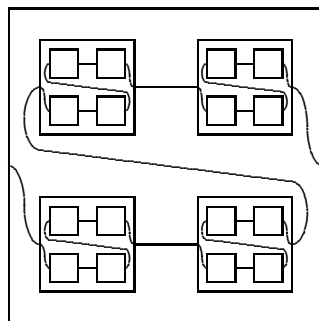


**Department of Mathematics and Statistics
University of Helsinki
Annual Report 2008**



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EDITED BY
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Helsinki, February 2010

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1. OVERALL VIEW

The Department of Mathematics and Statistics of the University of Helsinki is situated in two faculties, the Faculty of Science and the Faculty of Social Sciences. In July 2004 the department moved to new premises, the Exactum building (Gustaf Hällströmin katu 2b) in the Kumpula Campus. The department also has two offices in the premises of the Faculty of Social Sciences (Unioninkatu 37).

In 2008 the teaching faculty comprised a full time staff of 46; this consists of 20 professors, 19 university lecturers, and 7 assistants, senior assistants, doctor-assistants, postdoctoral researchers, university instructors, or instructors. There were about 10–15 teachers on a part-time basis. The department had 90 docents (in 2008, five new docents were appointed). The department accommodates researchers and foreign visiting scholars funded by the Academy of Finland and other external sources. The administrative and technical staff consists of 14 persons.

The department admits annually around 250–300 students to the mathematics or statistics programme. The name of the degree depends on the faculty the student has entered. In the Faculty of Science the degrees are the B.Sc., M.Sc., Ph.Lic., and Ph.D. degrees. In the Faculty of Social Sciences the degrees are the B.Soc.Sc., M.Soc.Sc., Lic.Soc.Sc., and D.Soc.Sc. degrees. In the new two-cycle degree system, adopted by the University of Helsinki at the beginning of the autumn term 2005, students in the mathematics programme can choose for the M.Sc. degree between three major subjects: mathematics, applied mathematics, and mathematics teacher. In the statistics programme the major subject for the M.Sc. and M.Soc.Sc. degrees is statistics. At the beginning of the autumn term 2006, the Faculty of Science introduced the bioinformatics major subjects within the statistics and computer science programmes, but at the beginning of the autumn term 2007 they were phased out and instead merged in the major subject of the new Master’s Degree Programme in Bioinformatics. The structuring of the studies of statistics by the Faculty of Science also included the start of the new Master’s Degree Programme in Bayesian Statistics and Decision Analysis with statistics as the major subject at the beginning of the autumn term 2007.

In the fall term 2008, 1528 students were majoring in mathematics or statistics. In addition there were 116 postgraduate students. Of the postgraduate students 58 worked at the department as assistants or as researchers financed by the university, the Academy of Finland, the graduate schools, or a private grant. During the year, 107 students took M.Sc. degree in mathematics and none in statistics, 7 took Ph.Lic. degree in mathematics and 1 in statistics, and 4 took Ph.D. degree in mathematics, 1 in applied mathematics, and 1 in statistics. In statistics, 7 students took M.Soc.Sc. degree, 1 took Lic.Soc.Sc. degree, and 1 took D.Soc.Sc. degree. The total amount of credit points (in the old system of so called study weeks) awarded to students was 21968.

The department gives ancillary courses in mathematics and statistics for students of physics, chemistry, and computer science. Students in many other degree programmes, in all the faculties, take mathematics and statistics courses as well. This strong methodological and service character of the department is reflected in the fact that over fifty percent of the yearly credit points are attributed to students minoring in mathematics or statistics.

In 2008 the department was participating in seven Graduate Schools: mathematical analysis and its applications; inverse problems; mathematical logic and alge-

bra; stochastics and statistics; computational biology, bioinformatics, and biometry; computational methods of information technology; and population genetics.

In the teaching of applied mathematics the department has cooperated with some industrial companies. The department has a postgraduate programme in industrial mathematics which is a part of the European programme ECMI.

The main research areas at the department are analysis, mathematical physics, transformation groups, mathematical logic, stochastics, and statistics. The staff of the department took part in 32 research projects funded by the Academy of Finland and in four network projects funded by the European Union.

In the year 2000 an evaluation of research was carried out by the Academy of Finland in all mathematics departments in Finnish universities. To quote the report of the evaluation panel, “the University of Helsinki is clearly the leading Finnish center of research in pure mathematics, due to its overall size and the presence of several strong groups”. In the year 2005 an evaluation of research during 1999–2004 was carried out in the whole University of Helsinki. The Department of Mathematics and Statistics achieved the highest grade. Researchers of the department take part in two Centres of Excellence in research selected by the Academy of Finland: the Research Unit of Analysis and Dynamics and the Finnish Centre of Excellence in Inverse Problems. In these the department is the co-ordinating partner.

In 2008 the researchers of the department published 124 refereed papers in journals and conference proceedings. Research to appear soon, or surveyed, was reported in 23 preprints or working papers and 90 communications in mathematical or statistical meetings and foreign seminars. The department has a preprint series of its own; in 2008 there appeared numbers 474–490.

The library of the former Department of Mathematics and main part of the library of the former Department of Statistics are now part of the Kumpula Science Library. In 2008 the accumulation of new mathematical or statistical books was 561 copies and the whole science library received 1100 titles of periodicals and reports, from which about 200 were in mathematics or statistics. Over 250 titles in mathematics or statistics are available in digital form. The library, being the largest mathematical library in Finland, also serves other Finnish universities.

The department has about 280 microcomputers, of which 25 are available to the students in a microcomputer classroom. The computers are in daily use for text processing, typesetting, communication with foreign research institutions, and running mathematical or statistical programs, numerical or symbolical.

The international journal *Annales Academiæ Scientiarum Fennicæ Mathematica* is edited in the department. The Finnish Mathematical Society has its office at the department. Teachers of the department have been responsible for the national activity of the International Mathematical Olympiads (IMO).

The department has representatives in various national organizations, for example in the Research Council for Natural Sciences and Engineering, and in the Matriculation Examination Board. There are also many international organizational contacts. The department has a member in the Board of the Mittag-Leffler Institute (Sweden) since 1986. The European Mathematical Society (EMS) is registered in Finland and has its office at the department.

In 2008 two students of the department participated in the ERASMUS student exchange program.

2. STAFF

2.1. REGULAR STAFF

Pure and applied analysis.

Astala, Kari, Ph.D., Professor, Academy Professor
 Harjulehto, Petteri, Ph.D., Postdoctoral Researcher
 Holopainen, Ilkka, Ph.D., University Lecturer, Acting Professor
 Hurri-Syrjänen, Ritva, Ph.D., University Lecturer, Acting Professor
 Koskenoja, Mika, Ph.D., Doctor-assistant, University Lecturer
 Kupiainen, Antti, Ph.D., Professor, Academy Professor
 Martio, Olli, Ph.D., Emeritus Professor
 Mattila, Pertti, Ph.D., Professor
 Mickelsson, Jouko, Ph.D., Professor, Senior Scientist
 Näätänen, Marjatta, Ph.D., Emerita Senior Lecturer
 Ola, Petri, Ph.D., University Lecturer
 Päivärinta, Lassi, Ph.D., Professor
 Partanen, Juha V., Ph.D., Instructor
 Rickman, Seppo, Ph.D., Emeritus Professor
 Saksman, Eero, Ph.D., Professor
 Seppälä, Mika, Ph.D., Professor
 Taskinen, Jari, Ph.D., University Lecturer
 Tukia, Pekka, Ph.D., Professor
 Tylli, Hans-Olav, Ph.D., University Lecturer
 Väisälä, Jussi, Ph.D., Emeritus Professor

Topology and algebra.

Elfving, Erik, Ph.D., Acting Doctor-assistant, Acting Assistant
 Honkasalo, Hannu, Ph.D., Docent, Head of Office
 Illman, Sören, Ph.D., Professor (Swedish)
 Junnila, Heikki, Ph.D., University Lecturer
 Luukkainen, Jouni, Ph.D., Acting Senior Assistant, University Instructor
 Pihko, Jukka, Ph.D., Emeritus Instructor
 Suominen, Kalevi, Ph.D., Emeritus Professor

Mathematical logic.

Hellsten, Alex, Ph.D., Acting Doctor-assistant, Acting University Lecturer
 Huuskonen, Taneli, Ph.D., Docent, Teaching Assistant
 Hyttinen, Tapani, Ph.D., University Lecturer
 Kennedy, Juliette, Ph.D., Acting University Lecturer
 Luosto, Kerkko, Ph.D., Docent, Acting University Lecturer
 Oikkonen, Juha, Ph.D., University Lecturer
 Väänänen, Jouko, Ph.D., Professor

Stochastics.

Gasbarra, Dario, Ph.D., Acting University Lecturer
 Nummelin, Esa, D.Tech., Professor
 Nyrhinen, Harri, Ph.D., University Lecturer
 Sottinen, Tommi, Ph.D., University Lecturer

Statistics.

Ekholm, Anders, Ph.D., Emeritus Professor
 Koistinen, Petri, D.Tech., Postdoctoral Researcher, Acting University Lecturer,
 Fee-paid Teacher
 Laaksonen, Seppo, Ph.D., Professor
 Lehtonen, Risto, Ph.D., Professor, Research Professor
 Miettinen, Jarkko, Lic.Soc.Sc., M.Sc. (Econ.), Assistant
 Mustonen, Seppo, Ph.D., Emeritus Professor
 Niemi, Hannu, Ph.D., Professor
 Pere, Pekka, Ph.D., University Lecturer
 Puranen, Juha, Lic.Soc.Sc., Emeritus Senior Lecturer
 Saikkonen, Pentti, D.Soc.Sc., Professor
 Tarkkonen, Lauri, D.Soc.Sc., Emeritus Professor
 Valaste, Maria, M.Soc.Sc., Project researcher, Fee-paid Teacher
 Vehkalahti, Kimmo, D.Soc.Sc., University Lecturer

Biomathematics and biometry.

Arjas, Elja, Ph.D., Professor
 Auranen, Kari, Ph.D., University Lecturer
 Corander, Jukka, Ph.D., Docent
 Eerola, Mervi, Ph.D., University Lecturer, Docent
 Geritz, Stefan, Ph.D., University Lecturer
 Gyllenberg, Mats, D.Tech., Professor
 Heikkinen, Juha, Ph.D., University Lecturer, Fee-paid Teacher
 Varvio, Sirkka-Liisa, Ph.D., University Lecturer

Computational data analysis.

Hyvärinen, Aapo, Ph.D., Professor

2.2. OTHER TEACHERS AND RESEARCHERS

Adjangba, Ari Amah, M.Sc., Teaching Assistant
 Ajanki, Oskari, M.Sc. (Eng.), Research Assistant
 Alamäki, Antti, Webmaster
 Ala-Mattila, Vesa, Ph.Lic., Doctoral Student, Teaching Assistant
 Arasola, Mari, Guidance Tutor
 Arponen, Heikki, M.Sc., Doctoral Student
 Bandyopadhyay, Jogia, Ph.D., Postdoctoral Researcher
 Bissell-Siders, Ryan, Ph.D., Doctoral Student
 Blåsten, Eemeli, M.Sc., Research Assistant, Doctoral Student, Teaching Assis-
 tant
 Boldin, Barbara, Ph.D., Postdoctoral Researcher
 Brännström, Niklas, Dr. (Math.), Postdoctoral Researcher
 Cano Arias, Jose Manuel, Ph.D., Postdoctoral Researcher
 Caprotti, Olga, Ph.D., Project Manager
 Cederström, Sebastian, Teaching Assistant
 Chousionis, Vasileios, Ph.D., Doctoral Student
 Clop Ponte, Albert, Ph.D., Postdoctoral Researcher
 Cristina, Jan, B.A. (Math.), Doctoral Student

Cruz Barriguete, Victor, Doctoral Student
 De Simone, Emiliano, Ph.D., Researcher
 Dong, Xiaojin, Fee-paid Teacher
 Eerola, Tapio, M.Sc., Doctoral Student, Teaching Assistant
 Ekonen, Markku, Ph.D., Fee-paid Teacher
 Fang, Chun, M.Sc., Doctoral Student
 Faraco, Daniel, Ph.D., Postdoctoral Researcher
 Feragen, Aasa, Ph.Lic., Doctoral Student
 Filin, Ido, Ph.D., Postdoctoral Researcher
 Granlund, Seppo, Ph.D., Docent
 Grönfors, Markus, Teaching Assistant
 Gupta, Rashi, M.Sc., M.Sc. (Eng.), Doctoral Student
 Haario, Heikki, Ph.D., Docent
 Habimana, Dominique, Research Assistant
 Hagelin, Aki, M.Sc., Teaching Assistant
 Halko, Aapo, Ph.D., Teaching Assistant
 Hämäri, Severi, M.A., Research Assistant, Teaching Assistant
 Hannula, Jani, Guidance Tutor
 Harju, Antti, M.Sc., Teaching Assistant
 Häsä, Jokke, M.Sc., Fee-paid Teacher
 Hautala, Anni, Guidance Tutor
 Heiskanen, Tomi, Ph.Lic., Doctoral Student
 Hella, Lauri, Ph.D., Docent
 Hinkkanen, Eino, Teaching Assistant
 Hirvonen, Åsa, Ph.Lic., Doctoral Student
 Holmström, Lasse, Ph.D., Docent
 Holopainen, Jonathan, Guidance Tutor
 Hou, Yonming, Doctoral Student
 Hoyer, Patrik, Ph.D., Fee-paid Teacher
 Hyhkö, Heikki, Research Assistant
 Hytönen, Tuomas, D.Tech., Postdoctoral Researcher, Fee-paid Teacher
 Jääskeläinen, Jarmo, M.Sc., Doctoral Student, Teaching Assistant
 Järvenpää, Sauli, Teaching Assistant
 Joensuu, Jani, Ph.Lic., Doctoral Student
 Joráti, Hadi, Ph.D., Postdoctoral Researcher
 Kaasalainen, Mikko, Ph.D., Academy Research Fellow
 Kaila, Risto, Ph.D., Teaching Assistant
 Kairema, Anna, M.Sc., Doctoral Student, Teaching Assistant
 Kalliovirta, Leena, Lic.Soc.Sc., Fee-paid Teacher
 Kanerva, Okko, Ph.D., Fee-paid Teacher
 Kankaanpää, Teppo, M.Sc., Doctoral Student, Teaching Assistant
 Karvo, Tiina, Guidance Tutor
 Kempainen, Antti, M.Sc. (Eng.), Doctoral Student, Teaching Assistant
 Kempainen, Mikko, M.Sc., Doctoral Student, Fee-paid Teacher
 Kesälä, Meeri, Ph.D., Postdoctoral Researcher
 Kisdí, Éva, Ph.D., University Researcher, Docent
 Kohonen, Jukka, M.Sc., Doctoral Student, Teaching Assistant
 Komi, Henna, M.Sc., Doctoral Student, Fee-paid Teacher
 Kontinen, Jarmo, M.Sc., Doctoral Student

