European Mathematical Society

NEWSLETTER No. 3

1st March 1992

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Typed by Beryl Betts and produced at the Faculty of Mathematical Studies, University of Southampton
Printed by Boyatt Wood Press, Southampton, UK

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For reasons of space, it has not been possible to print a list of original names of member societies in this issue. Such a list will now appear in the next issue.

COUNCIL ELECTIONS

The deadline for nominations for Council delegates representing individual members was 31 January 1992. On that date, there were 1105 individual members of the EMS, entitling them to 12 Council delegates. By the same date, 12 nomination forms had been received at the Society's office. These candidates were therefore declared elected, without the need for a ballot:

Thierry Aubin	John M. Howie	Jean-Marc Deshouillers
Bodil Branner	Max Karoubi	Henrik H. Martens
Pierre Bérard	Paul Malliavin	N. Desolneux-Moulis
Roger A. Fenn	Sean Dinnen	Mireille Martin-Deschamps

All the candidates supplied some biographical information, and we hope to have room to print this in the next issue of the newsletter.

After all the successful candidates had been notified of their election, two late nomination forms were received, and these unfortunately had to be declared invalid.

HUMAN CAPITAL AND MOBILITY PROGRAM OF THE EUROPEAN COMMUNITY

The EC will most probably soon launch a new program, with a very large budget, under the title Human Capital and Mobility: Research Training Fellowships.

In this scheme, a large number of fellowships at the post-doctoral level will be awarded to EC research workers who wish to work for a period of one to three years in various recognised centres or networks.

If this program is officially approved (and this could well happen in March 1992), institutes or networks (of at least 5 institutes in at least 3 EC countries) should apply directly to the Division 12 of the EC in Brussels to be recognised in the program.

It seems likely that applications by specialized networks will be particularly welcomed.

Individual research workers at the postdoctoral level should also apply under this new scheme to the EC, and in fact may already apply within the framework of the existing Science program.

This announcement is of course tentative, since the program has not yet been officially accepted by the European parliament. However, it seems so well suited to the needs of the mathematical community, that members of the E.M.S. may appreciate having their attention drawn to these new opportunities, so that those eligible can be ready to apply in good time.

For the EC Liaison Committee
Luc Lemaire, C.P. 218, Campus Plaine, Universite Libre de Bruxelles,
Bd du Triomphe, 1050 Bruxelles - BELGIUM e-mail: ULBMATH@ulb.ac.be

WOMEN MATHEMATICIANS

by

Eva Bayer

The proportion of women among mathematicians varies considerably from one European country to another. Roughly speaking, it lies between 2% and 50%.

Many women mathematicians, especially those living in the countries where women constitute a very low percentage of the mathematical population, feel uncomfortable about this situation. In 1986, some of them got together during the International Congress of Mathematics in Berkeley. This was the starting point of the group **European Women in Mathematics** (EWM). Since then, five EWM congresses have taken place, most recently at Luminy (near Marseille, in France), in December 1992. The next meeting will be held in Warsaw, in May or June 1993.

An association of women mathematicians has existed in the USA for more than 20 years, called **Association for Women in Mathematics** (AWM), with many European women mathematicians as members. Moreover, AWM took an active part in the creation of EWM: the meeting in Berkeley where the idea of EWM was born was a panel discussion organised by AWM. The French association of women mathematicians, **Femmes et Mathématiques**, was founded in 1987. It has already more than 100 members.

At the first meeting of the Executive Committee, EMS created a **committee on Women and Mathematics**. Unlike the other committees of the society, this one wishes to become superfluous as soon as possible. This will happen when the proportion of women among mathematicians throughout Europe gets close to 50%. For the moment, the main projects of the committee are the following:

1) To gather statistical information about the number of women mathematicians and the proportion of women among the students in mathematics. This is done with the help of the National Mathematical Societies. The preliminary results of this survey are very interesting.

2) To analyse in more detail the situation of Germany (one of the European countries with the lowest percentage of women mathematicians).

3) To understand the importance of role models in the study of mathematics and in the undertaking of a career as a mathematician.

The members of this committee are: Eva Bayer (Besançon), Ina Kersten (Bielefeld), Ragni Piene (Oslo), Stewart Robertson (Southampton), Barbara Roszkovska (Warsaw), Laura Tedeschini Lalli (Roma), Vera Trnkova (Praha).

There will be a **Round Table** on women mathematicians during the first European Congress of Mathematics, which is being held in Paris in July 1992.

The Round Table will consist of 5 short talks and a discussion with all the participants. Among other things, the work of the EMW committee will also be presented during this Round Table.

Pour en savoir plus:

For information concerning

EWM, contact one of the international coordinators:

Marketa Novak, Dept. of Computer Science, Chalmers University of Technology, 41296 Göteborg, Sweden.
e-mail: novak@cs.chalmers.se

Capi Corrales, Dept. de Algebra y Fundamentos, Facultad de Ciencias, University Complutense de Madrid, 28040 Madrid, Spain.
e-mail: capi@emducmll.bitnet

Marie Demlova, Dept. of Mathematics, Faculty of Electrical Engineering, Czech Technical University, Technicka 2, 16627 Praha 6, Czechoslovakia.
e-mail: deml@csearn.bitnet

The 1993 EWM Congress, contact

Anna Romanowska, Mathematical Institute, Warsaw University, Plac Politechniki 1, 00661 Warsaw, Poland.
e-mail: aroman@plwatu21.bitnet

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Carol Wood, Dept. of Mathematics, Wesleyan University, Middletown, CT 06459, USA.
e-mail: cwood@eagle.wesleyan.edu

Femmes et Mathématiques, contact

Catherine Goldstein, Université de Paris-Sud, Bâtiment 425, Mathématiques, Orsay, France.
e-mail: cgolds@matups.matups.fr

EMS committee, contact

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LOCAL CORRESPONDENTS

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EUROPEAN NEWS: Country by Country

HUNGARY:

Prizes: In 1991 the presidency of the Hungarian Academy of Sciences donated the Gold Medal of the Academy to Professor Pal Erdös.

