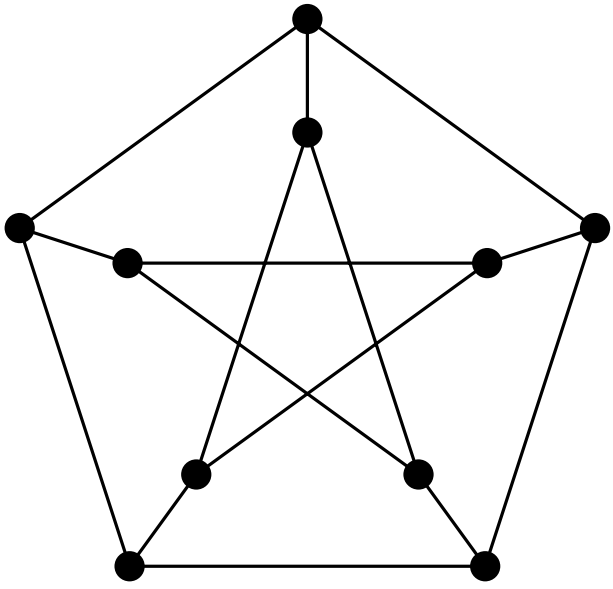
Application for Denmark to enter level III membership of the IMU

$$\Phi\left(\int_X f\,dP\right) \leq \int_X \Phi \circ f\,dP$$

Jensen's classical inequality for convex fuinctions (Johan Jensen 1859-1925)



Petersen's graph is an example of a 3-regular graph that is not 3-edge-colourable (Julius Petersen 1839-1910).

Submitted by The National Committee for Mathematics in Denmark.

Introduction

Denmark is a kingdom of about 5.8 million people. It is part of Scandinavia and joined the European Union in 1973, although Denmark never joined the Euro. Politically, culturally, and also scientifically, Denmark has close ties to its northern neighbors, in particular Norway and Sweden. At the level of mathematics, this manifests itself for example via the joint Nordic collaboration around Institut Mittag–Leffler, two joint Scandinavian journals, and numerous joint conferences and individual collaborations between these countries. Denmark also orients itself towards the rest of Europe both politically and scientifically via its membership of the EU, as well as to the rest of the world.

Danish mathematics has expanded considerably over the last 60 years. The number of universities in Denmark has doubled over this period and the number of research mathematicians has probably 5-doubled to the current level of around 185 tenured faculty of which about 75 are full professors. While the university degrees in mathematics 60 years ago mostly were aimed at providing future high school teachers plus a few who made it to a university research career (in Denmark or abroad), the career options are wide open, both within the private and the public sector, for a candidate with one of the several Master's degrees in mathematics offered today. Candidates with a degree in actuarial science, respectively, mathematics-economy (both degrees offered at mathematics departments) hold the highest, respectively, the 3rd highest average salaries nationwide among all candidates with a university degree, above, for example, candidates with a degree in law or medicine.

Forty years ago, there was no formal PhD education in Denmark. Today, most mathematics departments in Denmark have a flourishing PhD program with a large population of PhD students both from Denmark and from abroad, in total over 100 nationwide.

Danish mathematics is becoming increasingly international. A large, and still increasing, part of the faculty at the mathematics departments were not born in Denmark. Many courses beyond bachelor level are taught in English. A large fraction of the students admitted to the Danish Master's degrees in mathematics are from other EU contries as well as from outside EU, and a majority of postdocs and PhD students are recruited internationally.

We shall in this application give a brief overview of the current state of mathematics in Denmark. The last section lists some key figures and individual achievements of Danish mathematics, which, among many others, include: 5 plenary ICM lectures given by Danish mathematicians (2 since 2002), and 13 invited section talks (6 since 2002). Danish mathematicians

have received a total of 15 ERC grants (1 Synergy, 5 Advanced, 4 Consolidator and 4 Starting). One of the ten 2020 ECM prizes was awarded to Karim Adiprasito, appointed last year to the University of Copenhagen, and another to Phan Thanh Nam, a former PhD student of the University of Copenhagen.

A brief history of Danish Mathematics

Danish mathematical research and university level teaching began at the University of Copenhagen founded in 1479. The first rector C.T. Morsing of the reorganized protestant university was the first Dane who authored a textbook in mathematics: Aritmetica Brevis (1528). This book and the Geometria Rotundi (1583) written by the later professor of mathematics Thomas Fincke, were well received internationally. During the 17th century Danish mathematicians took an active part in international research. In particular, one can mention Erasmus Bartholin who was a central actor in the Latin translation of Descartes' La Géométrie, and Georg Mohr who proved that one can perform all the Euclidean constructions with compass alone (i.e., without a ruler). In the 18th century, Sorø Academy was for a brief period the leading institution in Danish mathematics, but in general the level was rather provincial. Caspar Wessel published the first geometric representation of complex numbers in 1797, but it remained unknown for the next century.

