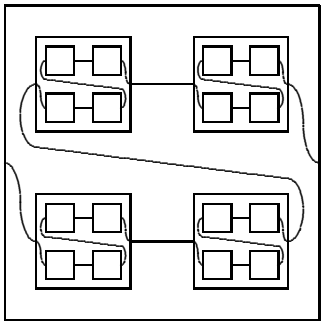
Department of Mathematics and Statistics
University of Helsinki
Annual Report 2006



Department of Mathematics and Statistics
University of Helsinki
Annual Report 2006

Edited by
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Helsinki, September 2007

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Contents

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 four offices in the premises of the Faculty of Social Sciences (Unioninkatu 37).

In 2006 the teaching faculty comprised a full time staff of 49; this consists of 21 professors, 20 lecturers, 7 assistants, and 1 instructor. There were about 10–15 teachers on a part-time basis in 2006. The department had 84 docents (in 2006, six 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 10 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 will be 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 will also include 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 2006, 1610 students were majoring in mathematics or statistics. In addition there were 126 postgraduate students. Of the postgraduate students 69 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, 48 students took M.Sc. degree, 12 took Ph.Lic. degree, and 9 took Ph.D. degree in mathematics. More exactly, of these 9 Ph.D. degrees, 2 were in applied mathematics and 1 in biometry. In statistics, 7 students took M.Soc.Sc. degree, 1 took Lic.Soc.Sc. degree, and 0 took D.Soc.Sc. degree. The total amount of credit points (in the old system of so called study weeks) awarded to students was 21477.

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 2006 the department was participating in 8 Graduate Schools: one in mathematical analysis and its applications, one in inverse problems, one in mathematical logic, one in stochastics, one in computational biology, bioinformatics, and biometry, one in computational methods of information technology, one in population

genetics, and one in statistical information, inference, and data analysis.

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 28 research projects funded by the Academy of Finland and in two 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 four Centres of Excellence in research selected by the Academy of Finland: the Research Unit of Geometric Analysis and Mathematical Physics, the Centre of Population Genetic Analyses, the Research Group of Economic Structures and Growth, and the Finnish Centre of Excellence in Inverse Problems. In the first and fourth of these the department is the co-ordinating partner.

In 2006 the researchers of the department published 132 refereed papers in journals and conference proceedings. Research to appear soon, or surveyed, was reported in 32 preprints or working papers and 64 communications in mathematical or statistical meetings and foreign seminars. The department has a preprint series of its own; in 2006 there appeared numbers 430–449.

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 2006 the accumulation of new mathematical or statistical books was 94 copies and the whole science library received 1861 titles of periodicals and reports, from which about 400 were in mathematics or statistics. In addition, many electronic information facilities are available. 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 two microcomputer classrooms. The computers are in daily use for text processing, typesetting, communication with foreign research institutions, and running mathematical or statistical programs, numerical or symbolical, also in supercomputers via nets.

The international journal Annales Academiae Scientiarum Fennicae 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. The treasurer of the EMS is a professor of the department.

In 2006 six students of the department participated in the SOKRATES/ ERAS-

MUS student exchange program, three in the NORDPLUS program, and one in an exchange program of the university.

The prize of the Rolf Nevanlinna Institute for the best Ph.D. thesis in mathematics in Finland in 2005 was conferred on Pekka Pankka, a member of the department.

2. Staff

2.1. Regular staff

Pure and applied analysis.

Astala, Kari, Ph.D., Professor, Academy Professor
Harjulehto, Petteri, Ph.D., Assistant, 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, Fee-paid Teacher
Kupiainen, Antti, Ph.D., Professor, Academy Professor
Lahtinen, Aatos, Ph.D., Professor
Martio, Olli, Ph.D., Professor
Mattila, Pertti, Ph.D., Professor
Mickelsson, Jouko, Ph.D., Professor
Näätänen, Marjatta, Ph.D., Senior Lecturer
Ola, Petri, Ph.D., University Lecturer, Senior Researcher (CE)
Päivärinta, Lassi, Ph.D., Professor, Senior Scientist (AF)
Partanen, Juha V., Ph.D., Acting University Lecturer, Instructor
Rickman, Seppo, Ph.D., Emeritus Professor
Seppälä, Mika, Ph.D., Professor
Taskinen, Jari, Ph.D., University Lecturer
Toppila, Sakari, Ph.D., Professor
Tukia, Pekka, Ph.D., Professor
Tylli, Hans-Olav, Ph.D., University Lecturer, Academy Research Fellow
Väisälä, Jussi, Ph.D., Emeritus Professor

Topology and algebra.

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

Mathematical logic.

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

Stochastics.

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

Statistics.

Ekholm, Anders, Ph.D., Emeritus Professor
Laaksonen, Seppo, Ph.D., Professor
Lehtonen, Risto, D.Soc.Sc., Acting Professor
Miettinen, Jarkko, M.Sc. (Econ.), M.Soc.Sc., Assistant
Mustonen, Seppo, Ph.D., Emeritus Professor
Niemi, Hannu, Ph.D., Professor
Pere, Pekka, Ph.D., University Lecturer
Puranen, Juha, Lic.Soc.Sc., Lecturer
Saikkonen, Pentti, D.Soc.Sc., Professor
Tarkkonen, Lauri, D.Soc.Sc., Professor
Valaste, Maria, M.Soc.Sc., Acting Assistant
Valkeapää, Annukka, M.Soc.Sc., Acting Lecturer
Vasama, Pyry-Matti, Lic.Soc.Sc., Lecturer
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., University Lecturer, Researcher (AF)
Eerola, Mervi, Ph.D., University Lecturer
Geritz, Stefan, Ph.D., University Lecturer
Gyllenberg, Mats, D.Tech., Professor
Heikkinen, Juha, Ph.D., University Lecturer
Ranta, Jukka, Ph.D., Acting University Lecturer

2.2. Other teachers and researchers

The following abbreviations are used: AF = Academy of Finland, CE = Centre of Excellence, EU = European Union, GS = Graduate School, pg = grant from a private foundation (or from a foreign public source), Tekes (Finnish Funding Agency for Technology and Innovation), UH = grant from the University of Helsinki.

Ajanki, Oskari, M.Sc. (Eng.), Research Assistant (CE), Teaching Assistant
Akudibillah, Gordon, M.Sc., Researcher (AF)
Alamäki, Antti, Translator (EU)
Ala-Mattila, Vesa, M.Sc., Researcher (CE, pg), Teaching Assistant
Alsuhail, Faiz, M.Soc.Sc., Teaching Assistant
Arponen, Heikki, M.Sc., Researcher (Tekes)
Bardsley, John, Ph.D., Visiting Professor
Bissell-Siders, Ryan, M.Sc., Researcher (UH), Fee-paid Teacher
Böss, Kalle, M.Sc., Doctoral Student (GS), Teaching Assistant
Caprotti, Olga, Ph.D., Project Manager (EU)
Chousionis, Vasileios, M.Sc., Doctoral Student (GS), Teaching Assistant
Chuppin, Ivan, Trainee

Costea, Serban, Ph.D., Postdoctoral Researcher (CE)
De Simone, Emiliano, Ph.D., Researcher (AF)
Dong Xiaojin, Teaching Assistant
Drasin, David, Ph.D., Visiting Professor
Eerola, Tapio, M.Sc., Doctoral Student (GS), Teaching Assistant
Enberg, Katja, Ph.D., Researcher (AF)
Erästö, Panu, Ph.D., Researcher (AF, GS)
Feragen, Aasa, Ph.Lic., Researcher (pg), Teaching Assistant
Fluch, Martin, M.Sc., Doctoral Student (AF), Fee-paid Teacher
Gasbarra, Dario, Ph.D., Researcher (CE), Teaching Assistant
Goebel, Roman, Ph.D., Researcher (GS)
Granlund, Seppo, Ph.D., Docent
Gupta, Rashi, M.Sc., M.Sc. (Eng.), Doctoral Student (GS)
Haapakoski, Jouni, Guidance Tutor
Haario, Heikki, Ph.D., Docent
Halko, Aapo, Ph.D., Teaching Assistant
Hämäläinen, Auli, Teaching Assistant
Hämäri, Severi, Teaching Assistant
Hänninen, Teemu, Ph.D., Teaching Assistant
Harju, Markus, M.Sc., Researcher (AF)
Harvala, Matti, Trainee
Häsä, Jokke, Teaching Assistant
Heino, Ville, M.Sc., Research Assistant (CE), Teaching Assistant
Heinonen, Antti, Guidance Tutor
Hella, Lauri, Ph.D., Docent
Hiltunen, Risto, Teaching Assistant
Hinkkanen, Eino, Teaching Assistant
Hirvonen, Åsa, Ph.Lic., Doctoral Student (pg, GS), Teaching Assistant
Holmström, Lasse, Ph.D., Docent
Huotari, Antti-Jussi, M.Soc.Sc., Teaching Assistant
Hyhkö, Heikki, Teaching Assistant
Hyry, Eero, Ph.D., Academy Research Fellow (AF)
Hytönen, Tuomas, Ph.D., Researcher (CE)
Hyvönen, Nuutti, D.Sc. (Tech.), Non-military Servant
Järvenpää, Sauli, Teaching Assistant
Järvilehto, Tarmo, Ph.Lic., Researcher (AF)
Joensuu, Jani, Ph.Lic., Researcher (CE), Teaching Assistant
Jost, Céline, Dipl.Math., Doctoral Student (GS)
Judin, Pekka, M.Sc., Researcher (CE), Teaching Assistant
Jurvanen, Pinja, M.Sc., Doctoral Student
Jussila, Tapani, Ph.D., Planner (EU)
Kaasalainen, Mikko, Ph.D., Academy Research Fellow (AF)
Kaila, Risto, Ph.D., Teaching Assistant
Kanerva, Okko, Ph.D., Fee-paid Teacher
Kankaanpää, Teppo, M.Sc., Teaching Assistant
Karhima, Jouni, Information Technology Specialist (EU)
Kauppinen, Jenni, M.Sc., Trainee (CE)
Kemppainen, Antti, M.Sc. (Eng.), Doctoral Student (pg, AF)
Kesälä, Meeri, Ph.Lic., Doctoral Student (GS), Fee-paid Teacher