Journals: The Journal of the Bolyai Mathematical Society, Matematikai Lapok, is appearing four times a year. The articles are written in Hungarian with resumés in English. The subscription fee is 450 Ft. (100 Ft = 1 ECU).

The Kömal. the mathematical and physical Journal of the Society for grammar-school students, will be published by the Eötvös Physical Society in future. Its new name is Közepiskolai Matematikai es Fizikai Lapok.

Conferences: **EUROCRYPT 92.** Workshop on the Theory and Applications of Cryptographic Techniques.

May 24-28, 1992.
Location: Hotel Fured, Balatonfured, Hungary.
Contact: Professor Tibor Nemetz
Math. Institute of the Hungarian Academy of Sciences
P.O. Box 127/H-1364, BUDAPEST
e-mail: h1137nem@ella.hu
Fax: (36-1)-117-71-66

THE ASL EUROPEAN CONFERENCE OF LOGICIANS organized by the Bolyai János Mathematical Society.

Location: Veszprém.
Contact: The Bolyai Mathematical Society
BUDAPEST
Fö u. 68. II.224, H-1027.
Telephone: 201-6974, 201-7656, 201-2011.
e-mail: h2499asl@ella.hu

In 1991 the Bolyai Mathematical Society celebrated its 100th anniversary. At the present time its financial possibilities are very restricted and it can only give very little support to its members to go to conferences, or to invite foreign mathematicians. The Society is looking for sponsors.

CZECHOSLOVAKIA

Journals: The Department of Logic of the Institute of Philosophy, Czechoslovak Academy of Sciences, is to publish a new journal *From the logical point of view* which will appear three times a year. The journal will be published in English and will focus on general problems of philosophical and mathematical logic. Contributions devoted to the applications of logical research in other fields (e.g. artificial intelligence, semantics of natural language, cognitive science) will be accepted as well. The subscription price is 30 US $ per issue and 80 US $ per volume of 3 issues. For more details contact Dept. of Logic, Institute of Philosophy of CSAS, Jilská 1, 11000 Praha 1, ČSFR.
Fax: 02/2313882 e-mail: FIL45@CSPGCS11

The Mathematical Institute, Czechoslovak Academy of Sciences, (Žitná 25, 11567 Praha 1) publishes the following Journals.

Czechoslovak Mathematical Journal.

Applications of Mathematics (formerly Aplikace Matematiky),

Mathematica Bohemica (Časopis pro pěstování Matematiky)

Conferences: **SUMMER SCHOOL/SEMINAR ON PARTIAL DIFFERENTIAL EQUATIONS.**

6-12 June 1992
University of West Bohemia, Cheb (Eger). The following lecture series will be given. 1. Fixed point theory and nonlinear boundary value problems. (Prof. Jürgen Appell; University of Würzburg). 2. Removable Singularities (Prof. Josef Král (Math. Inst. Acad. Sci. Prague).

This summer school is a yearly event. With the opening of borders and with the broader integration of European Mathematics the organizers are keen to open this school to other young European mathematicians.

Further information and application forms can be obtained from the organizers
Pavel Drábek and Alois Kufner
Department of Mathematics
University of West Bohemia
Americká 42, 30614 Plzeň, CZECHOSLOVAKIA.

SPRING SCHOOL IN POTENTIAL THEORY AND ANALYSIS:
Small and Exceptional Sets in Analysis and Potential Theory

19-25 April 1992, PASEKY
Faculty of Mathematics and Physics, Charles University.
Contact: J. Lukeš, Faculty of Mathematics and Physics
Charles University,
Sokolovská 83, 186 00 Praha 8
CZECHOSLOVAKIA
e-mail: umzjl@csearn.bitnet

WORKSHOP ON FUNCTIONAL ANALYSIS: RECENT TRENDS IN BANACH SPACES

3-9 May 1992, PASEKY
Main Organiser: Faculty of Mathematics and Physics
Charles University
Contact: J. Kottas, Faculty of Mathematics and Physics
Charles University, Sokolovská 83,
186 00 Praha 8, CZECHOSLOVAKIA
e-mail: umzjk@csearn.bitnet

WORKSHOP ON COMPUTING SCIENCE

24-26 June 1992, PRAHA, SOUTH BOHEMIA
Faculty of Mathematics and Physics, Charles University
Contact: A Kučera, Faculty of Mathematics and Physics
Malostranské nám. 25,
118 00 Praha 1, CZECHOSLOVAKLIA

EVOLUTION DIFFERENTIAL EQUATIONS (EVEQ 3)

29 June - 3 July 1992, PRAHA
Faculty of Mathematics and Physics, Charles University
Contact: J. Stará, Faculty of Mathematics and Physics
Sokolovská 83,
186 00 Praha 8, CZECHOSLOVAKIA
e-mail: umzjs@csearn.bitnet

THE 5th INTERNATIONAL CONFERENCE ON DIFFERENTIAL GEOMETRY AND ITS APPLICATIONS

24-30 August 1992, OPAVA
Silesian University in Opava
Contact: D. Krupka, Mathematical Institute,
Silesian University in Opava, Bezručovo nám. 13
746 01 Opava, CZECHOSLOVAKIA]

4th INTERNATIONAL SYMPOSIUM ON NUMERICAL ANALYSIS ISNA 92

31 August - 4 September 1992, PRAHA
Faculty of Mathematics and Physics, Charles University
Contact: I. Marek, Faculty of Mathematics and Physics,
Charles University, Malostranské nám. 25,
118 00 Praha 1, CZECHOSLOVAKIA
e-mail: isna@cspgukll.bitnet

MATHEMATICAL OPTIMIZATION AND MATHEMATICAL METHODS IN ECONOMICS

20-26 September 1992, PRAHA
Union of Czech Mathematicians and Physicists
Contact: Mailing address: F. Nožička
Faculty of Mathematics and Physics
Charles University, Malostranské nám. 25
118 00 Praha 1, CZECHOSLOVAKIA

BIFURCATION AND STABILITY OF VARIATIONAL INEQUALITIES

12-17 October 1992, PASEKY
Faculty of Mathematics and Physics, Charles University
Contact: J. Stará, Faculty of Mathematics and Physics
Charles University
Sokolovská 83
186 00 Praha 8, CZECHOSLOVAKIA
e-mail: umzjs@csearn.bitnet

YUGOSLAVIA

Journal: The Department of Mathematics of the University of Titograd and the Society of Mathematicians and Physicists of Montenegro are starting a journal **Mathematika Montisnigri**

This journal will be publishing papers in all areas of mathematics. There will be two issues a year and the first will be out in the middle of 1992.

