

Report of the group working on
Han's conjecture and noncommutative motives

Hausdorff Junior Trimester Program
New Trends in Representation Theory

Period of stay: September 1 to December 18

Group members: Sira Gratz, Theo Raedschelders, Špela Špenko, Greg Stevenson.

The main topic we worked on was Han's conjecture on the Hochschild homology of finite dimensional algebras. We were able to make progress, and have arguments verifying the conjecture, which avoid computation or explicit cycles, in a number of cases. This includes a general new reduction strategy which could potentially lead to a proof, as well as increasing the scope of the conjecture. In related work we were able to compute examples of motivic endomorphism rings in the singular case (perhaps the first examples) and find new motivic decompositions of various fundamental classes of algebras including symmetric Nakayama algebras.

The group has maintained contact and we are continuing to work toward a proof of the conjecture, and structure the results we obtained for publication. For instance, Gratz and Stevenson will visit Raedschelders and Špenko in March 2022, and Stevenson has a PhD student working on topics that arose during the semester.

We also worked as a group with Alexander Samokhin, who was invited to visit, on semiorthogonal decompositions for flag varieties. These discussions seem to have led to progress on the question of 'embedding dimension' for perfect complexes over finite dimensional differential graded algebras.

During our stay members of the group collaborated with other participants at the junior trimester program, and also with members of the Max Planck Institute. This has resulted in the following preprints:

- Sira Gratz, Alexandra Zvonareva, *Lattices of t -structures and thick subcategories for discrete cluster categories*, arXiv:2110.08606
- Scott Balchin and Greg Stevenson, *Big categories, big spectra*, arXiv:2109.11934

and further collaborative work is forthcoming.

Our stay at HIM was both productive and thoroughly enjoyable. Despite the, at the time, quite restrictive COVID-19 measures our group felt safe, and that HIM provided more than adequate cleaning and safety measures. We were very impressed with the extent to which the program was successfully run despite these challenges, and are still benefitting from the time we spent in Bonn.

JUNIOR TRIMESTER PROGRAM
NEW TRENDS IN REPRESENTATION THEORY
HAUSDORFF RESEARCH INSTITUTE FOR MATHEMATICS
01.09.2020 – 18.12.2020

DANIEL LABARDINI-FRAGOSO
ALEXANDRA ZVONAREVA

Group: Cluster algebras and algebras from surfaces

Research areas: Cluster algebras, representation theory of quivers and associative algebras, combinatorics, geometry.

Group members: Severin Barmeier, İlke Çanakçı, Wassilij Gnedin, Martin Kalck, Maitreyee Kulkarni, Daniel Labardini-Fragoso, Ian Le, Jacob Matherne, Lang Mou, Kaveh Mousavand, Sebastian Opper, Jonathan Rachowicz, Matthew Pressland, Zhengfang Wang, Emine Yildirim, Alexandra Zvonareva.

During the Junior trimester program the following scientific events were co-organized:

WINTER SCHOOL

The Winter School *Connections between representation theory and geometry*, organized by Jenny August, Sondre Kvamme, Daniel Labardini-Fragoso and Alexandra Zvonareva, took place online on October 5–9, 12–16 and 19–23, 2020. With more than 100 participants, the school brought together experts on various connections between representation theory and geometry, who delivered introductory 3-lecture mini-courses aimed at young representation theorists:

- A mini-course *Introduction to A-infinity structures* by Bernhard Keller (Université de Paris, Paris 7);
- A mini-course *Introduction to Fukaya categories* by James Pascaleff (University of Illinois);
- A mini-course *A geometric model for the bounded derived category of a gentle algebra* by Sibylle Schroll (University of Leicester).

The mini-courses were complemented by a number of one hour long talks linking the topics and putting them in a broader mathematical perspective:

- *Skew-gentle algebras and surface orbifolds* by Claire Amiot (Institut Fourier, Grenoble, France);
- *Perverse sheaves and schobers on Riemann surfaces* by Tobias Dyckerhoff (Universität Hamburg);
- *From Hall algebras to legendrian skein algebras* by Fabian Haiden (University of Oxford);
- *Partially wrapped Fukaya categories of symmetric products of marked disks* by Gustavo Jasso (Universität Bonn);
- *Homological mirror symmetry for log Calabi-Yau surfaces* by Ailsa Keating (University of Cambridge);
- *Homological mirror symmetry for not-so-simple singularities* by Yanki Lekili (Kings College London);
- *Plumbings and flops* by Ivan Smith (University of Cambridge).

All notes and videos from the Winter School are available at the [website](#).

MINICOURSE

Severin Barmeier and Zhengfang Wang, members of the group, gave a 4-lecture mini-course *Deformations of path algebras of quivers with relations* from September 29 to October 1, 2020. The videos are available at the [website](#).