In the 19th century new teaching positions in higher mathematics opened up at the Polytechnical College (today called the Technical University of Denmark) founded in 1829 in Copenhagen. However, the mathematical level remained low until around 1870 when H.G. Zeuthen and J. Petersen were appointed professors of mathematics at the two institutions. Zeuthen's research on algebraic geometry and history of mathematics and Petersen's work on geometry, algebra and graph theory mark the reentrance of Danish mathematics on the international scene. About the same time, T.N. Thiele and J.P. Gram made important contributions to statistics.

During the first half of the 20th century the geometric tradition was continued by J. Hjelmslev, P. Heegaard (Topology), and J. Nielsen, but from the 1930s mathematical analysis became the central research area at the Department of Mathematics of the University of Copenhagen with contributions by N. Nielsen, N.E. Nørlund and in particular Harald Bohr, who created the theory of almost periodic functions.

After the Second World War, the Danish Mathematical scene was drastically changed. In Copenhagen, B. Jessen, who continued Bohr's work and W. Fenchel (convexity) became the leading figures, and in Aarhus

whose University had been founded in 1928, a new dynamic and very internationally oriented mathematics department was created in 1954 by S. Bundgaard. Twenty years later three new mathematics departments followed suit: Odense University (founded 1966, mathematics from 1972), Roskilde University Centre (1972) and Aalborg University (1974).

Danish research funding

The Danish system for research funding is remarkable by the presence of a number of private funding institutions that combined distribute about twice as much money to Danish research as the total Danish *public* funding bodies. Also, unlike many other countries, Denmark has several public funding bodies each of which specializes in certain types of funding.

The closest Danish analog to the NSF from the US is the *Independent Research Fund Denmark* that awards individual grants typically in the range of 2–6 MDKK. *The Danish National Research Foundation* awards large centers in the amount of 100 MDKK and for periods up to 10 years. Mathematics has so far been awarded four such centers, and has one current very recently started center, GeoTop, in Copenhagen directed by N. Wahl.

The oldest private Danish research fund, and among the oldest in the world, is the *Carlsberg Foundation* that supports research in natural sciences and humanities. The 5 members of the Carlsberg Foundation are also members of the board of the Carlsberg Brewery, and they are elected by and among the members of the Royal Danish Academy of Sciences and Letters. The chair of the board of the Carlsberg Brewery and of the Carlsberg Foundation is physicist Flemming Besenbacher.

The biggest player in Danish research funding is the *Novo Nordisk Foundation*. Novo Nordisk, which specializes in medical products, in particular diabetes treatments, is the largest Danish company. A certain percentage of the revenue from the medical company is handed over the Novo Nordisk Foundation which distributes the money to research. The foundation originally focused solely on supporting medical research, but today it supports a wide range of sciences, including mathematics. For example, they have current calls for centers of excellence in data science and in quantum computing. The Novo Nordisk Foundation awards more than five times as much money to Danish research as the Independent Research Fund Denmark.

For mathematics, a very important private fund is the *Villum Foundation* (or the *Velux Foundation*), which receives its revenue from the Velux company that produces windows. The Villum foundation has funded several mathematical centers, and it has awarded a large number of personal grants to Danish mathematicians.

Finally, the European Research Council (ERC) plays an important role for supporting science and mathematics in Denmark.

Mathematics departments in Denmark

Denmark has eight universities (besides several specialized colleges): University of Copenhagen, Aarhus University, University of Southern Denmark (Odense), Roskilde University, Aalborg University, Technical University of Denmark, Copenhagen Business School and IT University of Copenhagen. The six former have research mathematicians.

A mini portrait of each of these six institutions and their mathematical research is given below.

Department of Mathematical Sciences, University of Copenhagen

Founded in 1479, the University of Copenhagen is the oldest university in Denmark. The first mathematics professor was appointed after the reformation in 1539, but it was not until 1907 that mathematics gots its own location and name: Mathematics Laboratory. The present mathematics department is a result of several mergers over the years. The department has expanded considerably over the last 10–15 years, thanks, in part, to significant external funding, and, not the least, thanks to the efforts of Erik Kjær Pedersen, who was chair of the department 2007–2016. Pedersen came to Copenhagen from a position at SUNY, Binghampton, where he also served as chair, with the vision of strengthening the mathematics department in Copenhagen by bringing the best practices from the US to Copenhagen and to Denmark. Today the department counts 49 tenured faculty (of which 32 are full professors), 4 tenure track assistant professors, 35 postdocs and 43 PhD students.