Kontinen, Juha, Ph.D., Postdoctoral Researcher, Fee-paid Teacher
Kontu, Mari, Guidance Tutor
Korhonen, Juho, Guidance Tutor, Teaching Assistant
Korhonen, Risto, Ph.D., Academy Research Fellow
Korppi, Tuomas, Ph.D., Postdoctoral Researcher, Teaching Assistant
Koskinen, Johanna, Guidance Tutor
Krupchyk, Katsiaryna, Ph.D., Academy Research Fellow
Kulathinal, Sangita, Ph.D., Researcher, Docent
Kulikov, Vadim, Fee-paid Teacher
Laakso, Teemu, M.Sc. (Eng.), Researcher
Lahtinen, Aatos, Ph.D., Emeritus Professor
Laine, Kim, Research Assistant
Laitila, Jussi, Ph.D., Researcher
Lamberg, Lars, Ph.D., University Researcher
Lassas, Matti, Ph.D., Docent
Laurila, Mikko, Guidance Tutor
Lehtinen, Johanna, M.Sc., Trainee
Lehtinen, Matti, Ph.D., Docent
Lehto, Olli, Ph.D., Academician, Emeritus Professor
Lehto, Pertti, Ph.D., Teaching Assistant
Lehto, Saara, M.Sc., Doctoral Student
Lehtonen, Tapani, Ph.D., Docent
Leppäranta, Anna-Riikka, B.Sc., Teaching Assistant, Guidance Tutor
Liesipohja, Susanna, Teaching Assistant, Guidance Tutor
Lindberg, Sauli, M.Sc., Doctoral Student, Teaching Assistant
Lindén, Henri, Ph.D., Researcher, Teaching Assistant
Lipponen, Henri, M.Sc., Doctoral Student, Teaching Assistant
Lipsanen, Jari, MA (Psychology), Teaching Assistant
Liu, Xiaoli, M.Sc., Doctoral Student
Llorente, Marta, Ph.D., Postdoctoral Researcher
Loikkanen, Juha, M.Sc., Researcher
Luisto, Rami, Teaching Assistant, Guidance Tutor
Lukkarinen, Jani, Ph.D., Researcher, Docent
Lyly, Teemu, Guidance Tutor
Määttä, Matti, M.Sc., Research Assistant
Malmivuori, Markku, Ph.D., Teaching Assistant
Marin, Laurent, Doctoral Student
Martin, Jussi, M.Sc., Doctoral Student, Teaching Assistant
Marttinen, Pekka, Ph.D., Doctoral Student
Mei, Peng, Doctoral Student
Meyer, Daniel, Ph.D., Postdoctoral Researcher
Miettinen, Eeva, Guidance Tutor
Moroni, Rossana, Doctoral Student
Muratore-Ginanneschi, Paolo, Ph.D., Senior Researcher
Mutshinda Mwanza, Crispin, M.Sc., Doctoral Student
Myrskylä, Mikko, D.Soc.Sc., Ph.Lic., Postdoctoral Researcher
Nevanlinna, Anni (Lilli), Guidance Tutor
Nieminen, Pekka, Ph.D., Postdoctoral Researcher, Teaching Assistant
Nikula, Miika, Teaching Assistant

Norros, Ilkka, Ph.D., Docent
 Nowling, Sean, Postdoctoral Researcher
 Noykova, Neli, Ph.D., University Researcher
 Nuija, Aleksandr, Doctoral Student, Teaching Assistant
 Nurmi, Ville, M.Sc., Doctoral Student, Teaching Assistant
 Nyberg, Henri, Lic.Soc.Sc., Teaching Assistant
 O'Hara, Robert, Ph.D., Academy Research Fellow
 Oinonen, Lotta, M.Sc., Teaching Assistant
 Ojalainen, Johanna, M.Sc., Researcher
 Oksanen, Susanna, Guidance Tutor
 Ondracek, Petr, M.Sc., Doctoral Student, Teaching Assistant
 Özdamar, Elif Özge, Doctoral Student
 Paajanen, Pirita, Ph.D., Postdoctoral Researcher, Fee-paid Teacher
 Pakkanen, Mikko, M.Sc., Doctoral Student, Teaching Assistant
 Pauna, Matti, Ph.D., Project Planner
 Peltonen, Kirsi, Ph.D., Docent
 Piironen, Petteri, Ph.D., Researcher, Fee-paid Teacher
 Pikkuhookana, Pinja, M.Sc., Researcher
 Pirinen, Matti, M.Sc., Doctoral Student, Teaching Assistant
 Prause, István, Ph.D., Postdoctoral Researcher
 Preoteasa, Diana, M.Sc., Doctoral Student
 Priklopil, Tadeáš, M.Sc., Doctoral Student
 Pulkkinen, Olli, Guidance Tutor
 Ramm-Schmidt, Erik, M.Sc., Doctoral Student, Fee-paid Teacher
 Rand, Heidi, B.Soc.Sc., Teaching Assistant
 Reunanen, Kaisa, B.Sc., Guidance Tutor
 Rontu, Jenny, Guidance Tutor
 Ruokolainen, Juha, Ph.D., Teaching Assistant
 Saarinen, Paula, LUMA project person, Guidance Tutor
 Sagizbaeva, Odenna, M.Sc., Doctoral Student
 Salminen, Jessica, Guidance Tutor
 Salo, Mikko, Ph.D., Postdoctoral Researcher, Academy Research Fellow, Docent
 Service, Robert, Ph.Lic., Doctoral Student, Teaching Assistant
 Sillanpää, Mikko J., Ph.D., Academy Research Fellow, University Researcher
 Sirén, Jukka, M.Sc., Doctoral Student, Teaching Assistant
 Sjölund, Stefan, Teaching Assistant
 Soultanis, Elefterios, Teaching Assistant
 Stenlund, Mikko, Ph.D., M.Sc. (Eng.), Postdoctoral Researcher
 Tähtinen, Vesa, Ph.Lic., Doctoral Student, Teaching Assistant
 Talponen, Jarno, Ph.D., Researcher, Teaching Assistant
 Tang, Jing, M.Sc., Doctoral Student
 Tarvainen, Vilppu, Fee-paid Teacher
 Tevanlinna, Aapo, Teaching Assistant
 Thomas, Andrew, University Researcher
 Tienari, Matti, Ph.D., University Researcher
 Tikkanen, Emmi, B.Soc.Sc., Teaching Assistant
 Tikkanen, Mika, Research Assistant
 Timperi, Kalle, Teaching Assistant, Guidance Tutor
 Toepfer, Eljas, M.Sc., Doctoral Student

Toivanen, Tanja, M.Sc., Doctoral Student
 Törneblom, Eljas, Ph.Lic., Doctoral Student, Teaching Assistant
 Traat, Imbi, Ph.D., Docent
 Tuomi, Lauri, Teaching Assistant
 Tuovinen, Anssi, Guidance Tutor
 Tuovinen, Riikka, Teaching Assistant
 Utz, Margarete, M.Sc., Doctoral Student
 Vähäkangas, Aleks, Ph.Lic., Doctoral Student, Teaching Assistant
 Vähäkangas, Antti, Ph.Lic., Doctoral Student, Teaching Assistant
 Valkeapää, Annukka, M.Soc.Sc., Teaching Assistant (also in 2007)
 Valkeila, Esko, Ph.D., Docent
 Vänskä, Simopekka, Ph.D., Postdoctoral Researcher
 Varila, Nina, Teaching Assistant
 Vehtari, Aki, D.Tech., Docent
 Veijanen, Ari, Dr., University Researcher
 Vesalainen, Esa, Research Assistant
 Vesanen, Petri, M.Sc., Doctoral Student, Teaching Assistant
 Vesanen, Tiina, M.Sc., Fee-paid Teacher
 Vikberg, Thomas, Office Secretary, Guidance Tutor, Teaching Assistant
 Virolainen, Matti, M.Sc., Doctoral Student, Teaching Assistant
 Virtanen, Jani, Ph.D., Postdoctoral Researcher, Fee-paid Teacher
 Vozella, Lara, M.Sc., Doctoral Student
 Vuolle-Apiala, Juha, Ph.D., Docent
 Vuori, Timo, M.Sc., Teaching Assistant
 Vuorinen, Matti, Ph.D., Docent
 Webb, Christian, M.Sc., Doctoral Student
 Weder, Ricardo, Ph.D., University Researcher
 Yan, Ping, Ph.D., Researcher, Teaching Assistant
 Ylinen, Kari, Ph.D., Docent
 Ylinen, Lauri, M.Sc. (Eng.), Doctoral Student

2.3. ADMINISTRATIVE, LIBRARY, AND TECHNICAL STAFF

Hautala, Terhi, M.Sc., Amanuensis
 Honkasalo, Hannu, Ph.D., Head of Office (see also 2.1)
 Laakso, Pirjo, Departmental Secretary
 Nikunen, Martti, Ph.D., Information Technology Specialist at the IT Department
 Nissinen, Piia, Office Secretary
 Pauninsalo, Raili, Departmental Secretary
 Rikkonen, Katriina, M.Sc., Amanuensis
 Rintala, Tiina, M.Sc., LUMA project person, Office Secretary
 Romu, Tiina, Office Secretary
 Salmivaara, Antti, Departmental Secretary
 Taskinen, Matti, D.Sc. (Tech.), Computer Systems Manager
 Tikkanen, Mika, Office Secretary, 2/08-9/08
 Tuohino, Pasi, Department Secretary
 Ulmanen, Riitta, Departmental Secretary

2.4. EDITORIAL STAFF

Riitta Ulmanen (see also 2.3) has been the administrative secretary of the European Mathematical Society and Ph.D. Mika Koskenoja (see also 2.1) the editorial secretary of the *Annales Academiae Scientiarum Fennicae Mathematica*.

3. EDUCATION

3.1. STUDENTS

Students majoring in mathematics or statistics are admitted in the degree programme in two ways, firstly on the basis of matriculation certificate and secondly via entrance examination. The following table contains the numbers of inscribed majors and the total numbers of majors in mathematics and statistics in 2002–2008.

Year	2002	2003	2004	2005	2006	2007	2008
New majors (Fac. of Sc.)	211	258	281	208	272	241	274
New majors (Fac. of Soc. Sc.)	32	25	33	27	32	15	7
Majors (Fac. of Sc.)	1178	1251	1331	1336	1426	1396	1388
Majors (Fac. of Soc. Sc.)	149	155	174	177	184	171	140

In 2008, there were 116 postgraduate students.

In 2008, 54 foreign students were studying at the department having their major subject in the mathematics programme or in the statistics programme. Of them 30 had the bachelor's degree as goal (3 of them being absent), 6 had the master's degree as goal (1 of them being absent), and 17 had a postgraduate degree as goal; in addition, 1 was studying a certain duration.

3.2. PROGRAMS OF STUDY

At the beginning of the autumn term 2005, the University of Helsinki adopted a new two-cycle degree system, i.e., bachelor–master system, in compliance with the joint European Bologna model. The new credits, the so called study points, correspond to the European system ECTS and replace the old system based on so called study weeks (an old credit was transformed into two new credits). The presentation in Subsections 3.2–3.3 follows the new system.

The department provides the mathematics programme and the statistics programme. The department is situated in two faculties, the Faculty of Science and the Faculty of Social Sciences, and the name of the degree depends on the faculty the student has entered. In the Faculty of Science the degrees are the B.Sc. (Bachelor of Science), M.Sc. (Master of Science), Ph.Lic. (Licentiate of Philosophy), and Ph.D. (Doctor of Philosophy) degrees. In the Faculty of Social Sciences the degrees are the B.Soc.Sc. (Bachelor of Social Sciences), M.Soc.Sc. (Master of Social Sciences), Lic.Soc.Sc. (Licentiate of Social Sciences), and D.Soc.Sc. (Doctor of Social Sciences) degrees.

At the beginning of the autumn term 2006, after an unofficial preliminary arrangement, the Faculty of Science formally introduced statistics as a degree programme, and also this decision is followed below. Before this extension of education, the Faculty of Science awarded postgraduate degrees in biometry, but this will not continue after the spring term 2008.

The major subject for the B.Sc. degree is mathematics or statistics; the major subject for the B.Soc.Sc. degree is statistics. In the mathematics programme the major subject for the M.Sc. degree is mathematics, applied mathematics, or mathematics teacher's education. In the statistics programme the major subject for the M.Sc. and M.Soc.Sc. degrees is statistics.

At the beginning of the autumn term 2006 the Faculty of Science introduced temporarily bioinformatics major subjects within the statistics and computer science programmes with a special student admission, but at the beginning of the autumn term 2007 they were phased out and instead merged in the major subject of the new Master's Degree Programme in Bioinformatics.

In order to be awarded the B.Sc. or the B.Soc.Sc. degree, a student must complete 180 credits of studies. Bachelor's degree is a prerequisite for Master's degree. In order to be awarded the M.Sc. or the M.Soc.Sc. degree, a student must complete 120 credits of studies. Bachelor's degree can be reached in 3 years of full-time study. Master's degree usually demands two more years.

A typical mathematics course is worth 10 credits and consists of 50–60 lectures (a lecture lasts 45 minutes) and 20–30 hours of problem solving classes in small groups. Some courses are taught also in Swedish or English.

Teacher's education includes some didactic studies which are carried out at the Department of Applied Sciences of Education within the Faculty of Behavioural Sciences of the university.

Beyond these degrees there are two postgraduate degrees, the Licentiate's degree, which is optional or aims at professional specialization, and the Doctor's degree, of which the latter has higher quality requirements.

For the B.Sc. degree in mathematics, the requirements are as follows (c for credit):

Mathematics	≥ 80 c
Minor subjects	≥ 50 c
General studies	15–17 c;

the total must be at least 180 c. The mathematics studies consist of the basic studies (25 c) and the intermediate studies (≥ 55 c). At least one minor subject is required, each of them of at least 25 c; typical choices are computer science, the physical sciences, chemistry, statistics, and theoretical philosophy; a module of methodological sciences (computer science and statistics) is also possible. In teacher's education the minor subjects include the basic and intermediate studies (60 c) in the second subject to be taught and 25 c of basic pedagogical studies. Every student writes a Bachelor's thesis (6 c).

For the M.Sc. degree in mathematics or applied mathematics it is needed at least 90 c of advanced studies in the major subject. There are four specialty lines in mathematics: algebra and topology, analysis, mathematical logic, and mathematical physics. There are five specialty lines in applied mathematics: applied analysis, biomathematics, computer-aided mathematics, insurance and finance mathematics, and stochastics. For the M.Sc. degree in mathematics teacher's education it is needed at least 70 c of advanced studies in the major subject and 35 c of intermediate pedagogical studies. The general studies comprise 2–5 c. The total must be at least 120 c, with more studies in the major subject or in the minor subject(s). A Master's thesis (40 c) is required as a part of the advanced studies of the major subject.

In the mathematics programme the major subject in the postgraduate degrees Ph.Lic. and Ph.D. can be mathematics or applied mathematics. A relevant M.Sc. level degree is a prerequisite. For each postgraduate student, an individual study programme is designed outlining the field of specialization, the topic of the thesis and the contents and schedule of the other required studies. A supervisor is also assigned to each student.

The requirements for the Ph.Lic. degree are as follows:

1. Studies in the research subject 50 c and general postgraduate studies 10 c.
2. Ph.Lic. thesis.

The requirements for the Ph.D. degree are as follows:

1. A Ph.Lic. degree in mathematics or applied mathematics, or part 1 of the requirements for Ph.Lic.
2. Ph.D. thesis.

For the B.Sc. and B.Soc.Sc. degrees in statistics, the requirements are as follows:

Statistics	≥ 80 c
Minor subjects	≥ 50 c
General studies	17–19 c;

the total must be at least 180 c. The statistics studies consist of the basic (25 c) and the intermediate (≥ 55 c) studies. At least one minor subject is required, each of them of at least 25 c. Mathematics is required as a minor subject with the courses (30 c) Analysis I–II (or equivalents of them) and Linear algebra and matrices I–II. Other recommended secondary subjects are for example computer science, social sciences, psychology, medicine, ecology and systematics, and the biosciences; a module of methodological sciences (computer science and mathematics) is also possible. Every student writes a Bachelor’s thesis (6 c). The only difference between the two degrees is in the required language studies.