RESEARCH OUTCOME

During the Junior trimester program the members of the group and their collaborators worked on the following topics: deformations of path algebras of quivers with relations; applications of representation theory to scattering amplitudes and categorification of scattering amplitudes; silting theory of Noetherian algebras; autoequivalences of derived categories of Brauer graph algebras and Brauer graph orders; derived equivalence classification of Brauer graph algebras; infinite triangulations and Verdier localisation; perfect matchings, dimer partition functions and cluster characters; continuous associahedron; web basis and categorification of Grassmannian cluster algebras; generalized cluster algebras and scattering diagrams; relative exact structures, Hall algebras and cluster characters.

Here is a list of research outcomes including preprints and ongoing projects, worked on or initiated during the program at the Hausdorff Institute by the members of the group (the members of the group are in bold).

Publications:

- **Severin Barmeier**, Koushik Ray, Learning scattering amplitudes by heart, Physics Letters B, 820, 136594, (arXiv:2101.02884).

Preprints:

- **Severin Barmeier, Zhengfang Wang**, Deformations of path algebras of quivers with relations (arXiv:2002.10001).
- **Severin Barmeier, Zhengfang Wang**, Deformations of categories of coherent sheaves via quivers with relations (arXiv:2107.07490).
- **Severin Barmeier**, Prafulla Oak, Aritra Pal, Koushik Ray, Hipolito Treffinger, Towards a categorification of scattering amplitudes (arXiv:2112.14288).
- **İlke Çanakçı, Alastair King, Matthew Pressland**, Perfect matching modules, dimer partition functions and cluster characters (arXiv:2106.15924).
- **Maitreyee C. Kulkarni, Jacob P. Matherne, Kaveh Mousavand, Job D. Rock**, A continuous associahedron of type A (arXiv: 2108.12927).
- **Sebastian Oppen, Alexandra Zvonareva**, Derived equivalence classification of Brauer graph algebras (arXiv:2103.12049).

Projects in progress:

- **Severin Barmeier, Martin Kalck, Zhengfang Wang**, Deformation quantization and singularity categories.
- **Severin Barmeier**, Sibylle Schroll, **Zhengfang Wang**, A_∞ deformations of Fukaya categories of surfaces.
- **Severin Barmeier, Zhengfang Wang**, Intrinsic formality of generalized Khovanov arc algebras and Stroppel's conjecture.
- **İlke Çanakçı, Martin Kalck, Matthew Pressland**, Infinite triangulations and Verdier localisation.

- **Wassilij Gnedin**, Silting theory of Noetherian algebras under change of rings .
- **Wassilij Gnedin**, Silting theory of Noetherian algebras modulo a normal regular element.
- **Wassilij Gnedin, Sebastian Opper, Alexandra Zvonareva**, Derived Picard groups of Brauer graph algebras and Brauer graph orders.
- **Ian Le, Emine Yildirim**, Web basis and Jensen-King-Su categorification of Grassmannian cluster algebras.
- **Daniel Labardini-Fragoso, Lang Mou** Generalized cluster algebras, Caldero-Chapoton algebras of gentle quivers with potential, and scattering diagrams.
- Xin Fang, Mikhail Gorsky, Yann Palu, Pierre-Guy Plamondon, **Matthew Pressland**, Relative exact structures, Hall algebras, cluster characters.

Final Report

Junior Trimester Program

New Trends in Representation Theory

Jenny August

Sondre Kvamme

February 25, 2022

- **Group name:** Higher Auslander–Reiten theory and tau-tilting theory.
- **Group members:** Jenny August, Johanne Haugland, Karin M. Jacobsen, Sondre Kvamme, Yann Palu, Hipolito Treffinger.
- **Duration:** September 1 - December 18, 2020.

We would like to thank the staff at the Hausdorff Research Institute for Mathematics (HIM) for their great help and support during the programme. We know that a lot of hard work went into providing us with such excellent working conditions, particularly during a pandemic. This was greatly appreciated, enabling all the members of the group to have fruitful scientific interactions with each other and with other participants of the programme.

1 Scientific activities

One of the highlights of our trimester programme was the winter school we organised in collaboration with the group *Cluster algebras and algebras from surfaces*. This was titled ‘Connections between representation theory and geometry’ and was motivated by recent results linking gentle algebras with Fukaya categories from symplectic topology. We brought together experts to explain this connection through a series of mini-courses:

- **James Pascaleff:** An introduction to Fukaya categories;
- **Bernhard Keller:** Introduction to A -infinity structures;
- **Sibylle Schroll:** A geometric model for the bounded derived category of a gentle algebra.

These mini-courses were then complemented by a collection of talks giving the state-of-the-art research in this direction.

The challenging circumstances of the pandemic meant that the whole event had to be held online. We were worried this would mean valuable networking opportunities would be lost but the HIM very kindly funded the use of the online social platform ‘Gather’ to counteract this. The online nature of the conference also had its advantages as we could reach a much wider audience, with over 150 attendees at some of the talks.

We would also like to particularly thank Stefan Hartmann, without whom this school could not have happened. He was extremely helpful and efficient in solving all our organisational problems.