Kisdi, Éva, Ph.D., Researcher (AF)
Kohonen, Jukka, M.Sc., Researcher (AF), Teaching Assistant
Koistinen, Petri, D.Tech., Researcher
Komi, Henna, M.Sc., Doctoral Student (EU), Fee-paid Teacher
Kontinen, Jarmo, M.Sc., Doctoral Student (pg)
Kontinen, Juha, Ph.D., Postdoctoral Researcher (AF), Teaching Assistant
Kontinen, Kirsi, Guidance Tutor
Koponen, Riina, Guidance Tutor
Korhonen, Janne, Guidance Tutor
Koriseva, Eija, M.Sc. (Eng.), Researcher (AF), Fee-paid Teacher
Korppi, Tuomas, Ph.D., Researcher (pg, AF), Teaching Assistant
Koski, Sampo, LUMA intermediary
Kostilainen, Milka, Guidance Tutor
Kourula, Jaakko, Compiler
Kulathinal, Sangita, Ph.D., Researcher (AF)
Kulikov, Vadim, Non-military Servant, Teaching Assistant
Kuparinen, Anna, M.Sc., Researcher (AF)
Kytölä, Kalle, Ph.D., Postdoctoral Researcher (AF)
Laakso, Teemu, M.Sc. (Eng.), Researcher (AF)
Laakso, Tomi, M.Sc., Researcher (CE), Teaching Assistant
Laine, Marko, Ph.Lic., Researcher , Fee-paid Teacher
Laitila, Jussi, Ph.Lic., Doctoral Student (AF)
Lamberg, Lars, Ph.D., Researcher (Tekes)
Lassas, Matti, Ph.D., Docent
Lehtinen, Anu, M.Sc., Teaching Assistant
Lehto, Olli, Ph.D., Academician, Emeritus Professor
Lehto, Pertti, Ph.D., Teaching Assistant
Lehto, Saara, M.Sc., Researcher (AF, pg)
Lehtonen, Kari, Research Assistant (EU)
Lehtonen, Tapani, Ph.D., Docent
Lindberg, Sauli, M.Sc., Research Assistant (CE), Teaching Assistant
Lindén, Henri, Ph.D., Researcher (pg), Teaching Assistant
Lipponen, Henri, M.Sc., Researcher (AF), Teaching Assistant
Lipsanen, Jari, Teaching Assistant
Liu, Xiaoli, Researcher (GS)
Loikkanen, Juha, M.Sc., Researcher (AF)
Määttä, Matti, Doctoral Student (pg)
Malmivuori, Markku, Ph.D., Researcher (CE), Teaching Assistant
Mäntyniemi, Samu, Ph.D., Researcher (GS), Fee-paid Teacher
Martin, Jussi, M.Sc., Doctoral Student , Teaching Assistant
Marttinen, Pekka, M.Sc., Doctoral Student (GS)
Meade, Douglas, Ph.D., Special Researcher (EU)
Metsä-Simola, Niina, Teaching Assistant
Mikonsaari, Roope, M.Sc., Researcher (EU)
Milén, Hannu, Trainee
Moroni, Rossana, Doctoral Student (jointly with KTL)
Muratore-Ginanneschi, Paolo, Ph.D., Postdoctoral Researcher (CE)
Mutshinda Mwanza, Crispin, M.Sc., Researcher (AF)
Myrskylä, Mikko, Ph.Lic., Doctoral Student (GS)

Nevanlinna, Lilli, Guidance Tutor
Nganga, Janet, Researcher (EU)
Nieminen, Pekka, M.Sc., Doctoral Student (GS), Fee-paid Teacher
Niemistö, Hannu, Ph.Lic., Doctoral Student (GS), Teaching Assistant
Nikula, Miika, Teaching Assistant
Nissinen, Piia, Guidance Tutor
Norros, Ilkka, Ph.D., Docent
Noykova, Neli (Nelly), Ph.D., Postdoctoral Researcher (AF)
Nuija, Aleksandr, Research Assistant (AF), Teaching Assistant
Nurmi, Ville, M.Sc., Researcher (AF, GS), Teaching Assistant
O'Hara, Robert, Ph.D., Academy Research Fellow (AF)
Ojala, Lauri, M.Sc., Researcher (AF)
Okuloff, Annaleena, M.Sc., Researcher (AF)
Okuyama, Yûsuke, Ph.D., Researcher (pg)
Ondracek, Petr, Doctoral Student (GS), Teaching Assistant
Özdamar, Elif Özge, Doctoral Student (GS)
Palomäki, Matti, Guidance Tutor
Pankka, Pekka, Ph.D., Postdoctoral Researcher (CE)
Pauna, Matti, Ph.Lic., Project planner (EU)
Peltonen, Kirsi, Ph.D., Docent
Peltonen, Petri, Teaching Assistant
Piiroinen, Petteri, Ph.D., Researcher (CE), Teaching Assistant
Pirinen, Matti, M.Sc., Doctoral Student (CE), Teaching Assistant
Prause, István, M.Sc., Researcher (pg)
Preoteasa, Diana, M.Sc., Doctoral Student (GS)
Puranen, Anssi, Guidance Tutor
Ramm-Schmidt, Erik, M.Sc., Teaching Assistant
Rämö, Johanna, M.Sc., Teaching Assistant
Ravaioli, Elena, Ph.D., Teaching Assistant
Rinkinen, Simo, M.Sc., Teaching Assistant
Rintala, Tiina, LUMA project person
Romu, Tiina, Guidance Tutor
Ruokolainen, Juha, Ph.D., Teaching Assistant
Saarikko, Ilana, M.Sc., Doctoral Student (GS)
Saksman, Eero, Ph.D., Docent
Sallinen, Satu, M.Sc., Teaching Assistant
Salminen, Mikko, Guidance Tutor
Salo, Mikko, Ph.D., Postdoctoral Researcher (AF)
Salonen, Vesajoona, M.Sc., Non-military Servant
Schwager, Monika, Ph.D., Researcher (AF)
Seitz, Deni, Trainee (CE), Guidance Tutor
Service, Robert, M.Sc., Doctoral Student
Silfverberg, Miikka, Teaching Assistant
Sillanpää, Mikko J., Ph.D., Academy Research Fellow (AF)
Sirén, Jukka, M.Sc., Doctoral Student (CE)
Solheim, Erling, M.Sc., Fee-paid Teacher
Stenlund, Mikko, M.Sc. (Eng.), Ph.D., Postdoctoral Researcher (AF)
Tähtinen, Vesa, M.Sc., Researcher (pg)
Talikota, Sarish, M.Sc., M.Sc. (Eng.), Researcher (AF)

Talonen, Jaakko, Teaching Assistant
Talponen, Jarno, Ph.Lic., Doctoral Student (AF)
Tammela, Hanna, Guidance Tutor
Tang, Jing, M.Sc., Doctoral Student (CE)
Tapaninen, Pekka, Non-military Servant
Thomas, Andrew, Researcher (CE)
Tiensuu, Sampo, Non-military Servant
Tiihonen, Petri, Guidance Tutor
Tilvis, Ville, Information Technology Specialist (EU)
Todd, Robert, M.Sc., Researcher (GS)
Toepfer, Eljas, M.Sc., Researcher (AF), Teaching Assistant
Tolvanen, Juha, Teaching Assistant
Tuohilampi, Antti, Research Assistant (EU)
Tuomiranta, Tuomas, Trainee (CE)
Turpeinen, Heini, Guidance Tutor
Uotila, Hanna, Guidance Tutor
Utz, Margarete, M.Sc., Doctoral Student (GS), Teaching Assistant
Vähäkangas, Aleksi, Ph.Lic., Doctoral Student (GS), Teaching Assistant
Vähäkangas, Antti, M.Sc., Researcher (CE, pg), Teaching Assistant
Valkeila, Esko, Ph.D., Docent
Vänskä, Simopekka, Ph.Lic., Researcher (Tekes)
Varvio, Sirkka-Liisa, Ph.D., Researcher (AF), Fee-paid Teacher
Vesanen, Tiina, M.Sc., Teaching Assistant
Viikinkoski, Matti, M.Sc., Doctoral Student (AF)
Viitamäki, Pertti, Guidance Tutor
Vikberg, Thomas, Teaching Assistant, Guidance Tutor
Viljanen, Marja-Leena, M.Sc., Researcher (EU)
Virtanen, Jani, Ph.D., Postdoctoral Researcher (AF)
Virtanen, Rebekka, Guidance Tutor
Vuori, Timo, M.Sc., Teaching Assistant
Vuorinen, Matti, Ph.D., Docent
Yan, Ping, Ph.D., Researcher (pg, AF)
Yasskin, Philip, Ph.D., Special Researcher (EU)
Ylinen, Kari, Ph.D., Docent
Ylinen, Lauri, M.Sc. (Eng.), Doctoral Student (CE), Teaching Assistant

2.3. Administrative, library, and technical staff

Hämäläinen, Tarja, Department Secretary
Hautala, Terhi, Research Secretary, Guidance Tutor Coordinator
Honkasalo, Hannu, Ph.D., Amanuensis (see also 2.1)
Laakso, Pirjo, Departmental Secretary
Nikunen, Martti, Ph.D., Laboratory Engineer
Pauninsalo, Raili, Departmental Secretary
Piironen, Arto, Guidance Tutor Coordinator
Rikkonen, Katriina, M.Sc., Department Secretary
Taskinen, Matti, M.Sc., Computer Systems Manager
Tuohino, Pasi, Secretary
Ulmanen, Riitta, Departmental Secretary

2.4. Editorial staff

Mäkeläinen, Tuulikki, M.Sc., Administrative secretary of the European Mathematical Society and editorial secretary of the Annales Academiae Scientiarum Fennicae Mathematica. Since September 2006 these posts have been held by Riitta Ulmanen and Ph.D. Mika Koskenoja, respectively.

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 2000–2006.