The research of the department covers most major areas of pure mathematics (algebra, number theory, geometry, topology, combinatorics, analysis, mathematical physics, quantum information theory, operator algebras and history of mathematics), probability theory, statistics, data science, machine learning, mathematical finance, operational research, and actuarial science. The department offers bachelor degrees in mathematics, actuarial sciences and mathematics-economy, and Master's degrees in the same three lines as well as in statistics. In 2019, a total of almost 300 students were admitted to the three bachelor study lines, and more than 150 were admitted to the four Master's study lines.

The department hosts two centers of excellence: The newly started Copenhagen Center for Geometry and Topology (GeoTop) funded by the Danish Natural Research Foundation and Centre for the Mathematics of Quantum Theory funded by the Villum Foundation. In addition there are a number of smaller centers, including Copenhagen Causality Lab and Mathematics of Reaction Networks with funding from several different sources.

Department of Applied Mathematics and Computer Science, Technical University of Denmark (DTU)

The Technical University of Denmark was founded by Hans Christian Ørsted in 1829. Mathematics was taught from the very beginning. Mathematics at DTU has been organized in various ways during the years. The last significant change was made in 2013, where Department of Mathematics and Department of Informatics was merged into Department of Applied Mathematics and Computer Science (DTU Compute). The tenured faculty currently consists of 23 full professors, 60 associate professors and 13 assistant professors. The department is organized in 11 research sections. Several of the sections are interdisciplinary and encompass activities in mathematics, statistics and computer science. Mathematicians are primarily located in Section for Mathematics, Section for Scientific Computing, Section for Dynamical Systems and Section for Algorithms, Logic and Graphs. The mathematical scientific staff in these sections is 11 full professors, 12 associate professors, 1 assistant professor, 4 postdocs and 12 PhD students.

The mathematical research includes a broad range of pure and applied disciplines: functional analysis, partial differential equations, inverse problems, algebra, coding theory, dynamical systems, geometry, scientific computing, control theory, combinatorics, graph theory.

DTU hosts a center of excellence, Computational Uncertainty Quantification for Inverse Problems (CUQI) funded by the Villum Foundation.

DTU has many educational programmes in engineering on the BSc and MSc level. 2700 students were admitted on the BSc level in 2019, and mathematics courses are a central part of the first-year curriculum in all programmes. These are taught by faculty at DTU Compute. DTU Compute also provides several advanced mathematical courses. Two programmes provide educations where mathematics is at the center: The BSc programme Mathematics and Technology and the MSc programme Mathematical Modelling and Computation.

The department is a vibrant environment with many international visitors and several workshops and PhD schoolds each year.

Department of Mathematics, Aarhus University
Aarhus University was founded in 1928. Mathematics started in 1954 by the hiring of Professor Svend Bundgaard who succeeded in building up a thriving and internationally well-connected department with strong research-based teaching. In particular, this was accomplished by an extensive programme of visiting professors in the early years, with many famous mathematicians visiting in the first decades of the life of the department. The present department counts 35 tenured faculty (10 full professors) 3 assistant professors, 11 postdocs and 19 PhD students.

The research at the department spans the whole range of pure mathematics (algebra, number theory, geometry, topology, analysis, mathematical physics, operator algebras) probability theory, statistics, data science, machine learning, mathematical finance, operational research. The degrees offered at the department at bachelor level are mathematics, mathematics-economy and data science. The masters degrees offered are complemented by a masters degree in statistics. In 2019 a total of 190 students were admitted to the bachelor programmes and 50 to the masters programme. The department also counts a Center for Science Studies, which teaches Philosophy of Science to students across all scientific disciplines.

Over the last decade the department has hosted the two centers of excellence: Center for Quantum Geometry of Moduli Spaces (QGM) funded by the Danish Natural Research Foundation, and Centre for Stochastic Geometry and Advanced Bioimaging (CSGB) funded by the Villum Foundation. The department also counts the Applied Statistics Laboratory (aStatLab) providing statistical support to other research groups at Aarhus University.

The department maintains its high international profile with many visitors as well as conferences, workshops and Master classes every year.

The University of Southern Denmark (SDU)
The University of Southern Denmark was founded in 1966, under the name of Odense University, and is the third largest university in Denmark.

In 1972 the Institute for Mathematics was founded at SDU. This department is today called the Department of Mathematics and Computer Science (or Imada for short), and consists of 33 academic staff including 14 professors and 15 associate professors. There are furthermore 7 PostDocs and 28 PhD students at Imada. Imada hosts experts from both mathematics and computer sciences, which provides an inter-discipline research atmosphere and enables students to have education programs incorporate features from both mathematics and computer sciences.

