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European Congresses: Paris and Budapest

2000 - The Year of Mathematics

Funding academic research in Germany

European Mathematics Education

Euronews

Book Reviews

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UNIVERSIDADE DA MADEIRA

The Universidade da Madeira announces openings for professors and assistants in the fields of mathematics, theoretical and experimental physics.

The candidates for professorships and assistantships must hold, respectively, doctorate and masters degrees or equivalent.

The evaluation of candidates will be based on the scientific, pedagogical and professional achievements with preferences for experience on the following research areas:

Functional Analysis, Stochastic Processes, Classical and Quantified Dynamical Systems as well as Disordered and Complex Systems.

The teaching language is Portuguese.

Candidatures, with curriculum vitae and list of publications should be directed to Presidente da Comissão Instaladora da Universidade da Madeira, Colégio dos Jesuítas, Largo do Município, 9000 Funchal, Portugal, and have to contain the following information: full name, names of parents, date and place of birth, single/married, residential address and telephone number, academic degree with listing of corresponding courses and grade, grades obtained in first academic degree, university where these grades were obtained and dates, as well as any other materials that the candidate considers is relevant for his evaluation. The deadline for application is April. 5, 1993.

Annual salaries.	Full professor	7.354.550\$00
	Associate professor	5.701.150\$00
	Assistant professor	4.938.150\$00
	Assistants	3.538.150\$00

First European Congress - Paris

July 6-10, 1992

Christine Bessenrodt and Ina Kersten

The first European Congress of Mathematics (ECM), held in Paris on July 6-10, 1992, attracted 1300 mathematicians from all over the world, with a remarkable number of participants coming from Eastern Europe.

The high interest of a wider public in the ECM was evident from its early beginnings; this was reflected by the financial support from many sources and by the speech of the French Minister of Research and Space, Hubert Curien, at the opening ceremony. Already the foundation of the European Mathematical Society (EMS) had set a political sign, as Friedrich Hirzebruch, the president of the EMS, pointed out in his address at the opening. At the end of the ECM, for example Manfred Vohrer, Member of the European Parliament, emphasized in a press release on the ECM, that this could be considered as one step to a United Europe. Also, the impressive media coverage was an indicator for the significance of the Congress for society at large.

In the scientific part of the ECM, a wide range of mathematics at the forefront of current research was covered in 10 plenary lectures in the Grand Amphithéâtre of the Sorbonne, and in 40 invited talks in parallel sections. Many speakers succeeded in giving a survey of recent work accessible to a general audience, sometimes along with explaining some of the difficult technicalities. Thus, the participants had the opportunity for broadening their general mathematical knowledge, as well as learning about recent new developments in their fields of expertise.

The first plenary speaker was S. Donaldson who presented a survey on the active area of "Gauge theory and 4-manifold topology"; he paid a special tribute to A. Floer who died in 1991 at the age of 34 and who had contributed the homology theory named after him. M. Vergne then gave a very impressive talk on "Cohomologie équivariante et formules de caractères" leading to the latest developments. The lecture by L. Babai on "Transparent proofs" was particularly well received by the audience as not only the ideas involved were at the same time fundamental and applicable but also the presentation was very clear and even entertaining. The talk by A.-S. Sznitman on "Brownian motions and obstacles" dealt with a very classical topic originating from physics into which some surprising new ideas have entered. D. Mumford talked on "Computer vision from a mathematical perspective", an area which is still 'in the making' and where every progress leads immediately to applications; there have been successes in introducing various mathematical tools but it is still elusive how human vision really works. The strong bonds with modern physics and technology were also very well illustrated by B. Engquist in his lecture on "Numerical approximation of hyperbolic conservation laws". A survey on a rather new algebraic subject which is under rapid development was presented by C. De Concini in his talk on "Representations of quantum groups at roots of 1". P.-L. Lions gave a very good talk "On some recent methods in nonlinear partial differential equations" which contribute to a better theoretical understanding of the solutions of such equations. The lecture by W. Müller on "Geometry and spectral theory" was concerned with problems of the type illustrated by Kac's question 'Can one hear the shape of a drum?' (answering this in the negative, recently two isospectral nonisometric plane domains have been found). The final speaker, V. I. Arnold of the Steklov Mathematical Institute, talked on "Vasiliev's theory of discriminants and knots", which is a very active area that involves different branches of mathematics and physics.

For the plenary as well as for the sectional talks, the organizers have shown a very good choice in the speakers – and they seem to have convinced many of them to present their research area in an expository style to a wider audience. Our comments on only some of the talks in the parallel sessions are a very subjective selection, as by their very nature, we could only attend some of the lectures. A. Björner spoke about "Subspace arrangements", a very interesting topic at

the intersection of topology and combinatorics, with applications to problems of computational complexity, which was well presented to the audience. In his lecture on “Values of zeta functions and their applications” D. Zagier illustrated surprising connections between a classical problem in number theory and questions in other areas of mathematics. R. Piene gave an excellent talk “On the enumeration of algebraic curves” explaining the new progress on Hilbert’s 15th problem. In the lecture on “Algebraic K-theory and Galois cohomology” A.S. Merkurjev presented a very good survey on recent work and on important conjectures.

Unusual to most participants was the poster session where all participants could present their work in a condensed form on a ‘poster’. About 285 mathematicians (many from Eastern Europe) took this chance and also sat at their posters in the Chapel of the Sorbonne on one day to answer questions. There were also other reasons for the participants to visit the Chapel as it also housed the exhibition “Horizons Mathématiques” on mathematical objects and satellite pictures. This was complemented by a possibility to play with mathematical puzzles and games presented by D. Singmaster at the Sorbonne.

On the occasion of this first European Congress, the City of Paris gave prizes to 10 excellent European mathematicians of age at most 32, namely to: R. Borcherds, J. Franke, A. Goncharov, M. Kontsevich, F. Labourie, T. Luczak, S. Müller, V. Sverak, G. Tardos and C. Voisin. A description of their work appeared in the EMS Newsletter No. 5. The prizes were awarded by Jacques Chirac (Maire de Paris) during a reception at the Hôtel de Ville; he also presented the medal of the City of Paris to F. Hirzebruch.

The most original feature of the ECM was the introduction of the 16 Round Tables in which the connections between mathematics and other areas of science, but also the relations to society, politics, history and education were investigated, with a focus on the European perspective. More precisely, their topics were: “Mathematics and the general public”, “Collaboration with developing countries”, “European mathematics – myth or historical fact?”, “Women and mathematics”, “Philosophy of mathematics: why and how?”, “Rôle of mathematics in educational policies”, “Let’s cultivate mathematics”, “European science policy for mathematics”, “Degrees harmonization and student exchange programs”, “Mathematical libraries in Europe”, “Mathematics, biology and medicine”, “Mathematics and computer science”, “Mathematics and chemistry”, “Mathematics and economics”, “Mathematics in social sciences” and “Mathematics and industry”. Many mathematicians took a very active part in the Round Table discussions which ran in parallel sessions on four afternoons. But the Round Tables did not only serve the purpose of initiating a reflection on the rôle of mathematics in the European societies by the mathematicians; going beyond this, the analyses done on and for this occasion led to suggestions addressed as well to the mathematical community as to society at large. Together with the mathematical lectures, reports on the Round Tables will appear in the Proceedings of the ECM.

The Round Tables already clearly expressed the concern about the position of mathematics and mathematicians in the general culture. There were also other events and activities underlining this, which emphasized the opening towards a wider public. At the beginning of the week, there was a meeting with the Congrès Mathématique Junior in which about 200 high school students and their teachers took part. In the afternoons, a mathematical film festival, Cinemath, was taking place in the Panthéon-Sorbonne; like the exhibition in the Chapel, this was open to the general public, and the programmes were also shown at the Science Museum, the Palais de la Découverte. The large halls of the Panthéon-Sorbonne were very well frequented also because of the numerous booths of societies and companies with scientific books and software on exhibition – and on sale.

There were also musical presentations at the Sorbonne, and a number of great social evening events for the participants of the Congress, like a reception at the Palais de la Découverte,

a concert at the church of Saint Eustache, and receptions at the respective embassies. At the German embassy we were among the participants who had the honour and pleasure of congratulating Henri Cartan on his 88th birthday!

During the whole congress, the participants were very well taken care of, there were many useful infos and helpful signs for orientation around the Sorbonne and the Panthéon-Sorbonne.

Many mathematicians had reasons to stay in Paris (or at least in France) for a longer time to attend one of the many specialized satellite conferences which took place right before or after the ECM.

For additional reading on the Congress we refer to the EMS Newsletter No. 5, and to the article in the AMS Notices (Sept. 1992).

The organizers of this first European Congress of Mathematics have succeeded magnificently in setting up a conference of high scientific standards, celebrating at the same time the relations with culture at large and not forgetting the social components. This first great event of the EMS was extremely successful in strengthening the relations inside Europe, in particular in binding East and West closer together. Our admiration and thanks to all the men and women involved in the organization who have not only had the courage of having new visions about such a Congress but who have also worked hard to make sure that they were realized!

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The Second European Congress - Budapest

The Second European Congress of Mathematics will take place in Budapest, Hungary, in 1996. Beside the various mathematical programs, an equally important aim of the Congress is to give an opportunity for mathematicians to discuss important semi-mathematical topics: problems of the mathematical community, aspects of teaching mathematics, relations to applications and society. Continuing the "traditions" of the Paris Congress, we plan to organize Round Tables. To make them successful, we need the support of you, our colleagues. We need your active participation, but first of all, we need your help to select the most important and most appealing themes. Therefore we ask you to send suggestions (title, description of the topic, list of potential panellists) to the Secretary of the Organizing Committee, Dr. Antal Balog (Mathematical Institute, Hungarian Academy of Sciences, BUDAPEST, Pf 127, H - 1364, Hungary). Of course, less elaborated ideas are welcome, too. We appreciate your cooperation in advance.