Year	2000	2001	2002	2003	2004	2005	2006
New majors (Fac. of Sc.)	201	220	211	258	281	208	272
New majors (Fac. of Soc. Sc.)	17	18	32	25	33	27	32
Majors (Fac. of Sc.)	1143	1168	1178	1251	1331	1336	1426
Majors (Fac. of Soc. Sc.)	131	136	149	155	174	177	184

In 2006, there were 126 postgraduate students.

In 2006, 50 foreign students were studying at the department having their major subject in the mathematics programme or in the statistics programme. Of them 9 had the bachelor's degree as goal, 21 had the master's degree as goal (2 of them being absent), and 12 had a postgraduate degree as goal; in addition, 8 were 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 and intermediate studies. 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 teached 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. An M.Sc. degree in one of the above mentioned three major subjects in the mathematics programme 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 major subject and intermediate or advanced studies in a minor subject, 60 c.
2. Ph.Lic. thesis.

The major subject studies in part 1 normally consist of advanced level courses and seminars.

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	≥ 70 c
Minor subjects	≥ 50 c
General studies	14–18 c;

the total must be at least 180 c. The statistics studies consist of the basic and intermediate 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, 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 2–6 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 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 in 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 1–4 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. An M.Sc. or M.Soc.Sc. degree in the statistics programme 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 major subject and intermediate or advanced studies in a minor subject, 60 c.
2. Ph.Lic. or Lic.Soc.Sc. thesis.

The major subject studies in part 1 normally consist of advanced level courses and seminars.

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 2006. The number of (ECTS) credits for each course is given in parentheses.

3.3.1. Mathematics

Basic and intermediate studies

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

Calculus (10): Differential and integral calculus of one real variable. Introduction to Maple. This course is intended for mathematics minors.

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. This course

together with the course Introduction to statistical inference (5) replace the old course Probability theory I (10).
Introduction to discrete mathematics (5): Elementary set theory, relations, functions, induction, combinatorics, graph theory. Intended in particular for students of computer science.
Logic I (10): Introduction to propositional logic and predicate logic.
Number theory for the beginners.

Advanced studies

Algebra and topology:
Algebra II (10).
Topology II (10).
Algebraic topology II.
Homotopy theory.
Finite transformation groups and P. A. Smith theory.

Analysis:
Measure and integral (6).
Real analysis I (6).
Function theory I (10): Introduction to the theory of functions of a complex variable.
Real analysis II.
Functional analysis (10).
Potential theory on metric spaces.
Geometric measure theory.
Metric geometry.
Introduction to differential geometry.
Introduction to conformal geometry.
Topological vector spaces.
Normed algebras.
A course on complex analysis.
Martingale transforms.

Mathematical logic:
Mathematical logic (10).
Independence friendly logic II.
Axiomatic set theory, continuation course.
Model theory.
Random models.
Large cardinals and iterated forcing.
Boolean-valued models and independence proofs in set theory.

Mathematical physics:
Introduction to mathematical physics: Dynamical systems and chaos.
Principal fibre bundles and Yang–Mills theory.
An introduction to random matrix theory.

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).
Integral equations.
Partial differential equations.
Analysis on quaternions and Clifford algebras.
Spline approximation.

Biomathematics:
Dynamics of structured populations.
Adaptive dynamics.
Modelling fluctuating populations.
Spatial models in ecology and evolution.
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.
Life insurance mathematics, continuation course.
Risk theory, continuation course.
Malliavin calculus.
Mathematical economics.
Large deviations, statistical mechanics, stochastic equilibrium economics.

Stochastics:
Probability theory.
Stochastic processes.

Mathematics teacher's education:
Advanced course for mathematics teachers (12): Advanced calculus with topology and measure theory organized in a seminar style.
Geometry (10).
Fundamental concepts of mathematics and their introduction with the Hungarian (Varga–Neményi) method (4).
Mathematics teaching laboratory.
Pro gradu course.

Graduate seminars

Transformation groups.
Analysis.
Functional analysis.
Geometric analysis.
Inverse problems.
Logic.
Finite model theory.
Mathematical physics.
Geometry, topology and physics seminar.
Math-phys journal discussion club.
Stochastics.
Random graphs.
Insurance mathematics.
Graduate student seminar.

3.3.2. Statistics

Basic and intermediate studies

Introduction to statistics (4/8): 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 (8).
Course in probability (10).
Statistical inference (10).
Linear models (5).
Applications of linear models (6–10).
Elements of statistical computing.
Statistics in practical research.
Frequency data and nonlinear multivariate analysis.
A statistical program course (SPSS).
Introduction to applying R programs.
Workshop on statistical programs.

Advanced studies

General statistics:
A second course in statistical inference (10).
Generalized linear models.
Multivariate methods.
Computationally intensive statistical methods.
Applications of Bayesian methods.
Probabilistic modelling with WinBUGS.

Biometry:
Hierarchical models.
Statistical modelling of infectious diseases.
Bayesian analysis for the life sciences.
Statistical methods in epidemiology.
Phylogenetic data analysis.
Bioinformatics of genetic past.
Geostatistics.
Statistical methods for assessing wildlife populations.

Measurement and survey methodology:
Measurement and collection of statistical data.
Survey methodology B.
Survey methodology.
Advanced survey sampling.

Time series and econometrics:
Stationary time series.
Multivariate time series.

Graduate seminars

Biomathematics and biometry.
Computationally intensive data analysis.
Bachelor's and Master's theses seminar.
Survey methodology.
Statistical computing.
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 will be 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 2000–2006 are shown in Table 1.

Table 1. Credit points awarded to students

Year	2000	2001	2002	2003	2004	2005	2006
Credits (Fac. of Sc.)	14715	12778	13198	13210	18121	17035	16150
Credits (Fac. of Soc. Sc.)	5759	5469	6681	7339	6870	6324	5327

The numbers of M.Sc. theses in each curriculum of the mathematics programme in 1999–2006 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	1999	2000	2001	2002	2003	2004	2005	2006	All
Mathematics	17	15	8	9	20	14	10	15	108
Applied math.	18	8	4	6	5	18	8	10	77
Computer math.			4	2	2	1	2	2	13
Teacher's	20	26	21	12	16	23	32	24	174
All	55	49	37	29	43	56	52	51	372

The number of M.Sc. theses in statistics was 1 in 2006. The number of M.Soc.Sc. theses in statistics was 6 in 2004, 7 in 2005, and 7 in 2006.

Table 3 includes the numbers of postgraduate theses in 1998–2006 in the Faculty of Science side of the department (in 1998–2003 Department of Mathematics and Rolf Nevanlinna Institute together).

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

Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	All
Ph.Lic.	5	4	4	10	6	9	4	2	7	51
Ph.D.	2	3	4	3	8	4	8	9	10	51

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

M.Sc. theses

M.Sc. theses in mathematics curriculum

Edvard Fagerholm: LLL-algoritmi ja sen sovelluksia

Tomi Hoviaro: Nilpotenttiryhmien ja verkkojen stabiilisuus

Anna Kairema: Hyperbolinen metriikka ja Schwarzin–Pickin lemma

Lauri Keskinen: Härtig-kvanttori

Pekka Kivenjuuri: Tasoverkkojen värittäminen

Sauli Lindberg: Kvasiharmoniset vektorikentät

Henri Lipponen: On trace extensions and cohomology of infinite dimensional Grassmannian manifold

Jussi Martin: KAM-lause

Lotta Oinonen: Jordanin käyrälause ja Schönfliesin lause

Valter Pohjola: Montelin lause ja rationaalikuvauksien Julian joukot

Erik Ramm-Schmidt: Paths in metric spaces

Laura Sutinen: Constructibility, the Continuum Hypothesis and other results about reals

Markus Tujula: Uniformisaatiolause

Matti Virolainen: Existence of G-invariant metrics and global K-slices in proper G-spaces

Benedictus Ågren: Measurable cardinals

M.Sc. theses in applied mathematics curriculum

Jouni Alakoski: Whittle-jonoverkkojen teoriaa

Marika Latvala: Pneumokokkibakteerin kantajuuden mallintaminen päiväkotilapsissa

Kimmo Lietosaari: Liikenne- ja autovahinkojen yhteisjakauman mallintaminen copuloiden avulla

Juho Nuto: Sukupuuttotodennäköisyyden estimaattori Bienaymé–Galton–Watsonin haarautumisprosessissa

Mikko Pakkanen: Jatkuvat semimartingaalit ja filtraation alkulaajennus

Hanna Rekola: Markovin ketjuista ja niiden soveltamisesta estimointiin adaptiivisilla MCMC-menetelmillä

Mari Salomäki: Optimaalinen jälleenvakuuttaminen

Maiju Seppälä: Kaasu–partikkelivirtausten numeeriset laskentamenetelmät

Jukka Sirén: Populaatioiden geneettisen rakenteen spatiaalinen mallintaminen

Jaakko Tuosa: T-splinit

M.Sc. theses in computer mathematics curriculum

Tapani Rousi: Nelikulmion modulin laskenta AFEM-elementtiohjelmalla

Jouko Toivola: An introduction to elliptic curves. Some remarks concerning cryptology, especially concerning the elliptic curve method (ECM) in factoring integers

M.Sc. theses in mathematics teacher curriculum

Jussi Hämäläinen: Matematiikan ja tilastotieteen laitoksen opetus opiskelijoiden kokemana

Mira Hämäläinen. Unkarilaisia matematiikan tehtäviä koululaisille

Miika Hyytiäinen: Logiikan opetus lukiossa. Logiikan perusteita ja niiden pedagogisia ongelmia

Otto Jaakonsaari: Opiskelijat ja matematiikan ja tilastotieteen laitos yhdessä opiskelumotivaatiota luomassa

Timo Järvenpää: Jaksolliset funktiot

Heikki Kaskinen: Mitä reaaliluvut ovat?