The department offers BSc and MSc degrees in Mathematics, Applied

Mathematics, Mathematics-Economy and Computer Science. The department furthermore offers MSc degrees in Data Science and Computer Science for working professionals, as well as part-time Masters in Science and Mathematics teaching and Mathematics aimed at high school teachers. The department admits around 200 students on its BSc degrees and slightly more than 100 students on its MSc degree programmes each year.

Imada furthermore has the centre Laboratory for Coherent Education and Learning (LSUL), which is a strategic research, development and education collaboration between the Faculty of Science at SDU and the professional colleges UCL and UC Syd. Imada also hosts the SDU eScience Centre where cutting-edge cloud technology and computational power through the supercomputer ABACUS 2.0 is developed and maintained. Other centres include CP3–Origins in collaborations with the Department of Physics, Chemistry and Pharmacy, the Interdisciplinary Centre on Population Dynamics (CPOD) in collaborations with the Department of Biology, the Faculty of Business and Social Sciences and the Faculty of Health Sciences, CRACS (on Algorithms, Complexity and Structure) and the Digital Innovation Office (DIO).

SDU furthermore hosts the new Centre for Quantum Mathematics (QM). This centre is focused on the mathematical foundation of quantum phenomena covering both foundations and applications in quantum engineering and has obtained an ERC Synergy Grant worth 10 million Euro.

The research conducted at Imada includes a wide number of areas including Algorithms (cheminformatics, graph algorithms, online algorithms, data structures, cryptology, graph theory, optimization), Analysis (operator algebra, philosophy of mathematics), Computational Mathematics (computational quantum field theory, numerical analysis, lattice field theory), Concurrency and Logic (DevOps, microservices, choreographic programming), Data Science and Statistics (bioinformatics, data mining, machine learning, optimization, visualization) and Mathematics and Science Education.

Department of Mathematical Sciences, Aalborg University
Aalborg University was established in 1974 as a merger of existing teaching institutions, including two providing engineering education ($3\,1/2$ year degrees). From these, the first mathematicians were transferred to the university, still with the primary obligation to teach mathematics to engineers. Gradually, a mathematics research group was built, originally mainly as an integral part of the university's large "Institute for Electronic Systems". The first professor, Steffen Lilholt Lauritzen, was hired in 1981, and he was vital in forming a strong group in statistics as well as in aiming for a broader

scope of mathematical research at the university.

With the help of Aarhus University, research groups in computer science were developed in close cooperation with mathematics, and in 1986, the Department of Mathematics and Computer Science was formed, still within the Institute for Electronic Systems.

In the following years, the two parts of the department grew, both as prolific research groups and also as teaching communities with degrees in both mathematics and computer science. In 1999, each topic became a separate full department of Aalborg University, no longer associated with Electronic Systems: The Department of Mathematical Sciences was born.

Now 21 years old, the department offers Bachelor's, Master's and PhD degrees in Mathematics (including Statistics), Mathematics-Economics and Mathematical Engineering. The yearly intake of bachelor students is slightly less than 100. In addition, the faculty members also teach courses servicing widely across the university, with a large task being courses in introductory mathematics for all bachelor students in science, engineering and technology. All teaching is carried out in accordance with the problem based learning principles of the university.

Today, tenured staff include 7 professors and 10 associate professors, and the department has 7 assistant professors, 3 postdocs and 7 PhD students. Around 80% of the activities of the department are funded by governmental sources and 20% by external collaborators, the latter component being increasing. Each year, a number of visitors spend time in the department. The main research areas are harmonic analysis and computational mathematics, mathematical physics, topology and its applications, reliable and secure communication, applied and computational statistics, spatial statistics, statistical genetics, and econometrics.

Mathematics at Roskilde University

Roskilde University was founded in 1973 and since the very beginning, studies at Roskilde University have combined problem oriented student owned project work mixed half and half with ordinary courses all the way from freshmen to final year. The first department structure at RUC came in 1978 where mathematics and physics formed the department IMFUFA, an acronym which encompasses the research in pure mathematics and physics, in their teaching and in their applications. Today IMFUFA is a research group within the Department of Science and Environment. The group consists of 6 tenured faculty, two of which are full professors, one assistant professor and 6 PhD students.

The research in mathematics at the department is today organized

around (i) mathematical modelling in biology and medicine, (ii) didactics of mathematics, and (iii) dynamical systems. The mathematical modelling research mainly focuses on mathematical health and disease modelling including methods for parameter estimation in particular mathematical modelling of cancer and epidemics. The didactics of mathematics research focuses on mathematics in the Danish high-school, and on the teaching and learning of mathematical modelling at high-school and university level. The dynamical systems research focuses on fluid dynamics, in particular the reaction-diffusion equation and the Navier Stokes equation, and on holomorphic dynamics together with its relation to orthogonal and extremal polynomials. The research areas are widely connected to the major branches of mathematics, real and complex analysis, algebra, statistics and combinatorics, geometry, differential equations and numerical analysis.