Gyula O.H. Katona
Chairman of the Organizing committee

An 2000 : Année mondiale des mathématiques

Une initiative et

un logo

Jacques-Louis Lions Président de l'IMU, Professeur au Collège de France, a présenté l'initiative *an 2000: année mondiale des mathématiques*, dans un article paru dans la revue de l'ICSU, **Science International** (No 49-52 Sept-Dec 1992), qui a bien voulu nous autoriser à le reproduire.

Le 6 Mai 1992, à RIO de JANEIRO, à l'occasion du 40ème anniversaire de l'IMPA (Instituto de Matematica Pura e Aplicada) et de la première réunion de son Comité Exécutif au Brésil, l'Union Mathématique Internationale (IMU) a déclaré l'an 2000, *Année Mondiale des Mathématiques*, sous le sigle *WMY 2000 (World Mathematical Year 2000)*

La Déclaration de Rio de Janeiro sur les Mathématiques est placée sous les auspices de l'UNESCO (Professeur F. Mayor), de l'Académie des Sciences du Tiers Monde (Professeur Abdus Salam et Professeur Carlos Chagas), du Ministère de la Recherche et de l'Espace de France (Professeur Hubert Curien), du Secrétaire d'Etat à la Science et à la Technologie du Brésil (Professeur H. Jaguaribe) et du Conseiller Fédéral de la Suisse (Dr. Flavio Cotti), qui organise le prochain Congrès International des Mathématiciens, à Zürich, en 1994.

La Déclaration de Rio de Janeiro sur les Mathématiques propose trois thèmes principaux.

1. Les grands défis du XXIème siècle

Dans sa conférence faite à Paris en 1900, le mathématicien David Hilbert avait dressé une liste de 23 questions jugées fondamentales pour le 20ème siècle. La Société Mathématique Américaine a proposé à l'Assemblée Générale de l'IMU à Kobé, Août 1990, qu'un Comité de Mathématiciens de renommée mondiale organise les efforts de la communauté mathématique pour dessiner les grands défis de la discipline pour le 21ème siècle. Ce Comité, dit du "Tournant du Siècle" (Turn of the Century Committee) est présidé par le Professeur Jacob PALIS Jr. Secrétaire de l'IMU. Il présentera à la prochaine Assemblée Générale de l'IMU (Zurich, Août 1994) une première liste de propositions.

2. Les Mathématiques, clés du Développement

Liaisons entre les diverses parties des Mathématiques, recherches et applications interdisciplinaires, développement des ordinateurs rendant possibles des calculs autrement hors d'atteinte, tout cela concourt chaque jour davantage à faire des Mathématiques, pures et appliquées, l'une des principales clés de la compréhension du monde et de son développement. Il est donc essentiel que, graduellement, les pays membres de l'UNESCO puissent atteindre un niveau permettant leur admission à l'IMU d'ici la fin du siècle. C'est l'Objectif n° 2 de la Déclaration de Rio sur les Mathématiques.

Cela suppose de très grands efforts supplémentaires dans le domaine de *l'Education*, de la *Formation* et - point très particulièrement sensible pour les pays où les ressources en devises sont difficiles - l'accès à *l'Information Scientifique*.

Des efforts dans ce sens sont déjà entrepris dans le cadre des deux grandes Commissions de l'IMU: l'I.C.M.I. (International Commission on Mathematical Instruction), présidée par le Professeur M. de Gùzman (Madrid) et dont le Secrétaire est la Professeur Mogens Niss (Danemark); la C.D.E. (Commission on Development and Exchange) présidée par le Professeur M.S. Narasimhan (Bombay et Trieste) et dont le Secrétaire est le Professeur P. Bérard (Grenoble). Cet objectif est poursuivi en action conjointe avec l'UNESCO. Le Directeur Général de l'UNESCO, Federico Mayor, a apporté un soutien total au projet. Le responsable UNESCO désigné est le Professeur A. Marzollo.

3. *L'image des Mathématiques*

Celle-ci constitue le thème n° 3 de la Déclaration de Rio de Janeiro sur les Mathématiques. Il s'agit d'assurer une présence systématique - et accessible au plus grand nombre - des mathématiques dans la "Société de l'Information", par des exemples, des applications; un très grand effort de "vulgarisation" va être entrepris dans le cadre de l'Année Mondiale des Mathématiques, par des expositions - permanentes ou itinérantes - des conférences et illustrations, dans les Musées et en Journées "Portes ouvertes", de manière à expliquer au grand public et aux jeunes en particulier, l'importance des Mathématiques, leur en donner le goût et attirer des vocations de spécialistes dont le 21ème Siècle aura le plus besoin.

Les informations relative à WMY 2000 seront diffusées d'abord par les moyens internes habituels de l'IMU (Bulletin de l'IMU, Bulletin de l'ICMI).

A ces moyens, vont s'ajouter les publications de "Newsletters". Une première "WMY 2000 Newsletter" sera publiée à partir de la mi-1993, en collaboration avec l'UNESCO et avec l'Institut qui porte le nom de Henri Poincaré, dont la science garde l'empreinte des travaux.

Contact: J. Palis, IMU Secretary
IMPA, Estrada Doña Castorina 110
Rio de Janeiro, RJ 22460, BRASIL

tiré de Science International

Appel à l'imagination des mathématiciens

L'an 2000, année mondiale des mathématiques, a un sigle: WMY 2000 (World Mathematical Year); il lui faut un logo.

Un concours est donc ouvert, parmi les mathématiciens, pour la conception du logo de WMY 2000, logo qui traduirait les objectifs de l'initiative, et devrait être lisible pour tous les pays du monde.

Les propositions sont à adresser à

WMY2000 Newsletter
Institut Henri Poincaré
11 Rue Pierre et Marie Curie
75005 PARIS

Un cadeau est réservé au gagnant.

The Deutsche Forschungsgemeinschaft (DFG)

and the funding of academic research in the Federal Republic of Germany

The system of research funding in the Federal Republic of Germany is often perceived as confusing. This impression is mainly due to two of its essential features: federalism - i.e. the involvement of the 16 component states (Länder) as well as the Federal Government - and pluralism - i.e. the division of responsibility for funding in most disciplines between several independent agencies, each of which, on the other hand, may be concerned with a wide range of disciplines.

The perhaps not so obvious advantages of these features for the system are its global stability (it is very difficult to get 17 governments to agree to an abrupt change of policy) and its local flexibility, for which the Deutsche Forschungsgemeinschaft (DFG), briefly described below, may serve as an example.

The following remarks will focus on the funding of basic (knowledge-oriented) research, disregarding the far larger sector of industrial and applied (product-oriented) research and development. The main channels for funding basic research in the Federal Republic can roughly be grouped into two categories:

A. Institutional funding

(i.e. long-term basic funding of research institutions)

- The universities are funded by the Länder.
- The Max Planck Society runs a total of over 50 institutes devoted to basic research in all areas of the sciences and the humanities; the Max Planck Institute for Mathematics in Bonn is one of them. The Society's budget is shared between the Federal Government and the Länder.
- The National Research Centres provide central facilities, e.g. particle accelerators, supercomputing centres, etc., for university scientists and maintain a substantial research effort of their own. They are jointly funded by the Federal Government (90%) and the Land (10%) in which they are situated.
- A number of other institutes devoted to basic and applied research are also jointly funded by the Federal Government and the Länder (50% each). This form of funding is particularly relevant in Eastern Germany, where (parts of) many of the institutes of the former Academy of Sciences have been transformed accordingly; the Institute for Applied Analysis and Stochastics (IAAS), e.g., continues a part of the work of the former Karl-Weierstrass-Institut für Mathematik.

B. Project-oriented funding

(i.e. short- to medium-term funding of individual research projects)

- The Deutsche Forschungsgemeinschaft (DFG) promotes research by furnishing financial support for research projects in all fields of the natural and social sciences and the humanities. 95% of its budget of DM 1.6×10^9 go to researchers at universities. Its work will be described briefly below.
- The Federal Ministry of Research and Technology has special programmes for basic research in key areas (health, environment, microelectronics, etc.), many of them designed to promote cooperation between industrial and academic research. University participation has risen to some 20% recently.
- Several private foundations (such as the Stiftung Volkswagenwerk) provide significant support for research projects.

Programme-oriented ("directed") research has less emphasis in Germany than in some other countries. Traditionally, institutional funding plays a larger role, due as much to a conviction that basic science and academic research should be as free as possible from government direction, as to the federal system.

The central autonomous funding agency for science and the humanities in the Federal Republic of Germany is the Deutsche Forschungsgemeinschaft (DFG). It is also responsible for international relations in research and represents Germany in the International Council of Scientific Unions (ICSU). Although funded almost exclusively through public sources (Federal and 16 Länder Governments), it is an association under private law, i.e. not a Government agency. It is autonomous in the sense that funding and policy decisions are taken in bodies in which scientists and scholars have the majority, although the financiers are, understandably, represented. Its funding decisions are based on peer review, proposals being judged on the basis of individual scientific merit alone. The 508 members of 37 reviewing boards are elected for a four-year term in an election in which all researchers in publicly financed institutions participate. The last elections, in 1991, saw a turnout of almost 40.000 voters.

The DFG has a varied arsenal of instruments for its mission of funding basic research, ranging from small travel grants, postdoc fellowships and individual research grants to "Sonderforschungsbereiche", large-scale, medium-term projects involving many scientists, often from several disciplines. The essential features of proposing projects and deciding on their funding are, however, the same in all cases. The bottom-up principle involved is a central part of the DFGs funding philosophy.

Project proposals, whatever their scale, are prepared by (groups of) individual researchers who are free in their choice of topic. They pass through a process of peer review in which the elected reviewers mentioned above play a major role, leading to a funding recommendation. The final funding decision is based on the reviewers' evaluation and taken in a Grants Committee whose scientific members (the majority!) represent the full range of disciplines served by the DFG. The members of these committees are elected by the member organisations of the DFG (the universities and principal research establishments). In this context it is important to note that the DFG's funds are not earmarked for certain disciplines, or, conversely, that individual disciplines do not have budgets fixed a priori. In principle, every grant proposal competes against every other proposal, whatever its subject, for the same limited resources. The multidisciplinary composition of the deciding bodies has always managed to ensure a fair division, based on the scientific merit of individual proposals, as judged by the peer reviewers.