THE INTERNATIONAL CENTRE FOR MATHEMATICAL SCIENCES, EDINBURGH

by

Frank Donald

The International Centre for Mathematical sciences (ICMS) is a joint venture of Edinburgh University and Heriot-Watt University, with the support of the City of Edinburgh, the London and Edinburgh Mathematical Societies, Standard Life and Scottish Provident. It is now conducting its first year long research programme on "Mathematical Problems in Materials Science".

During the programme, which runs until August 1992 there will be meetings on Fracture Mechanics, Superconductivity, Ferromagnetic Materials and Magnetostriction, and two international conferences. The first, in June, will deal with the mathematical modelling of the microstructure of crystals. The second, in August, will cover the kinetics of phase transformations. The programme is attracting a number of leading mathematicians, physicists and materials scientists to Edinburgh. Professor R D James, of the Department on Aerospace Engineering and Mechanics, University of Minnesota, is in residence throughout the year.

The mission of the ICMS is to create an environment in which the mathematical sciences will develop in new directions, and to encourage and exploit those areas of mathematics that are of relevance to other sciences, industry and commerce. The ICMS aims to promote international collaboration with particular reference to mathematicians working in developing countries. It is being assisted by the International Centre for Theoretical Physics in Trieste, which has been providing training and back up for developing country scientists for twenty five years. The first ICMS advanced course on "Geometry and Physics" was run in cooperation with the Trieste Centre during March 1991. A hundred researchers from 22 countries took part.

The ICMS scientific programme is selected by a panel of distinguished mathematicians, chaired by Professor J-L Lions, the President of the International Mathematical Union and of the French Space Agency. The research topics for 1992/93 are "Randomness and Computation", "Algebraic Graph Theory, Geometric and Combinatorial Methods in Group Theory" and "Mathematics for Petroleum Science." It is also planned to run an advanced course in Analysis.

The ICMS Programme Committee would be particularly interested in receiving proposals for research programmes or courses, especially those related to:

Numerical analysis and scientific computation
Mathematics in medicine
Applied differential geometry
Applications of fluid mechanics to the environment (eg water pollution)
Vibrations of complex systems (eg cars, aircraft)
Mathematics in operations research
Modelling and inference in interactive systems
Nonlinear stochastic partial differential equations (with applications to biology, engineering etc)

The ICMS benefits from the advice of a distinguished Scientific Advisory Board consisting of Professors E B Dynkin, M Gromov, Feng Kang, P D Lax, J-L Lions, J Palis, D Quillen, H Weinberger, all of whom have played a crucial part in the establishment and management of research institutes. The Board will be meeting in Edinburgh during the International Science Festival in April 1992, and some of its members will take part in a panel discussion on the future of mathematics. The discussion will be chaired by Sir John Kingman, Vice Chancellor of Bristol University, and Chairman of the United Kingdom Science and Engineering Research Council's Mathematics Strategy Panel.

For further information, and submission of research proposals, please contact:

Professor J M Ball
International Centre for Mathematical Sciences
Heriot-Watt University, Riccarton
Edinburgh EH14 4AS, UK.
Tel: (44) 31 451 3227
Fax: (44) 31 451 3249
e-mail: ICMS@cara.ma.hw.ac.uk

Further details of the above conferences

8-13 June 1992: Continuum Models for the Microstructure of Crystals
(From the points of view of continuum mechanics, the calculus of variations, experiment and computation. The speakers are leading mathematicians, material scientists, and physicists working on problems of common interest who will present new developments in the field. The meeting forms part of a one-month period of concentration on the microstructure of crystals during June 1992). For application forms and further information contact Dr. Nick Firoozye at the above address.

10-14 August 1992: Kinetics of Phase Transitions
(Topics to include Spinodal decomposition and coarsening, elastic interactions, the derivation of kinetic equations and their mathematical properties and the use of computers.) The conference takes place before the Edinburgh international Arts Festival 1992, one of the most prestigious cultural events in Europe which will be held from 16 August to 5 September. Rooms in Hotels on guesthouses can be reserved for participants. Enquiries and application forms at the above address.

OTHER CONFERENCES

ICM 94

The dates of the ICM'94 are August 3-11th 1994 and the dates 31 July -2 August, have been reserved for the meeting of the General Assembly of the IMU.

If any mathematical meetings are to be organized just before or just after these dates the information should be sent to

Professor Christian Blatter, Mathematik,
ETH-Zentrum, CH-8092, Zurich.
Fax: 01-252-3401.

This would help in avoiding the superposition of pre- and post-congress meetings in the same area.

THIRD INTERNATIONAL COLLOQUIUM ON DIFFERENTIAL EQUATIONS

18-22 August, Plovdiv, Bulgaria

The topics include Ordinary and Partial Differential Equations, including stochastic, numerical and applied aspects.