Pekka Kärki: Matematiikan opetuksen uudistusten vaikutukset 1970–90-luvun yläasteen oppikirjoissa yhtälökäsitteen opetuksen sisällöissä ja käsittelytavoissa sekä uuden matematiikan heikkoihin tuloksiin vaikuttaneet tekijät

Esa Korhonen: Verkko-opetusmateriaali lukujoukkojen opettamiseen

Pia Kyllönen: Hyperbolinen geometria

Timo Laitinen: Riemann–Stieltjesin integraali

Tuija Laurikainen: Laplace-muunnos

Anu Lehtinen: Oppimisorientaatioiden, pystyvyysuskomusten, ohjattuun toimintaan osallistumisen ja opiskelupaikan ensisijaisuuden yhteys Differentiaali- ja integraalilaskenta I.1 -kurssin opiskelumenestykseen

Jonna Loimisto: Matematiikan ja tilastotieteen laitos opiskelijoiden kokemana oppimisympäristönä

Maria Luoto: Funktion raja-arvo ja jatkuvuuden eri lajeja

Eveliina Mettänen: Avaruusgeometrian oppiminen ja sen konkreettisuus perusopetuksen luokilla 7–9

Katariina Nurmio: Funktio peruskoulun yläluokilla 7–9

Heli Pessa: Tutkimus analyysin peruskäsitteistä: Reaaliluvut, funktion raja-arvo ja funktion jatkuvuus

Aapo Rantalainen: Avaruuden $L^1(\mathbf{R}^n)$ differentioituvien kantojen ominaisuuksista

Anna-Marika Siponen: Emmy Noether

Ari-Pekka Vallenius: Peruskoulun yläluokkien polynomi- ja yhtälölaskentaa Suomessa ja Ruotsissa

Outi Vanhanen: Yhteistoiminnallinen opetuspaketti lukion pitkän matematiikan Polynomifunktiot-kurssilla käytettäväksi

Mari Vanhatalo: Hardyn epäyhtälö epäsäännöllisille alueille

Laura Vänskä: Murtolukujen opettamisesta peruskoulun luokilla 6–9

Laura Varpula: Integraalilaskenta suomalaisessa ja saksalaisessa lukion oppikirjassa

M.Sc. theses in statistics

Jenni Kauppinen: Luonnonvalinnan identifiointi merkkigeeniaineistosta

M.Soc.Sc. theses in statistics

Faiz Alsuhail: MVAR-mallin teoreettisia erityiskysymyksiä

Mia Malmila: Sairaanhoitajien määrän arviointi tilastotieteellisellä menetelmällä päivystystoimintaa toteuttavassa leikkausosastossa

Sami Nevala: Turvattomuuden tunteen mittaaminen kolmessa monikansallisessa survey-tutkimuksessa

Henri Nyberg: Dynaamiset probit-mallit ja suhdannesyklin ennustaminen

Juha-Matti Perttola: SAS2LaTeX-kompendiumi yleisen reliabiliteettiestimaattorin laskemiseen

Henri Riuttala: Vastauskadon aiheuttama harha ja sen paikkaaminen painottamalla kyselyaineistoissa: soveltaminen työterveyspaneelikyselyyn

Kati Tiirikainen: Koti- ja vapaa-ajan tapaturmat: monimuuttujamenetelmät väestöryhmien välisten erojen selvittämisessä

Ph.Lic. theses

Paula Erkkilä: Bergman-avaruudet ja -projektiot (mathematics)

Aasa Feragen: Characterization of equivariant ANEs (mathematics)

Åsa Hirvonen: Categoricity in homogeneous complete metric spaces (mathematics)

Oana Matei: Estimating ruin probabilities by multilevel splitting (applied mathematics)

Hannu Niemistö: On locality and uniform reduction (mathematics)

Jarno Talponen: On the Banach–Mazur rotation problem (mathematics)

Aleksi Vähäkangas: Bounded p-harmonic functions on models and Cartan–Hadamard manifolds (mathematics)

Lic.Soc.Sc. theses

Leena Kalliovirta: Misspecification tests based on quantile residuals (statistics)

Ph.D. dissertations

Emiliano De Simone: Thesis "Renormalization methods in KAM theory", Department of Mathematics and Statistics, University of Helsinki, 2006, 7+117 pp., also in electronic form; public examination 27.5.2006; opponent: Post Doctoral fellow Alain Schenkel (University of Helsinki); Ph.D. degree in mathematics 16.6.2006.

Panu Erästö: Thesis "Studies in trend detection of scatter plots with visualization", Department of Mathematics and Statistics, University of Helsinki, 2005, 26 pp., also in electronic form, and six articles; public examination 20.1.2006; opponent: prof. Fred Godtliebsen (University of Tromsø, Norway); Ph.D. degree in applied mathematics 24.2.2006.

Teemu Hänninen: Thesis "Aspects of atomic decompositions and Bergman projections", Department of Mathematics and Statistics, University of Helsinki, 2006, 21 pp., also in electronic form, and three articles; public examination 8.8.2006; opponent: prof. José Bonet (Polytechnical University of Valencia, Spain); Ph.D. degree in mathematics 22.9.2006.

Meeri Kesälä: Thesis "Finitary abstract elementary classes", Department of Mathematics and Statistics, University of Helsinki, 2006, 6+14 pp., also in electronic form, and three articles; public examination 19.12.2006; opponent: assoc.

prof. Monica VanDieren (Robert Morris University, USA); Ph.D. degree in mathematics 26.1.2007.

Kalle Kytölä: Thesis "Conformal field theory methods for variants of Schramm–Loewner equations", Department of Mathematics and Statistics, University of Helsinki, 2006, 4+50 pp. and four articles; public examination 28.10.2006; opponent: Ph.D. Krzysztof Gawędzki, Directeur de Recherche (École Normale Supérieure, Lyon, France); Ph.D. degree in mathematics 16.11.2006.

Jussi Laitila: Thesis "Composition operators on vector-valued BMOA and related function spaces", Department of Mathematics and Statistics, University of Helsinki, 2006, 22 pp., also in electronic form, and four articles; public examination 9.12.2006; opponent: doc. Mikael Lindström (Åbo Akademi University, Finland); Ph.D. degree in mathematics 26.1.2007.

Samu Mäntyniemi: Thesis "Bayesian fisheries stock assessment: integrating and updating knowledge", Rolf Nevanlinna Institute, Department of Mathematics and Statistics, University of Helsinki, 2006, 2+24 pp., also in electronic form, and five articles; public examination 9.6.2006; opponent: prof. Randall M. Peterman (Simon Fraser University, Canada); Ph.D. degree in biometry 22.9.2006.

Sampo Smolander: Thesis "Radiative transfer, interception and scattering in coniferous forests: models and applications for production ecology and remote sensing", The Finnish Society of Forest Science (the editorial office), Dissertationes Forestales **22** (2006), 33 pp., and six articles, also in electronic form; public examination 16.6.2006; opponent: prof. Ranga B. Myneni (Boston University, USA); Ph.D. degree in applied mathematics 22.9.2006.

Mikko Stenlund: Thesis "Homoclinic splitting without trees", Department of Mathematics and Statistics, University of Helsinki, 2006, 8+124 pp., also in electronic form; public examination 20.5.2006; opponent: prof. Guido Gentile (Università di Roma Tre, Italy); Ph.D. degree in mathematics 16.6.2006.

Simopekka Vänskä: Thesis "Direct and inverse scattering for Beltrami fields", Annales Academiae Scientiarum Fennicae Mathematica Dissertationes **149** (2006), 99 pp.; public examination 19.12.2006; opponent: prof. Paul A. Martin (Colorado School of Mines, USA); Ph.D. degree in mathematics 26.1.2007.

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 2006 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 2006.

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. In the course Introduction to statistics there are special mathematics support groups.

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 2006. 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

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 applicaton 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 2006 were the following, in alphabetical order of the responsible director (EU = European Union, Tekes: Finnish Funding Agency for Technology and Innovation, UH = University of Helsinki, AF = Academy of Finland).

Resolution of the genetic architecture of type 1 diabetes in Finnish families, with a special emphasis on age at onset. *Responsible director*: Arjas. *Funding* (2001–2006): AF, Juvenile Diabetes Research Foundation (USA), Sigrid Juselius Foundation.

Centre of population genetic analyses. *Responsible director*: Arjas. *Funding* (2002–2007): AF.

Statistical modelling of the ecological effects of GMOs in the boreal environment. *Responsible director*: Arjas. *Funding* (2004–2007): AF.

Bayesian latent class modelling for functional genomics: combining experimental results and data base knowledge (FGBayes). *Responsible director*: Arjas. *Funding* (2004–2007): AF.

Geometric analysis and its applications. *Responsible director*: Astala. *Funding* (2004–2009): AF.

Bayesian learning of generalized graphical model structures. *Responsible director*: Corander. *Funding* (2005–2007): UH.

Design of genetic studies for genome scan data. *Responsible director*: Gasbarra. *Funding* (2006–2007): AF.

Mathematical foundations of adaptive dynamics. *Responsible director*: Geritz. *Funding* (2006–2007): 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* (2006–2008): 100 Years Foundation of Technology Industry.

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

Singularities and blow-up algebras. *Responsible director*: Hyry. *Funding* (2001–2006): AF.

Transformation groups. *Responsible director*: Illman. *Funding* (1983/2004–2006): AF.

New mathematical methods in planetary and galaxy research. *Responsible director*: Kaasalainen. *Funding* (2006–2008): AF.

Stirring and mixing. *Responsible director*: Kupiainen. *Funding* (2002–2006): EU.

Mathematical physics. *Responsible director*: Kupiainen. *Funding* (2002–2007): AF.

From discrete to continuous models for multiphase flows. *Responsible director*: Kupiainen. *Funding* (2005–2007): Tekes.

Baltic–Nordic Network cooperation on education and research in survey statistics. *Responsible director*: R. Lehtonen. *Funding* (2004–2006): Norges forskningsråd (Nordplus Neighbour programme).

Japan–Finland potential theory conference. *Responsible director*: Martio. *Funding* (2006–2007): AF.

Finnish Centre of Excellence in Geometric Analysis and Mathematical Physics.
Responsible director: Mattila. *Funding* (2002–2007): AF.

Noncommutative geometry and quantum field theory. *Responsible director*: Mickelsson. *Funding* (2003–2006): AF.

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

Statistical modelling of ecological and genetic data. *Responsible director*: O'Hara. *Funding* (2004–2007): AF.

Partial differential equations and inverse problems. *Responsible director*: Päivärinta. *Funding* (2004–2006): AF.