This system permits a substantial amount of flexibility, leaving ample opportunity for new ideas and fields to obtain funding without delay. It also enabled the DFG to react very quickly when, in 1990, researchers in Eastern Germany began looking to the West for support. Even before political unification, the DFG was able to provide East German scientists with equipment and travel money; for instance, the DFG supported the attendance of a fairly large number of GDR mathematicians at the centennial meeting of the DMV in 1990. Once unity was established, East German scientists had full access to DFG funding; the DFG Senate also ruled that any scientist was eligible for support, irrespective of his or her political record, unless actually dismissed from public employ because of involvement with the "Security" forces. East German scientists also participated in the self-government of the DFG at the earliest possible opportunity. The various committees were enlarged to permit the election of members from the new Länder and in 1991 East German scientists and scholars participated in the election of the reviewing boards as voters and candidates. Thus 2 of the 6 members of the Mathematics Board now come from the new Länder.

Further information on the Deutsche Forschungsgemeinschaft is available from:

Robert Paul Königs, Mathematics Programme Officer
Deutsche Forschungsgemeinschaft, Kennedyallee 40,
W-5300 Bonn 2, Federal Republic of Germany.

International Congress of History of Science

The XIXth International Congress of History of Science, organised by the International Union of History and Philosophy of Science, Division of History of Science, IUHPS/DHS, takes place this year from 22 to 29 August in Zaragoza, Spain. In addition to a programme of plenary lectures, there will be symposia on a number of topics of interest to mathematicians:

- Some aspects of mathematics in the 20th century;
- Arts and mathematical sciences;
- Between mechanics and architecture;
- Logics and the foundations of mathematics;
- The impact of the computer on the sciences;
- History of model theory;
- Mathematisation of the biological, economic and social sciences;
- Algebra and curves: 16th - 17th centuries;
- The theory of parallels up to the end of the 19th century;
- Mathematical and philosophical aspects of Probability Theory between 1800 and 1950;
- The historical role of algebraic and discrete methods in infinitesimal calculus;
- Formation of mathematical schools in the 19th and 20th centuries;
- Pre-columbian mathematics, astronomy, and modes of thought;
- Ethnomathematics and ethno-science and the recovery of the history of science;
- Analysis and synthesis in mathematics: philosophy, history and historiography, a methodological discussion;
- Historiography of history of mathematics;
- D'Alembert and his time.

Registration (US \$325) is still possible for the conference. Hotel reservation is recommended before 31 May.

Further information is available from:

Chairman of the Organizing Committee
Professor Mariano Hormigón
Facultad de Ciencias (Matemáticas)
Ciudad Universitaria
50009 Zaragoza, SPAIN
e-mail ICHS@cc.UNIZAR.ES

Comment

LOBACHEVSKI, VARIČAK and HUBBLE'S REDSHIFT

J.F. Barrett

Jeremy Gray, in his articles on noneuclidean geometry [1], does well to mention the much neglected work of Varičak on the reformulation of the Special Theory of Relativity using hyperbolic geometry [2] which provides an alternative to the Minkowski space-time view nowadays universally used. Varičak's formulation avoids the use of ict as 4th coordinate and the special and limiting properties of the speed of light arise naturally from the fact that it represents the radius of curvature of the hyperbolic velocity space. Varičak's work has always received little recognition and soon after its appearance it became overshadowed by the General Theory of Relativity which offered the possibility of much greater generality. Nevertheless, his work pointed the way to the direct use of noneuclidean geometry in physics and was very much in the tradition of Lobachevski himself in its interest in the application of this geometry to the description of physical reality.

One extremely interesting aspect of Varičak's work concerns his remarkable reinterpretation of the Einstein Doppler-effect formula in terms of the divergent behaviour of Lobachevski parallels [3]. Apparently it has never been noticed that this is highly relevant to the explanation of the Hubble redshift - the reddening of the spectrum of distant nebulae discovered by Hubble in 1929 [4] and usually thought to be due to the expansion of the universe. The divergence of Lobachevski parallels provides a highly plausible explanation of this effect if it is assumed that space is hyperbolic with negative radius of curvature equal to the so-called Hubble radius currently estimated at 2×10^{23} km. Remarkably such an explanation applies even to a non-expanding universe. It would be fascinating if it were correct. However current opinion among cosmologists would tend to dismiss any such explanation based on hyperbolic geometry as improbable, it being maintained that available observational evidence is in favour of positive curvature and consequently of elliptic geometry for the large scale structure of space [5].

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2. V. Varičak: *Phys. Z.* 1910,11,93-96; *Jahrb. deutsch.math Verein* 1912,21,103-127.
3. *ibid.* e.g. 1912 p.121.
4. E. Hubble: *The Realm of the Nebulae*, Yale 1929.
5. S. Weinberg: *Gravitation and Cosmology*, Wiley 1972, p.448.

CRIVELLO DI ERATOSTENE

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B. Henry

EUROPEAN MATHEMATICS EDUCATION

(DIDACTICS OF MATHEMATICS)

Leo Rogers

Mathematics Education, Digby Stuart College, Roehampton Institute, London SW15 5PH, U.K.

With reference to the report of the Committee for Mathematics Education published by Professor Dr. W. Dörfler in the EMS Newsletter, I would like to offer the following observations and suggestions for possible further discussion and action.

1. ERASMUS/TEMPUS

An Erasmus network has been in operation for two years which involves the universities of Thessaloniki (the principal coordinator), Grenoble, Regensburg, Bologna, the Institute of Education (University of London), and Roehampton Institute, (University of Surrey).

The subject of this International Cooperation Programme (ICP) is "Didactics of Mathematics" and involves the exchange of students training to be teachers of mathematics on undergraduate and postgraduate programmes.

Tutors from the universities involved in the network have met to discuss the details of their different programmes, the needs of individual students taking part in the exchanges, and the possibility of "equivalent areas of study".

This year (31 October 1992) some more universities are being included in a renewed programme bid, which will also include proposals for staff exchanges, and areas of curriculum development.

Discussions are under way with some universities in Eastern Europe to consider a similar Tempus project.

2. A PROPOSAL

As a result of this cooperation, the idea of a postgraduate programme in "European Mathematics Education" has emerged, whereby interested tutors can cooperate in the formation of a programme for study and research where students can gain credit for work undertaken in different countries.

For example, a student might enrol for Masters Degree (D.E.A. level) in Mathematics Education (Didactics) in one country, but study for part of the time, (the Erasmus minimum is three months), in another community country, thereby gaining credits which could be transferred back to the institution in the home country to count for the final qualification.

Each mathematics research institution has developed its own characteristic programme in didactics; the content and style will not only reflect local and national interests, but the individual expertise of the tutors also has its outlet in the topics included in the programme.

The advantages of a proposal which allows students to move from one institution to another means that they can study particular problems or subject areas at first hand, with those who have the expertise. Clearly, the potential for the development of mutual understanding is considerable.

Some areas of study or research may be more appropriate for this mode of credit transfer, for example; comparisons of curriculum content, local and national organisation of mathematics teaching, problems of ethnic minorities, systems for training teachers, or the particular areas of expertise of some tutors. However, we must not close our minds to the potential developments, and it will only be by cooperation and discussion that we will be able to see what is practical in the short term, and what may be possible in the future.

3. WORK IN PROGRESS

Considerable work on the foundations for such studies have already been laid in the context of international groups such as the Psychology of Mathematics Education (PME) and the History and Pedagogy of Mathematics (HPM) where certain common European interests are being identified.

At the 7th International Congress on Mathematics Education a number of Topic Groups (TGs) considered problems concerning the mathematics curriculum and various projects for cooperation.

For example:

TG 14 "Cooperation Between Theory and Practice in Mathematics Education" (currently organised by Professor Luciana Bazzini from Pavia), where already some meetings have considered mutual problems of the curriculum, and proposals for comparison of projects.

TG 12 "Graduate Programs and the Formation of Researchers in Mathematics Education" (led by Professor Hans-Georg Steiner from Bielefeld), where the question of the basic components in the training of researchers in mathematics education was considered.

There are no doubt other groups of colleagues who may be operating, or are interested in similar projects, and it may be a good time to consider the development of a European framework for mutual cooperation and student exchange.

4. THE CREDIT TRANSFER SCHEME

Many institutions in England already operate a Credit Transfer System where students who move from one institution to another, (for whatever reason), may carry with them credit for the courses they have successfully completed. This allows students to accumulate (within reason) credits from different institutions to count towards their final award. This idea is similar in principle to the scheme that has been operated for some time by the Open University.

There already exists, in principle, the idea of a European Credit Transfer System (ECTS), with offices in Paris. However, some working examples of credits given for study in other countries can only come from those who participate in a scheme where practical problems are discussed, principles of equivalence are suggested, and mutually agreed solutions can be developed.

The major administrative problems appear to be in deciding what is an "equivalent amount of work". In the end, this is an academic problem, and must be left as a decision of those who teach the programmes since they know the content of the courses, and have a clear idea of the criteria and expectations for judging a successful student.

Another aspect is thinking and writing in a second language. Erasmus funds are available for language support, and special consideration needs to be given to students who prefer (or need) to write material for assessment in a language which is not their own.

A number of institutions have different periods of study; semesters, trimesters, and terms; often with different starting and finishing dates. One way to overcome this difficulty is to divide a course into different sections or "modules", each with its own assessment, which may be studied independently.

Many university courses already have foundation, (compulsory or core) sections, and options (electives) which may already be seen as free-standing, and would form the basis for the development of such a scheme.

5. The M.A. in MATHEMATICS EDUCATION

The following outline describes the programme for the M.A. in Mathematics Education given at Roehampton Institute (University of Surrey). This is offered as an example of a structure which provides a standard concept of "work load" and its accompanying assessment, together with the possibility of designating compulsory areas of work (the core course) and various options, (not all necessarily from the area of mathematics), which may be put together to form a coherent whole.

a) General Structure.

There are twelve modules.

Each module is considered to require 100 hours of student work. (total 1200 hours of study.)