Contact: S. Zlatev
Mathematical Faculty of Plovdiv University
Tsar Assen Str. 24. Plovdiv, 4000 BULGARIA

SECOND INTERNATIONAL CONFERENCE IN FUNCTIONAL ANALYSIS AND APPROXIMATION THEORY

14-19 September 1992
Acquafreda di Maratea, Italy

Contact: F. Altomare, Dipartimento di Matematica
Universitá di Bari, Campus Universitario
Traversa 200, Via Re David, 4, 70125 Bari, ITALY

ICOSSAR'93 The 6th international conference on Structural Safety and Reliability (ICOSSAR' 93) will be held in Innsbruck, Austria, **August 9-13 1993.** It is organized by the International Association for Structural Safety and Reliability (IASSAR) to provide a forum for project managers, analysis and design engineers and researchers to discuss new developments as well as state-of-the-art and novel applications of reliability assessments for all types of structures.

For further information contact:

ICOSSAR'93 Secretariat, c/o Institut für Mechanik, Universität Innsbruck, Technikerstr. 13,
A-6020 Innsbruck, AUSTRIA.
Tel: +43 512 748 4181 Fax: +43 512 748 418

1892 1932

Naissance de Stefan BANACH Théorie des opérations linéaires

1992 Congrès International en Analyse Fonctionnelle

Université de MONS-HAINAUT (Belgique) du 24 Août au 28 Août 1992

Co-organisé par:

Le Service d'Analyse et de Méthodologie Mathématique
de l'Université PARIS VI

Comité scientifique:

C. Finet, N. Ghoussoub, G. Godefroy, J.P. Gossez, S. Guerre-Delabrière, B. Maurey, G. Noël, A. Pelczynski, G. Pisier, D. Preiss, J. Schmets, L. Tzafriri

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OBJET DU CONGRES

A l'occasion du soixantième anniversaire de la première édition du livre de Stefan Banach "Théorie des opérations linéaires" et du centenaire de sa naissance, les équipes d'analyse des Universités de Mons-Hainaut et de Paris 6 organisent un congrès en Analyse Fonctionnelle.

Ce congrès a pour but non seulement de réunir les spécialistes de Géométrie des Espaces de Banach mais aussi de favoriser leurs contacts avec des mathématiciens d'autres disciplines.

En particulier, une telle manifestation permettra aux jeunes chercheurs d'entrer dans la communauté internationale des mathématiciens.

Outre une très large participation Franco-Belge, des mathématiciens de toute l'Europe et aussi du Canada, des Etats-Unis, d'Israël et du CIS seront invités à ce congrès.

Le livre de Stefan Banach a donné naissance à une théorie fondamentale en Mathématiques: les objets fascinants qui y sont introduits sont matière depuis plusieures décennies à recherche intensive. Des progrès spectaculaires dans cette discipline ont été accomplis ces dernières années.

Des techniques variées d'Analyse Fonctionnelle ont été introduites et utilisées par les spécialistes de Géométrie des Espaces de Banach. L'Analyse Fonctionnelle a également bénéficié des apports de la Géométrie des Espaces de Banach, notamment en Analyse Harmonique, en Théorie des Opérateurs ou en Probabilités.

European School of Group Theory

University of Twente Enschede, The Netherlands

The European School of Group Theory provides high level courses for young researchers on recent developments in Group Theory. Each year the School is organized in a different European country. The 1992 session will take place on the campus of the University of Twente, Enschede, The Netherlands, from August 24 until September 4, 1992.

The scientific program will consist of four main courses, some additional lectures by other specialists and a seminar, in which the participants can present their own work.

Main Courses

O. Mathieu (Paris, France)	Infinite dimensional Lie algebras
H. Schlichtkrull (Frederiksberg, Denmark)	Semisimple symmetric spaces
T.A. Springer (Utrecht, The Netherlands)	Representations of Weyl groups
L. Takhtajan (Boulder, USA)	Quantum groups

Further Information:

European School of Group Theory,
attn. Mrs. N. Mitrovic, CWI, P.O. Box 4079,
1009 AB Amsterdam, THE NETHERLANDS
Fax: +31-20-592 4199
Email: nada@cwi.nl

This school is held under the auspices of the EMS.

The first recipient of the Karl Georg Christian von Staudt Prize: Professor Hans Grauert

The Otto and Edith Haupt Foundation awarded the first Karl Georg Christian von Staudt Prize to Professor H. Grauert of the University of Göttingen for his outstanding and significant contributions to complex analysis.

The prize (worth 100,000 DM)was presented by Professor G. Jasper, Rector of the Friedrich-Alexander University, Erlangen-Nürnberg, during a ceremony held at the Redoutensaal in Erlangen on November 12, 1991.

The Otto and Edith Haupt Foundation was established at the University of Erlangen-Nürnberg in 1986. Otto Haupt (1887-1988) was a full professor of Mathematics there from 1921 to 1953.

In accordance with the statutes of the foundation, the prize is normally awarded every three years to a seientist working permanently at a German university or research institution. It is awarded for an excellent individual discovery of extraordinary significance or for a collection of scientific works by an outstanding researcher in the field of theoretical mathematics.

The prize is named after the mathematician Karl Georg Christian von Staudt (1798-1867) who was, from 1835 to 1867, a professor of the first ordinary "Lehrstuhl für Mathematik", founded at the University of Erlangen in 1743. Here is the list of his successors: H.Hankel, H. Pfaff, F. Klein, P. Gordan, E. Schmidt, E. Fischer, O. Haupt, Th. Schneider, R. Remmert and H. Bauer.

Karl Georg Christian von Staudt was strongly influenced by Carl Friedrich Gauss during his studies at the University of Göttingen. He obtained his degree in 1822 at Erlangen and then, after thirteen years as a "Gymnasiumlehrer" in Würzburg and Nürnberg, he was called to the "Lehrstuhl für Mathematik" in Erlangen. Von Staudt was one of the founders of projective geometry. His main contributions to the field are contained in the book "Geometrie der Lage", published in Nürnberg in 1847. Von Staudt's ideas and results have had a great impact on the development of geometry.