For the M.Sc. and M.Soc.Sc. degrees in statistics it is needed at least 85 c of advanced studies in the major subject. There are three specialty lines in statistics: biometry, social statistics (earlier: measurement and survey methodology), and time series analysis and econometrics. The biometry specialty line is divided into three sublines: bioinformatics and statistical genetics, environmental statistics, and medical statistics. The general studies comprise 1–5 c. The total must be at least 120 c, with more studies in the major subject or in the minor subject(s). A Master’s thesis (40 c) is required as a part of the advanced studies of the major subject.

The Faculty of Science also has the Master’s Degree Programme in Bayesian Statistics and Decision Analysis (EuroBayes) with statistics as its major subject. The programme is implemented as joint effort of six European universities. At the University of Helsinki the programme is coordinated by the Department of Mathematics and Statistics. The first student admission took place for the autumn term 2007. The degree requirements are 120 c advanced studies in the area, including an M.Sc. thesis of 40 c and general studies of 2–4 c.

The M.Sc. degree in bioinformatics can be earned in the Master’s Degree Programme in Bioinformatics, organized jointly by the University of Helsinki and Helsinki University of Technology. The first student admission took place for the autumn term 2006. In the major subject it is needed a minimum of 70 c of advanced studies in bioinformatics, including an M.Sc. thesis of 40 c. In the minor subjects,

the requirements are such that the B.Sc. and M.Sc. degrees must totally contain a minimum of 25 c of biology, medicine or other suitable subject and a minimum of 60 c of mathematics, statistics, and computer science, and of these a minimum of 40 c must be in the M.Sc. degree itself. The general studies are 2–4 c.

In the statistics programme the major subject in the postgraduate degrees Ph.Lic., Lic.Soc.Sc., Ph.D., and D.Soc.Sc. is statistics. A relevant M.Sc. or M.Soc.Sc. level degree is a prerequisite. For each postgraduate student, an individual study programme is designed outlining the field of specialization, the topic of the thesis and the contents and schedule of the other required studies. A supervisor is also assigned to each student.

The requirements for the Ph.Lic. and Lic.Soc.Sc. degrees are as follows:

1. Studies in the research subject 50 c and general postgraduate studies 10 c.
2. Ph.Lic. or Lic.Soc.Sc. thesis.

The requirements for the Ph.D. and D.Soc.Sc. degrees are as follows:

1. A Ph.Lic. or Lic.Soc.Sc. degree in statistics, or part 1 of the requirements for Ph.Lic. or Lic.Soc.Sc.
2. Ph.D. or D.Soc.Sc. thesis.

3.3. COURSES

The following is a list of all courses and seminars in 2008. The number of (ECTS) credits for each course is given in parentheses.

3.3.1. MATHEMATICS

BASIC AND INTERMEDIATE STUDIES

Review of high school mathematics.

Getting acquainted with mathematics (5): This course is intended for mathematics minors.

Single variable calculus (10): This course is intended for mathematics minors.
Teached in a virtual form.

Mathematical analysis (10): This course is intended for students of the Faculty of Social Sciences.

Mathematical analysis, continuation course (10): This course is intended for students of the Faculty of Social Sciences.

Analysis I (10): Elementary analysis in one real variable.

Analysis II (10): Elementary analysis in one real variable.

Linear algebra and matrices I and II (5 + 5): Elementary theory of real vector spaces, linear mappings, and matrices.

Algebra I (10): Elements of set theory. Introduction to some algebraic structures such as groups, rings, fields, and polynomial rings.

Topology I (10): Elements of point set topology with emphasis on euclidean and metric spaces.

Vector analysis (10): Elementary analysis in several variables.

Differential equations I and II (5 + 5): Elementary theory of ordinary differential equations.

Introduction to probability theory (5): Probability, random variables.

Introduction to discrete mathematics (5): Elementary set theory, relations, func-

tions, induction, combinatorics, graph theory. Intended in particular for students of computer science.

Logic I (10): Introduction to propositional logic and predicate logic.

Elements of set theory.

Group theoretical aspect to the Rubik cube.

Mathematical methods for scientists (10): Basic numerical methods using Matlab.

Mathematical typesetting in LaTeX.

Introduction to number theory (10).

Elementary introduction to complex numbers (3).

History of mathematics (3).

Bachelor's theses seminar in mathematics (3).

ADVANCED STUDIES

Algebra and topology:

Algebra II (10).

Topology II (10).

Topology III (10).

Algebraic topology.

Topological transformation groups I (10).

Alexander–Spanier cohomology (3).

Group theory (8-10).

Analysis:

Measure and integral (6).

Real analysis I (6).

Function theory I (10): Introduction to the theory of functions of a complex variable.

Function theory II.

Functional analysis (10).

Real analysis II (10).

Geometric measure theory.

Harmonic measure (10).

Harmonic maps II.

Martingales and harmonic analysis.

Function spaces.

Operator algebras.

Hyperreal numbers.

Topological vector spaces I (5).

Mathematical logic:

Mathematical logic (10).

Dependence logic (10).

Finite-model theory.

Axiomatic set theory (10).

Model theory (10).

Ramsey theory (10).

Mathematical physics:

Introduction to mathematical physics: Quantum dynamics.

Principal fibre bundles and Yang–Mills theory (10).

Applied analysis:

Advanced course in applied analysis (6): Functional analysis, Fourier series, and differentiable mappings.

Introduction to mathematical projects for industry (8).

Mathematical projects for industry (14).

Partial differential equations (10).

Scattering theory.

Basics of impedance tomography.

Integral equations (5).

Calderón's problem.

Non-classical noises.

Biomathematics:

The mathematics of infectious diseases (10).

Adaptive dynamics (10).

Stochastic population models (10).

Mathematical methods in biology: A course for life scientists.

Computer-aided mathematics:

Numerical methods and C/C++ language.

Insurance and finance mathematics:

Life insurance mathematics (8).

Life insurance mathematics, continuation course (4).

Mathematical finance (10).

Stochastics:

Stochastic processes (6).

Probability theory (8).

Stochastic analysis (10).

Introduction to the large deviations theory (6).

Theory of extreme phenomena (4).

Lévy processes (5).

Mathematics teacher's education:

Advanced course for mathematics teachers (12): Advanced calculus with topology and measure theory organized in a seminar style.

Geometry (10).

Basic concepts of school mathematics (6).

Mathematics teaching laboratory.

Analysis pro gradu seminar.

Seminar "Women in physical and mathematical sciences".

INTENSIVE COURSES (MAINLY FOR THE GRADUATE SCHOOLS)

Berezin transform in polynomial Bergman spaces and fluctuations of eigenvalues of random normal matrices.

GRADUATE SEMINARS

Transformation groups.
 Analysis.
 Functional analysis.
 Geometric analysis.
 Logic.
 Finite model theory.
 Mathematical physics.
 Geometry, topology, and physics.
 Inverse problems.
 Insurance mathematics.
 Stochastics.
 Random graphs.
 Graduate students' seminar.

3.3.2. STATISTICS

BASIC AND INTERMEDIATE STUDIES

Introduction to statistics (4/10): This course is intended for statistics minors.
 A second course in statistics (10): This course is intended for statistics minors.
 Introduction to statistical inference (5): Introduction to mathematical statistics.
 Parameter estimation.
 Data analysis (4/8).
 Course in probability (10).
 Statistical inference (10).
 Linear models (5).
 Sampling methods (6/8).
 Applications of linear models (6/8).
 Statistics in practical research (8/10).
 Frequency data and nonlinear multivariate analysis (5/10).
 Symbolic data analysis.
 Software tools/introduction to using the R software.
 Elementary Bayesian analysis (9).

ADVANCED STUDIES

General statistics:

A second course in statistical inference (10).
 Generalized linear models (5–8).
 Multivariate methods (5/10).
 Causal analysis (4-6).

Biometry:

Stochastic modelling.
 Hierarchical models (6–10).
 Analysis of infectious disease data (6).
 Practical course on phylogenetic analysis.
 Statistical methods in genetics (6-8).
 Event-history analysis (6-8).

Bayesian paradigm in genetic bioinformatics (6).

Statistical methods for association mapping.

Spatial analysis of area data.

Measurement and survey methodology:

Imputation methods/a course and a workshop.

Survey methodology (6/8).

Analysis of sampling data (6/8).

Time series and econometrics:

Multivariate time series (8/10).

Theory of regression analysis, continuation course (5).

GRADUATE SEMINARS

Biometry/reading group.

Biomathematics and biometry.

Neuroinformatics: Advanced data analysis methods in brain imaging (3).

Bachelor's and Master's theses seminar (1/4).

Survey methodology.

Statistical computing (SURVO).

Time series analysis and econometrics.

3.4. TEACHING, STUDIES, AND GRADUATES

This subsection is based on the old degree, credit point, and curriculum system that was in effect until autumn 2008 on those students that began their studies before autumn 2005 and so choose. The old system was explained in Subsection 3.2 of the Annual Report 2004 of the Department of Mathematics and Statistics, University of Helsinki.

The total amounts of credit points awarded by the department in 2002–2008 are shown in Table 1.

Table 1. Credit points awarded to students

Year	2002	2003	2004	2005	2006	2007	2008
Credits (Fac. of Sc.)	13198	13210	18121	17035	16150	15309	15821
Credits (Fac. of Soc. Sc.)	6681	7339	6870	6324	5327	6319	6147

The numbers of M.Sc. theses in each curriculum of the mathematics programme in 2001–2008 are given in Table 2. The number of graduates is rather low as compared with the student intake. One reason for this is the nature of mathematics, which makes great demands on the students. Another reason for the drop-out is that many students are not intending to graduate in mathematics but rather use the first year mathematics studies as a preparation for admission to other degree programmes or universities.

Table 2. Numbers of M.Sc. theses per curriculum (mathematics programme)

Year	2001	2002	2003	2004	2005	2006	2007	2008	All
Mathematics	8	9	20	14	10	15	15	19	110
Applied math.	4	6	5	18	8	10	9	25	85
Computer math.	4	2	2	1	2	2	4	1	18
Teacher's	21	12	16	23	32	24	39	47	214
All	37	29	43	56	52	51	67	92	427

The number of M.Sc. theses in statistics was 1 in 2006, 0 in 2007, and 0 in 2008. The number of M.Soc.Sc. theses in statistics was 6 in 2004, 7 in 2005, 7 in 2006, 12 in 2007, and 5 in 2008.

Table 3 includes the numbers of postgraduate theses in 2000–2008 in the Faculty of Science side of the department (in 2000–2003 Department of Mathematics and Rolf Nevanlinna Institute together).

Table 3. Numbers of Ph.Lic. and Ph.D. theses

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	All
Ph.Lic.	4	10	6	9	4	2	7	8	4	54
Ph.D.	4	3	8	4	8	9	10	8	6	60

The number of Lic.Soc.Sc. theses in statistics was 1 in 2004, 0 in 2005, 1 in 2006, 1 in 2007, and 1 in 2008. The number of D.Soc.Sc. theses in statistics was 1 in 2004, 0 in 2005, 0 in 2006, 1 in 2007, and 1 in 2008.

M.SC. THESES

M.SC. THESES IN MATHEMATICS CURRICULUM

Ari Amah Adjangba: The virtual isomorphism problem for finitely generated groups

Janne Estill: Lefschetzin kiintopistelauseesta

Antti Harju: On the anomalies in noncommutative gauge field theories

Jokke Häsä: Ankanan pakotuksen aksiooman vaikutus kontinuumiongelman

Ville Havia: Kaksi menetelmää Pellin yhtälön ratkaisemiseksi

Juuso Heinisuo: Analyttinen Radon–Nikodym-ominaisuus Banach-avaruuksille

Jouni Karhima: Ehrenfeucht–Fraïssé -pelin algoritmista ratkaisemisesta

Jaakko Kourula: Reaalilukujen satunnaisuus — Martin-Löfin ja Schnorrin määritelmät

Vadim Kulikov: Weak Ehrenfeucht–Fraïssé games

Titta Kutvonen-Lappi: Kvasihyperbolisen reunaehdon toteuttavista alueista

Juho Laakkonen: Reaalisuljettujen kuntien ratkeavuus

Miika Nikula: Yhdesti yhtenäisen tasojoukon Bergmanin avaruuden dualiteetista

Antti Perälä: Fredholm theory for Toeplitz operators in Bergman spaces

Jaakko Seppälä: Äärellisten kuntien alkeisteoria

Miikka Silfverberg: Äärellisten ryhmien vaihdannaisuusverkot

Topias Sulkanen: Seifertin–van Kampenin lause

Riikka Tuovinen: Kompositio-operaattorit Bergmanin avaruudessa A^2

Christian Webb: Invariant measures

Nina Ylinen: Homotopiateoria ja solukompleksit

M.SC. THESES IN APPLIED MATHEMATICS CURRICULUM

Leena Antila: Ytimen käsite talousteoriassa ja peliteoriassa

Lari Auvinen: Algoritmi vakuutusyhtiön tarkalle vararikkotodennäköisyydelle etukäteen annetun tarkasteluajan tilanteessa

Eemeli Blåsten: Distribuutioteorian alkeet ja sovellutuksia

Sari Grönbärj: Sisäpiiriläisen optimaalinen sijoitusstrategia arvopaperimarkkinoilla

Eva-Lotta Eskelinen: Nollakuponkijoukkovelkakirjan hinnoittelu

Anna Eteläaho: Korkorakenteet diskreetissä ajassa

Laura Haapala: Tyypin 1 diabeetikoiden lasten lukumäärän ja saanti-ian tilastollinen analyysi

Jonna Hakala: Hattendorffin lause

Henna Hostikka: Haarautumisprosessit

Tommi Hovi: Chain-ladder-menetelmän keskineliövirhe

Jari Inkinen: Audio denoising with wavelets and nonlinear diffusion

Anna Keinänen: Differentiaaliyhtälöt markovilaisissa henkivakuutusmalleissa

Satu Korhonen: Tasapainotilan olemassaolo jälleenvakuutus- ja arvopaperimarkkinoilla

Pekka Koskenkorva: Integral geometry in geometric computer vision

Laura Kurki: Thielen differenssiyhtälöt

Matti Määttä: Uncertainty principle in signal processing

Aino Nyblom: Arvioita vakuutusyhtiön vararikon todennäköisyydelle

Seppo Pulkkinen: A review of methods for unconstrained optimization: theory, implementation and testing

Ruusu Saarinen: Johdatus Calderónin ongelmaan

Veli-Matti Sivonen: Algorithms for unconstrained optimization with performance comparison and C# implementation

Laura Suomi: Bonusten muodostuminen henkivakuutuksessa ja tulevien bonusten ennustaminen

Piia Tantarimäki: Methods to generate a stochastic process with pre-described autocorrelation functions

Tanja Toivanen: Sijoitusriskit vararikkoteoriassa

Pekka Väättäinen: Arbitraasivapaus Markovin ketju -markkinoilla

Tuuli Wiio: Malliavin-laskenta Poisson-avaruudessa ja vakuutusyhtiön riskivaruuden herkkyysanalyysi