Eight modules are *taught* courses, and four are *dissertation* modules

Each *taught module* has 20 hours contact time. This 20 hours consists of lectures, seminars or private tutorial time which leaves the student with 80 hours for private study for each module.

Each taught module is *assessed* separately by coursework (an essay, project, or similar work) equivalent to 2,000 words in length.

Two assessments may be combined in some cases to produce a more substantial piece of work equivalent to 4,000 words.

The *dissertation* is a small-scale research project of 20,000 words and takes up four modules (400 hours), where some 30 hours is devoted to tutorial support.

Each subject area has a *core course* (foundation) of *three modules* decided by the tutors, and a number of options (electives).

If a student chooses the *three core modules* and *three more*, making a total of *six taught modules* and also a *dissertation* from the *same subject area* (for example, mathematics) then they are entitled to call their degree an M.A. in Mathematics Education.

This allows students with special interests in other parts of the school curriculum (for example the teaching of reading in primary school or science education), or more general interests like philosophy or psychology to include these in their complete programme.

The *mode of study* can be a *minimum of One year* (Full-time) or up to *Four Years* (Part-Time), allowing for the pacing of studies by working teachers or students with family or other responsibilities. Different combinations of Full-Time and Part-time study are also possible.

b) The Mathematics Modules.

The following headings give a brief indication of the content and style of the mathematics modules for the course.

The first three modules form the Core (or Foundation) Studies; the following five are options.

Within all of these modules opportunity is provided for students to work on areas which are of particular interest to them; thus a wide variety of variation within modules is possible.

i) History and Foundations of Mathematics

Introduction to the historical, social, economic and cultural contexts of mathematics. The nature of mathematics, its origins, philosophies, and relations with other subject areas.

ii) Cognitive Studies I: Theories of Learning Mathematics.

A review of some attempts to understand the development of mathematical ideas in the individual. theories of learning mathematics; mathematical ability; the relation of mathematical structures to cognitive development.

iii) Cognitive Studies II: Observations of Children Learning Mathematics.

The empirical experience of teachers in the classroom. Methodologies of observing and reporting on children learning. The relationship of theory to practice.

iv) Social and Cultural Issues.

Following from (i) above, a deeper study of particular issues for example; gender, ethnic minorities, problems of discourses, positioning, and power relations.

v) Politics and Management I: Children, Teachers and School Policies.

The origins of the school mathematics curriculum; organisation and management of mathematics teaching. The relationship between the mathematics curriculum, the nature of mathematics and theories of learning. The influence of technology.

vi) Politics and Management II: Local Government Planning, National and International Policies and Priorities.

Issues of policy and organisation outside the school; support for teachers; assessment and evaluation. National policies, curricula and systems and teaching mathematics in other countries; problems of comparison and evaluation.

- vii) Mathematics and the Primary Curriculum.** and
viii) (Two Modules)

A deeper study of special areas of interest for the primary curriculum; the teaching and assessment of particular aspects of mathematics. Technology and the primary mathematics curriculum. Themes, topic work, and cross-curricular approaches.

- ix) Mathematics and the Secondary Curriculum.** and
x) (Two Modules)

A deeper study of special areas of interest for the secondary curriculum; the teaching and assessment of particular topics. Technology and the secondary mathematics curriculum. The world of work; vocational issues; mathematics in higher education.

6. FURTHER EXAMPLES

Examples of the curricula of some of the other universities in our Erasmus network can be found in the recently published bilingual (Greek, English) collection entitled:

"Topics on Didactics of Mathematics" ICP-91-G-0027/11 Thessaloniki 1992.

7. A EUROPEAN NETWORK

Colleagues who are interested to contribute to the idea of a programme for the training of teachers and researchers in European Mathematics Education are invited to contact Leo Rogers at Roehampton Institute.

If enough support is forthcoming, it is hoped that it may be possible to organise a forum for discussion in the near future.

Groupe International de Recherche en Pédagogie de la Mathématique

Siège social: Institut Supérieur d'Etudes et de Recherches Pédagogiques.

BP 02 L-7201 Walferdange Grand-Duché de Luxembourg

tél: 352-333420-1 fax: 352-333256

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Secrétaire:	Edward C. Martin	Racquet Court 1818 North Lauderdale 33068 USA tél 1-305-726-3069 (privé) 1-305-370-1691 (bureau)

continued.....

première annonce

**22^{me} Rencontre Internationale
du GIRP**

**Las Navas del Marquès
25 - 31 juillet 1993.**

La 22^{me} Rencontre Internationale du GIRP se déroulera au CASTILLO-PALACIO MAGALIA à Las Navas del Marquès (AVILA) en Espagne et aura pour thème général

**La Géométrie
Moyen Pédagogique
de l'Education Mathématique**

Le thème sera abordé dans des conférences de 3 heures, des relations d'expériences récentes de 1 heure et des communications de 30 minutes.

Le logement des participants est prévu au CASTILLO-PALACIO MAGALIA dans lequel auront lieu aussi les réunions.

La pension complète sera de l'ordre de 10000 Ptas par personne et par jour en chambre double (11500 Ptas en chambre à un lit, 9000 Ptas en chambre à 3 lits).

La taxe d'inscription à la Rencontre se montera à 1200 francs belges et comprendra les frais de l'excursion.

Le nombre des participants non espagnols à GIRP 22 ne peut dépasser 50 personnes. Auront priorité les habitués de GIRP et l'inscription se fera dans l'ordre des réponses de participation recues.

**Les participants s'engagent à assister
à la totalité de la Rencontre.**

Si vous désirez participer à la rencontre, veuillez vous inscrire provisoirement en vue de recevoir la deuxième annonce avec des détails plus précis concernant le programme de GIRP 22. Nous vous demandons lors de cette inscription, de bien vouloir répondre aux questions suivantes:

- Désirez-vous présenter une relation ou une communication?
Si oui : sur quel sujet précis?

Les personnes ayant exprimé le désir de présenter une relation ou une communication, sont invitées à en envoyer un résumé précis au Comité Directeur du GIRP qui examinera la demande en vue son acceptation et fixera la durée de présentation.

En vue de recevoir la deuxième annonce de GIRP 22, veuillez faire parvenir votre fiche d'inscription à l'une des adresses suivantes:

Vecino Rubio Francisco

Calle Vargas 4 III C, 28003 Madrid, España.

Dieschbourg Robert

I.S.E.R.P. Bp.002, 7201 Walferdange, G-D de Luxembourg.

Le président, Bruno D'Amore

Computers in Teaching Initiative

Centre for Mathematics and Statistics
c/o Faculty of Education
University of Birmingham
UK - Birmingham B15 2TT
Tel: 021 414 4800 - email: CTIMaths@bham

Department of Statistics
University of Glasgow
University Gardens
UK - Glasgow G12 8QW
Tel: 041 339 8855 Ext.40446 - email: CTIStat@glasgow

Co-Directors: Dr. Michael Beilby (Birmingham); Dr. Adrian Bowman (Glasgow)
Coordinator: Ms. Pam Bishop (Birmingham)

Introduction

Mathematics and Statistics are taught in some form in all UK universities and play a fundamental role in Engineering and in the Pure, Applied and Social Sciences. Characteristically, classes are large and resources short, and there is thus potentially an enormous payoff for the introduction of efficient and effective teaching methods. This can be achieved through development of teaching styles that are facilitated through computer based techniques. We have surveyed the field of courseware developed for this purpose, and have documented and disseminated information about existing material. At the same time we have identified areas where development could take place, and are looking to a Mathematics and a Statistics consortium to take a lead in these developments.

Our constituency

We have targeted the 2000 academic staff based in university Mathematics and/or Statistics departments. At present our mailing list contains the names of 1500 people who in some way, by returning a reply slip, attending a workshop, meeting us on a visit, or making an enquiry, have registered a wish to receive regular newsletters and guides. We also write to over 200 Heads of Departments, not all in Mathematics and Statistics.

We believe that our customers should include polytechnics. At present about 40% of enquiries and contacts come from polytechnics where there is traditionally more emphasis on examining teaching methods. There will be economies of scale when the community is enlarged, and we look forward to offering our full range of services to the whole of the higher education sector. There is also scope for extending the information service overseas. We already have correspondents in Australia and a number of contacts in the United States. We have also had enquiries from Germany and Sweden.

Operation of the Centre

It is a feature of the CTI Centre that the 16 members of the two Management Committees (for Mathematics and for Statistics) are active in promoting the Centre, making visits, reviewing software and speaking at meetings. In addition, Centre staff have visited 19 departments, given 30 presentations, taken part in 8 conferences and received 24 visitors. Through this involvement the Centre has positioned itself within the community. We believe that

- A comprehensive information source will be appreciated as an asset by the community;
- personal visits mean a two-way exchange of information and strengthen contacts;
- quality newsletters and guides will be seen as worthy of attention, and
- regular workshops will promote contacts and will continually put the Centre in front of academics.

There is considerable anecdotal evidence to claim that we have been successful in these respects.

The database and the Guide to Software for Teaching

The database now contains a fairly full list of software packages. There are over 900 entries classified into sections with cross-references to reviews and suppliers. The latest edition of the *Guide to Software for Teaching*, which is taken from the database, illustrates its considerable extent. We believe that we now have a good coverage of the field, although there is still a need to come to terms with the wealth of material in the United States.

Extracts from the database are available as fact sheets containing the most up-to-date information. Detailed enquiries can be made by phone and answered directly from the database.

Newsletters

We publish a quarterly newsletter *Maths & Stats* that, after nine issues, is well regarded in the community. It contains reviews, notices and adverts. Production is of high quality, much to the credit of the equipment donated by IBM. There is a steady flow of contributions.

MATHEMATICS EDUCATION

Evidence of the success of the newsletter is that it has already generated £3200 revenue from advertisements. It should also be noticed that extracts from the newsletter are appearing in the Mathematics in Computing Software Supplement that is included quarterly in the IMA Bulletin.

Workshops

During 1991/2 we held five one-day workshops on the following themes

- Using computers to teach calculus.
- Teaching material in a Windows environment.
- Mathematics courseware with a graphical user interface.
- DERIVE and its use in teaching.
- The statistical package S-Plus.