Inverse problems and reliability of models. *Responsible director*: Päivärinta. *Funding* (2005–2007): Tekes.

Inverse problems and partial differential equations. *Responsible director*: Päivärinta. *Funding* (2005–2006): AF.

Sandike. *Responsible director*: Päivärinta. *Funding* (2005–2007): Tekes, GE Healthcare, PaloDEx.

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* (2006–2008): AF, Tekes.

Web advanced learning technologies (WebALT). *Responsible director*: Seppälä. *Funding* (2005–2006): European Commission (eContent program), University of Helsinki (coordinator), Eindhoven University of Technology (contractor), Technical University of Catalonia (contractor), University of Cologne (contractor), Swiss Federal Institute of Technology – Lausanne (participant).

Unified analysis of complex traits: phenotypes, multilocus markers, and gene expression microarrays. *Responsible director*: Sillanpää. *Funding* (2003–2008): AF.

Finnish Mathematical Society international visitor programme in mathematics. *Responsible director*: Taskinen. *Funding* (2005–2006): AF, Finnish Academy of Science and Letters, Niilo Helander Foundation.

Operator theory and applications. *Responsible director*: Tylli. *Funding* (2002–2006): AF.

Logic and its applications. *Responsible director*: Väänänen. *Funding* (1998–2007): AF.

Spectral theory of Toeplitz operators and matrices. *Responsible director*: Virtanen. *Funding* (2005–2008): 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 reseach 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 is a joint venture with the Department of Mathematics and Statistics at the University of Jyväskylä. Two of the three teams of this research unit work 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 is headed by Pertti Mattila.

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 Päivärinta; 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. The Econometrics research group is closely connected with the Research Unit of Economic Structures and Growth (RUESG) at the Department of Economics. The Centre of Population Genetic Analyses and the RUESG also are national centres of excellence funded by the Academy of Finland.

5. Publications

All printed research publications (items 1–104), articles in conference proceedings (105–132), preprints and working papers (133–164), teaching material (165–166), and publications of general interest (167–210) in 2006 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 [40] is a research monograph and [130] an edited conference proceedings. For technical reasons the coverage of the publications does not exactly fit with the calendar year 2006. 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. K. Ahonen, M. L. Hämäläinen, Mervi Eerola, and K. Hoppu, *A randomized trial of rizatriptan in migraine attacks in children*, Neurology **67** (2006), 1135–1140.
2. T. Aittokallio, Mats Gyllenberg, O. Polo, J. Toivonen, and A. Virkki, *Model-based analysis of mechanisms responsible for sleep-induced carbon dioxide differences*, Bulletin of Mathematical Biology **68** (2006), 315–341.
3. András Ambrus, István Hortobágyi, Riitta Liira, Marjatta Näätänen, and Maija Salmela, *"Why do we complicate the solution of the problem?" Reflection of Finnish students and teachers on a mathematical summer camp*, Teaching Mathematics and Computer Science **4** (2006), 405–415.
4. Kari Astala, Tadeusz Iwaniec, and Gaven Martin, *Pucci's conjecture and the Alexandrov inequality for elliptic PDE's in the plane*, Journal für die Reine und Angewandte Mathematik **591** (2006), 49–74.
5. Kari Astala and Lassi Päivärinta, *Calderón's inverse conductivity problem in the plane*, Annals of Mathematics (2) **163** (2006), 265–299.
6. Asta Audzijonytė, Jakob Damgaard, Sirkka-Liisa Varvio, Jouni K. Vainio, and Risto Väinölä, *Phylogeny of Mysis (Crustacea, Mysida): History of continental invasions inferred from molecular and morphological data*, Cladistics **21** (2005), 575–596.
7. Erik Aurell and Paolo Muratore-Ginanneschi, *Optimal hedging of derivatives with transaction costs*, International Journal of Theoretical and Applied Finance **9** (2006), 1051–1069.
8. Michel Bauer, Denis Bernard, and Kalle Kytölä, *Multiple Schramm–Loewner evolutions and statistical mechanics martingales*, Journal of Statistical Physics **120** (2005), 1125–1163.
9. Russell M. Brown and Mikko Salo, *Identifiability at the boundary for first-order terms*, Applicable Analysis **85** (2006), 735–749.
10. Ralf Brüggemann, Helmut Lütkepohl, and Pentti Saikkonen, *Residual autocorrelation testing for vector error correction models*, Journal of Econometrics **134** (2006), 579–604.
11. Ray Chambers, Jan van den Brakel, Dan Hedlin, Risto Lehtonen, and Li-Chun Zhang, *Future challenges of small area estimation*, Statistics in Transition **7** (2006), 759–769.
12. Jukka Corander, Mats Gyllenberg, and Timo Koski, *Bayesian model learning based on a parallel MCMC strategy*, Statistics and Computing **16** (2006), 355–362.
13. Jukka Corander and Pekka Marttinen, *Bayesian model learning based on predictive entropy*, Journal of Logic, Language and Information **15** (2006), 5–20.
14. Jukka Corander and Mattias Villani, *A Bayesian approach to modelling graphical vector autoregressions*, Journal of Time Series Analysis **27** (2006), 141–156.
15. A. A. Dovgoshei and Olli Martio, *Mutually singular functions and computation of the lengths of curves*, Izvestiya: Mathematics **70** (2006), 693–716.
16. O. Dovgoshey, Olli Martio, Vladimir I. Ryazanov, and Matti Vuorinen, *The Cantor function*, Expositiones Mathematicae **24** (2006), 1–37.
17. O. Dovgoshey, Olli Martio, V. Ryazanov, and Matti Vuorinen, *Linear distortion of Hausdorff dimension and Cantor's function*, Collectanea Mathematica **57** (2006), 193–210.
18. Alan Dow, Heikki Junnila, and Jan Pelant, *Coverings, networks and weak topologies*, Mathematika **53** (2006), 287–320.
19. Mervi Eerola, Taina Huurre, and Hillevi Aro, *The problem of attrition in a Finnish longitudinal survey on depression*, European Journal of Epidemiology **20** (2005), 113–120.
20. Miroslav Engliš, Teemu Hänninen, and Jari Taskinen, *Minimal L^∞-type spaces on strictly pseudoconvex domains on which the Bergman projection is continuous*, Houston Journal of Mathematics **32** (2006), 253–275.
21. Panu Erästö and Lasse Holmström, *Selection of prior distributions and multiscale analysis in Bayesian temperature reconstructions based on fossil assemblages*, Journal of Paleolimnology **36** (2006), 69–80.
22. Kurt Falk and Pekka Tukia, *A note on Patterson measures*, Kodai Mathematical Journal **29** (2006), 227–236.
23. Marianne S. Fred, Robert B. O'Hara, and Jon E. Brommer, *Consequences of the spatial configuration of resources for the distribution and dynamics of the endangered Parnassius apollo butterfly*, Biological Conservation **130** (2006), 183–192.
24. Dario Gasbarra, Sangita Kulathinal, Isha Dewan, and Aulikki Nissinen, *Testing dependence between the failure time and failure modes: An application of enlarged filtration*, Journal of Statistical Planning and Inference **136** (2006), 1669–1686.

25. Dario Gasbarra and Mikko J. Sillanpää, *Constructing parental linkage phase and genetic map over distances* < 1 cM *using pooled haploid DNA*, Genetics **172** (2006), 1325–1335.
26. Stefan A. H. Geritz, Mats Gyllenberg, and Ping Yan, *Plant growth and the optimal sharing of photosynthetic products with a mycorrhizal symbiont*, Evolutionary Ecology Research **8** (2006), 577–590.
27. Duncan J. Golicher, Robert B. O'Hara, Lorena Ruíz-Montoya, and Luis Cayuela, *Lifting a veil on diversity: A Bayesian approach to fitting relative-abundance models*, Ecological Applications **16** (2006), 202–212.
28. Georges Grekos, Labib Haddad, Charles Helou, and Jukka Pihko, *Variations on a theme of cassels for additive bases*, International Journal of Number Theory **2** (2006), 249–265.
29. Rashi Gupta, Petri Auvinen, Andrew Thomas, and Elja Arjas, *Bayesian hierarchical model for correcting signal saturation in microarrays using pixel intensities*, Statistical Applications in Genetics and Molecular Biology **5** (2006), Article 20, 20 pp. (electronic)
30. V. Ya. Gutlyanskiĭ and Olli Martio, *The boundary behavior of conformal mappings with quasiconformal extensions*, Doklady Mathematics **73** (2006), 190–192.
31. Mats Gyllenberg, Timothy Lant, and Horst R. Thieme, *Perturbing evolutionary systems on dual spaces by cumulative outputs*, Differential and Integral Equations **19** (2006), 401–436.
32. Mats Gyllenberg, Ping Yan, and Yi Wang, *A 3D competitive Lotka–Volterra system with three limit cycles: A falsification of a conjecture by Hofbauer and So*, Applied Mathematics Letters **19** (2006), 1–7.
33. Mats Gyllenberg, Ping Yan, and Yi Wang, *Limit cycles for competitor–competitor–mutualist Lotka–Volterra systems*, Physica D. Nonlinear Phenomena **221** (2006), 135–145.
34. Heikki Haario, Marko Laine, Antonietta Mira, and Eero Saksman, *DRAM: Efficient adaptive MCMC*, Statistics and Computing **16** (2006), 339–354.
35. Petteri Harjulehto, *Traces and Sobolev extension domains*, Proceedings of the American Mathematical Society **134** (2006), 2373–2382.
36. Petteri Harjulehto, Peter Hästö, Mika Koskenoja, and Susanna Varonen, *The Dirichlet energy integral and variable exponent Sobolev spaces with zero boundary values*, Potential Analysis **25** (2006), 205–222.
37. Petteri Harjulehto, Peter Hästö, and Visa Latvala, *Sobolev embeddings in metric measure spaces with variable dimension*, Mathematische Zeitschrift **254** (2006), 591–609.
38. Petteri Harjulehto, Peter Hästö, and Mikko Pere, *Variable exponent Sobolev spaces on metric measure spaces*, Functiones et Approximatio Commentarii Mathematici **36** (2006), 79–94.
39. Peter Hästö, Zair Ibragimov, and Henri Lindén, *Isometries of relative metrics*, Computational Methods and Function Theory **16** (2006), 15–28.
40. Juha Heinonen, Tero Kilpeläinen, and Olli Martio, *Nonlinear potential theory of degenerate elliptic equations*, Dover Publications, Mineola, NY, 2006. A new edition of: Oxford Mathematical Monographs. Oxford Science Publications, Clarendon Press, Oxford, New York; Oxford University Press, New York, 1993.
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42. Lê Tuân Hoa and Eero Hyry, *Castelnuovo–Mumford regularity of canonical and deficiency modules*, Journal of Algebra **305** (2006), 877–900.
43. Fabian Hoti and Mikko J. Sillanpää, *Bayesian mapping of genotype* $\times$ *expression interactions in quantitative and qualitative traits*, Heredity **97** (2006), 4–18.
44. Eero Hyry, Yukio Nakamura, and Lauri Ojala, *Adjoint ideals and Gorenstein blowups in two-dimensional regular local rings*, Mathematische Zeitschrift **254** (2006), 767–783.
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46. Tuomas Hytönen, *Vector-valued wavelets and the Hardy space* $H^1(\mathbb{R}^n, X)$, Studia Mathematica **172** (2006), 125–147.
47. Tuomas Hytönen and Cornelia Kaiser, *New proof of the* $T(1)$ *theorem for Triebel–Lizorkin spaces*, Georgian Mathematical Journal **13** (2006), 485–493.
48. Tuomas Hytönen and Denis Potapov, *Vector-valued multiplier theorems of Coifman–Rubio de Francia–Semmes type*, Archiv der Mathematik **87** (2006), 245–254.
49. Tuomas Hytönen and Lutz Weis, *A* $T1$ *theorem for integral transformations with operator-valued kernel*, Journal für die Reine und Angewandte Mathematik **599** (2006), 155–200.