M.SC. THESES IN COMPUTER MATHEMATICS CURRICULUM

Johanna Lehtinen: Tietokoneavusteisen matematiikan opetus yläkoulussa

M.SC. THESES IN MATHEMATICS TEACHER CURRICULUM

Vesa Aaltonen: Markovin ketjut

Johanna Elo: Tunteet, itsetunto ja sukupuolierot

Päivi Eronen: Käytännönläheisiä matematiikan tehtäviä peruskoulun 7. luokalle

Maarit Hakkola: Kompleksilukujen perusteet ja opetuspaketti kompleksiluvuista lukiolaiselle itsenäisesti opiskeltavaksi

- Jussi Havia: Epäeuklidiset muunnokset Poincarén kiekossa
- Marke Heijala: Yhtälöiden opettaminen peruskoulussa
- Elina Heikkinen: Kryptografiaa lukiolaisille
- Suvi Helaja: Opialin integraaliepäyhtälö
- Pia Hokkanen: Geometrian opetus Ruotsin lukioissa
- Sari Järveläinen: Matematiikan pääaineopiskelijoiden murtolausekkeiden osaamisesta opintojen alkuvaiheessa
- Paavo Juutilainen: Lyhyen matematiikan ylioppilaskirjoituksista
- Milka Kostilainen: Singulaariarvohajotelma
- Jarmo Lamminmäki: Lukujonot ja sarjat lukion pitkässä matematiikassa
- Toivo Lehtinen: Cantorin joukko
- Jussi Lehtonen: Oppikirja ”Pitkään matematiikkaan!”
- Minna Lehtonen: Erilaisia ajattelutapoja sanallisten matematiikan tehtävien ratkaisuisissa ja kielen merkitys ajatteluun
- Mikael Meinander: Undervisning av plangeometri i grundskolan i årskurserna 7–9
- Ilpo Numminen: Procluksen liialliset oletukset koskien yhdensuuntaisia suoria
- Niina Nurminen: Todennäköisyyslaskennan jatkuvat jakaumat lukion erikoiskurssilla
- Anna Nuutinen: Muuttujanvaihto pintaintegraaleissa
- Maria Öhman: Mikä oli todistettava — Todistusajattelu lukion matematiikan opetuksessa
- Noora Ollikainen: Perusopetuksen yläluokkien geometrian oppikirjojen analyysi ja vertailu: Millaisia ovat Suomen ja Ruotsin kouluissa käytössä olevat geometrian oppikirjat ja miten ne eroavat toisistaan?
- Jukka Pajunen: Jordanin–Hölderin lause
- Kirsi Pennanen: Geometriset konstruktiot ja matemaattinen käsitteenmuodostus
- Marjut Pihala: Lukiomatematiikan pitkän ja lyhyen oppimäärän tarjoamat valmiudet kauppakorkeakoulun pääsykokeeseen valmistautumisessa
- Johanna Pikkarainen: Lukion pitkän matematiikan ”Funktiot ja yhtälöt” -kurssin oppikirjojen vertailu
- Pekka Rajala: Differentiaaliyhtälöiden sarjaratkaisuista
- Tiina Rintala: Kolmiulotteisuuden hahmottaminen eheytyneen opetuksen teemana
- Nina Roini: Raja-arvot ja jatkuvuus lukiossa ja ylioppilaskirjoituksissa
- Marileena Rossi: Matriisilaskennan opetusmoniste
- Tuire Säämänen-Sandelin: Todennäköisyyslaskenta peruskoulussa ja lukiossa
- Antero Saarnio: Fourier-analyysiä Hilbertin avaruudessa L^2
- Markus Sali: p -Laplacen yhtälön ratkaisujen olemassaolo ja yksikäsitteisyys
- Jan-Erik Sandelin: Päättelyn tarkistaminen tietokoneohjelmalla ja tarkistamisen soveltaminen opetusohjelmistossa
- Juha Sipilä: Talousmatematiikan opetusmoniste
- Jussi Sirén: Konkreettinen avaruuskordinaatisto
- Marianne Sjöberg: Tason symmetriaryhmät
- Heini Soppi: Hilbertin paralleeliaksoomaan liittyviä lauseita
- Johannes Sorvali: Kaksipaikkaisen Ramseyn funktion arvot pienillä parametreilla
- Tatu Suomi: Numeeriset menetelmät lukiomatematiikassa

Eero Taipalus: Joukkojen äärettömästä luonteesta
 Juha Tiensuu: Cantorin joukko
 Ville Tilvis: Schrödingerin aaltoyhtälön numeerisia ratkaisumenetelmiä
 Marja Tonttila: Geometria lukion pitkässä matematiikassa — oppikirjavertailu
 Rosa Vedenpää: Compulsory education mathematics curriculum in Finland and Hong Kong
 Pertti Viitamäki: Kompleksilukujen alkeet — lisämateriaali lukiolaiselle
 Marjut Wanberg: Minitorioita eräällä yläkoulun yhdeksännellä luokalla — Esi-
 merkkeinä jakolasku ja yhtälöt

M.SC. THESES IN STATISTICS

M.SOC.SC. THESES IN STATISTICS

Sampo Kantele: Lineaarisen rakenteellisen keskiarvo-mallin laajennus useaan käsittelyryhmään ja soveltaminen kliiniseen tutkimisaineistoon
 Heikki Kunnas: Ekologisen vasteen mallit
 Mikko Muurinen: Interaktiiviset ja dynaamiset web-koropleettikartat terveystietojen visualisoinnissa
 Pekka Rätty: Liikenteen muutoksen estimointi tieverkolle sijoitetun otospistejoukon avulla
 Tarja Tuovinen: Ääriarvomenetelmät sähkömarkkinoiden riskinarvioinnissa

PH.LIC. THESES

Eija Koriseva: Kommutaattorit avaruudessa ℓ^p (mathematics)
 Ahti Mykkänen: Plurisubharmonisista funktioista (mathematics)
 Robert Service: Partial unconditionality and weakly null sequences (mathematics)
 Antti Veilahti: Tannakian formalism applied to the category of mixed Hodge structures (mathematics)

LIC.SOC.SC. THESES

Henri Nyberg: Dynaamiset probit-mallit ja taantumajaksojen ennustaminen (statistics)

PH.D. DISSERTATIONS

Ryan Bissell-Siders: Thesis “On linear order and computation—The expressiveness of interactive computations on linear orders and computations indexed by ordinals”; Department of Mathematics and Statistics, University of Helsinki, 2008, 18 pp., and five articles, totally 130 pp., also in electronic form; public examination 21.11.2008; opponent: prof. Lauri Hella (University of Tampere, Finland); Ph.D. degree in mathematics 19.12.2008.

Vasileios Chousionis: Thesis “Boundedness and convergence of singular integrals on fractal type sets”; Department of Mathematics and Statistics, University of Helsinki, 2008, 16 pp., also in electronic form, and three articles; public examination 22.11.2008; opponent: prof. Guy David (Université Paris-Sud 11, France); Ph.D. degree in mathematics 19.12.2008.

Pekka Marttinen: Thesis “Discovering hidden structures in molecular data using a Bayesian partition model approach”; Department of Mathematics and Statistics, University of Helsinki, 2008, 4+23 pp., also in electronic form, and five articles; public examination 26.9.2008; opponent: prof. Carlo Berzuini (University of Cambridge, UK); Ph.D. degree in statistics 21.11.2008.

Jarno Talponen: Thesis “Convex-transitive Banach spaces and their hyperplanes”; Department of Mathematics and Statistics, University of Helsinki, 2008, 22 pp., also in electronic form, and three articles; public examination 26.6.2008; opponent: prof. (emer.) Richard J. Fleming (Central Michigan University, USA); Ph.D. degree in mathematics 19.9.2008.

Antti Juho Tanskanen: Thesis “Mathematical models on the impact of noise and dyadic molecular structures on the properties of a cardiac myocyte”; Department of Mathematics and Statistics, University of Helsinki, 2008, 65 pp., also in electronic form, and four articles; public examination 15.5.2008; opponent: prof. Daniela Calvetti (Case Western Reserve University, USA); Ph.D. degree in applied mathematics 12.6.2008.

Aleksi Vähäkangas: Thesis “Dirichlet problem at infinity for p -harmonic functions on negatively curved spaces”; Department of Mathematics and Statistics, University of Helsinki, 2008, 4+13 pp., also in electronic form, and three articles; public examination 13.12.2008; opponent: docent Petri Juutinen (University of Jyväskylä, Finland); Ph.D. degree in mathematics 23.1.2009.

D.SOC.SC. DISSERTATIONS

Reijo Sund: Thesis “Methodological perspectives for register-based health system performance assessment—Developing a hip fracture monitoring system in Finland”, STAKES (National Research and Development Centre), Research Report **174**, 2008, 88 pp., also in electronic form, and six articles; public examination 4.4.2008; opponent: prof. Ulrich Rendtel (Freie Universität Berlin); D.Soc.Sc. degree in statistics 12.6.2008.

3.5. FORMS OF TEACHING

The traditional forms of teaching mathematics and statistics are lectures, problem solving classes, and (principally in postgraduate studies) seminars. Teaching applied mathematics and statistics may include study projects applying numerical or statistical computer programs and, in applied statistics, even preparing a net poster. In 2008 there were around 120 small problem solving groups per period convening once a week. In addition to this traditional line, several pilot programmes have been run in recent years to advance teaching and collaboration between students and teachers at the department. Attempts have been made to develop forms of activity which meet students at all stages of their studies. Special effort has been put with great success in teaching the courses for beginning students. This has been done by choice of teachers and by attempts to activate the students during lectures and to meet their needs. Besides this general policy, the following special programmes were active in 2008.

Instruction groups. In connection with the main analysis course (Analysis I–II) the students took part in special instruction groups in addition to usual lectures and problem solving classes. In these groups the students worked together with

the instructor on problems presented *ex tempore*. This activity was the version of tutoring in use for first year students.

Student and teacher tutoring. First year students are gathered in small groups guided by older students. The aim of these groups is to discuss problems of studying mathematics and to encourage the students to study together. Each group has a teacher tutor to give mathematical help when needed.

Study room. There is a special study room where the students can go and study and ask for help from an assistant.

Pro gradu seminar. In statistics it has been an old tradition of the Faculty of Social Sciences to have a Bachelor's and Master's theses seminar.

Study group. In autumn 1998 a new kind of learning environment in mathematics was added. About 30 students started in this programme in autumn 2008. These students study together the central portion of the basic and intermediate level of mathematics. The work is based on approaching entire courses (or mathematics in general) from general phenomena related to their central and most difficult problems. This form of instruction has been directed especially to teacher training.

3.6. EVALUATION OF TEACHING

The department is aware of the importance of regular evaluation of teaching. For some years, the department has carried out evaluation of courses via questionnaires filled in by students.

3.7. EMPLOYMENT PROSPECTS OF GRADUATES

The employment prospects for mathematics and statistics graduates have generally been good and they are expected to remain so. Most mathematicians are employed by teaching in schools, polytechnics, and universities. University teachers are usually also researchers; this is in particular the case with the Department of Mathematics and Statistics. Researchers in applied mathematics often act as consultants in industrial mathematics or participate in research projects of other sciences. Traditionally mathematicians have also worked in insurance companies. There is a growing demand of mathematicians in finance. Statisticians cooperate with researchers of behavioural and social sciences, medicine, ecology, molecular biology, economics, and technical sciences in applying probabilistic modelling and analysing data. Statisticians are needed in enterprises and administration for planning and analyzing activities.

4. RESEARCH

4.1. REVIEW (2005)

During 1999–2004 the department took important new steps by hiring several top professors from other universities in Finland. We are particularly proud of having been able to add Pertti Mattila and Kari Astala from Jyväskylä to our traditionally strong analysis group. Our group in applied mathematics was completely revitalized by the hiring of the inversion theorist Lassi Päivärinta from Oulu and the biomathematician Mats Gyllenberg from Turku. We also hired Mika Seppälä from Florida to reshape our research in computer-aided mathematics. During 2003

preparations were made for a fusion of the Department of Mathematics, the Department of Statistics and the Rolf Nevanlinna Institute (RNI). The fusion took place starting from the beginning of 2004. In this process the large and successful biometry group of Elja Arjas, earlier in the research institute RNI, joined the mathematics and statistics departments. The fusion also brought Pentti Saikkonen, an excellent econometrician, from the Department of Statistics to the ranks of the newly enlarged Department of Mathematics and Statistics. These successful actions, coinciding with a move to the brand new Exactum-building in Kumpula, have put the department on a road to a very bright future. It comes then as no surprise that the results of the department have improved significantly in all fronts. In 2004 we exceeded our goal in doctoral training by 100%. The reshaping of the department has opened new research possibilities. Traditionally there has been a strong group in stochastics (Nummelin) in the department. In the analysis group there is a newborn interest in stochastic methods (Astala, Päivärinta) and these methods are also widely used in mathematical physics (Kupiainen). Since the research of Arjas, Gyllenberg and Saikkonen is close to stochastic analysis, the department is looking forward to creating a very strong group in this area. Recent publications show that this is not only a hope. At the same time the department intends to maintain research in its traditional areas at the top international level. The department co-ordinates the Centre of Excellence in Geometric Analysis and Mathematical Physics.

The department has a large group working on a wide variety of topics in pure and applied mathematical analysis. All subgroups have strong international connections. Quasiconformal mappings (Astala, Martio, Tukia) has been traditionally a very strong area in Helsinki and it continues to be so. The group is working also on many closely related topics, such as applications of quasiconformal mappings to material science, inverse tomography (Astala and Päivärinta) where a long-standing open impedance tomography problem of Calderon was solved, and Kleinian groups and Teichmüller spaces. Gutlyanskiĭ and Martio have found new results on boundary smoothness of conformal mappings. Martio as well as Holopainen and Laakso also work in nonlinear potential theory and analysis in metric spaces. Much of Holopainen's work has been on manifolds and non-euclidean spaces. Various function spaces come up naturally in nonlinear potential theory and the theory of quasiconformal and quasiregular mappings—particular emphasis has been on variable exponent spaces. Mattila moved to Helsinki in 2003. He works in geometric measure theory and its applications to other parts of analysis like analytic capacity and removability problems. Taskinen and Tylli work on functional analysis. The work of Tylli concerns Banach spaces and their operators. With Odell he recently studied weakly compact approximation in Banach spaces. In applied analysis the main research area is inverse problems. Päivärinta and his students have studied inverse boundary value and spectral problems and scattering theory with special emphasis to conductivity problems (medical imaging, geological prospecting) and inverse problems in population dynamics. The group has strong connections to other analysis groups in the department and to the Helsinki University of Technology. Seppälä develops computational approaches to problems in conformal geometry. The central focus has been on Hilbert's 22nd Problem, the Problem of Numerical Uniformization, on Riemann surfaces and algebraic curves.