The workshops provide an important stimulus to academics working in relative isolation in their own departments, and appear to be encouraging experimentation in teaching style. A number of issues have been raised in discussion, eg resources, course content, the need for collaboration, demand for good computer based material and tutorial support.

Questionnaires are routinely distributed to participants to assess the value of the workshops. They indicate satisfaction with the relevance of the material presented.

Promoting the use of packages

In addition to supporting the crucial role of computers in providing an environment in which data can be analysed and explored, the Centre has a role in making the community aware of software and methods that are more directly aimed at communication of principles and ideas. Fairly full information is now available from the Centre about prices and availability, and about peer usage of the packages. This improves access to the software and assists in assessment. The workshops also provide a pool of advice.

We have published 16 reviews in the area of mathematics and 8 in the area of statistics. A further 18 packages are out for review. The number of statistical packages that are available is vast and a selective strategy is necessary. We decided to begin with the major packages in current use in UK Statistics departments. Consultants have been appointed for each of these and in most cases introductory notes have been created.

The Centre is promoting *self-help* groups in which teaching methods are discussed. There are two already operating in which worksheets for the packages DERIVE and MATLAB are circulated amongst a circle of teachers. The Centre administers the circulation and has set up meetings with the distributors. Further groups are planned for *Mathematica* and *Maple*.

Servicing the community

On average 6 direct enquiries are received per week; this is an increase of 25% on the previous year. Contact information, notice of workshops and availability of information sheets can be obtained by assessing the NISS Bulletin Board. The *Guide to Software for Teaching* is distributed annually to departments, and newsletters are sent quarterly to individuals. There are 57 information sheets available by post and electronic mail on request.

The Centre also runs two electronic mail discussion lists, one for statistics and one for mathematics. This activity is not directly related to teaching but is a useful service we can perform with our current resources, and which has the advantage of maintaining our profile within the community.

Consortia for courseware development

Much of the latter part of the year has been spent in preparing bids for funding under the Teaching and Learning Technology programme (TLT). The contacts made by the Centre have been invaluable in drawing together departments across the Mathematics community. Three planning meetings have been held, visits have been made to 15 departments, and 46 are listed in the final bid for the preparation of course material to teach service mathematics to science and engineering students. The Statistics committee have put together a complementary bid based across five institutions. The whole process has been very time-consuming, but if the bids are successful, the shortfalls identified by the Centre will begin to be addressed.

Concluding remarks

We believe that, within staffing limitations, the work of the Centre has gone a long way towards meeting the overall objectives of the CTI Initiative. We have been accepted as a reference point for teaching in mathematics and statistics. The Centre fulfils an important and expanding role, and it is hoped that funding will be secured to carry this into the future.

UK Mathematics Courseware Consortium

This is a Consortium which builds computer-based modules for teaching Mathematics at degree level across the Sciences, Engineering and Management Studies. It addresses the specific problems of

- helping students as they 'bridge the gap' between school or college and university, and attempt to cope with Mathematics at the beginning of the first year, and
- convincing students of the relevance of Mathematics to application areas.

These are enormous problems in the current university sector. At any time as many as 300k students take Mathematics in some form as part of their coursework and many of these are not well prepared for the demands of their degree courses. With the trend towards wider access the numbers with difficulties will increase dramatically over the period to the end of the century and, without alternative provision, are likely to occupy of the order of two extra staff in each institution in the UK.

The deliverables

In total 30 computer-based course modules will be produced over a period of 2½ years. There will be 14 Foundation and 16 Application modules each with content approximately equivalent to the classwork that is associated with and contained in 5 conventional lecture hours. The application topics include Engineering, Earth Sciences, Biology, Business Studies, and Physics and Chemistry.

The instructional design of the modules will be similar to and have the flexibility of the Self-Paced Courses which have been implemented in book form for teaching Mathematics at a number of universities including the University of Southampton. They will be delivered using hypertext in a style that includes interaction, student-led experiments, and continual assessment, and they will be available on PC and Macintosh platforms. Extension to workstations is also being considered. In the initial stages the modules will be prepared using Asymetrix Toolbook, Hypercard and Authorware.

The participants

Authoring and testing will be undertaken by individual academics who are actively involved in teaching at member institutions. To date, 42 universities have expressed an interest in being involved. Funding will be available from the Consortium to facilitate authoring, but departments would have to give matching support and show a commitment to integrating the activity within their teaching programme.

Authors would be supported technically from six resource centres located at Birmingham, Cambridge, Heriot Watt, Keele, Liverpool and Coventry. Collectively technicians and specialists at these centres would develop tools which (i) provide access to mainstream computer algebra facilities, (ii) support hypertext within Microsoft Windows and Macintosh System 7 environments, (iii) give access to 'multimedia', (iv) support continual assessment, and (v) provide links to professional mathematics systems.

The overall responsibility for the project rests with an Academic Council, and management is undertaken by an Executive formed from the collaborators at the principal sites. The lead site for the Consortium is the University of Birmingham, from where the project is administered.

Contact

Dr. M.H. Beilby, UK Mathematics Courseware Consortium, Centre for Computer-Based Learning, University of Birmingham, Birmingham B15 2TT, UK.

EUROPEAN NEWS: Country by Country

DENMARK

NATO Advanced Study Institute

Real and Complex Dynamical Systems

June 20 - July 2 1993

Hillerød, Denmark

Program: The institute aims to bring together leading researchers involved in the mathematical analysis of both real and complex dynamics, to emphasize the recent exchange of ideas and tools between the two areas.

Principal Speakers: V. Baladi (Lyon), B. Branner (Lyngby), C. Budd (Bristol), A. Douady (Orsay), J.H. Hubbard (Cornell), P. Jones (Yale), B. Kitchens (IBM T.J. Watson Research Centre), R. Perez Marco (Orsay), J. Milnor (Stony Brook), M. Shishikura (Tokyo Institute of Technology), S. van Strien (Amsterdam), C.T. Sparrow (Cambridge), M. Viana (Porto/IMPA), J.-C. Yoccoz (Orsay), L. S. Young (Arizona/UCLA).

Finance: Partial financial assistance will be available. Priority will be given to graduate students. Requests for participation and financial assistance should be sent as soon as possible.

Contact: B. Branner
Mathematical Institute
Building 303
The Technical University of Denmark

ITALY

Riemann Prize

For a time Riemann lived in Verbania, Lake Maggiore and is buried there. In his memory the Municipal Administration of Verbania have established four annual awards divided into two sections. The first is for scholars under 30 and the second for students of high schools from the districts of Domodossala, Omegna and Verbania. These prizes will be awarded for (a) a dissertation about trigonometric series, multiplicative number theory or Z and L-functions; (b) a dissertation about string theory, quantum gravity and super-symmetries; (c) a dissertation about the influence on Riemann's work. Also a prize is awarded to two students or two groups of students and their teachers who develop a critical study on the History of Mathematics or Physics.

GEORGIA**Journal:**

A new mathematical journal "Proceedings of Georgian Academy of Sciences. Mathematics" will be published bimonthly, starting from February 1993. The journal provides articles both with full proofs and also short communications in pure and applied mathematics. Each issue contains approximately 130 pages.

The language of publication is usually English although in exceptional cases English summaries are given.

The aspiration for wide international co-operation and our interest in a great variety of problems is shown by the fact that along with Georgian mathematicians the Editorial Board of the Journal involves many well known foreign mathematicians: O. Besov (Moscow), B. Boyarski (Warszawa), G. Fickera (Roma), I. Gohberg (Tel-Aviv), F. Hirzebruch (Bonn), J. Kurzweil (Prague), J.-L. Lions (Paris), L. Marcus (Minneapolis), D. Puppe (Heidelberg), J. Vorovich (Rostov-on-Don).

The annual subscription rate \$189.00 should be transferred to the Union Bank of Switzerland, Zurich, account in US dollars No. 69020.71 B of the Export-Import Bank of the Republic of Georgia. Please indicate that this amount is intended for the journal "Proc. Georg. Acad. Sci. Mathematics" and send some document certifying transfer registration together with the mailing address of the subscriber. All correspondence should be addressed to

I. Kiguradze, Editor-in-Chief
 "Proceedings of Georg. Acad. Sci. Math."
 A. Razmadze Mathematical Institute
 1, Z. Rukhadze Str.
 380093, Tbilisi, REPUBLIC OF GEORGIA

Prize: The presidium of the Georgian Academy of Sciences awarded A. Razmadze the Prize of the Academy for 1992 to Professor N. Kandelaki and Professor N. Vakhania for their cycle of papers "Orthogonal Random Vectors and the Hurwitz-Randon-Eckmann Theorem".

This prize is awarded in every three years.

Conference:

Georgian Mathematical Union

Georgian Congress of Mathematicians

11-15 October 1993

Tbilisi

This Congress is open for participants from abroad

Contact:

Dr. N. Skhirtladze

I. Vekua Institute of Applied Mathematics of Tbilisi State University

2 University str., 380043 Tbilisi, **Republic of Georgia.**

Fax (007 8832) 304697

e-mail: gmu@imath.kheta.georgia.su

POLAND

International Summer Schools on Symmetry and Structural Properties of Condensed Matter

The Institute of Physics of Adam Mickiewicz University (Uniwersytet im. Adama Mickiewicza) organize every other year an International Summer Schools on Theoretical Physics with the title, Symmetry and Structural properties of Condensed Matter. The main aim of these Schools is to transform mathematical methods into physical problems which enable us to give an adequate description of, sometimes unusual, properties of matter. The idea was proposed by Professor T. Lulek in 1989 and two Schools, in 1990 and 1992 were organized. The lecturers included both mathematicians and physicists. The proceedings of the first school were published in 1991 and those of the second one will be published in 1993 by World Scientific (Singapore). The next School will be in August 1994. Details are available from:

Dr. Wojciech Florek
Uniwersytet im. Adama
Mickiewicza Institut Fizyki
ul. Jana Matejki 48/49
60-769 Poznań, POLSKA (POLAND)

RUSSIA

THE SUSLIN FOUNDATION

Michal Yakovlevich Suslin, famous as the founder of Descriptive Set Theory and the author of many outstanding theories, was born in 1894 in Krasavka which is not far from the ancient Russian city of Saratov. It is in the centre of Russia, by the river Volga.