Roskilde University offers dual subject Bachelor's degrees with mathematics as one subject, Master's degrees with mathematics and PhD degrees in mathematics. The annual enrollment is approximately 15 students on the Bachelor's programmes with mathematics and approximately 10 students on the Master's programmes.

The department hosts a Carlsberg Foundation Semper Ardens project PandemiX, and will host an upcoming Lundbeck Foundation Fellowship in "Personalized prediction of blood cancer progression using clinical data and mathematical modeling". The department is currently striving to build a centre for Mathematical Bioscience.

IMFUFA receives annually 10–20 international visitors and organizes several conferences and workshops.

Mathematical Societies in Denmark

The Danish Mathematical Society

Founded on October 8, 1873, The Danish Mathematical Society (DMF) is one of the oldest national mathematical societies (preceded and presumably inspired by the mathematical societies of London (1865), Finland (1868) and France (1872)). The purpose of the society was and still is: To promote research and teaching in mathematics. Soon after its foundation the society had attracted 65 members consisting of a widely mixed group of mathematically interested individuals, ranging from military personnel over elementary school teachers to university professors.

In the early days (and until the 1930s) the society was strongly concentrated in Copenhagen as was the case with Danish academia in general. The society would have a meeting approximately once a month, where a

mathematical (or sometimes physical or educational) topic was presented and debated. In the first half of the 20th century, the DMF was simply the center for high leveled mathematics in Denmark, featuring lectures by some of the World's most prominent mathematicians (Hilbert, Hardy and Lebesgue just to mention a few).

Beginning in the 1930s, local universities were founded outside Copenhagen, and eventually this also led to new Danish mathematics departments. The number of university mathematicians working in Denmark increased accordingly during the period 1950–1980, but has been relatively stable since the 1980s. In the same period the number of members of the DMF increased correspondingly and the present level is around 350 members. The profile of the members has also changed so that the majority of the present members are affiliated with university mathematics, whereas mathematics teachers from elementary schools and high schools have formed independent associations.

While the decentralization and extension of Danish academia had an increasing effect on the number of DMF-members, it has also radically changed the nature and frequency of the activities of the society, since the members are now scattered throughout the country. Even in a small country like Denmark it has proven difficult to attract members from distant parts of the country to meetings and lectures arranged by the society. It is therefore the present strategy of the society to concentrate attention to a a few but highly profiled meetings and seminars per year with the ambition of significant member participation.

It remains a major point of focus for the DMF to serve as a unifying network for all (high-level) mathematics in Denmark. The society publishes the bi-annual magazine "Matilde" and a monthly electronic newsletter. In association with the mathematical societies of the other Nordic countries DMF owns and appoints the editorial board of *Mathematica Scandinavica*. DMF also appoints board members to a number of central mathematical organizations in Denmark, including the Danish National Committee for Mathematics which administers the Danish membership of the IMU.

Danish Center for Applied Mathematics and Mechanics (DCAMM)

The center was formed in 1970 at the Technical University of Denmark (DTU) with the purpose of strengthening the research collaboration within applied mathematics and mechanics at DTU and to facilitate international contacts within these scientific fields. The center has since extended its activities to include Aalborg University, Aarhus University and University of

Southern Denmark. There are currently around 500 members of the center, of which 300 are university faculty, 160 are PhD students, and the rest are members from industry and from abroad.

The main activities of the center are scientific seminars (13 in 2019) and a bi-annual three-day symposium with focus on disseminating the research of the PhD students and promoting their collaboration (more than 100 participants in 2019). Furthermore, DCAMM has an Annual Speaker program, where an internationally recognized researcher is invited to give a talk at one or more of the member universities. The 2019 speaker was professor E. Paul Sorensen, Brown University, USA, who gave the talk *Isogeometric Analysis of Solids, Fluids, and FSI for Extreme-Event Simulation.*

DCAMM also coordinates a researcher education program with courses at the PhD level (7 in 2019). The courses attract many international speakers and students.

DCAMM supports the National Committee for Theoretical and Applied Mechanics which acts as a link to the International Union of Theoretical and Applied Mechanics (IUTAM). Several members of DCAMM play key roles in various committees in IUTAM, and Professor Viggo Tvergaard, Department of Mechanics, DTU, was the president of IUTAM 2012–16.

The Danish committee of mathematics instructions (DMUK)
In 1994 the Commission on Mathematical Instruction (DMUK) was re-established as a sub-commission to ICMI within the [legal] framework of the Articles of Association of the IMU in 1986. The raison d'être of DMUK is to maintain liaison with the Commission in all matters pertinent to its affairs. The purpose of DMUK is:

- establish connections between ICMI and Denmark,
- to promote the exchange of information and views on mathematical instructions at all levels of education in the country,
- to increase the knowledge in Denmark of international curricula in mathematics education, and to disseminate information about Danish initiatives abroad,
- to promote initiatives for research and development of Danish mathematics education at all educational levels.

