

## Assessment of grant application submitted to the Research Council of Norway

### Grant application

Project number	263132
Project title	Higher categories and representation theory
Project manager	Bergh, Petter Andreas
Project Owner	Norges Teknisk-Naturvitenskapelige Universitet
Programme/Activity	Fri prosj.st. mat.,naturv.,tek
Case officer	Terje Strand

### Confirmation

By completing and submitting this form, I / we confirm the following (applies for the individual referee or the referee panel):

- I am /We are qualified to assess this application. See Regulations on Impartiality and Confidence in the Research Council of Norway.	Yes
- I/We have read and understood both the criteria I/we have been asked to use for assessing the application and the description of the scale of marks. The scale of marks is to be applied as an absolute scale, i.e. marks are to be determined for each grant application independently and not relative to other applications that the panel/referee is assessing.	Yes
- I/We understand and accept the guidelines for assessing applications for the Research Council of Norway. See Guidelines for referees/panels who assess applications for the Research Council of Norway.	Yes
- I am/We are qualified to conduct this assessment.	Yes

## Summary of marks

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Criterion	Mark
Scientific merit	6
Boldness in scientific thinking and scientific innovation	B
The project manager and project group	6
Implementation plan and resource parameters	C
International cooperation	B
Dissemination and communication of results	C
Overall assessment of the referee/panel	5

## Criteria

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### Scientific merit

How would you rank the project's scientific merit?

This criterion gives an indication of the essential, fundamental aspects of the research project. The scientific merit of a project will be assessed in relation to the following points:

- \* Originality in the form of scientific innovation and/or the development of new knowledge.
- \* Whether the research questions, hypotheses and objectives have been clearly and adequately specified.
- \* The strength of the theoretical approach, operationalisation and use of scientific methods.
- \* Documented knowledge about the research front.
- \* The degree to which the scientific basis of the project is realistic.
- \* The scientific scope in terms of a multi- and interdisciplinary approach, when relevant.

A strong project in algebra, with relations to algebraic topology. Mostly centered around higher categories, n-angulated categories, higher triangulated structures and higher representation theory. These structures are highly relevant in modern algebra, but also in topology and other fields. Note also that this area could have applications e.g. to computer science, and is also currently becoming popular in mathematical or theoretical physics. The description of the research project is clear and explicit. All subprojects appear to be within mainstream current research in the area of the project.

Selected mark : 6 - Excellent

The project's objectives, research questions and hypotheses are very clearly presented and are based on an excellently formulated and highly original project concept. The project is in the forefront of its field and will contribute to scientific innovation as well as generate important new knowledge. The project is of excellent quality, with no significant weak points. Publications in leading scientific journals in the field are highly likely.

## Boldness in scientific thinking and scientific innovation

Will the project contribute to significant advances in theory or methodology, or lead to groundbreaking results that will expand the current knowledge base?

This criterion gives an indication of how likely it is that the research project will lead to significant advances in theory, methodology or scientific knowledge, as opposed to more incremental progress.

Relevant elements to be assessed in this context include:

- \* Bold hypotheses
- \* High potential for significant theoretical advancement
- \* Original methodology
- \* Creative approach to expanding the current knowledge base in the field

The questions are very natural, and laid out in a clear and convincing manner. The project is a fairly broad attack at higher categories, from various viewpoints, but it lacks "carrot questions" (e.g. a big conjecture the resolution of which would be the optimal outcome).

Selected mark : B - Good

The project has a high potential for scientific innovation. It is likely to result in clear theoretical advancement, and/or the development of novel methodology and/or a significant expansion of knowledge. The project is highly creative.

## The project manager and project group

How would you rank the qualifications of the project manager and project group?