In mathematical physics Antti Kupiainen's research has dealt with dynamical systems, nonlinear parabolic PDE's and stochastic PDE's. In dynamical systems a

new approach to Kolmogorov–Arnold–Moser theory was developed with Bricmont and Gawędzki and was applied to the construction of invariant tori for PDE’s with postdoc Schenkel. With Bonetto and Lebowitz projections of fractal Sinai–Ruelle–Bowen measures of infinite dimensional hyperbolic dynamical systems were shown to be absolutely continuous w.r.t. Lebesgue measure. With Bricmont and postdoc Lefevere ergodicity and exponential mixing of stochastic 2d Navier–Stokes equation was proved in the so called turbulent situation. With Korvola and Taskinen novel scaling behaviour of front solutions of the fourth order nonlinear Cahn–Hilliard PDE were proved. With Gawędzki et al advection PDE with random scale invariant Hölder continuous and temporally correlated velocity fields was studied and was argued to have various scaling behaviours in the long or short time behaviour of solutions. Jouko Mickelsson, who recently moved permanently to the department, has worked on geometric problems in quantum field theory. With Simon Scott he studied the Segal axiom system on functorial quantum field theory, applied to cases with broken gauge or diffeomorphism symmetries in models in both $1 + 1$ and higher dimensions. With Alan Carey he has worked on gerbes arising from quantum field theory models, applying index theory and representation theory of infinite-dimensional groups. An important application of these ideas is a simple construction of twisted K-theory classes on compact Lie groups using a quantum field theory model.

The stochastic research group (Nummelin, Nyrhinen, Sottinen) has been active in the research of stochastic analysis, theory of finance, theory of Gaussian and self-similar processes, the theory of large deviations, insurance mathematics, Markov chains, and mathematical economics. Specific subjects of study have been the theory of arbitrage pricing, queuing theory, insurance ruin problems, and the theory of economic equilibrium.

In topology, the research group on transformation groups, lead by Illman, has proved the existence and uniqueness of G -equivariant triangulations of smooth manifolds on which an arbitrary Lie group G acts by a proper and smooth action; that every smooth proper G -manifold with compact orbit space has a well-defined simple G -homotopy type and that each G -diffeomorphism between such spaces has equivariant Whitehead torsion equal to zero; the existence of real analytic G -invariant Riemannian metrics; introduction of the strong-weak topology on the set of smooth G -maps between smooth G -manifolds; approximation of smooth G -maps by real analytic G -maps; and that when G is a Lie group each proper locally linear G -manifold has the G -homotopy type of a G -CW complex. Recently there is also renewed interest to attack the famous Hilbert–Smith conjecture. The research group has very good international contacts. Junnila works with topology of Banach spaces. The work is closely related to the theory of renormings. Junnila has studied the weak topology of a Banach space and the weak-star topology of a dual Banach space, and has obtained topological characterizations for several kinds of functional analytic properties that are relevant in renorming theory.

The Helsinki Logic Group, led by Väänänen, is well-known for its own paradigm in game-theoretic model theory that has led to breakthroughs in both the set-theoretically oriented infinitary logic in co-operation with Shelah, Todorcevic and Velickovic, and in the study of generalized quantifiers in finite model theory, in co-operation with computer scientists (Libkin) and philosophers of language (Westerståhl). Another area of logic that has been strongly influenced by this group (Hyttinen) is homogeneous model theory, which generalizes first order model theory

considerably. Shelah-style classification theory for homogeneous classes has been developed. Also geometric stability theory for homogeneous classes is studied leading to co-ordinatization theorem. Several team members are in close co-operation with philosophers in the area of logic and philosophy of mathematics.

In statistics, characteristic to the research of the biometry group, which is a partner in the Centre of Excellence on Population Genetic Analyses, has been its strong emphasis on scientific substance as the most important criterion and motivation for the work. Nearly all papers published by the members of this group involve collaboration with other scientists, mostly with a biological or medical background, and real data. The motivation for this type of work comes from the general perception that thoughtful and skilled mathematical modeling, combined with novel statistical inferential and computational methodology, makes better science. In practice, nearly all work carried out in the group has followed the Bayesian paradigm to statistics, then also involving a strong computational element. The range of topics, as well as the size of the biometry group itself, have grown substantially from the start in 1994, when two graduate students began their study on modeling and analyzing bacterial carriage data provided by the Finnish National Public Health Institute, and their work was supervised by an occasional visitor from the University of Oulu. The biometry group was formally established, then as a part of Rolf Nevanlinna Institute, and got its first regular faculty position in 1997. Currently, the research can be roughly grouped into the following categories: (1) modeling and analysis of infectious diseases, (2) genetic mapping and relationship estimation, (3) modeling and analysis of population size and structure, (4) statistical methodology for functional genomics and proteomics, (5) environmental and ecological modeling and inference, including risk assessment and decision support, (6) event history modeling and data analysis, (7) development of statistical methods, and (8) diverse theoretical contributions to statistical methodology, including graphical probability models, non-parametric Bayesian estimation and smoothing, and martingale and filtering methods.

In another area of statistics, econometrics (Saikkonen, Pere), where the department is a partner in the Centre of Excellence on Economic Structures and Growth, research has focused on the estimation and testing theory of scalar and vector autoregressive models used to model nonstationary trending time series. These models have played a central role in studying long run economic equilibrium relations. New test procedures to discriminate between stationary and so-called (co)integrated time series have been obtained, especially in the presence of structural breaks, and a very general asymptotic estimation and testing theory for cointegrated vector autoregressive models has been developed. A related research area has dealt with nonlinear models for stationary but strongly autocorrelated and possibly conditionally heteroskedastic time series for which a mixture of autoregressive models has been formulated and found empirically promising.

Research in measurement and survey methodology (Laaksonen, Tarkkonen, Vehkalahti) is focused on the measurement errors affecting various statistical models, adjustments due to missingness in survey data using imputation and weighting, variance estimation methods and software tools, multinational sampling designs and cross-country comparisons on wages flexibility using multi-level longitudinal data.

The biomathematics research group led by Gyllenberg, who joined the department in 2004, has on the one hand focused on the mathematical theory of structured

populations and models that explicitly relates evolution by natural selection to population dynamics (ecology). Results on the qualitative behaviour of both finite and infinite dimensional dynamical systems generated by such models have been obtained. On the other hand, Gyllenberg has developed mathematical methods for bacterial taxonomy (classification of bacteria based on genotypic data) and used these methods to challenge the established taxonomy of the family Vibrionaceae. Gyllenberg has also considered mathematical models of human physiology and drug design.

The WebALT research group, lead by Seppälä, investigates with major EU funding, in co-operation with linguists (Carlson), advanced methods to redesign basic mathematics instruction by profiting of the multi-lingual possibilities offered for knowledge management by XML and MathML.

4.2. FUNDED RESEARCH GROUPS

The externally funded research groups and projects in 2008 were the following, in alphabetical order of the responsible director (AF = Academy of Finland, EU = European Union, ME = Ministry of Education, Tekes: Finnish Funding Agency for Technology and Innovation, UH = University of Helsinki).

Centre of population genetic analyses (coordinated by the University of Oulu). *Responsible director:* Arjas. *Funding* (2002–2009): AF, ME.

ComMIT – Graduate School in computational methods of information technology (coordinated by the Helsinki University of Technology). *Responsible director:* Arjas. *Funding* (2002–2008): AF, ME.

Geometric analysis and its applications. *Responsible director:* Astala. *Funding* (2004–2011): AF.

Conformal structures and dynamics. *Responsible director:* Astala. *Funding* (2007–2010): EU.

FiDiPro professor in geometric analysis. *Responsible director:* Astala. *Funding* (2008–2013): AF.

Adaptive dynamics of multi-species systems. *Responsible director:* Geritz. *Funding* (2006–2008): UH.

The mathematical theory of adaptive dynamics of structured populations. *Responsible director:* Gyllenberg. *Funding* (2005–2008): AF.

Structure of the attractor in competitive systems motivated by ecology and evolution. *Responsible director:* Gyllenberg. *Funding* (2006–2009): AF.

Research and education project in industrial mathematics. *Responsible director:* Gyllenberg, Kupiainen, Päivärinta. *Funding* (2006–2010): 100 Years Foundation of Technology Industry.

Variable exponent spaces. *Responsible director:* Harjulehto. *Funding* (2005–2008): AF.

Analysis and metric geometry. *Responsible director:* Holopainen. *Funding* (2008–2011): AF.

Vector-valued singular integrals. *Responsible director:* Hytönen. *Funding* (2007–2009): AF.

New mathematical methods in planetary and galaxy research. *Responsible director:* Kaasalainen. *Funding* (2006–2010): AF

Diofantos approximation and rational iteration in discrete integrability. *Responsible director:* Korhonen. *Funding* (2006–2011): AF.

Homology theory: A nonstandard angle of vision. *Responsible director:* Korppi. *Funding* (2007–2009): AF.

Boundary value problems for overdetermined partial differential equations. *Responsible director:* Krupchyk. *Funding* (2008–2013): AF.

From discrete to continuous models for multiphase flows (coordinated by the Lappeenranta University of Technology). *Responsible director:* Kupiainen. *Funding* (2005–2009): Tekes.

Mathematical physics. *Responsible director:* Kupiainen. *Funding* (2002–2009): AF.

Finnish Centre of Excellence in Analysis and Dynamics Research. *Responsible director:* Kupiainen. *Funding* (2008–2013): AF, UH.

Co-operation for expanding the capacity in education and reseach on survey sampling and related statistical applications. *Responsible director:* Lehtonen. *Funding* (2007–2008): Nordic Council of Ministers.

Advanced methodology for European Laeken indicators. *Responsible director:* Lehtonen. *Funding* (2008–2010): EU.

Mathematical theory of energy transport for weakly perturbed wave equations. *Responsible director:* Lukkarinen. *Funding* (2008–2012): AF.

MALJA – Graduate School in mathematical logic (coordinated by the University of Tampere). *Responsible director:* Luosto. *Funding* (2003–2009): ME, AF.

Geometrical analysis in Lie groups and applications. *Responsible director:* Mattila. *Funding* (2006–2009): EU.

Geometric problems of quantum field theory. *Responsible director:* Mickelsson. *Funding* (2007–2010): AF.

Mathematics magazine Solmu — research and development project. *Managing director:* Näätänen. *Funding* (1998–2012): Wihuri foundation (AF, LUMA project, Finnish Cultural Foundation).

Large deviations and stochastic analysis and their applications to insurance mathematics, mathematical finance, and mathematical economics. *Responsible director:* Nummelin. *Funding* (2007–2009): AF.

Acquiring literature in actuarial and finance mathematics. *Responsible director:* Nyrhinen. *Funding* (2008–2010): The Foundation for Promotion of the Actuarial Profession (Helsinki).

Statistical modelling of ecological and genetic data. *Responsible director:* O'Hara. *Funding* (2004–2009): AF.

Growth of subgroups and representations and the related zeta functions. *Responsible director:* Paajanen. *Funding* (2008–2010): AF.

Inverse problems and reliability of models (coordinated by the Lappeenranta University of Technology). *Responsible director:* Päivärinta. *Funding* (2005–2011): Tekes.

Inverse problems in electromagnetics and image processing. *Responsible director:* Päivärinta. *Funding* (2005–2008): AF.

Finnish Centre of Excellence in Inverse Problems. *Responsible director:* Päivärinta. *Funding* (2006–2011): AF, Tekes, UH.

Graduate School in inverse problems. *Responsible director:* Päivärinta. *Funding* (2006–2013): ME, AF.

The 7th international conference on function spaces, differential operators and nonlinear analysis: FSDONA2008. *Responsible director:* Päivärinta. *Funding* (2008): Finnish Academy of Science and Letters, Federation of Finnish Learned Societies, Rolf Nevanlinna Institute.

Stochastic and harmonic analysis, interactions and applications. *Responsible director:* Saksman. *Funding* (2006–2009): AF.

Inverse problems in electromagnetics and seismology. *Responsible director:* Salo. *Funding* (2008–2013): AF.

eContentPlus Program Thematic Network Joining Educational Mathematics (JEM). *Responsible director:* Seppälä. *Funding* (2006–2009): EU.

Unified analysis of complex traits: phenotypes, multilocus markers, and gene expression microarrays. *Responsible director:* Sillanpää. *Funding* (2003–2009): AF.

Elliptic boundary value problems in domains with cusps. *Responsible director:* Taskinen. *Funding* (2008–2009): AF.

Graduate School in mathematical analysis and its applications. *Responsible director:* Tylli. *Funding* (2007–2013): ME, AF.

Logic and its applications. *Responsible director:* Väänänen. *Funding* (1998–2011): (UH,) AF.

Spectral theory of Toeplitz operators and matrices. *Responsible director:* Virtanen. *Funding* (2005–2009): AF.

4.3. EVALUATION OF RESEARCH

In the year 2000 an evaluation of research was carried out by the Academy of Finland in all mathematics departments in Finnish universities. The following is a quotation from the report of the evaluation panel:

“The University of Helsinki is clearly the leading Finnish center of research in pure mathematics, due to its overall size and the presence of several strong groups. By far the strongest and largest of these groups are the analysts, who can

count a commanding presence in areas relating to quasiconformal mapping. Here Martio leads a distinguished group in partial differential equations. The geometry of quasiconformal maps is represented by a deep and excellent group that includes a world leader in Tukia. The analysts also have a good presence in function spaces and functional analysis. Kupiainen is probably Finland's most famous mathematician at the moment. He is to be congratulated for a rapidly developing and extremely active and internationally recognized group in mathematical physics. This has brought an entirely new field to Finland. Väänänen leads a rather large group of logicians. This group is of very high quality and has managed to develop strong international contacts and collaborations. Illman leads a small but highly respected team in transformation groups."

In the year 2005 an evaluation of research during 1999–2004 was carried out in the whole University of Helsinki. The assessment was supervised by the Research Council of the University. The international panels were appointed by the Rector on the proposal of the Research Council.

The Department of Mathematics and Statistics achieved the highest grade in this evaluation. In the previous research assessment in 1999 the Department of Mathematics and the Department of Statistics were evaluated separately; the former obtained the highest grade. From the present assessment report:

"The grade has been given taking into account that the majority of the submitted publications are of a high international level and most others are of a good international level. Some of the research done in the Department is very strong, on a top European or world class level. In particular this applies to parts of the research in pure and applied analysis and in mathematical physics. It also applies to logic and parts of the research in statistics and biomathematics. The panel notes, however, that the Helsinki Department cannot be considered to be on the level of the best European mathematics departments, the reason being that major areas of mathematics are not covered. . . . the committee felt that an attempt to recruit more widely should be made."

In 2001, the Research Unit of Geometric Analysis and Mathematical Physics was selected by the Academy of Finland as a centre of excellence in research for the years 2002–2007. The unit was a joint venture with the Department of Mathematics and Statistics at the University of Jyväskylä. Two of the three teams of this research unit worked in Helsinki, the Mathematical Physics group of Antti Kupiainen and the group of Olli Martio working on Nonlinear PDE's and Metric Concepts in Analysis. The unit was headed by Pertti Mattila.

In 2007, the Research Unit of Analysis and Dynamics was selected by the Academy of Finland as a centre of excellence in research for the years 2008–2013. The unit is a joint venture with the Department of Mathematics and Statistics at the University of Jyväskylä. The unit is headed by Antti Kupiainen.

In 2005, the Research Unit of Inverse Problems was selected by the Academy of Finland as a centre of excellence in research for the years 2006–2011. The unit is a joint venture with the Universities of Kuopio and Oulu and the Helsinki, Lappeenranta, and Tampere Universities of Technology. The unit is headed by Lassi Päiväranta; other senior researchers at the department are Mikko Kaasalainen and Petri Ola.