At any one time, DMUK members include two representatives from each of the associations of mathematics teachers, three representatives from each Mathematical Society in Denmark and The National Committee for

Mathematics in Denmark and, finally, the ministerial specialist consultants in mathematics education.

DMUK holds two annual whole day member meetings. A business committee broadly representing the different member groups handles the work in between these meetings.

The Danish Society of Theoretical Statistics (DSTS)
The Danish Society of Theoretical Statistics was founded in 1971 as the academic society of statisticians in Denmark, who are generally trained at the mathematics departments of the Danish universities, including the Danish Technical University. From the beginning DSTS was engaged in international collaboration, primarily through the Nordic collaborative efforts in publishing the Scandinavian Journal of Statistics (since 1974) and the biennial conferences that started in 1965 under the name *Nordic Conference in Mathematical Statistics*, and are still active, now in collaboration with colleagues in the Baltic States.

Today the society has around 400 members employed in academia, public sector research and industry, particularly pharma and finance. Besides the international activities indicated above, the society organizes two-day meetings and shorter meetings around Denmark, covering methodology and applications of statistics as well as topics related to statistical aspects of general public trends. Member services include a website that announces job openings, seminars and other relevant material.

DSTS is Denmark's representative in the Federation of European National Statistical Societies (FENStatS) and its sub-committees, and affiliated organizational member of the International Statistical Institute (ISI).

Internationalization

The National Committee for Mathematics in Denmark
The Danish membership of the IMU is carried by the National Committee for Mathematics and by the Royal Danish Academy of Sciences and Letters. The National Committee has 7 members, of which two are appointed by the Royal Danish Academy of Sciences and Letters, two by the Danish Mathematical Society, one by Danish Center for Applied Mathematics and Mechanics, one by the Danish Society for Theoretical Statistics, and one by the The Danish committee of mathematics instructions. Mikael Rørdam and Søren Fournais are the current chair and vicechair of the committee.

The National Committee works closely together with the Danish Mathematical Society.

The National Committee for Mathematics is responsible for submitting this application to the IMU for advancing to membership level III.

Institut Mittag-Leffler
Institut Mittag-Leffler is the oldest mathematical research institute, founded in 1916 by Gösta and Signe Mittag-Leffler with the purpose of supporting Swedish and Nordic mathematics. It operates under the auspices of the Royal Swedish Academy of Sciences with the cooperation by the mathematical communities in all Nordic countries, including Denmark. Arne Jensen (from Aalborg University) was director of Institut Mittag-Leffler in 1993–95.

In addition to semester-long programs, the institute hosts week-long workshops and summer schools, as well as outreach activities for high school students and teachers. The institute is the publisher of the journals Acta Mathematica and Arkiv för Mathematik founded in 1882 and 1946, respectively, both of which are now published as Green Open Access journals.

The institute has been and continues to be an important component in Danish mathematical life, and a large number of Danish mathematicians have contributed and continues to contribute to the institute and its activities. Most semester-long programs have had Danish participants, and many have been co-organized by Danish mathematicians. In addition, the editorial board of Acta Mathematica has had continual representation by Danish mathematicians with Tobias Colding and Jesper Grodal currently serving as members of the editorial board. Uffe Haagerup (from the University of Southern Denmark) was Editor-in-Chief of Acta Mathematica 2000–2006. Finally, Lars Hesselholt currently serves as the Danish member of the board of the institute.

Mathematical Journals

Mathematica Scandinavica
Mathematica Scandinavica was founded in 1953 as a collaboration between the national mathematical societies of Denmark, Finland, Iceland, Norway and Sweden. It is a peer-reviewed journal covering all of mathematics, publishing papers of moderate length, and is run on a non-profit basis. The journal has green open access policy, with no embargo period and a 5 year moving wall for free access to articles. Currently about 640 journal pages are published per year, both online and in print. Subscribers are principally mathematical libraries from across the globe.

The journal office is based at the Department of Mathematics, at the University of Aarhus in Denmark, with a local Coordinating Editor (cur-

rently Andrew Swann). Each of the participating societies nominates a national editor: currently Wojciech Szymanski (SDU, Denmark), Mikko Salo (Jyväskla, Finland), Ragnar Sigurdsson (Reykjavik, Iceland), Paul Arne Østvær (Oslo, Norway) and Jan Stevens (Göteborg, Sweden).

