

BFS/TFS Mathematics program – the joint project «Pure mathematics in Norway»

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1 Summary

The project is funded by BFS and TFS in collaboration with UiB, NTNU, UiO and UiT. The aim is to strengthen research in pure mathematics in Norway, by contributing to national and international research collaboration, mobility for researchers and Ph.D. students, and training of master and Ph.D. students.

The project will support the following activities:

1. Networking and interaction for the Norwegian community of mathematicians:
 - Annual joint meeting of Norwegian mathematicians. The first time in Bergen, 2018.
 - Joint day seminars (one per department per semester) and BFS/TFS Colloquium.
 - National mobility. Visits to one of the other departments, up to one week.
2. Activities for graduate students:
 - Gathering based courses for Ph.D. students.
 - Summer/winter schools and Master classes, for Ph.D. and master students.
 - Mobility for Ph.D. students. Travel abroad, from two weeks up to three months.
 - Stipends for Ph.D. students to visit ICM or ECM. Up to four stipends, ideally one at each department. This year for ICM 2018.
3. International activities and exchange:
 - Workshops and meetings.
 - BFS/TFS guest professors. From two weeks up to three months.
 - International mobility. Incoming and outgoing. Also «research in pairs».

For more details on the above activities, see section 3 below.

The project will be managed by a Project Committee (PC) with representatives from all four departments. Applications for funding will be submitted locally at each department, to a Local Project Committee (LPC).

The starting date of the project is 1 May 2018. Application deadlines for the various activities are shown in section 2. **All applications are submitted locally, to the LPC.**

2 Application deadlines for 2018

Activities	Deadlines 2018	Activity period	Comments	Follow-up from applicants after end of activity
Mobility (national, international and Ph.D.)	LPC accepts applications continually	1-12 months after application deadline	LPC makes decisions within allocated budget.	Short report and budget.
Workshops and summer/winter schools	1 Feb and 1 Oct NB! From 2019, the deadlines will be 1 April and 1 Oct every year.	4-15 months after application deadline	LPC makes prioritized list. PC makes final decision.	Final report including program, participants, budget and self-assessment.
ICM 2018 for Ph.D. students	1 March	1-9 Aug 2018	LPC nominates candidates. PC makes final decision. Max. 4 stipends.	Detailed report/essay about the experience, to be published on web page.
BFS/TFS Guest Professors	1 April and 1 Oct	next two semesters	LPC nominates. PC makes decision.	Guest professors are invited to write a popular piece about their research or a related topic.
Gathering based courses and Master classes	1 June and 1 Dec	next two semesters	LPC forwards applications to PC. PC makes decision.	Final report including program, participants, budget and self-assessment.
Joint day seminars and BFS/TFS Colloquiums	1 June and 1 Dec	next semester	LPC nominates. PC makes decision.	Final report including program, participants, budget and self-assessment.

3 Details on planned activities

3.2 Networking and interaction in the Norwegian community of mathematicians

The Norwegian community of pure mathematics at the University of Bergen, NTNU Trondheim, University of Oslo, and University of Tromsø can roughly be divided into four groups:

- Analysis, including complex analysis, analysis on manifolds, operator algebras, and PDE;

- Algebra and structural methods in computational and applied mathematics;
- Algebraic geometry and representation theory;
- Geometry, topology and Lie theory.

Partly these fields are quite distinct, with different languages and research profiles making interaction challenging. But partly mathematics is also growing together with more and more connections between different areas, and a move towards more common language by realising that there are common underlying structures and methods in distinct fields.

A significant aim of the project is to increase interaction, contact, and cooperation within the Norwegian mathematical community both within each field, but also between the different fields. We propose the following activities.

3.2.1 Joint meeting of Norwegian mathematicians

We are usually familiar with the Norwegian mathematicians working in our own field, but quite often not with those working in other fields. Each year we will organize a joint meeting for Norwegian mathematicians with parallel sessions, making it of interest to all Norwegian mathematicians. We will get to know what Norwegian mathematicians at large work on, and we will enable personal exchange between mathematicians in different areas.

1. The meeting will be organized for two or three days.
2. It will include some plenary talks, and then parallel sessions in the various fields.
3. The meeting will rotate between the four universities: Bergen 2018, Trondheim 2019, Tromsø 2020, and Oslo 2021.
4. The meetings will have one extra first day for Ph.D. students, where they will talk about their research.

One model we have in mind are the AMS meetings. Another model is the *Arbeitstagung* at the Max Planck Institute for Mathematics in Bonn. Which model to apply will be up to the local organizers in cooperation with the Project Committee. The format will also be adapted as one gains experience with organizing the meeting.

3.2.2 Joint day seminars and BFS/TFS colloquium

These are one day seminars with topics of interest within one field or at the intersection of two or more fields. Participants from the other universities would come in the morning (or evening before) and leave at the end of the day, thus making it effectively a work day just in another city.