The ceremony at the Redoutensaal in Erlangen opened and closed with a concert. After a speech by the Rector, Professor Remmert (University of Münster) delivered a lecture on "Komplexe Analysis in Sturm und Drang". Here the main results of Hans Grauert were presented in the historical perspective of the recent remarkable development of complex analysis and geometry. The recipient of the prize delivered his talk "C.F. Gauss oder der Geist der alten Mathematik in Göttingen". In the evening, the colloquium lecture "Komplexe Analysis und Geometrie - zum mathematischen Werk von Hans Grauert" was given by Professor W. Barth at the Mathematical Institute of the University of Erlangen.

(Based on materials supplied by Professor Heinz Bauer of the University of Erlangen-Nürnberg.)

Programmes in Mathematics at Czech Universities

Pavel Drábek

Five new universities were founded in the Czech republic in 1991: the University of South Bohemia in České Budějovice, the University of Ostrava in Ostrava, the University of Silesia in Opava, J.E. Purkyně University in Ústí nad Labem and the University of West Bohemia in Plzeň. The majority of these institutions were created by integrating existing independent faculties or institutes. Together with institutions already in existence - e.g. Charles University in Prague, the Czech Technical University in Prague (ČVUT), Masaryk University in Brno, the Technical University in Brno (VUT), and Palacký University in Olomouc, the new universities providing special programmes in Mathematics at several levels.

Three-year undergraduate courses for the BSc degree or five-year courses for the MSc degree in Mathematics are provided at Charles University, Masaryk University and Palacký University. Applied mathematics can be included in the five-year course for the Master's or Engineer's degree at the Silesian, Ostrava and West Bohemian Universities, at CVUT in Prague and VUT in Brno.

Three- or five-year postgraduate courses, which include a dissertation, are provided at several of these institutions commencing in the academic year 1991/1992. The curricula are structured so that the level of this degree is comparable to that of the PhD degree in West Europe and the USA. The following postgraduate programmes in Mathematics can be studied at Charles University : algebra, differential and integral equations, potential theory, econometrics, geometry and global analysis, combinatorics and discrete mathematics, mathematical linguistics, mathematical logic, operational research, probability and mathematical statistics, software systems, theoretical informatics, number theory, theory of functions and functional analysis, topology and general structures, scientific- technical computing, data structures and mathematical modelling in natural sciences. Masaryk University in Brno offers algebra, discrete mathematics, geometry, mathematical analysis, mathematical informatics; at Palacký University in Olomouc algebra, mathematical analysis, approximative and numerical methods can be studied. Applied topics such as mathematical engineering are available at the university of West Bohemia in Pilsen, ČVUT in Prague and VUT in Brno, data compilation and mathematical modelling in agriculture at the Agricultural Institute in Prague.

The structure of the postgraduate programmes reflects the cooperation that has existed and still exists between the staff of universities and industry, research institutes and foreign institutions.

A number of lectures and seminars specifically intended for postgraduate students are given in English or in other world languages at Czech universities. Well-known mathematicians from world-famous universities are being invited to give lectures. Study at Czech universities is therefore open to foreign students as well.

SOPHUS LIE (1842-1899)

(Some reflections on his 150th anniversary)

by

Eldar Straume

University of Tromsø

Norway

Today, Sophus Lie is generally regarded as one of the great and influential mathematicians in the history of mathematics. He virtually created a new discipline, which has survived and developed through the 20th century into an important area of mathematics usually referred to as modern Lie theory, with all its ramifications and applications in various branches of mathematics and natural sciences. Lie's seminal influence in many aspects of the theory has continued to this day, although the subject he initiated also found new and surprising directions, after the turn of the century.

Some of us would probably agree with the somewhat drastic statement of J. Dieudonné (Gazette des Mathématiciens, 1974): "Les groupes de Lie sont devenus le centre des mathématiques; on ne peut rien faire de sérieux sans eux". However, those early days of Lie theory, or Lie's original work on his continuous groups and its motivation, are not so well known today.

Lie's continuous groups arose from his transformation theory in the early 1870's, after he discovered that the concept of symmetry could be applied to differential equations and utilized to integrate (or solve) such equations. Lie's ideas were a far-reaching discovery inspired by the spectacular earlier success of Galois's group theory applied to the solution of algebraic equations. Lie had added the "geometrical dimension" to the study of differential equations, and the immediate consequence was a general integration procedure based on the invariance of a differential equation (or system) with respect to a continuous symmetry group.

Lie's work on differential equations, however, passed into oblivion after his death, and was actually dormant for about 50 years until renewed interest in the subject arose from applications of Lie groups (or algebras) to differential equations, modelling a wide range of physical processes. Lie's contact transformations have now been generalized in various ways. Thus, during the last decades the group analysis of differential equations has developed into a "renewed" discipline, combining theory with modern computer technology. (See, e.g., the works of Ovsiannikov, Ibragimov, R. Anderson, P. Olver, or members of the Sophus Lie

Centre in the (recent) USSR). Today, Lie theory is pervading mathematical physics. A somewhat arbitrary random sampling of recent papers in this area, for example, indicates that about 30% of the papers deal with symmetry conceptions, Lie groups or algebras, their representations or generalizations in some way. The following statement may perhaps not be far-fetched (P. Olver, Appl. of Lie Groups to Diff.Eq., Springer 1986, p.xv): "It is impossible to overestimate the importance of Lie's contribution to modern science and mathematics".

Rather than giving a sketch of the "standard" biography of Lie, I will dwell more on a few chosen important events in his career. At the end, I will take up some controversial aspects of Lie's reputation today.

In 1959 Lie was ready for studies at the University in Christiania (= Oslo) after having abandoned plans for a military career because of his bad eyesight. He graduated in 1865 with a degree in natural sciences but with no special preference for mathematics. Being very ambitious, he firmly believed in pursuing an academic career. However, during the next 3-4 years he could not make up his mind as to which discipline to choose. But after 1866 his interests in diverse fields such as botany, zoology, physics, and astronomy were gradually repressed by an increasing search through the mathematical literature in the University's library (whose load records reveal an interesting story about Lie's first critical years).