50. Tuomas Hytönen and Lutz Weis, *Singular integrals on Besov spaces*, Mathematische Nachrichten **279** (2006), 581–598.
51. Tapani Hyttinen, *Cardinal invariants and eventually different functions*, Bulletin of the London Mathematical Society **38** (2006), 34–42.
52. Tapani Hyttinen, *Uncountably categorical local tame abstract elementary classes with disjoint amalgamation*, Archive for Mathematical Logic **45** (2006), 63–73.
53. Tapani Hyttinen and Meeri Kesälä, *Independence in finitary abstract elementary classes*, Annals of Pure and Applied Logic **143** (2006), 103–138.
54. Tapani Hyttinen and Olivier Lessmann, *Simplicity and uncountable categoricity in excellent classes*, Annals of Pure and Applied Logic **139** (2006), 110–137.
55. Céline Jost, *Transformation formulas for fractional Brownian motion*, Stochastic Processes and their Applications **116** (2006), 1341–1357.
56. Mikko Kaasalainen and Lars Lamberg, *Inverse problems of generalized projection operators*, Inverse Problems **22** (2006), 749–769.
57. S. Kaasalainen, Mikko Kaasalainen, T. Mielonen, J. Suomalainen, J. I. Peltoniemi, and J. Näränen, *Optical properties of snow in backscatter*, Journal of Glaciology **52** (2006), 574–584.
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62. Juha Kontinen, *The hierarchy theorem for second-order generalized quantifiers*, Journal of Symbolic Logic **71** (2006), 188–202.
63. Yuriy Kozachenko, Tommi Sottinen, and Olga Vasylyk, *Simulation of weakly self-similar stationary increment* $\mathrm{Sub}_\varphi(\Omega)$*-processes: A series expansion approach*, Methodology and Computing in Applied Probability **7** (2005), 379–400.
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66. Anna Kuparinen, *Mechanistic models for wind-dispersal*, Trends in Plant Science **11** (2006), 296–301.
67. Kalle Kytölä, *On conformal field theory of* $\mathrm{SLE}(\kappa, \rho)$, Journal of Statistical Physics **123** (2006), 1169–1181.
68. Kalle Kytölä and Antti Kemppainen, $\mathrm{SLE}(\kappa, \rho)$ *local martingales, reversibility and locality*, Journal of Physics. A. Mathematical and General **39** (2006), L657–L666.
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202. Juha Oikkonen, *Mitä reaaliluvut ovat ja eivät ole?*, Dimensio **70** (2006), no. 3, 36–37.
203. Juha Oikkonen, *Ovatko reaaliluvut desimaalilukuja?*, Dimensio **70** (2006), no. 4, 50–51.
204. Juha Oikkonen, *Selittääkö lukusuora reaaliluvut?*, Dimensio **70** (2006), no. 5, 50–51.
205. Juha Oikkonen, *Uusia kokemuksia matematiikan opetuksessa*, Dimensio **70** (2006), no. 6, 6–7.
206. Lassi Päivärinta and Marjatta Näätänen, *Ajatuksia matematiikasta, sen soveltamisesta ja opettamisesta*, Solmu **2006**, no. 3, 4–5.
207. Mikko Salo, *Inversio-ongelmat — matematiikkaa ja sen sovelluksia*, Arkhimedes **2006**, no. 5, 20–25.
208. Mika Seppälä, *K. I. Virtanen 1921–2006: muistokirjoitus*, Arkhimedes **2006**, no. 5, 4–5.
209. Andrew Thomas, *The BUGS language*, R News **6** (2006), no. 1, 16–21.
210. Andrew Thomas, Bob O'Hara, Uwe Ligges, and Sibylle Sturtz, *Making BUGS open*, R News **6** (2006), no. 1, 12–17.

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 29, 64; Kari Astala 4–5, 105; Kari Auranen 58, 98; Madhuchhanda Bhattacharjee 95; Jean Bricmont 134–135; Olga Caprotti 106; Jukka Corander 12–14; Serban Costea 136; O. Dovgoshey (A. A. Dovgosheĭ) 15–17; Mervi Eerola 1, 19, 96; Miroslav Engliš 20, 137; Panu Erästö 21; Kurt Falk 22; Dario Gasbarra 24–25, 84, 108; Stefan Geritz 26; Rashi Gupta 29, 85; Vladimir Ya. Gutlyanskiĭ 30; Mats Gyllenberg 2, 12, 26, 31–33, 80, 102–103, 107, 138, 169–171; Heikki Haario 34; Teemu Hänninen 20; Petteri Harjulehto 35–38, 139, 172; Peter Hästö 36–39, 139; Ville Heikkala 140; Alex Hellsten 41, 173; Lê Tuân Hoa 42; Lasse Holmström 21; Ilkka Holopainen 141; Fabian Hoti 43; Eero Hyry 42, 44; Tapani Hyttinen 51–54, 110; Marja Hytönen 174; Tuomas Hytönen 45–50, 109, 168; Tadeusz Iwaniec 4; Céline Jost 55, 142; Heikki Junnila 18; Mikko Kaasalainen 56–57, 69, 74, 78, 81; Antti Kemppainen 68; Juliette Kennedy 176; Meeri Kesälä 53, 173; Juha Kinnunen 144–145; Éva Kisdi 59–60; Jukka Kohonen 177; Jarmo Kontinen 113; Juha Kontinen 62, 147; Tuomas Korppi 178–179; Mika Koskenoja 36; Sangita Kulathinal 24, 64; Antti Kupiainen 134–135, 148; Anna Kuparinen 66; Kalle Kytölä 8, 67–68; Teemu Laakso 69; Seppo Laaksonen 70–72, 114–117, 121, 133, 167, 180–181; Aatos Lahtinen 118, 165–166, 182–183; Marko Laine 34; Jussi Laitila 73, 149; Lars Lamberg 56; Saara Lehto 174; Risto Lehtonen 11, 119–120; Henri Lindén 39, 140; Peter Lindqvist 144; Gaven J. Martin 4; Olli Martio 15–17, 30, 40, 145, 150–151, 184–185; Pekka Marttinen 13; Pertti Mattila 152; Géza Meszéna 80; Johan Metz 107; Jouko Mickelsson 122; Paolo Muratore-Ginanneschi 7, 123, 148; Seppo Mustonen 186; Lauri Myrberg 165–166; Marjatta Näätänen 3, 187–196, 206; Yukio Nakamura 44; Sergey Nazarov 82; Pekka Nieminen 154; Nelly Noykova 104, 132; Ville Nurmi 124; Harri Nyrhinen 155; Robert O'Hara 23, 27, 77, 79, 87, 92, 197–199, 210; Juha Oikkonen 200–205; Lauri Ojala 44; Petri Ola 61, 112; Lassi Päivärinta 5, 93, 105, 206; Pekka Pankka 83, 156; Mikko Pere 38, 76; Jukka Pihko 28; Matti Pirinen 84; Seppo Rickman 88; Vladimir I. Ryazanov 16–17; Pentti Saikkonen 10, 75, 89, 143, 153, 161; Eero Saksman 34, 128; Mikko Salo 9, 86, 90–91, 111, 125–127, 146, 157–158, 207; Mika Seppälä 106, 129, 131, 208; Mikko Sillanpää 25, 43, 95; Tommi

Sottinen 63, 97; Jarno Talponen 159; Olli Tammi 99–100; Lauri Tarkkonen 163; Jari Taskinen 20, 82, 137, 160; Andrew Thomas 29, 209–210; Pekka Tukia 22, 101; Hans-Olav Tylli 73, 128; Jouko Väänänen 94, 130; Jussi Väisälä 151, 162; M. K. Vamanamurthy 140; Suvi Vanhatalo 174; Susanna Varonen 36; Sirkka-Liisa Varvio 6, 65; Kimmo Vehkalahti 163, 175; Joan Verdera 152; Matti Vuorinen 16–17, 140; Yi Wang 32–33; Ping Yan 26, 32–33, 102–103.