All journal articles have DOIs, and are indexed by MathSciNet and ZbMath, with MathSciNet recording over 17,000 citations to the journal. Web of Science records over 800 citations/year to the journal during each of the last 7 years.

Scandinavian Journal of Statistics, Theory and Applications (SJS)

Scandinavian Journal of Statistics, Theory and Applications is an international statistics journal that has been published since 1974. It was formed by the professional statistical societies of Denmark, Finland, Norway and Sweden, and is managed by a governing board with two representatives from each of the four countries. The governing board appoints the editor(s)-in-chief and the editorial board. The journal is currently published by Wiley in four issues per year containing a total of 50–60 papers. The journal receives around 300 submissions per year with the vast majority of the submissions as well as the published papers from outside of the Nordic countries. The surplus generated by the publication of SJS has been used to support the statistical community, e.g., by funding prices and travel grants for young researchers or by funding the SJS Lectures at the biennial NORDSTAT and Nordic-Baltic Biometric Conferences.

Gender balance in Danish Mathematics

As in most other countries the gender balance among Danish university mathematicians remains a challenging issue. At least since the early 2000s several initiatives have been launched by successive governments and university leaderships to improve on the gender balance in all of academia and in the natural and technical sciences in particular. While these initiatives have certainly raised the awareness of the problem in Danish academia as a whole, the actual progress evolves at a slower pace than one could rightfully wish for. Around a decade ago the University of Copenhagen invoked dedicated measures to improve gender balance, with significant positive impact. Today all Danish mathematics departments have formulated specific gender policies, e.g., by dictating specific improvements on gender balance within stipulated time frames. Notably, several women in Danish mathematics have in recent years served as leaders of research centers including

Nathalie Wahl (GeoTop), Eva Bjørn Vedel Jensen (Stochastic geometry and advanced bioimaging) and Susanne Ditlevsen (Dynamical Systems Interdisciplinary Network).

In parallel with the local university initiatives, the Danish mathematics community has embraced international initiatives promoting gender balance. For example the association of European Women in Mathematics (EWM) counts several Danish mathematicians among its active members. Moreover, the Danish Mathematical Society has joined the international May 12 celebrations by organizing an annual "Women in Maths Dinner" to which all women in Danish mathematics (from PhD-students to professors) are invited. In 2020 plans were made to precede this dinner by half a day of lectures given by local and international women in mathematics. Unfortunately the present Corona crisis has put a temporary stop to all physical arrangements of that kind, but the plans will be re-launched next year at the latest.

Danish Mathematics in numbers

Danish Mathematics

Danish mathematicians have contributed to the development of the subject at all levels. We list selected high points below. Danish mathematicians have contributed with a total of approximately 2,750 peer-reviewed research publications in mathematics in the last 5 years (2015–2019 incl).

ICM speakers

Plenary

Harald Bohr (1932, Zurich), Jakob Nielsen (1936, Oslo), Børge Jessen (1954, Amsterdam), Uffe Haagerup (2002, Beijing), Ib Madsen (2006, Madrid)

Section

Ib Madsen (1978, Helsinki), Jens Carsten Jantzen (1983, Warszawa), Uffe Haagerup (1986, Berkeley), Marcel Bökstedt, Jesper Lützen and Carsten Thomassen (1990, Kyoto), Henning Haahr Andersen (1994, Zurich), Vagn Lundsgaard Hansen and Lars Hesselholt (2002, Beijing), Mikael Rørdam (2006, Madrid), Tinne Hoff Kjeldsen, Jesper Grodal (2010, Hyderabad), Søren Galatius (2014, Seoul)

ERC grants

Synergy Grant
Jørgen Ellegaard Andersen (2019)

Advanced Grant
Ib Madsen (2009), Uffe Haagerup (2010), Per Christian Hansen (2011), Carsten Thomassen (2012), Jan Philip Solovej (2013)

Consolidator Grant
Søren Galatius (2016), Mark Podolskij, Nathalie Wahl (2018), Matthias Christandl (2019)

Starting Grant
Søren Fournais (2008), Nathalie Wahl (2009), Matthias Christandl (2013), Karim Adiprasito (2016)

Selected fellowships

Fellow of the American Mathematical Society
Henning Haahr Andersen, Søren Galatius, Jesper Grodal, Vagn Lundsgaard Hansen, Lars Hesselholt, Jens Carsten Jantzen, Tinne Hoff Kjeldsen, Jesper Lützen, Ib Madsen

Fellow of the Institute of Mathematical Statistics
Søren Asmussen, Søren Johansen, Steffen Lauritzen, Thomas Mikosch, Michael Sørensen

Fellows of the Econometric Society
Søren Johansen

Fellow of the Society of Industrial and Applied Mathematics
Per Christian Hansen

Honorary Fellow of the Institute of Combinatorics and its Applications
Carsten Thomassen