Lie had his "Eureka" some night in 1867, waking up his close friend Ernst Motzfeldt and shouting "I have found it, it is quite simple". He started to write and circulate short notes, like aphorisms, and in 1869 a short paper was printed at his own cost. An extended version of the paper was submitted to Videnskabsselskabet (the Academy of Science in Christiania), but still nobody dared to propose its publication. The title was "Representation der Imaginären der Plangeometrie", indicating his idea of representing two complex variables as points in 3-space, something regarded as physically impossible. Here Lie also came with his now famous "metaphysical" statement that "every theorem of plane geometry is a special case of a stereometric double theorem in the geometry of line congruences". [In fact, in their commentary in Lie's Gesammelte Abhandlungen, 1922-34, Engel and Heegard were unable to decipher everything in the paper despite its 130 pages.]

It was the efforts and influence of Motzfeldt which prevented Lie's mathematical career from collapsing initially. Fortunately, in the same year, acceptance of the paper in Crelle's Journal resulted in a travel grant which opened the gate to the leading mathematical centres in Europe. In the autumn of 1869 Lie visited Göttingen and Berlin, the latter being the centre of the scientific aristocracy of Prussia, including such prominent mathematicians as Kronecker, Kummer and Weierstrass. Through his frequent letters home to Motzfeldt, Lie describes in detail his daily experiences and feelings.

In Berlin, Lie met Felix Klein for the first time. Klein had been a pupil of Plücker, whose new 4-dimensional geometry of space, namely his line geometry, was well known to both Klein and Lie. Their common interests in this direction made them close friends. Besides, they both felt like "outsiders" and participated little in the seminars in Berlin, since the "dull" formal analytic dominance of the Weierstrassian school did not stimulate their geometrical interests. However, Kummer's seminar was an exception, and here Lie gave talks about his own work.

In Christiania, Lie had sent letters to Reye and Clebsch. Here in Berlin, Lie received an encouraging response; both Reye and Clebsch were impressed by Lie's "Imaginären" paper. In addition, Kummer was working on line congruences of degree 3; it turned out that Lie had actually done some special cases back in Christiania, but in a much more general way. Lie even explained some mistakes in the work of Kummer, who gave Lie very flattering compliments. Instantaneously, the "internatiónal" Sophus Lie was born, a man who suddenly was filled with that self-confidence and resolution so characteristic of his later life. He wrote to Motzfeldt: "...in the years 1864-68, I really underestimated my own mental power".

In the winter of 1870, Lie went to Paris, where he became acquainted with leading French mathematicians such as M. Chasles, C. Jordan, and G. Darboux. During his student days in the early 60's in Christiania, Lie had heard Sylow's lectures on Galois theory. However, the meeting with Jordan and his treatises on group theory seem to have convinced Lie about the importance of groups in geometry.

In July in Paris, Lie discovered a so-called contact transformation, which, by a suitable choice of constants, would send lines in space into spheres. This resulted in his famous line-sphere transformation and also his sphere geometry, a generalization of Plücker's line geometry. His doctoral dissertation in 1871, "On a class of geometric transformations" (in Norwegian) is actually an elaboration of some pithy ideas in his first work together with those "strange" transformations and correspondences from one space to another which he discovered during his trip in 1869-70.

Lie became a full professor at the University in Christiania in 1872, a position he held all the rest of his life, since he was formally on leave in 1886-98 when he was a professor in Leipzig. Most of Lie's original ideas were, in fact, discovered and more or less worked out during intense periods in the 1870's. A serious problem for Lie in Christiania was the lack of communication with contemporary mathematicians in Europe. Despite his influential mathematical friends in Germany and France, international recognition came slowly to Lie, who became frustrated. As the years passed, Lie gradually felt more isolated in Christiania and expressed his complaint in letters to his foreign friends. So, he was happy to be offered Klein's chair in Leipzig when Klein moved to Göttingen in 1886.

Another of Lie's communication problems was due to his mathematical style. Like a "Synthetiker", he arrived at mathematical truths more via geometrical insight than logical, analytical reasoning. This also made his papers less accessible. For this reason, in 1885 Klein and Mayer in Leipzig sent their student Friedrich Engel to Christiania to assist Lie in writing a complete and "modern style" treatise on his theory of continuous groups. Engel worked faithfully by Lie's side for 8 years, until their project had expanded to 3 voluminous books in 1893.

In Leipzig Lie became more involved in the German mathematical milieu, and also attracted students from many foreign countries, such as the USA, France and Poland. His teaching load was much heavier than at home; he also advised a large number of doctoral degree students. Lie's lectures on his own research were highly rated by the students, in contrast to his somewhat unpopular obligatory lectures on standard topics. "Räsonieren wir mit dem Begriffen" was his favourite sentence, and he preferred to draw a picture instead of giving rigorous proofs (see G Kowalewski: Bestand und Wandel. Verlag von R. Oldenbourg, Müchen, 1950).

Finally, I have some remarks about the current literature on the life of Sophus Lie. Many authors describe him as a genius with extraordinary geometrical insight, an auto-didact from provincial Norway whose mathematical creativity was ignited by reading about the recent developments of geometry at the time, such as projective geometry (Monge, Poncelet) and especially the line geometry of Plücker. Lie's reputation today, as a historical person at least, is largely influenced by the opinions of a few of his closest contemporaries who survived him into the new century, notably F. Klein, F. Engel and some of Lie's students. Keeping this in mind, for some reason or another there also seem to exist a few "myths" attached to Lie. For example, "It was Plücker who created Lie as a mathematician", "Lie's mathematical development was largely influenced by Klein", "Lie could not express his ideas without Engel," and "Lie became mentally insane".