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 2006: Ilkka Holopainen 4, Ritva Hurri-Syrjänen 3, Tuomas Hytönen 3, Tapani Hyttinen 1, Céline Jost 1, Heikki Junnila 2, Meeri Kesälä 2 (1), Juha Kontinen 2, Antti Kupiainen 4 (2), Aatos Lahtinen 1, Jussi Laitila 2, Risto Lehtonen 4, Henri Lindén 2, Pekka Marttinen 2, Pertti Mattila 3, Jouko Mickelsson 4, Pekka Nieminen 2, Lassi Päivärinta 1 (2), Matti Pirinen 1, Mikko Salo 4 (3), Mikko Sillanpää 1, Jari Taskinen 1, Hans-Olav Tylli 2 (3), Aleksi Vähäkangas 1.

These communications total 53 (11). Of the communications 33 (10) were invited talks.

6.2. Visits abroad

The following are the visits of the personnel for working abroad for at least two weeks in 2006.

Tuomas Hytönen: Technische Universiteit Delft, The Netherlands, 4.–20.12.

Antti Kupiainen: Institute for Advanced Study, Princeton, USA, 10.4.–10.5.; USP, São Paulo, and IMPA, Rio de Janeiro, Brazil, 1.–14.8.

Saara Lehto: University of Michigan, Ann Arbor, USA, 3.4.–31.5.

Pekka Marttinen: Ghent University, Belgium, 21.8.–21.12.

Jouko Mickelsson: Université Blaise Pascal, Clermont-Ferrand, France, 24.3.–22.4.; Erwin Schrödinger Institute, Austria, 10.5.–10.7.; KTH, Stockholm, Sweden, several periods.

Lassi Päivärinta: University of Delaware, USA, 11.8.2005–13.8.2006, and University of Washington, Seattle, USA, 3.4.–3.5. and 12.5.

Mikko Salo: University of Washington, Seattle, USA, 8.3.–4.6.

6.3. Editing journals

Elja Arjas: Genetics (USA), member of the editorial board; International Statistical Review (The Netherlands), member of the editorial board.

Juha Heikkinen: Scandinavian Journal of Statistics (UK), associate editor.

Éva Kisdi: Evolutionary Ecology Research (USA), editor; Acta Biotheoretica (The Netherlands), member of the editorial staff; Proceedings of the European Conference on Mathematical and Theoretical Biology, 2005–2006 (Germany), editor; Journal of Evolutionary Biology (UK), member of the board of reviewing editors.

Mika Koskenoja: Arkhimedes (Finland), member of the editorial board; Solmu (Finland), editor.

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; Journal of Statistical Physics (USA), member of the editorial board; Reviews in Mathematical Physics (Austria), member of the editorial board.

Olli Lehto: Annales Academiae Scientiarum Fennicae Mathematica (Finland), member of the editorial board.

Risto Lehtonen: Statistics in Transition Journal, guest editor of special issues of December 2005, March 2006, and December 2007.

Olli Martio: Annales Academiae Scientiarum Fennicae Mathematica (Finland), chief editor; Discrete and Continuous Dynamical Systems – Series B (USA), member of the editorial board; 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 (India), associate editor; Bulletin de la Société des Sciences et des Lettres de Lódz, Série: Recherches sur les Déformations (Poland), member of the editorial board.

Pertti Mattila: Acta Mathematica (Sweden), editor; Annales Academiae Scientiarum Fennicae Mathematica (Finland), member of the editorial board.

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

Robert O'Hara: Journal of Negative Results—Ecology and Evolutionary Biology (Finland), editor.

Juha Oikkonen: Dimensio (Finland), member of the editorial board.

Lassi Päivärinta: Journal of Inverse and Ill-Posed Problems (The Netherlands), member of the editorial board.

Seppo Rickman: Annales Academiae Scientiarum Fennicae Mathematica (Finland), member of the editorial board.

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

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

Pekka Tukia: Annales Academiae Scientiarum Fennicae Mathematica (Finland), 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): Erik Elfving 1, Ilkka Holopainen 4, Ritva Hurri-Syrjänen 4, Tuomas Hytönen 1, Tapani Hyttinen 3, Aatos Lahtinen 1, Henri Lindén 2, Jouko Mickelsson 3, Pekka Nieminen 1, Matti Pirinen 1, Mikko Salo 1, Mikko Sillanpää 7, Jari Taskinen 2, Hans-Olav Tylli 2 (5).

These refereeings total 33 (5).

6.5. Managerial duties in scientific and professional organizations

Elja Arjas: TRIGR, Data Safety and Monitoring Committee, Finland, expert.

Kari Astala: Finnish Mathematical Society, president; Mittag-Leffler Institute, Sweden, member of the board.

Mats Gyllenberg: Finnish Mathematical Society, president; European Mathematical Society, Finland, member of the committee for applied mathematics.

Åsa Hirvonen: Finnish Mathematical Society, Finland, member of the board, secretary.

Ritva Hurri-Syrjänen: Foundation of mathematics and natural sciences, University of Helsinki, vice chairman.

Sören Illman: Federation of Finnish Learned Societies, substitute member of the board.

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

Antti Kupiainen: Helsinki Institute of Physics, member of the board of directors; Erwin Schrödinger Institute, Vienna, Austria, member of the scientific advisory board; Service de Physique Théorique, Saclay, France, member of the scientific advisory board.

Seppo Laaksonen: Executive Committee of the CAED (Comparative Analysis of Enterprise Micro Data), member; Finnish PISA Survey Group, advisor in sampling and statistical methods.

Aatos Lahtinen: Federation of Finnish Learned Societies, member of the board; Academy of Finland, member of the panel of experts; Matriculation Examination Board, president.

Risto Lehtonen: Permanent Steering Committee of the Baltic–Nordic Network on Survey Sampling (Universities of Helsinki, Stockholm, Umeå, Tartu, Latvia, and Vilnius, and Institute of Mathematics and Informatics, Vilnius), member; Statistics Finland, member of the scientific board.

Jouni Luukkainen: The association HYT of the scientists of the University of Helsinki, appointed vice representative.

Olli Martio: European Mathematical Society, Finland, member of the executive committee, treasurer, member of the meetings committee, member of the group on relations with European institutions; European Mathematical Foundation, Switzerland, member of the board of trustees, treasurer; Finnish National Committee for Mathematics (IMU), chairman; LUMA-center, Finland, member of the board; Mathematics Foundation, Finnish Academy of Science and Letters, chairman of the trustees.

Pertti Mattila: Academy of Finland, member of the Research Council for Natural Sciences and Engineering; National Science Foundation, USA, expert; Vetenskapsrådet, Sweden, expert.

Jouko Mickelsson: Scientific committee of the conference "Gerbes, Groupoids, and Quantum Field Theory", Erwin Schrödinger Institute, Vienna, Austria, May–July, member.

Marjatta Näätänen: Finnish Mathematical Society, vice president; European Women in Mathematics (EWM), auditor.

Neli Noykova: International Program Committee of the 26th IASTED International Conference of Modelling, Identification, and Control MIC 2007, February 12–14, 2007, Innsbruck, Austria, member.

Juha Oikkonen: LUMA-center, Finland, vice member of the board.

Lassi Päivärinta: Rolf Nevanlinna Institute, support foundation, member of the board of directors.

Mika Seppälä: WebALT project, coordinator; OpenMath Society, Finland, member of the executive committee; Finnish Graduate School in Mathematical

Analysis and Its Applications, chairman of the board.

Mikko Sillanpää: External reviewer for inner evaluation purposes of the New Zealand Forest Research Institute Scion, Rotorua, New Zealand; Reviewer of a Wellcome Trust Senior Fellowship application from the Wellcome Trust, UK.

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

Hans-Olav Tylli: Finnish Graduate School in Mathematical Analysis and Its Applications, member of the board; Tuning Educational Structures in Europe, phase III (European Commission of Culture and Education), expert; Arkhimedes journal, Finland, member of the commission; Scientific committee for the conference "Mathematics Days 2006 and the 2nd Finnish–Estonian Mathematical Colloquium", Tampere, Finland, member.

Jouko Väänänen: Association for Symbolic Logic, Committee on Logic in Europe, member.

6.6. Assessments for appointments

The following are the numbers of assessments for appointments to a professorship or docentship: Petri Ola 1, Sören Illman 1, Pentti Saikkonen 1.

6.7. Refereeing Ph.D. theses

Kari Astala, Ilkka Holopainen, Mikko Kaasalainen, Jouko Mickelsson, and Jari Taskinen have acted as a referee, Marjatta Näätänen has acted as a member of a thesis tribunal, Mikko Sillanpää has acted as an opponent, and Hans-Olav Tylli has acted twice as an opponent and five times as a referee.

6.8. Activities in the society

Aapo Halko has been the organizer of an international web page mscrossroads.org on the MS disease. He has been a member of the editorial board of the mathematics web magazine Solmu.

Alex Hellsten has been the coordinator of the Summamutikka center, which contains the mathematical activities of the LUMA center.

Heikki Junnila has been a member of the board of the Niemi Foundation (Niemisäätiö).

Meeri Kesälä has planned and realized activities of the Summamutikka center; in particular, she has organized visits of school children to the department.

Juha Kontinen has been a project person in Summamutikka center.

Antti Kupiainen has been a member of the board of the Niilo Helander Foundation.

Seppo Laaksonen has acted as a member of the statistical group of the Council of University Rectors.

Aatos Lahtinen, as president of the Matriculation Examination Board, was interviewed several times on radio and television. He has also delivered several talks concerning the matriculation examination.

Saara Lehto has been a coordinator of the Summamutikka center. She was organizing seven mathematics days occasions and three mathematics clubs in schools in the capital area, two education workshops for school teachers, a Xenons day for

children, and a stand presentation of the Summamutikka center in the Mathematics Days in January in Tampere, and she delivered four talks. The annual report 2005 of the university had a story about the inauguration of the Summamutikka center.

Kerkko Luosto is a member of the training group of the Finnish Mathematical Society for high school students and a member of the competition committee of the MAOL association.

Jouni Luukkainen has tried to improve the freedom of thought, conscience, and religion by bills of protest to the Attorney General and to the Parliamentary Ombudsman and by a written statement to the Administration Committee of the Parliament of Finland. Partly because of bills of protest of Luukkainen to the Parliamentary Ombudsman in 2003, the Finnish National Board of Education gave a rectified guidance concerning participation in religious or (secular) ethics educations and refusal to attend religious occasions in the school.