The Statistical Genetics research group lead by Elja Arjas is a partner in the Centre of Population Genetic Analyses, which in 2002–2007 was a national centre

of excellence funded by the Academy of Finland. The Econometrics research group is a partner in the Research Unit of Economic Structures and Growth, which in 2002–2007 was a national centre of excellence funded by the Academy of Finland.

5. PUBLICATIONS

All printed research publications (items 1–113), articles in conference proceedings (114–124), preprints and working papers (125–147), teaching material (148–149), and publications of general interest (150–194) in 2008 due to the personnel (and to a few other persons affiliated to the department) are listed below in alphabetic order in Sections 5.1–5.5, respectively. Of these [12] is an edited research monograph, [23] a research monograph, and [148] and [149] textbooks. For technical reasons the coverage of the publications does not exactly fit with the calendar year 2008. Section 5.6 contains a list of all authors belonging to the personnel (or some to the guests), with references to the items authored by these persons. This list of publications does not include Ph.D. theses; they are listed separately in Section 3.4.

5.1. PRINTED RESEARCH PUBLICATIONS

1. Kari Astala, Albert Clop, Joan Mateu, Joan Orobítg, and Ignacio Uriarte-Tuero, *Distortion of Hausdorff measures and improved Painlevé removability for quasiregular mappings*, Duke Mathematical Journal **141** (2008), 539–571.
2. Kari Astala, Daniel Faraco, and László Székelyhidi, Jr., *Convex integration and the L^p theory of elliptic equations*, Annali della Scuola Normale Superiore di Pisa Cl. Sci. (5) **7** (2008), 1–50.
3. Kari Astala, Tadeusz Iwaniec, and Gaven J. Martin, *Monotone maps of \mathbb{R}^n are quasiconformal*, Methods and Applications of Analysis **15** (2008), 31–37.
4. Mark van Atten and Juliette Kennedy, *“Gödel’s modernism: On set-theoretic incompleteness,” revisited*, Logicism, Intuitionism, and Formalism (2008), Springer, Dordrecht, 303–355.
5. Madhuchhanda Bhattacharjee, C. H. Botting, and Mikko J. Sillanpää, *Bayesian biomarker identification based on marker-expression proteomics data*, Genomics **92** (2008), 384–392.
6. Klaus D. Bierstedt, José Bonet, and Jari Taskinen, *Weighted inductive limits of spaces of entire functions*, Monatshefte für Mathematik **154** (2008), 103–120.
7. Barbara Boldin, *Persistence and spread of gastro-intestinal infections: the case of enterotoxigenic Escherichia Coli in piglets*, Bulletin of Mathematical Biology **70** (2008), 2077–2101.
8. Mario Bonk, Juha Heinonen, and Eero Saksman, *Logarithmic potentials, quasiconformal flows, and Q -curvature*, Duke Mathematical Journal **142** (2008), 197–239.
9. Jukka Corander, Pekka Marttinen, Jukka Sirén, and Jing Tang, *Enhanced Bayesian modelling in BAPS software for learning genetic structures of populations*, BMC Bioinformatics **9** (2008), Article 539, 25 pp.
10. Jukka Corander, Jukka Sirén, and Elja Arjas, *Bayesian spatial modeling of genetic population structure*, Computational Statistics **23** (2008), 111–129.
11. P. Descamps, F. Marchis, J. Pollock, J. Berthier, F. Vachier, M. Birlan, Mikko Kaasalainen, A. W. Harris, M. H. Wong, W. J. Romanishin, E. M. Cooper, K. A. Kettner, P. Wiggins, A. Kryszczyńska, M. Polinska, J.-F. Coliac, A. Devyatkin, I. Verestchagina, and D. Gorshonov, *New determination of the size and bulk density of the binary Asteroid 22 Kalliope from observations of mutual eclipses*, Icarus **196** (2008), 578–600.
12. Andreas Deutsch, Rafael Bravo de la Parra, Rob J. de Boer, Odo Diekmann, Peter Jagers, Éva Kisdi, Mirjam Kretzschmahr, Petr Lansky, and Hans Metz (editors), *Mathematical modeling of biological systems. II: Epidemiology, evolution and ecology, immunology, neural systems and the brain, and innovative mathematical methods*, Modeling and simulation in science, engineering and technology, Birkhäuser Boston, Boston, MA, 2008, xviii+386 pp.
13. Odo Diekmann and Mats Gyllenberg, *The second half—with a quarter of a century delay*, Mathematical Modelling of Natural Phenomena **3** (2008), no. 7, 36–48.

14. Odo Diekmann, Yi Wang, and Ping Yan, *Carrying simplices in discrete competitive systems and age-structured semelparous populations*, Discrete and Continuous Dynamical Systems **20** (2008), 37–52.
15. Oleksiy Dovgoshey and Olli Martio, *Blow up of balls and coverings in metric spaces*, Manuscripta Mathematica **127** (2008), 89–120.
16. J. Ďurech, D. Vokrouhlický, Mikko Kaasalainen, D. Higgins, Yu. N. Krugly, N. M. Gaftonyuk, V. G. Shevchenko, V. G. Chiorny, H. Hamanowa, V. Reddy, and R. R. Dyvig, *Detection of the YORP effect in asteroid (1620) Geographos*, Astronomy and Astrophysics **489** (2008), L25–L28.
17. J. Ďurech, D. Vokrouhlický, Mikko Kaasalainen, P. Weissman, S. C. Lowry, E. Beshore, D. Higgins, Yu. N. Krugly, V. G. Shevchenko, N. M. Gaftonyuk, Y.-J. Choi, R. A. Kowalski, S. Larson, B. D. Warner, A. L. Marshalkina, M. A. Ibrahimov, I. E. Molotov, T. Michalowski, and K. Kitazato, *New photometric observations of asteroids (1862) Apollo and (25143) Itokawa—an analysis of YORP effect*, Astronomy and Astrophysics **488** (2008), 345–350.
18. Paula Erkkilä and Jari Taskinen, *Sup-norm estimates for Bergman-projections on regulated domains*, Mathematica Scandinavica **102** (2008), 111–130.
19. Aasa Feragen, *Equivariant embedding of metrizable G -spaces in linear G -spaces*, Proceedings of the American Mathematical Society **136** (2008), 2985–2995.
20. Eva A. Gallardo-Gutiérrez, María J. González, Pekka J. Nieminen and Eero Saksman, *On the connected component of compact composition operators on the Hardy space*, Advances in Mathematics **219** (2008), 986–1001.
21. Rashi Gupta, Elja Arjas, Sangita Kulathinal, Andrew Thomas, and Petri Auvinen, *Bayesian hierarchical model for estimating gene expression intensity using multiple scanned microarrays*, EURASIP Journal on Bioinformatics and Systems Biology **2008**, Article ID 231950, 9 pp.
22. Mats Gyllenberg, Éva Kisdi, and Margarete Utz, *Evolution of condition-dependent dispersal under kin competition*, Journal of Mathematical Biology **57** (2008), 285–307.
23. Mats Gyllenberg and Dmitrii S. Silvestrov, *Quasi-stationary phenomena in nonlinearly perturbed stochastic systems*, de Gruyter Expositions in Mathematics 44, Walter de Gruyter, Berlin, 2008, xii+579 pp.
24. Petteri Harjulehto and Peter Hästö, *Sobolev inequalities for variable exponents attaining the values 1 and n* , Publicacions Matemàtiques **52** (2008), 347–363.
25. Petteri Harjulehto, Peter Hästö, and Visa Latvala, *Harnack’s inequality for $p(\cdot)$ -harmonic functions with unbounded exponent p* , Journal of Mathematical Analysis and Applications **352** (2008), 345–359.
26. Petteri Harjulehto, Peter Hästö, and Visa Latvala, *Minimizers of the variable exponent, non-uniformly convex Dirichlet energy*, Journal de Mathématiques Pures et Appliquées **89** (2008), 174–197.
27. Petteri Harjulehto and Ritva Hurri-Syrjänen, *On a (q, p) -Poincaré inequality*, Journal of Mathematical Analysis and Applications **337** (2008), 61–68.
28. Petteri Harjulehto, Tuomo Kuusi, Teemu Lukkari, Niko Marola, and Mikko Parviainen, *Harnack’s inequality for quasiminimizers with nonstandard growth conditions*, Journal of Mathematical Analysis and Applications **344** (2008), 504–520.
29. Petteri Harjulehto and Visa Latvala, *Fine topology of variable exponent energy superminimizers*, Annales Academiae Scientiarum Fennicae Mathematica **33** (2008), 491–510.
30. Lisa Harris, Jani Lukkarinen, Stefan Teufel, and Florian Theil, *Energy transport by acoustic modes of harmonic lattices*, SIAM Journal on Mathematical Analysis **40** (2008), 1392–1418.
31. Jarkko Hautamäki, Elina Harjunen, Airi Hautamäki, Tommi Karjalainen, Sirkku Kupiainen, Seppo Laaksonen, Jari Lavonen, Erkki Pehkonen, Pekka Rantanen, and Patrik Scheinin, *Claims, arguments and models*, PISA06 Finland: Analyses, reflections and explanations /edited by Jarkko Hautamäki et al., Ministry of Education Publications, Helsinki **2008:44**, pp. 197–208.
32. Jarkko Hautamäki, Elina Harjunen, Airi Hautamäki, Tommi Karjalainen, Sirkku Kupiainen, Seppo Laaksonen, Jari Lavonen, Erkki Pehkonen, Pekka Rantanen, and Patrik Scheinin, *PISA results from 2000 through 2006*, PISA06 Finland: Analyses, reflections and explanations /edited by Jarkko Hautamäki et al., Ministry of Education Publications, Helsinki **2008:44**, pp. 11–23.

33. Jarkko Hautamäki, Seppo Laaksonen, and Sirkku Kupiainen, *Interests and attitudes*, PISA06 Finland: Analyses, reflections and explanations /edited by Jarkko Hautamäki et al., Ministry of Education Publications, Helsinki **2008:44**, pp. 181–192.
34. Jarkko Hautamäki, Seppo Laaksonen, and Patrik Scheinin, *Level and balance of achievement*, PISA06 Finland: Analyses, reflections and explanations /edited by Jarkko Hautamäki et al., Ministry of Education Publications, Helsinki **2008:44**, pp. 37–49.
35. Jarkko Hautamäki, Patrik Scheinin, Seppo Laaksonen, Pekka Rantanen, Airi Hautamäki, and Sirkku Kupiainen, *PISA as a tool for comparing educational systems*, PISA06 Finland: Analyses, reflections and explanations /edited by Jarkko Hautamäki et al., Ministry of Education Publications, Helsinki **2008:44**, pp. 53–63.
36. Ville Heikkala, Henri Lindén, Mavina K. Vamanamurthy, and Matti Vuorinen, *Generalized elliptic integrals and the Legendre \mathcal{M} -function*, Journal of Mathematical Analysis and Applications **338** (2008), 223–243.
37. Tuomas Hytönen, *On Petermichl's dyadic shift and the Hilbert transform*, Comptes Rendus Mathématique. Académie des Sciences. Paris **346** (2008), 1133–1136.
38. Tuomas Hytönen, Alan McIntosh, and Pierre Portal, *Kato's square root problem in Banach spaces*, Journal of Functional Analysis **254** (2008), 675–726.
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180. Juha Oikkonen, *Matematiikka sisäisessä ja ulkoisessa maailmassamme*, Dimensio **72** (2008), no. 3, 31–33.
181. Jukka Pihko, *Lukuteorian helmiä lukiolaisille*, Solmu **2008**, no. 1, 14–15.
182. J. Rousu and Elja Arjas, *Tutkintojärjestelmän uudistus jäänyt Suomessa puolitiehen*, Helsingin Sanomat **24.2.2008**.
183. Kalevi Suominen, *Olli Jussila in memoriam*, Arkhimedes **2008**, no. 6, 12.
184. Jouko Väänänen and Ulrich Trottenberg, *Maths for everyday life* (Introduction to the Special Theme), ERCIM News **73** (2008), 10–11.
185. Simopekka Vänskä, *Matematiikkaa tämän päivän maailmassa*, Dimensio **72** (2008), no. 1, 40–41.
186. Kimmo Vehkalahti, *Correspondence analysis in practice, Second Edition by Michael Greenacre* (Book review), International Statistical Review **76** (2008), 149–150.
187. Kimmo Vehkalahti, *Statistical test theory for the behavioral sciences by Dato N. M. de Gruiter, Leo J. Th. van der Kamp* (Book review), International Statistical Review **76** (2008), 154–155.

188. Kimmo Vehkalahti, *Design, evaluation, and analysis of questionnaires for survey research by Willem E. Saris, Irmtraud N. Gallhofer* (Book review), *International Statistical Review* **76** (2008), 317–318.
189. Kimmo Vehkalahti, *Margins of error: A study of reliability in survey measurement by Duane F. Alwin* (Book review), *International Statistical Review* **76** (2008), 319.
190. Kimmo Vehkalahti, *Factor analysis at 100: Historical developments and future directions edited by Robert Cudeck, Robert C. MacCallum* (Book review), *International Statistical Review* **76** (2008), 323–324.
191. Kimmo Vehkalahti, *Applied multiway data analysis by Pieter M. Kroonenberg* (Book review), *International Statistical Review* **76** (2008), 441–442.
192. Kimmo Vehkalahti, *Handbook of data visualization edited by Chun-houh Chen, Wolfgang Härdle, Antony Unwin* (Book review), *International Statistical Review* **76** (2008), 442–443.
193. Kimmo Vehkalahti, *The concise encyclopedia of statistics by Yadolah Dodge* (Book review), *International Statistical Review* **76** (2008), 460–461.
194. Thomas J. Webb, Robert B. O’Hara, and Robert P. Freckleton, *Does double-blind review benefit female authors?*, *Trends in Ecology & Evolution* **23** (2008), 351–353.

5.6. AUTHORS

This section contains a list of all researchers either belonging to the personnel or more loosely affiliated to the department who have published papers in Sections 5.1–5.5. The numbers following the names indicate the items in the reference lists authored by these persons.