These "myths" are far from the truth! Everything written about Lie's life can be traced back to Engel's address in Der königlich sächsischen Gesellschaft der Wissenschaften zu Leipzig in 1899. It is now an appropriate time to study Lie's biography on the basis of all the material available today, including the large collection of letters (in Norwegian) between Lie and his Norwegian friends. [It is a task for the Norwegian mathematical community to make all these sources available for the international community by providing translations into German, say.]

It is true that after 1889 Lie had to struggle with health problems, which also negatively influenced his mental spirit and optimism. In the following years he also became increasingly homesick. I cannot resist pointing out some little known facts in connection with the well-known controversy and final break between Klein and Lie around 1892. Klein's Erlangen Program from 1872 had not attracted much attention; in fact, it was Lie rather than Klein himself who had influenced the mathematical development envisioned in this Program (see e.g. T. Hawkins, "The Erlanger

Program of Felix Klein", Hist. Math. 11(1984)). Klein decided to republish the Program and also write about its origins (in which Lie was much involved), but Lie disagreed strongly with Klein's views on what had happened in the past. It also turned out that Klein burned all the letters he had received from Lie up to 1877 (and thus breaking a previous mutual agreement between them). The conflict was unavoidable.

In the 20-page preface to Vol. III, Theorie der Transformationsgruppen, 1893, which he dedicated to the École Normale Supérieure, Lie expressed his anger in sharp statements. He sent shock waves through the German mathematical community, and publicly attacked their "strongest" man, Klein. However, many in this community depended on Klein and were faithful to him, condemning Lie's accusations. Engel, for example, had no choice, being without a permanent position, and was practically forced to withdraw from further collaboration with Lie. Indeed, Klein's influence was so strong that, after Lie's death, his "defence" of Lie's behaviour by referring to the close relationship between genius and madness really created a generally accepted explanation which has survived up to the present. By this act of "defence" Klein did his old friend an incredible injustice.

Addendum

1) In addition to the 3 volumes (about 2000 pages) of Theorie der Transformations-gruppen (with Engel), Lie and his assistant G. Scheffers completed 3 other voluminous books, in 1891, 1893, and 1896. All these 6 books were published by B.C. Teubner Publishers in Leipzig. Moreover, about 180 papers of Lie have been catalogued by Engel and Heegard in the Gesammelte Abhandlungen (Band 1-6, 1922-34). An extra "Nachlass" volume was later prepared by Engel, which also included some letters. Engel died during the Second World War, and his manuscript was partially lost. A modified version of this was printed in 1960.

2) The Norwegian mathematical community will celebrate Sophus Lie's 150th anniversary by arranging a "Sophus Lie Memorial Week" in Oslo 17-22 August 1992. Information about this event will be published elsewhere.

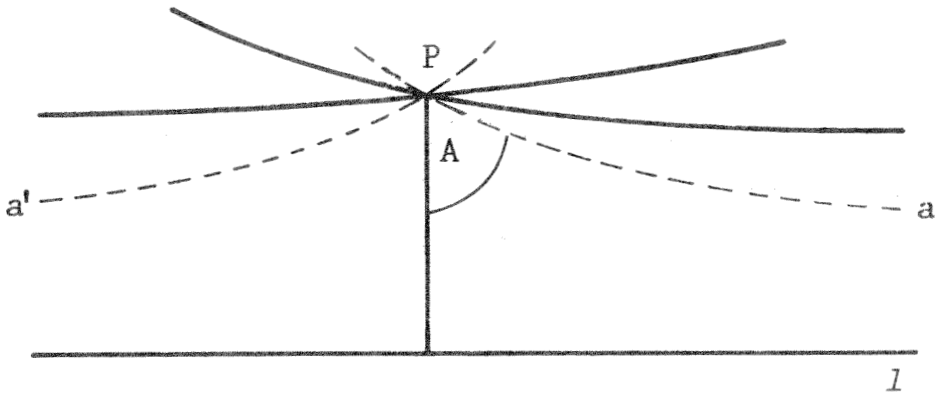
1992 sees the 200th anniversary of Nicolai Ivanovich Lobachevskii, one of the two discoverers (with the Hungarian János Bolyai) of non-Euclidean geometry. So it seems appropriate to discuss some of the implications in the Newsletter in this, the year of Lobachevskii.

Non-Euclidean geometry - 1 *

by

Jeremy Gray

In 1829 Lobachevskii gave an account of a geometry different from Euclid's but physically plausible. He assumed that given a point P and a line l, in the same plane there are many lines through the point P that do not meet l. Of these, a and a' are asymptotic to l. Lobachevskii studied the angle A they make with the perpendicular to l through P, the angle of parallelism.



Extensive accounts in Russian were followed in 1837 by an account in French in the recently founded *Journal für Mathematik*, and then by a booklet in German in 1840. Alas, the French version presumed familiarity with the earlier Russian accounts, and all were based on the very assumption that defenders of Euclid would wish to deny. So it was hardly surprising that Lobachevskii's work, and the still more obscurely published essay by Bolyai, should find few adherents.

Setting aside the logical problem that drawing coherent conclusions from a premise does not establish its consistency with other assumptions, the challenge that

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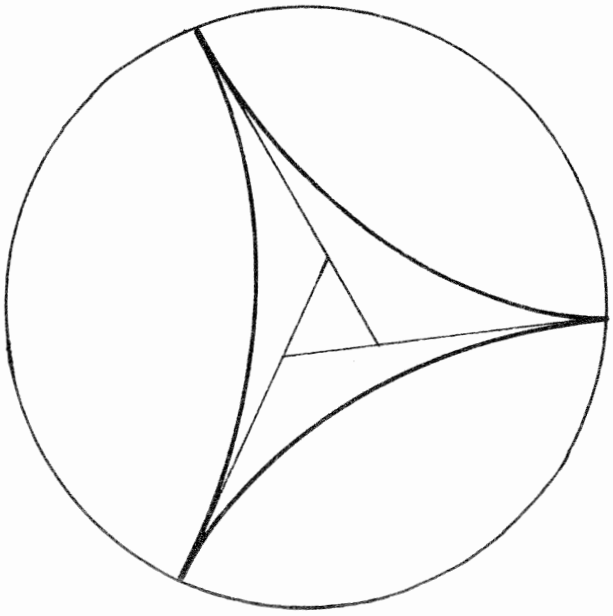
This is the first of a series of four articles on the history of non-Euclidean geometry by Jeremy Gray

