

Call for Proposals

No. 39

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Priority Programme “Homotopy Theory and Algebraic Geometry” (SPP 1786)

In March 2014, the Senate of the Deutsche Forschungsgemeinschaft (DFG, German Research Foundation) had established the Priority Programme “Homotopy Theory and Algebraic Geometry” (SPP 1786). The programme is designed to run for six years. The DFG invites with this call proposals for the second (and last) three-year funding period.

Ideas from algebraic geometry have influenced modern homotopy theory, for example, the use of the moduli stack of elliptic curves in the construction the topological modular forms spectrum. In the other direction, the introduction of motivic homotopy theory has enabled the application of methods and constructions from homotopy theory to problems in algebraic geometry. The slice spectral sequence was invented in motivic homotopy theory, but its counterpart in equivariant stable homotopy theory was a key ingredient in the solution of the Kervaire invariant one problem. The motivic Adams and Adams-Novikov spectral sequences have been used to extend computations of the classical stable homotopy groups of spheres, while comparison methods from classical stable homotopy theory have been adapted to compute the first few stable motivic stems. The central purpose of this programme is to advance research at the nexus between homotopy theory and algebraic geometry, with the goal of furthering the cross-fertilisation between these areas. We expect the individual research projects to contribute to at least one of the following research areas.

Motivic homotopy theory:

- motivic chromatic homotopy theory and the algebraic geometry of the Adams-Novikov spectral sequence
- further investigation of slice towers and spectral sequences
- the introduction of aspects of classical homotopy theory, such as obstruction theory, the use of operads and recognition principles, in the motivic setting
- construction and study of motivic cohomology operations and their application to problems in algebraic geometry and arithmetic
- extensions to non- A^1 -invariant theories and motivic approaches to the study of non- A^1 -invariant phenomena
- the development of a motivic homotopy theory of rigid analytic spaces and other adic spaces
- computations of motivic homotopy groups of spheres and special varieties, and applications of these to problems in algebraic geometry and K-theory
- the use of homotopical invariants in arithmetical settings, such as existence of rational points and related questions

Derived algebraic geometry:

- K-theory of ring spectra, logarithmic structures on ring spectra, logarithmic topological Hochschild homology
- extensions of the construction of the topological modular forms spectrum to other formal groups and to the motivic setting
- characteristic classes for String bundles, especially the use of the topological modular forms spectrum and motivic liftings of connective covers of MU and MO

Differential homotopy theory and motivic aspects of classical homotopy theory:

- using differential homotopy theory and motivic versions of Deligne cohomology for constructing homotopical and motivic invariants
- the use of index theory for the construction of motivic invariants
- equivariant aspects of differential homotopy theory
- differential cobordism invariants, Deligne and Arakelov cobordism
- cobordism categories and motivic analogs
- motivic aspects of rational homotopy theory

Equivariant homotopy theory:

- foundations of equivariant homotopy theory, global equivariant homotopy theory, equivariant formal group laws
- equivariant motivic homotopy theory and motivic homotopy theory of stacks
- real motivic homotopy theory, Hermitian K-theory and Chow-Witt groups
- motivic aspects of real and tropical enumerative geometry

Proposals for this Priority Programme should address research questions as indicated by (but not restricted to) the above sample topics. It is advisable to state explicitly the relation of the proposed project to the overall programme as well as to other (potential) projects as “2.5 Other information” in the project description. More detailed information on the thematic focus of the Priority Programme is available at the programme’s website.

Proposals for this second three-year funding period have to be submitted starting 6 November and no later than **5 December 2017**. They have to be submitted via DFG’s secured portal “elan”. Registered applicants may either continue existing projects via “Proposal Submission – Proposal Overview / Renewal Proposals” or select “Proposal Submission – New Project – Priority Programmes”, where they will find the programme guidelines (guideline 50.05, in particular, part B), the instructions for preparing project proposals (guideline 54.01) as well as a template for the project description (53.01, in rtf-format). The proposal has to be structured as shown in the template (the omission of non-relevant items being admitted if the numbering remains unaffected otherwise) – however, it is advisable to prepare the proposal as a pdf-file, e. g., using LaTeX, instead of using the rtf-file. The submission process itself can be reached by clicking on “Start online form”, followed by selecting “SPP 1786/2”.

If you have never before submitted a proposal to DFG through “elan”, you need to register in advance. This can be done online by yourself – however, it takes one to two working days to be confirmed by DFG staff. If you need to register, please complete your registration before **27 November 2017**.

Note that the descriptions of the projects and all CVs need to be prepared in English. Further, compliance with DFG's rules for publication lists (guideline 1.91) is expected: Beside the general bibliography, every proposal should include a list of up to ten publications by the applicant(s) (and/or members of his group) that relate directly to the project. Any academic CV submitted to the DFG must not list more than ten publications, which describe best the scientist's research profile. Publications in these lists need to be classified as a) refereed publications (published articles and monographs; accepted articles with note of acceptance by the journal) or b) other publications (e. g., preprints on arXiv), which need to be accessible online (please mention the arXiv number or provide links).

A review meeting with reviewers and applicants will be held on Tuesday, 20 March 2018, in Essen. The precise schedule and place will be communicated on the programme's website, which will also be the place where potential other information relevant to all applicants will be published.

Further information

More information on the Priority Programme is available under:
www.uni-due.de/~bm0032/SPP1786/Web/index

DFG's portal "elan":
<https://elan.dfg.de>

DFG's forms and guidelines for Priority Programmes:
www.dfg.de/spp/formulare

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