The mathematicians at Saratov have held study groups on Suslin's work on two occasions. They have also formed The Suslin Foundation, a public society aimed at supporting fundamental mathematical research and organising regular meetings on Suslin's work.

The main tasks of The Suslin Foundation are: holding scientific conferences; arranging visits by distinguished scholars; publishing scientific literature; providing financial support for young scientific talent; promoting activities in memory of Suslin; maintaining and developing the Suslin Library of mathematical literature.

Anyone who supports the aims and work of The Suslin Foundation can become a member. Its financial base is formed by members' subscriptions, sponsorship, etc..

We appeal to mathematicians everywhere for their support. A cycle of international scientific conferences on Suslin's areas of interest is to be held in September 1994 as part of the Suslin Jubilee, marking the centenary of Suslin's birth. We invite mathematicians from any part of the world to contribute to the organisation and programme of these events.

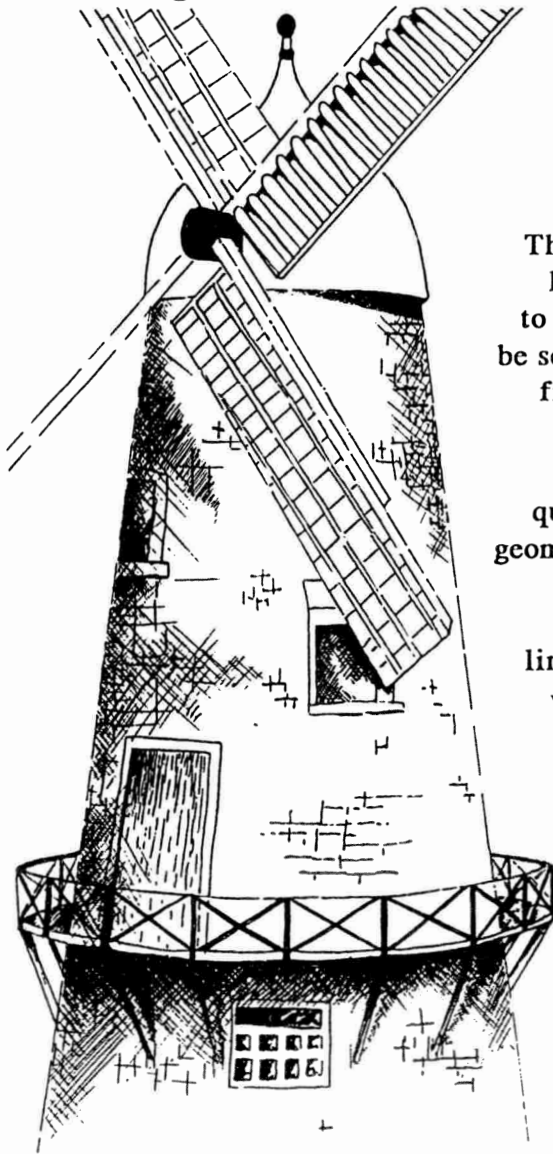
For further information, please write to:

Vladimir Molchanov
Executive Director of the Suslin Foundation
Faculty of Mathematical Studies
The Pedagogical Institute
ul. Michurina 92
Saratov, RUSSIA

QP-PQ

QUANTUM PROBABILITY AND APPLICATIONS CONFERENCE

Nottingham, U.K. 29th March - 3rd April 1993



George Green (1793-1841)
miller and mathematician

The conference seeks to bring together mathematicians and physicists interested in various aspects of quantum probability. The mornings will be reserved for expository lectures which are intended to be accessible to non-specialists. Research presentations will be scheduled for early evening, leaving afternoons free for less formal seminars and discussion.

Among the topics to be discussed are: quantum stochastic flows and non-commutative geometry; markov structures and quantum groups; quantum martingales and stopping times; non-commutative independence and central limit theorems; non-causal, Wiener space and white noise analysis; quantum measurement and open systems; entropy and statistical mechanics.

Organised by: R.L.Hudson, J.M.Lindsay

Financially supported by: London Mathematical Society, Royal Society, University of Nottingham

For further information please contact:

Jo Frampton, Conference Secretary

Email: jof@maths.nott.ac.uk

FAX: +44-602-514951

Telex: 37346 UNINOTG

Mathematics Department, University Park,
GB-Nottingham NG7 2RD

BRIEF REVIEWS

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

H.Koch: Introduction to Classical Mathematics I, Kluwer Academic Publishers, Dordrecht, 1991, xvii+453 pp., \$ 149.00, ISBN 0-7923-1231-7

This book is directed towards all those who have mastered two years of university mathematics and represents a very nice union of methods of modern algebra and analysis. Using fresh mathematical language the author leads the reader through several parts of modern algebra (e.g. quadratic forms, cyclotomic polynomials, commutative fields and Galois theory, theory of algebraic equations), number theory (algebraic theory, quadratic fields, prime number theorem, the geometry of numbers) and analysis (the theory of complex functions, meromorphic differentials on closed Riemann surfaces, Riemannian geometry, combinatorial topology, uniformization). (lb)

H.Bauer: Maß- und Integrationstheorie. 2., bearbeitete Auflage, de Gruyter Lehrbuch, Walter de Gruyter, Berlin, 1992, xviii+260 pp., DM 52.00, ISBN 3-110-13625-2

One of the best textbooks on measure and integration. A high level of exposition, a good motivation of concepts studied, a careful choice of results as well as examples and exercises, historical comments and a nice style of presentation of theory and applications - this all makes reading the book very pleasant. Basic (abstract) measure theory (with a special emphasis to the Lebesgue measure and measures on the real line) is introduced in the first Chapter. The abstract Lebesgue integral is treated in Chapter 2 including L^p -spaces, the Radon-Nikodym theorem, convergence of measurable functions and uniform integrability. Product measures and Fubini's theorem are studied in Chapter 3. The last Chapter deals with topological measure theory: Borel and Radon measures, Radon measures on Polish spaces and locally compact spaces, the Riesz representation theorem, weak convergence of measures and weak compactness. The book is an excellent introduction to the subject and will be appreciated by anybody interested in analysis, probability and statistics as well as in applications of ideas of measure theory and integration in mathematical physics, mathematical economics or important branches of geometry. (in)

F.Hirzebruch, T.Berger, R.Jung: Manifolds and Modular Forms. A Publication of the Max-Planck-Institut fAspects of Mathematics, vol.E20, Friedrich Vieweg & Sohn, Wiesbaden, 1992, xii+211 pp., DM 68.00, ISBN 3-528-06414-5

During the last ten years a fruitful interaction between natural the study of genera for cobordism rings (Landweber, Ochanine, Stong) and new ideas from theoretical physics (Witten and others) led finally to a proof of the rigidity theorem for the equivariant universal elliptic genus of spin manifolds (Bott, Hirzebruch, Taubes). The present book contains a very nice description of the theory of elliptic genera based on a course given by the first author in Bonn 5 years ago. It keeps the flavour of lectures, there are many examples illustrating the theory and background material is included (without proofs) making the book understandable to a broader mathematical public. A rigidity theorem for the level N genus of compact complex manifolds is proved in the paper of the first author which is reproduced in an appendix. The other appendices contain a minicourse on modular forms (by N.P.Skoruppa), a short description of the Index Theorem for the twisted Dirac operator (P.Baum) and a description of the role of Zolotarev polynomials (by R. Jung). The book can be warmly recommended to anybody interested in the field. (vs)

S.Guerre-Delabrière: Sequences in Banach spaces, Pure and Applied Mathematics 166, Marcel Dekker, Inc., New York, 1992, xiv+207 pp., \$ 99.75, ISBN 0-8247-8723-4

This book offers a nice, modern and self-contained presentation of some topics in the theory of Banach spaces. Much of the material consists of some deep results obtained during the last two decades. The first chapter of the book is devoted to results which are already classical: Schauder, unconditional and shrinking bases, the so-called distortion problem for ℓ_1 and the discussion of spaces containing ℓ_p , $p \in (1, \infty)$ or c_0 . In the next chapters, the author introduces new concepts of ultrapowers and spreading models in Banach

spaces and stable Banach spaces in the study of the structure of certain Banach spaces. Functional analytic properties of L_p , $p \in (1, \infty)$, ultrapowers of L_p -spaces and characterizations of ℓ_q -subspaces of L_p are included. According to the author, this book is intended for graduate students. It might serve, however, as a very useful reference book for specialists in the field. (joko)

A.Fröhlich, M.J.Taylor: Algebraic Number Theory, Cambridge studies in advanced mathematics 27, Cambridge University Press, Cambridge, 1991, xiv+355 pp., \$ 79.95, ISBN 0-521-36664-X

This very nice and carefully written introduction to algebraic number theory is based on various lectures given (independently) at Cambridge University. Approximately one half of this book is more theoretical (Dedekind domains, extensions, classgroups and units, L-functions), the remaining part - especially Chapters V, VI and VII - is "devoted to giving a detailed study of various arithmetic objects in situations of particular interest". This part then contains several topics which are usually omitted in books of this kind, e.g. cubic, sextic and biquadratic fields, binary quadratic forms, Brauer relations etc. Many excellent examples, more than eighty exercises (partly following B.Birch's "Oxford question sheets"). Appendix (Characters of Finite Abelian Groups), Suggested Further Reading ("one sentence" brief reviews of eighteen books with related topics) and Index. This successful book can be recommended to specialists as well as to beginners having a basic knowledge of modern algebra. (bn)

N.Berline, E.Getzler, M.Vergne: Heat Kernels and Dirac Operators, Grundlehren der Mathematischen Wissenschaften, Springer-Verlag, Berlin, 1992, vii+369 pp., DM 118.00, ISBN 3-540-53340-0

