \$ 271.50, ISBN 0-444-88632-X

The first volume of the intended multi-volume treatise on group representations contains most of the module-theoretic material needed for a solid study of group representations and characters, while the second volume is concerned with classical introductory results on this subject. The exposition is very detailed and the author attempts to present the results as general as possible. The monograph may well address both graduate students and mathematicians working in the field. However, a student will need a lot of patience to reach some of the most classical results (Frobenius groups are treated on p. 1100 and the Burnside's p aq b theorem appears on p. 1179). (tk)

B.R. Gelbaum: Problems in Real and Complex Analysis, Problem Books in Mathematics, Springer-Verlag, New York, 1992, ix+488 pp., 18 fig., DM 118.00, ISBN 0-387-97766-X, ISBN 3-540-97766-X

A collection of almost 900 problems and their solutions from various parts of mathematical analysis. It covers basic topology and functional analysis (real- and complex-valued functions, limits, continuity, measure theory and its interplay with topology), integration theory (the Daniell as well as the measure-theoretic approach). The real analysis part also includes several problems on Haar measure, probability theory and ergodic theory. The complex analysis part covers elementary theory of holomorphic functions, entire functions, analytic continuation, singularities, harmonic functions, families of functions and convexity theorems. The majority of problems are "theoretic" in character. The book is a rich source of well chosen problems from mathematical analysis and will be useful for mathematics students as well as teachers. (in)

J. C. Bermond (Ed.): Interconnection Networks, Discrete Applied Mathematics, vol. 5, North-Holland, Amsterdam, 1992, viii+580 pp., \$ 271.50, ISBN 0-444-89342-3

This is a special issue of Discrete Applied Mathematics (called DAMIN) which collects articles dealing with all the combinatorial aspects of Interconnection Networks, in particular in view of their use in Parallel Computing. The forty papers deal mostly with static or point to point Interconnection Networks and also with fault tolerance or vulnerability properties using either combinatorial tools or probabilistic ones. Altogether the papers collected in DAMIN, and the problems they solve or propose, represent an important stream of research. I would particularly recommend the book to researchers in Parallel Computing where it should find many applications. (ml)

U.Hornung, P.Kotelenez, G.Papanicolaou (Eds.): Random Partial Differential Equations (Proc. of the Conference held at the Mathematical Research Institute at Oberwolfach, Black Forest, Nov.19-25,1989), International Series of Numerical Mathematics, vol.102, Birkhäuser, Basel, 1991, ix+165 pp., ISBN 3-7643-2688-3, ISBN 0-8176-2688-3

The book contains a selection of papers presented at a colloquium at the Mathematical Research Institute Oberwolfach in 1989. General theory of stochastic partial differential equations, particularly

the theorems on approximations and on comparison, small perturbations, large time behaviour are dealt with in papers by P.L.Chow and J.L.Jiang, G.Jetschke, P.Kotelenez, R.Manthey, A.Millet, D.Nualart and M.Sanz, W.Kirsch and L.A.Pastur. Additive functionals on a diffusion are treated by S.Albeverio, P.Blanchard and Z.M.Ma, the Nelson diffusion by G.Dell' Antonio. Papers related to physical models are on the exclusion processes (A.Benassi, J.P.Fouque), on the conductivity of a square lattice (K.Golden) and simulation of mechanical systems (W.V.Wedig). Other topics covered are Hellinger integrals (B.Grigelionis) and a stochastic Fubini theorem (L.G.Gorostiza, J.A.León) with applications to stochastic evolution equations. (pm)

J.H.Silverman, J.Tate: Rational Points on Elliptic Curves, Undergraduate Texts in Mathematics, Springer-Verlag, New York, 1992, x+281 pp., 34 fig., DM 58, ISBN 0-387-97825-9, ISBN 3-540-97825-9

This excellent book is a considerably expanded new edition of the second author's famous "Haverford lectures", given at Haverford College in 1961. Namely, the first three and half chapters of this book follow the lectures. Chapter two contains the Nagell-Lutz Theorem, chapter three a special case of the Mordell Theorem and finally chapter four (again a special case of) the Hasse theorem (due to Gauss). The remaining part of this chapter is devoted to Lenstra's well known elliptic curve algorithm. (The first author offers even two computer packages to perform basic computations on elliptic curves.) Chapters V and VI are new - integer points on elliptic curves, special case of Siegel's Theorem (using "Thue's" method) and introduction to the theory of complex multiplication. Appendix A is devoted to projective geometry (background for this book, further an elementary proof of Bezout's Theorem and "reduction modulo p"). Each chapter (and even the appendix) ends with sets of very nice exercises, some of them being very far from routine. The book ends with a short bibliography and index. The reviewer is convinced that this book will play the same role as Tate's lectures in further development of number theory. The book can be warmly recommended to teachers, students, to beginners and experts or anyone who likes to learn the fundamentals of this nice part of number theory. (bn)

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Editors: Boris Apanasov, Walter D. Neumann, Alan W. Reid, Laurent Siebenmann

1992. XII, 457 pages. 17 x 24 cm. Cloth DM 134,- ISBN 3-11-012598-6

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