Honory Fellow of the Royal Statistical Society
Ole Eiler Barndorff-Nielsen

Selected international distinctions

Selected distinguished lectures

Steffen Lauritzen, Laplace Lecturer (World Congress in Probability and Statistics), 2004
Steffen Lauritzen, Wald Lecturer (World Congress in Probability and Statistics), 2012
Thomas Mikosch, Medallion Lecturer (Institute of Mathematical Statistics), 2018

Distinguished Awards

ECM Prize (2020): Karim Adiprasito
Humboldt Forschungspreis: Ib Madsen (1992), Ole Eiler Barndorff-Nielsen (2001), Uffe Haagerup (2012), Steffen Lauritzen (2016), Thomas Mikosch (2018)
Clay Fellow: Søren Galatius (2007-2010)
Guy Medal in Silver: Steffen Lauritzen (1996)
Guy Medal in Bronze: Jonas Peters (2019)
Ostrowski Prize: Ib Madsen (2011)
ESF's 14th European Latsis Prize: Uffe Haagerup (2012)
European Prize in Combinatorics: Karim Adiprasito (2015)
New Horizon Prize: Karim Adiprasito (2019)
Lester R. Ford Award from Mathematical Association of America: Carsten Thomassen
Member of Academia Europaea: Ole Eiler Barndorff-Nielsen
John von Neumann Theory Prize: Søren Asmussen

Honorary doctorates

Faculty at Danish universities has been awarded honorary doctorates from the following international universities:
East China Normal University: Uffe Haagerup
Heriot–Watt University: Søren Asmussen
Katholieke Universiteit Leuven: Ole Eiler Barndorff-Nielsen
University of Bern: Eva Bjørn Vedel Jensen
University of Lund: Gerd Grubb
Université Paul Sabatier, Toulouse: Ole Eiler Barndorff-Nielsen
Université de Reims: Gerd Grubb
Wroclaw University: Søren Asmussen

Editorships

Faculty at Danish universities serve currently as editors for the following journals:

Chief Editorships

- Bernoulli (Mark Podolskij)
- Discrete Mathematics and Theoretical Computer Science (Jørgen Bang-Jensen)
- Extremes (Thomas Mikosch)
- IMU-Net (Martin Raussen)
- Journal of Graph Theory (Carsten Thomassen)
- Journal of Mathematical Physics (Jan Philip Solovej)
- J. Royal Statistical Society, Series B (Steffen Lauritzen, from 2021)
- Mathematica Scandinavica (Andrew Swann)
- Nagoya Mathematical Journal (Lars Hesselholt)
- Reviews in Mathematical Physics (Jacob Schach Møller)
- Risks (Mogens Steffensen)
- Springer Briefs in Probability and Mathematical Statistics (Mark Podolskij)

Members of Editorial Board

Acta Math., Advances/Journal of Applied Probability, Advances in Operator Theory, Algebraic and Geometric Topology, Annales Henri Lebesgue, Annales Henri Poincare, Annals Institute of Statistical Mathematics, Annals of Statistics, Archive for History of Exact Sciences, Asian European Math. Journal, The Australian Journal of Combinatorics, Bernoulli, Biometrika, Brazilian J. Prob. and Statistics, Bull. Belgian Math. Soc., Bulletin of the Korean Mathematical Society, Combinatorica, Comm. Math. Phys., Differential Geometry and Applications, Discrete Mathematics, Electronic Journal of Electronics, European Journal of Combinatorics, Exp. Math., Geom Dedicata, Geometry and Topology, International Mathematics Research Notices, Historia Mathematica, Insurance: Mathematics and Economics, International Statistical Review, Japanese J. Statistics and Data Science, J. American Statistical Association, J Applied and Computational Topology, J Combinatorial Theory Ser. B, J. Graph Theory, J Homotopy and Related Structures, J Knot Theory Ramifications, Journal of Lie Theory, J. Math. Analysis and Applications, J. Math. Psychology, J. Topology, Lithuanian Mathematical

Journal, Math.BioSci., Mathematical Biosciences and Engineering, Mathematical Proc. of the Royal Irish Academy, Mathematics of Computation and Data Science, Modern Stochastics: Theory and Applications, Queueing Systems, Research in Math. Sciences, Revista Mathematica Complutense, Revue d'Historie des Mathematiques, Revue Roumaine de Mathématiques Pures et Appliquées, Sampling Theory in Signal and Image Processing, Scandinavian Actuarial Journal, Scandinavian J. Statistics, Selecta Mathematica, SIAM J. Applied Algebra and Geometry, SIAM J. Mathematics of Data Science, Statistical Inference for Stochastical Processes, Stochastic Models, Stochastic Processes and their Applications.