Lobachevskii posed to his readers was to accept his formulation of geometry. In the lengthy Russian papers he attempted to think through what the basic objects of geometry (such as lines and planes) should be. But he went on to argue that since geometry was about measurement its arguments should be expressed in formulae, such as his formula for the angle of parallelism and its implications in non-Euclidean trigonometry. To traditionalists both positions were unacceptably novel. Indeed, Gauss was one of the few to appreciate the merits of Lobachevskii's case, and he had been thinking about the matter for many years.

The more Gauss's own investigations failed to establish the logical necessity of Euclidean geometry, the more he came to doubt it. In unpublished notes and in letters to friends he confided theorems in the new geometry, and observed that the logical possibility of a new geometry meant that the nature of geometry was henceforth empirical. But he never was able to give an unambiguous coherent account of non-Euclidean geometry. Perhaps the logical problem that Lobachevskii was prepared to sweep aside was not one that Gauss was willing to ignore. He indicated that the appropriate trigonometry is that of a surface of constant negative curvature, but more is required. The story that he investigated the land measurements of Hannover to resolve the empirical question is false (not least because he knew that astronomical tests were required). This was also the view of his friend the astronomer Bessel, and Lobachevskii, who was able to draw on the first accurate theory of stellar distances to propose a test involving stellar parallax; the results were inconclusive.

Gauss did give a splendid elementary argument that the area of a triangle is proportional to the difference between π and its angle sum, based on the following dissection.



The tacit assumption that the area of a triangle with vertices 'at infinity' is finite was later vindicated on elementary grounds by Liebmann. The reader is challenged to give similar proofs.

Nonetheless, when Gauss, Bolyai, and Lobachevskii died in the 1850s their confidence in non-Euclidean geometry was far from widely shared, so it seems appropriate to end with a pair of 'refutations', both published by Legendre although the first is much older.

One: Let ABC be a triangle with angle sum $= \pi - \delta$, and assume that $\delta > 0$. Reflect it in BC; suppose A goes to A_1. Draw a line through A_1 meeting AB extended at B_1 and AC extended at C_1, say. Then the angle sum of triangle AB_1C_1 is less than $\pi - 2\delta$. Repeat this construction indefinitely. At the n^{th} stage, triangle AB_nC_n has an angle sum less than $\pi - 2^n\delta$. For some n this is negative, which is absurd, so triangles cannot have an angle sum less than π.

Two: Given AB of length p and two angles A and B at A and B, a triangle is determined. In particular, the remaining angle C is a function of p, A and B. But angle is a dimensionless quantity, while p has the dimensions of length. So it cannot appear in the formula for C. But if C depends only on A and B the corresponding geometry is Euclidean. (What, then, of spherical geometry?)

Nebenwirkungen eines Vortrages von Professor Brieskorn über Polyeder

Platon gewidmet

B. Henry

Die Sonne schien mir aufs Katheder -
ich liess die Kreide sinken
und nahm mir alle fünf Polyeder -
ging Bier mit ihnen trinken.

Hab mich betrunken! Kann ja geschehen!
Die Fünf, die haben's genau so gemacht.
Nicht mehr symmetrisch! Nicht zu verstehen!
Die Welt ist platonisch zusammengekracht.

In Prag, den 14. Dezember 1987
Übersetzung aus Tschechischem:
Professor Brieskorn

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Heat Kernels and Dirac Operators

1992. VII, 369 pp. (Grundlehren der mathematischen Wissenschaften, Bd. 298) Hardcover DM 118,- ISBN 3-540-53340-0

The past few years have seen the emerge of new insights into the Atiyah-Singer Index Theorem for Dirac operators. In this book, elementary proofs of this theorem, and some of its more recent generalizations, due to the authors and J.-M. Bismut, are presented. The formula for the index of the Dirac operator is obtained from the classical formula for the heat kernel of the harmonic oscillator. The only prerequisites to reading this book are a familiarity with basic differential geometry.There are several chapters of preparatory material, including a treatment of connections and Quillen's theory of superconnections, characteristic classes, the theory of the heat equation and its solution on a compact manifold, Clifford algebras, Dirac operators, and equivariant differential forms.

The book finishes with a treatment of the index bundle and Bismut's local version of the Atiyah-Singer Index Theorem for families. As an application the curvature of the determinant line bundle is calculated, following Bismut and Freed.

This book will be of interest to graduate students and researchers in differential geometry, Arakelov geometry, group representation, and also in theoretical physics.

R.V. Gamkrelidze, Academy of Sciences Moscow (Ed.)

Geometry I

Basic Ideas and Concepts of Differential Geometry

1991. V, 264 pp. 62 figs. (Encyclopaedia of Mathematical Sciences, Vol. 28) Hardcover DM 136,- ISBN 3-540-51999-8

Contents: D.V. Alekseevskij, V.V. Lychagin, A.M. Vinogradov

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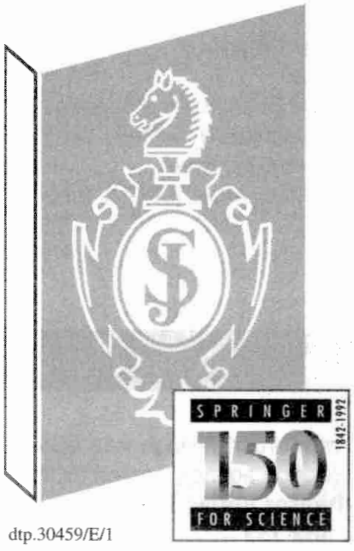

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