1. The joint day seminars will be organized around one or more international guests.
2. It will usually also contain talks by Norwegian mathematicians, so as to make it from three to five talks during the day.
3. Some seminars may be organized at regular intervals with a designated name. A model is the Onsager lectures in Trondheim, after Nobel laureate Lars Onsager. We will each year have an Elizabeth Stephansen lecture, a seminar with focus on female speakers. We remark that ES was the first Norwegian woman with a Ph.D. in mathematics, a pioneer in 1902. (The next was in 1971!)

Each institution will normally host one such seminar each semester, and themes should be distributed to reflect the overall research activity in Norway.

One of these joint seminars may after competitive application be extended to a two or three day seminar under the name *BFS/TFS colloquium* and get an extra funding of 30–60K NOK. It will be organized 3–8 times during the four years, at most once each semester, depending on available funding, demand, and quality of proposal. The BFS/TFS colloquium will include a social dinner for the participants.

3.2.3 Mobility between Norwegian universities

To promote research cooperation between Norwegian mathematicians, we will support travel and stay between Norwegian universities:

1. For single or two day stays with main purpose of giving a guest talk.
2. For week long stays with the purpose of joint research activities.

3.3 Activities for graduate students

Among the mathematics departments in Norway, Oslo and Trondheim have medium sized departments in pure mathematics, while Bergen and Tromsø are rather small. As a consequence the advanced courses we can offer at each department are limited. Also for a number of graduate students the research groups are of small size.

3.3.1 Gathering based courses

In Bergen we have a master program in mathematics for experienced teachers. These take regular mathematics courses, organized by six two-day gatherings during the semester. This has been a success.

We envision to do the same with advanced courses for Ph.D. students. Such a course can be lectured in four to six gatherings during a semester, each of two days. This could be attended by all interested Ph.D. students in Norway, who would travel to attend these gatherings, supported by the project. This will weave the Norwegian community of Ph.D. students better together, and we believe it would provide both effective learning for the students and an effective way of teaching for those organizing the course.

3.3.2 Schools and master classes

We will support international research schools and summer and winter schools for master and Ph.D. students. These schools will be organized by Norwegian research groups who can apply for support from the project. We will also support master classes, which are typically three day courses lectured by one or two international lecturers on a specific topic.

3.3.3 Mobility for Ph.D. students

Ph.D. students funded by university grants only have their salaries from the university and no designated funding for travel. We will fund travel and partly lodging for stays from two weeks up to three months, at institutions abroad. The students should provide a description of the usefulness of the stay together with a recommendation by their advisor.

Every second year the ECM and ICM meetings are organized. We will invite Norwegian Ph.D. students to compete for a trip to these meetings. Up to four students will be supported, ideally one from each institution, and in return they will be asked to write a detailed report/essay about their experience, made available on the project web site.

3.4 International activities and exchange

Pure mathematics is an exceedingly international activity. Research papers do not in general have many authors, normally one to three authors, but the authors typically work at different institutions and in different countries. It is therefore absolutely essential for a thriving Norwegian mathematics community to have ample support and time for international contact and travel.

3.4.1 Workshops and meetings

The RCN supports conferences after application, but only those which are organized at regular intervals and rotate between countries. Through competitive calls we will support workshops and meetings on topics of significant recent international interest, or workshops organized by Norwegian research groups as a service to the international mathematical community. We see it as a significant boost to research activities in Norway that we can apply and get funding for workshops and meetings from this project. This will make Norwegian research groups take a more active and leading role in the international mathematical community.

3.4.2 BFS/TFS Guest professors

To strengthen international research connections, to teach specialized topics, and to increase exposure to significant international research themes, each department will every year appoint a number of BFS/TFS Guest professors. These will have stays at the departments of a minimum of two weeks and up to a maximum of three months. During this time they will teach a mini-course on a specific topic, or possibly a more extensive course if the stay is six weeks or more. They may also contribute to supervision of master and Ph.D. students.

The BFS/TFS Guest professors will be invited to write a popular piece (short or longer) about their research or on related topics they find fascinating, to be published on the project web site.

There will be around twelve months each year available for such positions, distributed among the four institutions. We will have particular focus on inviting women to such positions. There is internationally a fairly great imbalance between women and men in research positions in pure mathematics, so attaining gender balance for these positions may be challenging. But the Project Committee will monitor the selection process with the aim that a significant part of these positions be filled by women.

3.4.3 International mobility

We will invite international guests for three to five day stays at our departments. They will give guest lectures and do joint research activities. We will support travel for people from other Norwegian departments who would like to attend guest lectures.

We will support travel by Norwegian mathematicians to international institutions for stays from one to two weeks, preferably for joint research cooperation. We will support research in pairs activities at suitable places, provided a good plan for research cooperation is presented.