Elja Arjas 10, 21, 50, 84, 93, 182; Kari Astala 1–3, 114; Mark van Atten 4; Kari Auranen 64, 76; Petri Auvinen 21, 50; Madhuchhanda Bhattacharjee 5; Bogdan Bojarski 126; Barbara Boldin 7; José Bonet 6; Mario Bonk 8; Heikki Bonsdorff 127; Niklas Brännström 115; Jean Bricmont 56; Vasileios Chousionis 128–129; Albert Clop 1; Jukka Corander 9–10, 50; Odo Diekmann 12–14, 73–74; Oleksiy Dovgoshey 15, 131–133; Paula Erkkilä 18; Daniel Faraco 2; Aasa Feragen 19; Dario Gasbarra 54, 134; Stefan Geritz 81; Rashi Gupta 21; Vladimir Gutlyanskiĭ 126; Mats Gyllenberg 13, 22–23, 81, 112, 150–153; Severi Hämäri 135; Petteri Harjulehto 24–29, 154; Peter Hästö 24–26, 136; Ville Heikkala 36; Juha Heinonen 8; Lasse Holmström 51; Fabian Hoti 64, 113; Ritva Hurri-Syrjänen 27; Tuomas Hytönen 37–43, 155; Tapani Hyttinen 44; Sören Illman 45; Tadeusz Iwaniec 3, 114; Hadi Joráti 137; Mikko Kaasalainen 11, 16–17, 46–47, 62, 67–68, 156; Juliette Kennedy 4, 49, 116; Éva Kisdi 12, 22; Jukka Kohonen 50, 158; Petri Koistinen 51; Juha Kontinen 52, 117; Risto Korhonen 159; Mika Koskenoja 160, 165; Yuriy Kozachenko 138; Sangita Kulathinal 21, 54, 93; Vadim Kulikov 161; Anna Kuparinen 55; Antti Kupiainen 56, 118; Seppo Laaksonen 31–35, 48, 57–60, 77, 119–120, 123, 162–163; Aatos Lahtinen 164; Jussi Laitila 139; Lars Lamberg 61, 121; Matti Lassas 63; Risto Lehtonen 75, 140; Henri Lindén 36, 65, 136, 165; Jani Lukkarinen 30, 66; Jouni Luukkainen 166; Gaven Martin 3, 114; Olli Martio 15, 69, 122, 125, 133, 148, 157, 167–169; Pekka Marttinen 9; Pertti Mattila 129, 141; Hans Metz 12, 72–74; Crispin M. Mutshinda 78–79; Marjatta Näätänen 170–175; Sergey Nazarov 80; Pekka Nieminen 20; Neli Noykova 97; Robert O’Hara 55, 78–79, 82–83, 85, 92, 98, 176–178, 194; Juha Oikkonen 179–180; Lassi Päivärinta 63, 86, 156; Pekka Pankka 143; P. V. Paramonov 144; Jukka Pihko 181; István Prause 88–90; Vladimir Ryazanov 126; Pentti Saikkonen 70–71, 94–95, 103, 130, 142; Eero Saksman 8, 20, 53, 63, 96, 157; Ryan Siders 145; Mikko Sillanpää 5, 54, 97, 113; Dmitrii Silvestrov 23; Jukka Sirén 9–10; Tord Snäll 98; Tommi Sottinen 134, 138; Kalevi Suominen 183; Vesa Tähtinen 99; Sarish Talikota 50; Jarno Talponen 100–101; Jing Tang 9; Lauri Tarkkonen 124; Jari Taskinen 6, 18, 80, 102, 146–147; Matti Taskinen 110; Andrew Thomas 21;

Hans-Olav Tylli 96, 139; Ignacio Uriarte-Tuero 1; Margarete Utz 22; Jouko Väänänen 49, 104–106, 184; Aleksi Vähäkangas 107; Jussi Väisälä 108; Maria Valaste 124; Mavina K. Vamanamurthy 36; Simopekka Vänskä 109–110, 185; Sirkka-Liisa Varvio 111; Olga Vasylyk 138; Kimmo Vehkalahti 124, 149, 186–193; Jani Virtanen 87, 102, 146–147; Matti Vuorinen 36; Yi Wang 14; Ping Yan 14; Kari Ylinen 40; Lauri Ylinen 121.

6. OTHER ACTIVITIES

6.1. COMMUNICATIONS IN MATHEMATICAL OR STATISTICAL MEETINGS

The following are the numbers of communications in mathematical or statistical conferences and other scientific meetings (in parentheses the numbers of talks given in colloquia or seminars abroad) delivered by the personnel of the department in 2008: Elja Arjas 1, Niklas Brännström 1, Stefan Geritz 1 (2), Mats Gyllenberg 8, Ilkka Holopainen 4 (3), Tuomas Hytönen 7, Mikko Kaasalainen 5, Éva Kisdi 1, Juha Kontinen 3, Risto Korhonen 2, Antti Kupiainen 3, Seppo Laaksonen 5, Risto Lehtonen 3 (1), Jani Lukkarinen 2 (1), Olli Martio 5 (1), Jouko Mickelsson 2, Paolo Muratore-Ginanneschi 2 (4), Pekka Nieminen 2, Harri Nyrhinen 1, Robert O'Hara 3, Mikko Pakkanen 1, Petteri Piironen 1, Diana Preteasa 1, Tadeáš Přiklopil 1, Pentti Saikkonen 1, Mikko Sillanpää (1), Mikko Stenlund 1 (1), Jari Taskinen 1, Hans-Olav Tylli 3 (2), Margarete Utz 1, Simopekka Vänskä 2.

These communications total 74 (16). Of the communications 51 (12) were invited talks.

6.2. VISITS ABROAD

The following are the visits of the personnel for working abroad for at least two weeks in 2008.

Niklas Brännström: University of Warwick, UK, six visits of totally 27 days during May–November; Barcelona, Spain, 13.–27.9.

Tuomas Hytönen: Fields Institute, Toronto, Canada, 6.1.–7.2., 13.–23.2.

Juha Kontinen: University of California, Santa Cruz, USA, 3.9.–16.12.

Antti Kupiainen: École Normale Supérieure, Paris, France, 1.–15.2.; Institute Henri Poincaré, Paris, France, 1.–31.3., 15.–30.11; Isaac Newton Institute, Cambridge, UK, 7.–22.9., 7.–14.12.

Jouko Mickelsson: Australian National University and University of Adelaide, Australia, 28 days in March–April; KTH, Stockholm, Sweden, 5 weeks in May, August or December.

Pekka Nieminen: University of Zaragoza, Spain, 22.9.–21.12.

Pentti Saikkonen: European University Institute, Florence, Italy, 8.3.–28.6.

Mikko Stenlund: Courant Institute, New York University, USA, 1.1.–31.12.

Jari Taskinen: Universidad Politecnica de Valencia, Spain, 10.–24.6.

6.3. EDITING JOURNALS

Elja Arjas: Genetics (USA), associate editor; Statistics Surveys, executive editor.

Mats Gyllenberg: Journal of Mathematical Biology (Germany), chief editor; Differential Equations & Applications (Croatia), chief editor; Journal of Biological

Dynamics (USA), member of the editorial board; International Journal of Biomathematics (China), member of the editorial board.

Éva Kisdi: Evolutionary Ecology Research (USA), editor; Journal of Evolutionary Biology (UK), reviewing editor; Acta Biotheoretica (The Netherlands), member of the editorial board.

Mika Koskenoja: Annales Academiae Scientiarum Fennicae Mathematica (Finland), editorial secretary; Arkhimedes (Finland), member of the editorial board; Solmu (Finland), member of the editorial board.

Antti Kupiainen: Communications in Mathematical Physics (USA), member of the editorial board; Mathematical Physics Electronic Journal (Spain), member of the editorial board; Grundlehren der mathematischen Wissenschaften (Germany), member of the editorial board; Reviews in Mathematical Physics (Austria), member of the editorial board.

Seppo Laaksonen: Journal of Survey Research Methods, associate editor; Scandinavian Journal of Statistics, member of the editorial board.

Risto Lehtonen: Statistics in Transition Journal (Poland), associate editor; AStA—Advances in Statistical Analysis (Germany), associate editor.

Olli Martio: Annales Academiae Scientiarum Fennicae Mathematica (Finland), chief editor; Discrete and Continuous Dynamical Systems – Series B (USA), editor; Computational Methods and Function Theory (Germany), member of the editorial board; Ukrainian Mathematical Bulletin (Ukraine), member of the international board; Journal of Function Spaces and Applications (Germany/India), associate editor; Bulletin de la Société des Sciences et des Lettres de Łódź, Série: Recherches sur les Déformations (Poland), member of the editorial board.

Harri Nyrhinen: Scandinavian Actuarial Journal (Sweden), editor.

Robert O’Hara: Journal of Evolutionary Biology (UK), member of the board of reviewing editors; Journal of Negative Results—Ecology and Evolutionary Biology (Finland), editor.

Pentti Saikkonen: Econometric Theory (UK), co-editor.

Mikko Sillanpää: Theoretical and Applied Genetics (Germany), member of the editorial board.

6.4. REFEREEING FOR JOURNALS

The following are the numbers of appointments to a referee for a mathematical, statistical, or scientific journal or compilation (or, respectively, to a reviewer for an abstract or review journal): Jorgia Bandyopadhyay 1, Barbara Boldin 2, Stefan Geritz 4, Petteri Harjulehto 7, Tuomas Hytönen 2 (4), Tapani Hyttinen 3, Mikko Kaasalainen 3, Éva Kisdi 13, Risto Korhonen 4, Seppo Laaksonen 9, Risto Lehtonen 3, Jani Lukkarinen 5, Jouni Luukkainen 2, Olli Martio 7, Jouko Mickelson 2, Paolo Muratore-Ginanneschi 4, Pekka Nieminen 1, Harri Nyrhinen 2, Robert O’Hara 17, Diana Preoteasa 1, Mikko Sillanpää 6, Jari Taskinen 1, Hans-Olav Tylli 6 (5), Simopekka Vänskä 1, Kimmo Vehkalahti 2.

These refereeings total 108 (9).

6.5. MANAGERIAL DUTIES IN SCIENTIFIC AND PROFESSIONAL ORGANIZATIONS

Elja Arjas: Trial to Reduce IDDM in the Genetically at Risk (TRIGR), Data Safety and Monitoring Committee, Finland, expert; Foundation for Research, Science and Technology, New Economy Research Fund (NERF), New Zealand, expert.

Kari Astala: Mittag-Leffler Institute, Sweden, member of the board.

Mats Gyllenberg: European Mathematical Society, Finland, member of the commission; European Mathematical Society, Finland, member of the committee for applied mathematics; European Research Council, EU, Brussels, Belgium, mathematics panel, member; Vetenskapsrådet, Sweden, expert; Estonian Research Council, Estonia, expert; OECD Global Science Forum “Mathematics in Industry”, member of the steering group; European Science Foundation, Strasbourg, France, Research networking programme Frontiers of Speciation Research; Nordic Committee for Applied and Industrial Mathematics (NORTIM), member; Finnish Mathematical Society, president; Arkhimedes journal, Finland, member of the commission; Finnish Academy of Science and Letters, mathematics and science section, member.

Ilkka Holopainen: ESF Research Networking Programme HCAA (Harmonic and Complex Analysis and its Applications), member of the steering committee; NordForsk, Nordic network “Analysis and Applications”, member of the steering committee.

Tapani Hyttinen: Logic Colloquium 2009, member of the program committee.

Mikko Kaasalainen: Finnish Centre of Excellence in Inverse Problems, member of the steering group; Tekes/MASI Inversion Problem Project, member of the steering group; research member of the Rosetta project (Europa); research member of the Pan-STARRS project (USA); research member of the LSST project (USA).

Éva Kisdi: European Society for Mathematical and Theoretical Biology, secretary.

Mika Koskenoja: European Mathematical Society, administrative assistant (monitoring and reporting EU funded EMS events).

Antti Kupiainen: Helsinki Institute of Physics, member of the board of directors; Erwin Schrödinger Institute, Vienna, Austria, member of the scientific advisory board.

Seppo Laaksonen: European Social Survey, member of the Sampling Expert Panel; International Wage Flexibility Project, global network of 13 countries, member of the Finnish team; Helsinki University PISA (Programme of the International Student Assessment of the OECD) Research Group, methodological expert of the executive committee; Global CAED (Comparative Analysis of Enterprise Micro Data) Network, member of the executive committee; International Association of Survey Statisticians, France, vice-president and member of the nominations committee; COST Action/TC/DC:IS0701 “Comparative Analysis of Enterprise Data: Industry Dynamics, Firm Performance, and Worker Outcomes”, European network, member of the management committee.

Risto Lehtonen: Baltic–Nordic–Ukrainian (BNU) Network on Survey Statistics, member of the board; European Working Group on Small Area Estimation (EWORSAE), member of the board; Steering Committee of the AMELI Research Project, member of the board; Statistisches Bundesamt Deutschland (Desatis), member of the census 2011 expert committee; Statistics Finland, member of the scientific board.

Olli Martio: ESF PESC Programme: Harmonic and Complex Analysis and its Applications, Norway, member of the board; Lithuanian State Science and Studies Foundation, Lithuania, expert; Deutsche Forschungsgemeinschaft, Germany, expert; University of Trondheim, Norway, member of the international evaluation group of study programs; Finnish National Committee for Mathematics (IMU),

chairman; Finnish Academy of Science and Letters, Mathematics Foundation, chairman of the trustees; Finnish Academy of Science and Letters, Publication Committee, vice chairman; Matriculation Examination Board, member.

Pertti Mattila: Academy of Finland, member of the Research Council for Natural Sciences and Engineering.

Jouko Mickelsson: University of Helsinki, member of the expert pool.

Paolo Muratore-Ginanneschi: International Collaboration for Turbulent Research (<http://www.ictr.eu>), expert member.

Marjatta Näätänen: Finnish Mathematical Society, vice president; Finnish National Committee for Mathematics, member.

Harri Nyrhinen: Astin Colloquium 2009, Scientific committee, member.

Robert O’Hara: Projects Arc 2008, Université Libre de Bruxelles, Belgium, expert evaluator.

Eero Saksman: Mittag-Leffler Institute, Sweden, member of the board.

Mikko Sillanpää: Reviewer of Research Grant Application for Israel Science Foundation; reviewer of Research Grant Applications for the University of Helsinki; a member of the pool of experts of the University of Helsinki.

Jari Taskinen: Finnish Mathematical Society, Finland, member of the board, treasurer; Rolf Nevanlinna Institute, Finland, chairman of the board of directors for the support foundation.

Hans-Olav Tylli: Finnish Graduate School in Mathematical Analysis and Its Applications, chairman of the board; Tuning Educational Structures in Europe, phase IV (European Commission of Culture and Education), Mathematics Subject Group, member.

6.6. ASSESSMENTS FOR APPOINTMENTS

The following are the numbers of assessments for appointments to a professorship or docentship: Elja Arjas 1, Ilkka Holopainen 1.

6.7. REFEREEING PH.D. THESES

Stefan Geritz, Mats Gyllenberg and Risto Lehtonen have acted as an opponent, and Elja Arjas, Tuomas Hytönen, Risto Korhonen, Jouko Mickelsson, Paolo Muratore-Ginanneschi, Robert O’Hara, Juha Oikkonen and Aki Vehtari have acted as a referee.

6.8. ACTIVITIES IN THE SOCIETY

Erik Elfving has acted as an auxiliary member of the mathematics section of the Matriculation Examination Board.

Tuomas Hytönen was the leader of the team of the University of Helsinki in the International Mathematics Competition for University Students in Blagoevgrad, Bulgaria, 25.–31.7., and the vice leader of the team of Finland in the high school students mathematics competition Baltic Way 2008, Gdansk, Poland, 6.–10.11.

Mikko Kaasalainen was interviewed in the Finnish radio series “the Time of Mathematics” about inverse problems. He contributed to the exhibition “Mathematics—traditions and applications” at the Helsinki University Museum Arppeanum.

Mika Koskenoja wrote an article on the teachings of the poker game in the magazine Pokerisivut.com.

Antti Kupiainen was a member of the board of the Niilo Helander Foundation. He was interviewed in the Finnish radio on nonequilibrium phenomena.

Seppo Laaksonen was a vice chairman of the Puistola-seura and published two articles on statistics in Helsingin Sanomat.

Jouni Luukkainen was an appointed vice representative of the association HYT of the scientists of the University of Helsinki. He organized a demonstration and published seven opinion writings against the obligatory religious education of the European Schooling Helsinki demanding back the secular ethics alternative of the Europa Schools.

Olli Martio gave a talk in an occasion of the Finnish National Board of Education and was interviewed in the Finnish television on the mathematics exam in the Matriculation Examination.