Since the discovery of the Atiyah-Singer Index Theorem 30 years ago, the Dirac operator on Riemannian manifolds and its generalizations have played a key role in the development of global analysis. The book offers a systematic exposition of the Atiyah-Singer Theorem for a generalized Dirac operator D on a compact manifold with complete and simplified proofs based on the kernel of the heat operator e^{-tD^2} . Three main parts are: (i) the construction of the heat kernel based on the Lichnerowicz formula for D^2 and local index theorem; (ii) an equivariant version of the local index theorem which generalizes the local index theorem as well as the Weyl character formula and Kirillov formula for characters of irreducible representations of compact Lie groups; (iii) the local index theorem for families of Dirac operators based on Quillen's notion of a superconnection (which was recently used in string theory, Arakelov theory and the theory of moduli of Yang-Mills fields). The book is very nicely written, well-organized and self-contained (it contains a condensed summary of the background knowledge needed). Strongly recommended to anybody willing to understand one of the main lines of evolution of contemporary mathematics. (vs)

F.K.Hwang, D.S.Richards, P.Winter: The Steiner Tree Problem, Annals of Discrete Mathematics, vol.53, North-Holland, Amsterdam, 1992, xii+340 pp., \$ 117.00, ISBN 0-444-89098-X

The Euclidean Steiner Tree problem is a famous optimization problem which, despite being of a continuous nature, is solvable by purely combinatorial tools. Though the problem is in general intractable (NP-hard), it gained a lot of attention and it motivated development of a theory which became a rich part of combinatorial optimization. The book under review is an excellent survey on the Steiner problem, its variants and their applications. Three of the four parts which the book consists of are of primary significance and interest (each of these three parts has been written by one of the three coauthors) - I. Euclidean Steiner problem (a brief historical note reveals that Steiner's name in the problem title is not appropriate, the origins of the problem are traced back to Fermat and the Czech mathematician Jarník), II. Steiner problem in networks (a relatively recent but intensively studied variant) and III. Rectilinear Steiner problem (a variant closely related to questions which arise in VLSI layouts). Each of these parts contains definitions and an introduction to the particular variant of the Steiner problem, description of exact (superpolynomial) algorithms, a number of polynomially solvable instances and an extensive survey of heuristics. Another positive feature of the book is that it is well updated (e.g., it contains a proof of only recently proved Gilbert-Pollack conjecture on the Steiner ratio). (jk)

K.Jacobs: Resultate. Ideen und Entwicklung in der Mathematik. Band 1: Proben mathematischen Denkens, Band 2: Der Aufbau der Mathematik, Friedrich Vieweg & Sohn, Braunschweig, 1990, xii+207 pp., x+265 pp., DM 162.00, ISBN 3-528-08980-6, ISBN 3-528-08981-4

This book is a good and carefully organized exposition of basic mathematical ideas, problems and methods. To a certain extent, the book grew out of lectures “Mathematik für Philosophen” and consequently, it presents an interesting way to do mathematics. Strongly recommended to teachers as well as to students of mathematics and amateurs. Contents: I. Proben mathematischen Denkens: 1. Geometrie, 2. Elemente der Algebra, 3. Vollständige Induktion, 4. Optimierung, Spieltheorie, Ökonomie, 5. Topologie, 6. Dynamik. II. Der Aufbau der Mathematik: 7. Logik, 8. Mengen, Abbildungen, Relationen, 9. Zahlen und algebraische Strukturen, 10. Allgemeine Betrachtungen zur Mathematik. (jbe)

V.I.Arnol'd: Ordinary Differential Equations, Springer-Verlag, Berlin, 1992, iv+334 pp., 272 fig., DM 78.00, ISBN 3-540-54813-0

Among the most fascinating features of V. I. Arnol'd's book (devoted mainly to the qualitative theory of ordinary differential equations) we find the deep geometrical insight and numerous examples from physics accompanying the whole text. It leads reader quickly to the main theorems and properties of solution (leaving some long and technical proofs to the end of the book) and aims to place the results in the context with other parts of mathematics and physics. The book is very readable with a lot of problems and questions throughout the text. This is an English translation of the third Russian edition of the book where the first two chapters were significantly expanded and several sections were added so that it now covers (among many other things) the standard syllabus of the theory of ordinary differential equations. Strongly recommended to specialists as well as to the general public. (js)

K.Doerk, T.Hawkes: Finite Soluble Groups, de Gruyter Exposition in Mathematics 4, Walter de Gruyter, Berlin, 1992, xii+891 pp., DM 268.00, ISBN 3-110-12892-6

The monograph is a comprehensive treatise on a substantial part of the theory of finite soluble groups as it has developed during the past three decades. A special attention is paid to the following themes: Schunk classes, formations, projectors, Fitting classes and injectors. The account is based on constructive methods and the material is illustrated with numerous examples and supplied with prerequisites and historical notes. The book will certainly serve as a standard reference. (tk)

S.Roman: Advanced Linear Algebra, Graduate Texts in Mathematics, vol.135, Springer-Verlag, Berlin, 1992, xii+363 pp., 26 fig., DM 98.00, ISBN 3-540-97837-2

This book can be characterized as “linear algebra revisited”. The first part of the book contains a standard introduction to linear algebra with the main emphasis on the structure of finite dimensional linear operators. The second part deals with more advanced topics, e.g. orthogonal geometries, Hilbert spaces and tensor products. The last chapter contains an introduction to the umbral calculus of formal power series. At the end of each chapter, a set of carefully selected exercises is provided. The book is clearly and thoroughly written (occasionally, some easy proofs are omitted), easy to read and understand. It can be used as a textbook for advanced undergraduate students. (pn)

V.D.Goppa: Geometry and Codes, Kluwer Academic Publishers, Dordrecht, 1988, ix+157 pp., \$ 64.00, ISBN 9-0277-2776-7

Work in the last decade showed that many results of algebraic geometry are closely connected with the theory of codes. The book contains a good introduction to the theory of algebraic curves over a finite field F_q including a discussion of divisors, the Riemann-Roch theorem, generalized Jacobians as well as Weierstrass points and the zeta function. The theory is then applied to coding and decoding algorithms for codes on curves (e.g. codes on conics, twisted cubics, normal curves, generalized Jacobian codes and codes based on rational mappings). The book is written in a simple and nice style and can be recommended to everybody interested in the theory of codes and the theory of algebraic curves over a finite field. (jb)

G.Fischer, F.Hirzebruch, W.Scharlau, W.Turnig (Eds.): Ein Jahrhundert Mathematik 1890-1990. Festschrift zum Jubiläum der DMV, Dokumente zur Geschichte der Mathematik, Friedrich Vieweg & Sohn, Braunschweig, 1990, xii+830 pp., DM 198.00, ISBN 3-528-06326-2

The Union of German Mathematicians was founded in 1890 from a branch of the Union of German Naturalists and Physicians. This Festschrift (a usual form of rendering homage to a person or an institution) describes the meanings of mathematics and the variety of its development in German speaking countries during the period 1890-1990, the rich history of this Union on the background of results obtained by German mathematicians, and the influence of German mathematics on the world mathematics and vice versa.

The introductory contribution *Professional union – institution – government* by N. Schappacher (with the assistance of M. Kneser) is devoted to the relation of mathematics to the society and politics in Germany since 1890 and is focussed especially to the period of German “Nazionalsozialismus”. The contents of the other contributions is clear from their titles: *Outline history of informatics 1890-1990* by F.L. Bauer, *Discrete mathematics* by M. Aigner, *Partial differential equations and Calculus of variations* by J. Bemelmans, S. Hildebrandt, W. von Wahl, *Elements of Geometry* by W. Benz, *Numerical mathematics* by L. Collatz, *Differential geometry* by P. Dombrowski, *On the development of the theory of functions in Germany from 1890 to 1990* by D. Gaier, *On the history of convex geometry and geometry of numbers* by P.M. Gruber, *Probability* by U. Krengel, *On the development of applied analysis and mathematical physics in the last century* by R. Leis, *From the Hilbert’s “Basissatz” to the classification of finite simple groups* by G.O. Michler, *Algebraic theory of numbers* by J. Neukirch, *Erich Hecke and the role of L-series in the theory of numbers* by S.J. Patterson, *Quadratic forms* by A. Pfister, *Algebraic topology* by H.-W. Henn and D. Puppe, *Mathematical logic* by K. Schütte and H. Schwichtenberg, *The history of analytic theory of numbers* by W. Schwarz and *Mathematical statistics* by H. Wittig.

The style of contributions is not unified, but this makes the reading of the book more interesting. The book as a whole is an important and valuable contribution to the history of mathematics. Since it is also enjoyable to read, it could be recommended not only to historians of mathematics and professional mathematicians, but also to students of mathematics. (joda)

G.J.Székely: Paradoxes in Probability Theory and Mathematical Statistics, Kluwer Academic Publishers, Dordrecht, 1987, xii+250 pp., \$ 59.00, ISBN 9-0277-1899-7

This book was originally published in Hungarian. In 1986, an English translation appeared. The present book is obviously a reprint of this edition with the same misprints (e.g. p.74 6 paramter should read parameter, p.78 13 sapmle should read sample and p.98₁₄ polinomial should read polynomial). By the way, in 1990 also a German translation was published. The book is divided into four chapters which describe topics from probability theory, mathematical statistics, random processes and foundation theory. The first part containing classical paradoxes will be most attractive for a broad audience since no special preliminary knowledge is assumed here. Some assertions can be considered as (a little) surprising but hardly paradoxical (e.g. that in a non-regular system the maximum-likelihood estimate may not be the best one, see p.194). In an appendix, one page contains a table of the distribution function $\Phi(x)$, which can be expected in a book about probability and statistics, and ten pages contain a table of the first twenty thousands of digits of π , which is perhaps the last paradox. The book is very popular already now and it can be really recommended to everybody. It contains not only interesting problems and their explanations but also historical notes and references. When reading this excellent book, check kindly whether 55 people is the correct answer to the birthday paradox on p.62; my solution was 57 people. (ja)

J.H. van Lint: Introduction to Coding Theory, Graduate Texts in Mathematics, vol.86, Springer-Verlag, Berlin, 1992, xii+183 pp., DM 86.00, ISBN 3-540-54894-7,

The second (slightly enlarged) edition of the van Lint’s book is a short, concise, mathematically rigorous introduction to the subject. Basic notions and ideas are clearly presented from the mathematician’s point of view and illustrated on various special classes of codes. The first six chapters contain an introduction to the coding theory, including Shannon’s theorem, bounds on codes and the most important classes of codes (Hamming codes, Golay codes, Reed-Muller codes, Kerdock codes, BCH-codes, Reed-Solomon codes, quadratic residue codes). In the rest of the book, more specialized topics are treated, e.g. perfect codes (including non-existence theorems), Goppa codes, Justesen codes, convolutional codes. This nice book is a must for every mathematician wishing to introduce himself to the algebraic theory of coding. (pn)

Progress in Mathematics

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Progress in Mathematics is a series of books intended for professional mathematicians and scientists, encompassing all areas of pure mathematics. This distinguished series, which began in 1979, includes research level monographs, polished notes arising from seminars or lecture series, graduate level textbooks, and proceedings of focused and refereed conferences. It is designed as a vehicle for reporting ongoing research as well as expositions of particular subject areas.