This criterion gives an indication of the qualifications of the project manager and project group. The project manager and project group will be assessed in relation to the following points:

- \* Project management
- \* Expertise and experience within the field of research
- \* Publication record
- \* Experience with national and international collaboration on projects
- \* Experience with supervision of students and younger researchers
- \* The degree to which the project manager and project group are part of a research environment that has the competence and resources needed to ensure the success of the project

Bergh and Oppermann are highly accomplished at an international level. They continuously produce high quality papers in leading journals. They are currently managing a project of similar size and have experience in PhD supervision. (Probably also in PostDoc supervision, but this is not adequately documented.)

Selected mark : 6 - Excellent

The project manager and/or research/project group is/are qualified at a high international level, has/have contacts within the foremost national and international research environments and will be able to play an important role in ensuring the success of the project.

## Implementation plan and resource parameters

How well-suited are the implementation plan and resource parameters in relation to the project?

This criterion gives an indication of whether the plan for project implementation is satisfactory, and whether the planned use of resources in the project is well-suited for the tasks in the project, based on assessment of the following elements:

- \* Plans for project implementation, including breakdown into work packages/sub-projects, milestones and deliverables.
- \* Need for personnel resources, as listed in terms of work time distributed by work packages, sub-projects or milestones.
- \* Need for other resources (such as equipment, data collection, field work), distributed by work packages/sub-projects or milestones.

The assessment is not to be linked to any scientific risk.

The research plan is very clearly laid out and well planned. However, this project could just as well be carried out by Bergh and Oppermann (and their international collaborators) alone, and it remains unclear why three PostDocs and one student would be required. In fact, the proposal explicitly refuses to give adequate details of how the fellows will be involved, not even the PhD student. Moreover, for a project this size it is surprising that it doesn't involve a conference or workshop. Finally, the proposal claims that the involved researchers will travel internationally (conferences, research visits), but it is not obvious whether there is a sufficient budget for this. (Bergh and Oppermann might be sufficiently senior to be invited, but for the fellows this is not clear at all.) Similarly, the budget for incoming research visits is not clear.

Selected mark : C - Weak

The project plan and planned use of resources have deficiencies, and the project is not considered to be realistic.

## International cooperation

How would you rank the international cooperation set out for the project?

This criterion gives an indication of the extent and quality of the international cooperation activities set out for the project.

Bergh and Oppermann have a strong international network with active collaborations. This involves both junior people and established leaders in the field. It is less clearly documented how this international network will be involved in the actual project.

Selected mark : B - Good

The international cooperation activities set out for the project have a satisfactory scope and quality.

## Dissemination and communication of results

How would you rank the quality of the dissemination and communication plans?

This criterion gives an indication of the quality of the dissemination and communication plans for the project. Dissemination and communication of results will be assessed in relation to the following points:

- \* Plans for scholarly publication, dissemination and other communication activities.
- \* Plans for popular science dissemination and communication activities vis-à-vis the general public as well as users of the project results, including planned use of channels and measures.
- \* Plans for ensuring that important users (in industry, community life and public administration) are incorporated into/take part in dissemination activities for the project.

When assessing dissemination and communication plans, importance should be attached to the level of detail provided and how realistic the plans are.

The proposal only mentions journal articles and conference talks as dissemination devices. The use of the arXiv is not mentioned in the proposal, but it seems safe to assume that Bergh and Oppermann will continue to use it. Whether the PostDocs and students will post their papers on the arXiv, and whether the project as such will be visible on the web seems less clear. The project does not involve any workshops or conferences to be held in Norway.

Selected mark : C - Weak

The project's dissemination and communication plans exhibit deficiencies.

## Overall assessment of the referee/panel

How does the project rank in terms of the referee's/panel's overall assessment?

This criterion indicates the overall view of the referee/panel, based on the specific criteria which they have been asked to assess.

This is a scientifically very strong project (although not absolutely exceptional in boldness). The project manager(s) have strong track records at high international level and are certainly qualified to run a project this size. However, as far as management and implementation goes the proposal is much too tersely written.

Selected mark : 5 - Very good

A project of national and international interest. Publications in recognised journals may be anticipated. The researchers are very well recognised in their field.

## Special points to consider

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Comments to special points to consider