Marjatta Näätänen organized a session on teaching of mathematics and a mathematical video showing in the Mathematics days in Otaniemi in January. She was a vice member of the board of directors of the association of the Lecturers of the University of Helsinki. She was a member of the planning group for the LUMA center also chairing the mathematics group and organizing mathematics workshops. She was a member of the editorial board of the mathematics web magazine Solmu, writing articles and taking care of financial affairs and publicity for Solmu. She provided files on mathematics teaching from France, Hungary, Sweden and UK organizing their translation for Solmu. She continued the primary math teaching experiment in the Hungarian method in several Finnish schools, with LUMA schooling on the subject and with mediating Finns to a math summercamp in Hungary. She contributed to the mathematics diploma activities for schoolchildren, with the diploma problems for the grades 1 and 2 ready. She cooperated with schools giving education for teachers in different places of the country. She organized a mathematics weekend at Maunula school. She wrote in newspapers on the significance of mathematics, and was interviewed in the Finnish radio series “the Time of Mathematics” (“Women and mathematics”), in the Voima journal (“The girls want to calculate”), and in the Sunday pages Sunnuntaisuomalainen of various Finnish newspapers (“The decline of mathematics”).

Pekka Nieminen was interviewed in the Finnish radio series “the Time of Mathematics” about operators and measures.

Harri Nyrhinen was a vice member of the board of examiners of actuarial mathematicians and a vice member of the working group for actuarial education.

Juha Partanen has acted as an auxiliary member of the mathematics section of the Matriculation Examination Board.

Mikko Stenlund was interviewed in the Finnish radio series “Time of Mathematics” about his earning of the Rolf Nevanlinna doctoral thesis award.

Simopekka Vänskä was interviewed three times in the Finnish radio series “the Time of Mathematics” (on scattering of Beltrami fields, on the golf, and on the baseball). He acted as an expert for the Finnish Baseball and Softball association.

7. GUESTS

The following is a list of the foreign guests of the department in 2008.

Alizon, Samuel, ETH, Zürich, Switzerland, 15.–21.12.

Ball, Frank, University of Nottingham, UK, 18.–21.11.

Ball, Roderick, NZ Forest Research Institute, New Zealand, 8.4.–6.6.

- Barabás, György, Eötvös University, Hungary, 16.–18.1.
- Bojarski, Bogdan, Polish Academy of Sciences, Poland, 29.3.–5.4.
- Boldin, Barbara, University of Ljubljana, Slovenia, 21.–23.1.
- Bricmont, Jean, UCL Louvain-la-Neuve, Belgium, 15.–21.6., 18.–26.8.
- Chakborty, Mihir Kumar, University of Calcutta, India, 26.9.–14.10.
- Ciginas, Andrius, Vilnius University, Lithuania, 4.–15.12.
- Diekmann, Odo, University of Utrecht, The Netherlands, 24.8.–31.10.
- Dovgoshey, Oleksiy, Institute of Applied Mathematics and Mechanics NAS of Ukraine, Ukraine, 15.5.–30.6.
- Dzeitsava, Hanna, Belarus, 21.–30.8.
- Fouxon, Itzhak, Hebrew University of Jerusalem, Israel, 17.–23.11.
- Gill, James T., Washington University in St. Louis, USA, 1.–18.12.
- Gutlyanskiĭ, Vladimir, Institute of Applied Mathematics and Mechanics NAS of Ukraine, Ukraine, 1.–11.4. (and 20.7.–20.9.2007).
- Hadeler, Karl, University of Tübingen, Germany, 29.9.–1.10.
- Hallander, Jon, University of Umeå, Sweden, 15.–17.12.
- Harding, Karin, University of Gothenburg, Sweden, 25.–27.11.
- Hedenmalm, Håkan, Royal Institute of Technology, Stockholm, Sweden, 1.–31.10.
- Ihnatsyeva, Lizaveta, Belarus, 21.–30.8.
- Ivanishko, Iya Alexandrov, Belarus, 21.–30.8.
- Jagers, Peter, 24.–31.8.
- Knowles, Antti, ETH, Zürich, Switzerland, 13.–15.10.
- Kytölä, Kalle, Université de Genève, Switzerland, 3.–4.1.
- Lakshitanov, Evgeny, University of Aveiro, Portugal, 6.–8.8.
- Lê, Út Van, University of Oulu, Finland, 21.–30.8.
- Leon, Jens, University of Bonn, Germany, 30.5.
- Lusky, Wolfgang, Universität Paderborn, Germany, 30.3.–5.4.
- Madani, Farid, Université de Parix VI, France, 21.–30.8.
- Martin, Gaven, Massey University, New Zealand, 14.–31.7.
- Metz, J. A. J. (Hans), University of Leiden, The Netherlands, 4.–8.2., 3.–6.3., 14.–18.4., 15.–19.9., 6.–10.10., 20.–23.10.
- Nakanishi, Toshihiro, Shimane University, Matsue, Japan, 30.4.–3.5.
- Nazarov, Sergey, Steklov Institute, St. Petersburg, Russia, 19.6.–2.7., 16.–25.8.
- Nekrasaite, Vilma, Vilnius Gediminas Technical University, Lithuania, 6.–31.10.
- Neumann, Gunter, University of Aarhus, Denmark, 2.–5.12.
- Pérez Caro, Pedro, Universidad Autónoma de Madrid, Spain, 1.9.–31.10.
- Pugliese, Andrea, 24.–31.8.
- Särndal, Carl-Erik, University of Montreal, Canada, 4.–18.1., 18.–23.8.
- Snyder, Robin, 24.–31.8.
- Srebro, Uri, Technion, Israel, 9.–14.7.
- Stenlund, Mikko, New York University, Courant Institute of Mathematical Sciences, USA, 3.–4.1.
- Svennungsen, Thomas O., University of Oslo, Norway, 5.–16.5.
- Tsirelson, Boris, Tel Aviv University, Israel, 9.–15.3.
- Vasilevski, Nikolai, CINVESTAV, Mexico City, Mexico, 8.–19.5.
- Veraar, Mark, Universität Karlsruhe, Germany, 9.–15.3.
- van Voorn, George, Vrije Universiteit, Amsterdam, The Netherlands, 28.–31.10.
- Waldmann, Patrik, University of Umeå, Sweden, 15.–17.12.
- Zambrano, Pedro, University of Colombia, Colombia, 25 days in November.

Zygalakis, Konstantinos, Cambridge University, DAMP, UK, 9.–11.12.

Of these 49 guests 6, namely R. Ball, Diekmann, Dovgoshey, Gutlyanskiĭ (in 2007), Hedenmalm, and Pérez Caro, stayed at least one month.

8. LIBRARY

At the beginning of March 2001 the Library of the Department of Mathematics was incorporated with other libraries of the exact sciences in the faculty to form the Kumpula Science Library. The Library of Mathematics stayed in Heimola with the department until they moved together to Kumpula during the spring and summer 2004. Also the main collection of journals and books (about 100 shelfmeters) from the Department of Statistics moved to the Kumpula Science Library.

The collection of mathematics in Kumpula is the only one containing advanced mathematical literature at the University of Helsinki. This collection covers a wide range in the fields of mathematics. It is considered to be of a very high international standard (especially the journals). In 2008 the acquisitions in mathematics and statistics were exclusively funded by the department. In 2008 the accumulation of the bought new mathematical or statistical books was 561 copies, and the whole library received around 1100 titles of periodicals and reports, from which about 200 were in mathematics and statistics. Over 250 titles in mathematics or statistics are available in digital form (e.g. Academic Press, AMS, Elsevier, Springer-Verlag), mostly through FinELib (a national electronic database). The most important reference database in mathematics is the “MathSciNet”.

The book and journal catalogues are part of the electronic HELKA- and LINDA-databases. Because the books have been catalogued into HELKA-database, they can be borrowed automatically with HELKA-, Lyyra- or UniCard. The serials check-in is carried out using the Voyager program.

The ARTO database is being upkept in the library. ARTO contains information on articles either published by Finnish authors or published in Finnish journals. Also the database JULKI (Publication database) of the University of Helsinki is updated by the library.

The core customers consists of teachers and researchers at the department, as well as of graduate students and advanced undergraduate students, and of the mathematical and statistical departments of other Finnish universities. The opening hours have been 9–18 during the semesters and 9–16 off semesters, Monday through Friday. The staff of the department has round-the-clock access to the library.

9. COMPUTING FACILITIES

The department has about 250 PC computers and 30 Macintosh computers, which are all connected to the university network. For output there are 20 laser printers. The computers are mainly used for word processing, typesetting, and communication by electronic mail, but some mathematical and statistical programs are used as well. The campus support team of the IT department takes care of the equipment and consults the staff in automatic data processing. Students can use a microcomputer classroom, which has 25 PC computers and one laser printer. The students and the staff of the department have about 750 accounts on the UNIX machines and about 1500 accounts on the Novell networks of the university.

10. ADMINISTRATION

The administrative posts on the university, faculty, or department level held by members of the department in 2008 were the following. If a name is followed by a name in parentheses, the latter person had been elected to replace the first person when needed.

Election Collegium. Hannu Niemi and Lassi Päivärinta were members. Mikko Salminen was a student member.

Board of directors of the Open University / University of Helsinki. Hannu Niemi was the chairman.

Steering group for the Internet services of the Finnish Open University. Hannu Niemi was the chairman.

Campus council for the Kumpula Campus. Mikko Salminen was a student vice member.

Campus council for the City Centre Campus. Hannu Niemi was a member.

Faculty Council (Faculty of Science). Members in the quota of professors were Mats Gyllenberg (Lassi Päivärinta), Olli Martio (Pertti Mattila) –30.9., and Pertti Mattila 1.10.– (Jouko Väänänen 30.10.–). Mikko Salminen was a student member.

Faculty of Science. Jouko Väänänen was a third vice dean of the faculty 11.9.–.

Faculty Council (Faculty of Social Sciences). Hannu Niemi was the dean of the faculty.

Faculty planning board (Faculty of Science). Olli Martio –30.9., Mats Gyllenberg 1.10.–, and vice dean Jouko Väänänen were members. Mikko Salminen was a vice student member –31.7. and a student member 1.8.–.

Faculty entrance board (Faculty of Science). Hannu Honkasalo and Jari Taskinen were members. Mikko Salminen was a vice student member.

Faculty entrance board (Faculty of Social Sciences). Maria Valaste was a member.

Postgraduate student entrance board (Faculty of Social Sciences). Hannu Niemi was a member.

Subject-teacher student entrance board in the Faculties of Science, Biosciences, and Behavioural Sciences. Juha Partanen (Olli Martio –30.9.; Juha Oikkonen 1.10.–) was a member.

Teaching development board in the Faculty of Science. Juha Oikkonen was a member.

Teaching development board in the Faculty of Social Sciences. Kimmo Vehkalahti was a member.

Scientific experts group in the Faculty of Science. Mats Gyllenberg was a member.

Communication group in the Faculty of Science. Mats Gyllenberg was a member.

Research and postgraduate committee in the Faculty of Social Sciences. Seppo Laaksonen was a member.

International affairs committee in the Faculty of Social Sciences. Risto Lehtonen was a member.

Chairman. The chairman of the department was Olli Martio –30.9. and Mats Gyllenberg 1.10.–. The first vice chairman was Mats Gyllenberg –30.9. and Hans-Olav Tylli 1.10.–, and the second vice chairman was Pentti Saikkonen.

Department Board. The four members of the department board from the quota of professors were Olli Martio (Jouko Mickelsson) –30.9., Jouko Mickelsson (Eero Saksman) 1.10.–, Pertti Mattila (Kari Astala), Hannu Niemi (Pentti Saikkonen), and Lassi Päivärinta (Mats Gyllenberg –30.9., Esa Nummelin 1.10.–). The four members from the quota of other personnel were Antti Kemppainen (Åsa Hirvonen), Pekka Pere (Maria Valaste), Hans-Olav Tylli (Dario Gasbarra), and Riitta Ulmanen (Terhi Hautala 14.2.–). The four members from the quota of students were Teemu Kujala (Jouni Haapakoski), Jaakko Mali (Mikko Salminen), Pii Nissinen (Susanna Oksanen), and Petri Peltonen (Auli Hämäläinen). The board was chaired by the chairman of the department.

Kumpula Science Library board. Jouko Väänänen was the chairman 11.9.–. Ilkka Holopainen (Pertti Mattila) was a member.

Subject-teacher student evaluation board in mathematics. The members were Erik Elfving, Alex Hellsten, Mika Koskenoja, Jouni Luukkainen, and Juha Partanen.

11. ECONOMY

The expenses covered directly by the department can be divided into the following ten parts:

- The salaries of the regular staff.
- The salaries of the graduate school students.
- The activities of the Centres of Excellence.
- Teaching fee allocation (the salaries of the instructors and the teaching assistants).
- The acquisitions of the library: books, periodicals, and CD-ROMs.
- Research: reports.
- Travels and scholarships.
- Computers: microcomputers, printers, computer software etc.
- Rents.
- Mixed expenditure (this includes, e.g., mailing, telephone, telefax, photocopy paper).

The following table first gives these costs in thousands of euros in 2007. The figures are presented in two columns A and B per year concerning the Faculty of Science and the Faculty of Social Sciences, respectively. Unfortunately, the respective figures in 2008 were not available. The costs in 2008 are given in another report system. For the sake of comparison the figures in 2007 are also given in this other report system.

Year	2007A	2007B	Year	2007A	2007B	2008A	2008B
Salaries	2190	620	Invoicing	-2	0	0	0
Gr. schools	489	0	Investments	32	0	88	0
Centres of Ex.	183	0	Supplies	61	8	95	4
Teaching	310	74	Salaries	2693	663	3226	534
Library	103	7	Rents	648	121	653	105
Research	7	0	Service	69	10	78	11
Travels	14	5	Travels	74	5	30	2
Computers	19	0	General	-239	-3	-201	-4
Rents	639	121	VAT	13	0	11	0
Mixed	43	10	Other	379	2	396	2
Total	3997	837	Total	3729	806	4376	655

The external funding in 2008 for the department concerning the Faculty of Science amounted to 2.867 million euros, of which 2.032 million euros came from the Academy of Finland and 348000 euros from the EU. In 2007 these figures were 3.856 [3.801] million euros, of which 2.943 [2.874] million euros came from the Academy of Finland and 279000 [294000] euros from the EU. The figures here and below in brackets are based on a different report system used earlier in these annual reports and are given for the sake of comparison. Concerning the Faculty of Social Sciences, the external funding in 2008 amounted to 69000 euros, of which 24000 euros came from the EU; there was no funding from the Academy of Finland. In 2007 these figures were 48000 [36000] euros, of which 4000 [4000] euros came from the Academy of Finland.

12. PREMISES

In July 2004 the department moved from different locations to premises in Kumpula Campus. The new Exactum building (Gustaf Hällströmin katu 2b) with its four wings offers in its third and fourth floors a unified space for the new unified department. The premises consist of 98 offices, totally 1401,5 m², and 13 rooms in general use, totally 221 m². That is, 111 rooms altogether, totally 1622,5 m². In the first floor there are three additional offices for researchers, totally 45 m², and in the basement two stock rooms, totally 40 m², or, in fact, also a major part of a third one with 50,5 m².

In Exactum the department is the sole or the major user of 11 teaching halls with totally 362 seats and two microcomputer rooms with totally 43 seats. The department shares the use of the three auditoriums of Exactum with totally 568 seats.

The department also has two offices in the premises of the Faculty of Social Sciences (Unioninkatu 37).