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PM 109

F. Eyssette / A. Galligo

Université de Nice-Sophia Antipolis, Nice, France

Computational Algebraic Geometry

1992. 344 pages. Hardcover
sFr. 118.– / 138.–
ISBN 3-7643-3678-1

The theory and practice of computation in algebraic geometry has experienced a vigorous development over the past few years. Of particular significance is the subject's role as a major component in the improvement of computer algebra systems (e.g. Maple, Mathematica, Reduce, Macsyma, Axiom, Macaulay, etc.), which have become essential tools for many scientists. The rich theoretical implications, combined with a wide range of applications in science and engineering, have attracted the attention of an international group of mathematicians, leading to the establishment of a biannual conference. MEGA-92 contains a selection of refereed papers from the conference held in Nice, France in April of 1992, building upon the auspicious beginnings of MEGA-90 (Castiglione, Italy 1990.)

The themes of the meeting were: Effective methods and complexity issues in commutative algebra, projective geometry, real geometry, and algebraic number theory; Algebraic-geometric methods in algebraic computing and applications.

The expositions offered in both MEGA-92 and MEGA-90 will prove invaluable to professional mathematicians and graduate students wishing to work in this rich and stimulating field.

PM 107

J.L. Brylinski, Pennsylvania State Univ., University Park, PA, USA

Loop Spaces, Characteristic Classes and Geometric Quantization

1992. 295 pages. Hardcover
sFr. 84.– / DM 94.–
ISBN 3-7643-3644-7

Characteristic classes and more generally cohomology classes to bundles have important applications in mathematics and physics. The first examples of these classes were constructed by Chern, Pontrjagin, Stiefel and Whitney to study the geometry of manifolds. In the past 25 years characteristic classes have been used to construct some of the basic objects in infinite-dimensional geometry and loop groups, geometric quantization, quantum groups, knot invariants and gauge theory.

This book develops a Chern-Weil theory of characteristic classes of gerbes. Gerbes (invented by Giraud) are fiber bundles whose fibers are groupoids (certain categories). Gerbes arise naturally in geometry, for instance whenever one has a family of symplectic manifolds or a bundle of projective Hilbert spaces. A product of this theory is a geometric construction of ordinary degree 3 cohomology of manifolds, with classes, Deligne cohomology, and the geometric quantization of the magnetic monopole. The book also gives the construction of a holomorphic line bundle over the space of singular knots in a smooth 3-manifold, and discusses the Kaehler structure of this space of knots.

The book will be of interest to topologists, geometers, Lie theorists and mathematical physicists, as well as to operator algebraists. It is written for graduate students and researchers, and will be an excellent textbook. It has a self-contained introduction to the theory of sheaves and their cohomology, line bundles and geometric prequantization a la Kostant-Souriau.

Previously published

PM 108

S. David

Séminaire de Théorie des Nombres, Paris, 1990-1991

1993. 308 pages. Hardcover
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ISBN 3-7643-3684-6

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P. Buser

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1992. 470 pages. Hardcover
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J. Tirao / N.R. Wallach (Eds)

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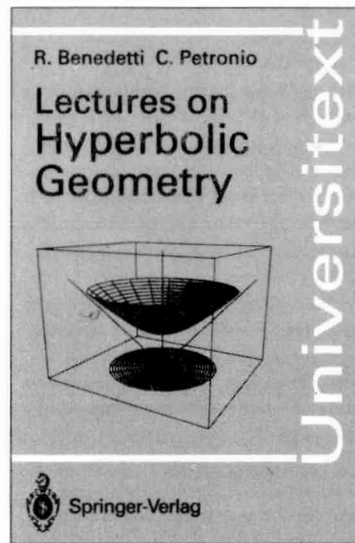
New Books in Geometry

R. Benedetti, C. Petronio

Lectures on Hyperbolic Geometry

1992. XIV, 330 pp. 175 figs. (Universitext)
Softcover DM 48,- ISBN 3-540-55534-X

The book concerns the geometry of manifolds and in particular hyperbolic manifolds; its aim is to provide an exposition of some fundamental results, and to be as far as possible self-contained, complete, detailed and unified. Since it starts from the basics and it reaches recent developments of the theory, the book is mainly addressed to graduate-level students approaching research, but it will also be a helpful and ready-to-use tool to the mature researcher. After collecting some classical material about the geometry of the hyperbolic space and the Teichmüller space, the book centers on the two fundamental results: Mostow's rigidity theorem (of which a complete proof is given following Gromov and Thurston) and Margulis' lemma. A unified exposition is given of Wang's theorem and the Jorgensen Thurston theory. A large part is devoted to the three-dimensional case: a complete and elementary proof of the hyperbolic surgery theorem is given based on the possibility of representing three manifolds as glued ideal tetrahedra. The last chapter deals with some related ideas and generalizations (bounded cohomology, flat fiber bundles, amenable groups). This is the first book to collect this material together from numerous scattered sources to give a detailed presentation at a unified level accessible to novice readers.



U. Dierkes, S. Hildebrandt, A. Küster,
O. Wohlrab

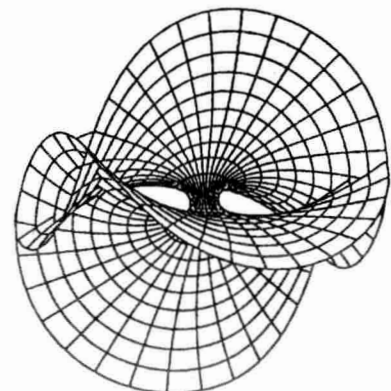
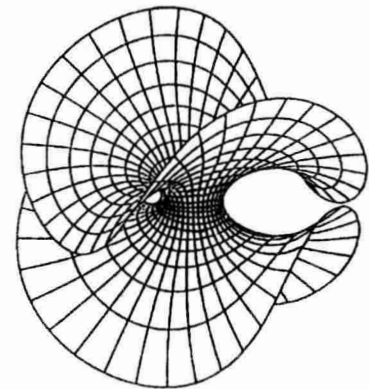
Minimal Surfaces I Boundary Value Problems

1992. XIII, 508 pp. 172 figs. 8 colour plates. (Grundlehren der mathematischen Wissenschaften, Vol. 295) Hardcover DM 148,- ISBN 3-540-53169-6

Minimal Surfaces II Boundary Regularity

1992. Approx. 360 pp. 57 figs. (Grundlehren der mathematischen Wissenschaften, Vol. 296) Hardcover DM 178,- ISBN 3-540-53170-X

Minimal Surfaces I is an introduction to the field of minimal surfaces and a presentation of the classical theory as well as of parts of the modern development centered around boundary value problems. Part II leads the reader up to the regularity theory for nonlinear elliptic boundary value problems illustrated by a particular and fascinating topic. There is no comparably comprehensive treatment of the problem of boundary regularity of minimal surfaces available in book form. This long-awaited book is a timely and welcome addition to the mathematical literature.



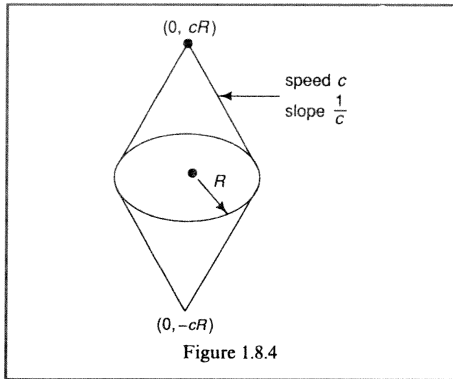
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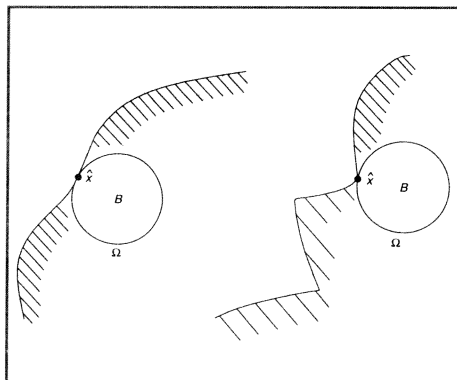


M. Renardy, R.C. Rogers

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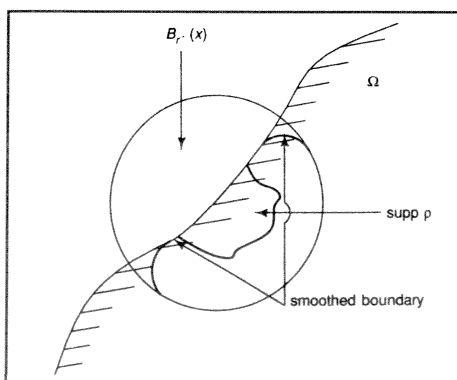


J. Rauch

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1991. X, 263 pp. 42 figs. (Graduate Texts in Mathematics, Vol. 128) Hardcover £ 36.50 ISBN 3-540-97472-5

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