Marjatta Näätänen has been a member of the editorial board of the mathematics web magazine Solmu; written several articles, organized translations of foreign material, and taken care of financial affairs and publicity for Solmu. She has a collaboration project with Hungarians. This includes a primary math teaching experiment in several schools in Finland, math summercamps in Hungary for Finns, and in-service education for primary teachers. Marjatta Näätänen was one of the organizers of the Mathematics days in Tampere in January 2006 and has organized mathematical video showings for a larger public. She has been a member of the planning group for the LUMA center also chairing the mathematics group. She organized a mathematics weekend at Maunula school.

Hannu Niemi has been the chairman of the board of directors of the E. J. Sariola Foundation. He has also been a board member and secretary of the Finnish–Lithuanian Culture Foundation and the vice chairman of the Donelaitis Society – Friends of Lithuania. He has been a member of the Editorial and Advisory Board of the monograph series "On the Boundary of Two Worlds: Identity, Freedom, and Moral Imagination in the Baltics" published by Rodopi Publishing House.

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

Tommi Sottinen has been a member of the editorial board of Solmu.

Since 1996 a scrapbook containing information about the department and articles of public interest written by persons in the department is maintained in the office.

7. Guests

The following is a list of the foreign guests of the department in 2006.

Antonov, Nikolay, St. Petersburg, Russia, 10 days

Arazy, Jonathan, prof., University of Haifa, Israel, 7 days

Ball, Roderick D., Ph.D., New Zealand Forest Research Institute, New Zealand, 14.–20.12.

Bauer, Andrea, Ph.D., University of Bonn, Germany, 1.2.–31.3., 5.–28.8.

Bhattacharjee, Madhuchhanda, Ph.D., University of Lancaster, UK, 6.–10.2.

Bokma, Folmer, Ph.D., University of Umeå, Sweden, 28.8.

Bonami, Aline, prof., Université d'Orleans, France, 4 days

Bonet, José, prof., Universidad Politecnica de Valencia, Spain, 20 days

Brakalova-Trevithick, Melkana, prof., SUNY Stony Brook University, USA, 28.7.–21.8.

Bricmont, Jean, prof., UCL, Louvain-la-Neuve, Belgium, 20 days
Carey, Alan, prof., Australian National University, Canberra, Australia, 2.–8.11.
Coburn, Lewis, prof., SUNY Buffalo, USA, 14 days
Csörnyei, Marianna, prof., University College, London, UK, 24.–28.4.
Diening, Lars, Ph.D., University of Freiburg, Germany, 18.–21.10.
Dovgoshey, Oleksiy, prof., NAS of Ukraine, Donetsk, Ukraine, 15.4.–15.6.
Engliš, Miroslav, prof., Czech Academy of Sciences, Czech Republic, 20 days
Faddeev, Ludwig, academician, Euler International Mathematical Institute, Russia, some days in September
Gawędzki, Krzysztof, prof., ENS, Lyon, France, 6 days
Gentile, Guido, Università di Roma Tre, Italy, 5 days
Gurka, Peter, Ph.D., Czech University of Agriculture, Czech Republic, 22.–30.9.
Hekmati, Pedram, KTH, Stockholm, Sweden, 15 days in November
Hinkkanen, Aimo, prof., University of Illinois at Urbana-Champaign, USA, 22.6.–6.7.
Hristova, Snezhana, prof., University of Plovdiv, Bulgaria, 17.–21.5.
Johansson, Kurt, prof., KTH, Stockholm, Sweden, 5 days
Kim, Kang-Tae, prof., Pohang University of Technology, Republic of Korea, 10 days
Kolk, Enno, Ph.D., University of Tarto, Estonia, 5.–9.6.
Langmann, Edwin, Ph.D., KTH, Stockholm, Sweden, 2.–5.11.
Leon, Jens, University of Bonn, Germany, 1.–2.2.
Loone, Leiki, Dr., University of Tarto, Estonia, 7.–13.4.
Mitsis, Themistoklis, prof., University of Crete, Greece, 30.4.–6.5.
Nazarov, Sergey, prof., Steklov Institute, St. Petersburg, Russia, 30 days
Peloso, Marco, prof., Politecnico di Torino, Italy, 7 days
Potomkin, Volodymyr, prof., NAS of Ukraine, Donetsk, Ukraine, 20.–31.8.
Rochberg, Richard, prof., Washington University, USA, 20 days
Ryazanov, Vladimir, prof., NAS of Ukraine, Donetsk, Ukraine, 1.–31.8.
Särndal, Carl-Erik, prof., University of Montreal, Canada.
Schul, Raanan, Ph.D., UCLA, USA, 14.–20.9.
Soomer, Virge, Ph.D., University of Tarto, Estonia, 7.–13.4.
Thompson, Katie, Ph.D., Kurt Gödel Research Center, Vienna, Austria, 4.–16.6.
Tomoyasu, Kazuo, prof., Miyakonojo National College of Technology, Japan, 20.–27.8.
Upmeier, Harald, prof., Philipps-Universität Marburg, Germany, 7 days
Walczak-Typke, Agatha, Ph.D., Kurt Gödel Research Center, Vienna, Austria, 4.–16.6. and 8.–20.12.
Wang Maofa, Ph.D., University of Wuhan, China, 4.5.–1.7.
Yun Ziqiu, prof., Suzhou University, China, 29.7.–5.9.

Of these 43 guests six, namely Bauer, Dovgoshey, Nazarov, Ryazanov, Wang, and Yun 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 2006 the acquisitions in mathematics and statistics were exclusively funded by the department. In 2006 the accumulation of the bought new mathematical or statistical books was 94 copies, and the whole library received 1861 titles of periodicals and reports, from which about 400 were in mathematics and statistics. Over 200 titles in mathematics 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- 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 Mon 8–18, Tue–Thu 8–18, and Fri 8–16 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 260 PC computers and 20 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 laboratory engineer of the department supports 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 780 accounts on the UNIX machines and about 1400 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 2006 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. Kalervo Aalto (student), Elja Arjas, Ilkka Holopainen, Hanna Jäntti (student), and Hannu Niemi were members.

Senate of the University of Helsinki. Jouko Väänänen was a member.

Board of directors of the National Library of Finland. Hannu Niemi was the chairman.

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. Jouko Väänänen was a member.

Campus council for the City Centre Campus. Hannu Niemi was the chairman.

Faculty Council (Faculty of Science). Members in the quota of professors were Elja Arjas (Lassi Päivärinta) and Jouko Väänänen (Olli Martio). Ilkka Holopainen (Mika Koskenoja) was a member in the quota of the other teachers and researchers and the other personnel.

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

Faculty planning board (Faculty of Science). Jouko Väänänen (Olli Martio) was a member.

Faculty entrance board (Faculty of Science). Hannu Honkasalo and Pekka Tukia were members. Mikko Salminen was a student member.

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

Subject-teacher student entrance board in the Faculties of Science, Biosciences, and Behavioural Sciences. Juha Partanen (Olli Martio) 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. Antti Kupiainen was a member.

Chairman. The chairman of the department was Jouko Väänänen.

Department Board. The four members of the department board from the quota of professors were Olli Martio (Sören Illman), Pertti Mattila (Kari Astala), Hannu Niemi (Lauri Tarkkonen), and Lassi Päivärinta (Elja Arjas). The four members from the quota of other personnel were Kari Auranen (Sirkka-Liisa Varvio), Juha Puranen (Kimmo Vehkalahti), Hans-Olav Tylli (Roman Goebel –15.3., Jussi Laitila 16.3.–), and Riitta Ulmanen (Martti Nikunen). The four members from the quota of students were Kirsi Kontinen (Terhi Hautala), Jukka Kontto (Margareeta Häkkinen), Arto Piironen (Juha Sipilä), and Pertti Viitamäki (Maria Lemponen). The board was chaired by the chairman of the department.

Kumpula Science Library board. Olli Martio (Pertti Mattila) was a member.

Subject-teacher student evaluation board in mathematics. The members were Erik Elfving, Taneli Huuskonen, Mika Koskenoja, and Sakari Toppila.

11. Economy

The expenses covered directly by the department can be divided into the following nine 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.
— Mixed expenditure (this includes, e.g., mailing, telephone, telefax, photocopy paper).

The following table gives these costs in thousands of euros in the last five years. The figures for the years 2002–2003 concern the Department of Mathematics. The figures for the years 2004–2006 are presented in two columns A and B per year concerning the Faculty of Science and the Faculty of Social Sciences, respectively.

Year	2002	2003	2004A	2004B	2005A	2005B	2006A	2006B
Salaries	1719	2050	2465	526	2514	566	2386	660
Gr. schools	280	243	244	0	145	0	331	24
Centres of Ex.	123	216	215	0	344	0	144	0
Teaching	233	310	373	79	330	67	302	64
Library	130	110	90	2	103	1	117	5
Research	5	7	8	0	10	0	6	0
Travels	20	12	56	2	11	4	11	2
Computers	75	50	60	4	29	4	30	0
Mixed	40	42	45	15	40	10	28	14
Total	2625	3040	3556	628	3526	652	3355	769

In 2002 and 2003 the external research funding for the Department of Mathematics amounted to approximately 1.51 million euros and 1.40 million euros, respectively. These amounts do not include the Graduate Schools.

The external funding in 2006 for the department concerning the Faculty of Science amounted to 2.75 million euros, of which 1.77 million euros came from the Academy of Finland and 477000 euros from the EU. In 2005 these figures were 2.65 million euros, 1.57 million euros, and 291000 euros, respectively, whereas in 2004 these figures were 2.31 million euros, 1.63 million euros, and 119000 euros, respectively. Concerning the Faculty of Social Sciences, there was no external funding from the Academy of Finland in 2005–2006, but 60000 euros in 2004.

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 1377 m^2, and 13 rooms in general use, totally 219 m^2. That is, 111 rooms altogether, totally 1596 m^2. In the second floor there are two additional offices for researchers, totally 56 m^2, and in the basement two stock rooms, totally 40 m^2, or, in fact, also a major part of a third one with 50,5 m^2.

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 four offices in the premises of the Faculty of Social Sciences (Unioninkatu 37).