2 Research Projects

- **All the members of the group** started a new project on generalizing tau-tilting theory to higher Auslander–Reiten theory. This combined in a nice way the expertise of some of the group members on higher Auslander–Reiten theory with the expertise of some of the other group members on tau-tilting theory. We met most Fridays from 09:00 to 12:00 during the programme to work on this project, and we have continued the collaboration after the programme finished. Currently we are in the process of writing up our results [AHJKPT].

This project would not have been possible without the junior trimester programme, which enabled all the members to meet in person and work together for a long period of time.

- **Jenny August** worked on generalising the connection between type A cluster combinatorics and type A singularity theory to an infinite setting. This is joint work with Man-Wai Cheung, Eleonore Faber, Sira Gratz and Sibylle Schroll, but it was significantly helped by Jenny and Sira being able to meet in-person during the programme. This is currently in the final stages of being written up [ACFGS].
- **Johanne Haugland** finished the preprint [HS] (joint with Mads H. Sandøy) while supported by the HIM, which establishes a notion of higher Koszul duality and relates this to n -hereditary algebras.
- **Johanne Haugland** also worked on a project with Raphael Bennett-Tennenhaus, Mads H. Sandøy and Amit Shah aiming to describe and study structure-preserving functors in higher homological algebra. The first results arising from this collaboration are expected to appear in the preprint [BTHSS] soon.
- **Johanne Haugland and Karin Jacobsen** had a project looking for examples of d -cluster-tilting subcategories in the module category or derived category of a gentle algebra. Together with Sibylle Schroll, they have now proved that there are no such examples aside from ones already known in the literature. This has resulted in the preprint [HJS].
- **Karin Jacobsen** started a new collaboration during the programme with Job D. Rock where they have been combining their interests of gentle algebras and continuous quivers. This is still ongoing, but so far they have results extending the ideas of relations and admissible ideals to the continuous setting.
- **Sondre Kvamme** was able to finish a project during the programme, which led to the publication [HKR].
- **Sondre Kvamme and Yann Palu** worked on the theory of exact ∞ -categories and their derived categories (joint with Gustavo Jasso and Tashi Walde). This was done by finding a new connection between the notion of a category of fibrant objects in homotopy theory, and the notion of a coresolving subcategory in representation theory. The work was facilitated by the fact that Gustavo Jasso was also in Bonn as a participant of the programme.
- **Yann Palu** took the opportunity of his stay during the semester to work with Mikhael Grosky on two ongoing projects in collaboration with Hiroyuki Nakaoka. The first one concerns higher positive and negative extensions in extriangulated categories and led to the preprint [GNP]. The second project is almost completely written down and a preprint should be on arXiv soon. It is related to mutation of rigid objects in hereditary extriangulated categories, a setting that encompasses mutation of cluster tilting objects, mutation

of 2-term silting objects, as well as some combinatorial flips appearing in relation to gentle algebras.

- **Hipolito Treffinger** started a collaboration with fellow trimester participant Severin Barmier on the algebraic phenomena arising in the amplituhedron, which led to the preprint [BOPRT] (joint with Prafulla Oak, Aritra Pal and Koushik Ray). This collaboration started from a chance meeting over coffee at the HIM so truly would not have happened without the trimester programme.
- **Hipolito Treffinger** finished a previous collaboration studying the connection between classical torsion pairs and their higher counterparts. The resulting publication [AJST] (joint with Javad Asadollahi, Peter Jørgensen, and Sibylle Schroll) was the basis for the research project carried out by our group during the trimester.
- **Hipolito Treffinger** gave a series of lectures at the LMS Autumn Algebra School while he was supported by the HIM. This also resulted in a survey article [T] which will appear in the proceedings of the school, and which will be published by Cambridge University Press.
- **Hipolito Treffinger** also started another collaboration while supported by the HIM on deformation theory for finite cluster complexes. This project (joint with Nathan Ilten and Alfredo Nájera Chávez) led to the preprint [INT].

References

- [AJST] Javad Asadollahi, Peter Jørgensen, Sibylle Schroll and Hipolito Treffinger, *On higher torsion classes*, to appear in Nagoya Mathematical Journal, [arXiv:2101.01402](#).
- [ACFGS] Jenny August, Man-Wai Cheung, Eleonore Faber, Sira Gratz and Sibylle Schroll, *Cluster structures for the A_∞ curve singularity*, in preparation.
- [AHJKPT] Jenny August, Johanne Haugland, Karin M. Jacobsen, Sondre Kvamme, Yann Palu and Hipolito Treffinger, *τ_n -tilting theory and higher torsion classes*, in preparation.
- [BOPRT] Severin Barmier, Prafulla Oak, Aritra Pal, Koushik Ray and Hipolito Treffinger, *Towards a categorification of scattering amplitudes*, [arXiv:2112.14288](#).
- [BTHSS] Raphael Bennett-Tennenhaus, Johanne Haugland, Mads H. Sandøy, Amit Shah, *The category of extensions and a characterisation of n -exangulated functors*, in preparation.
- [GNP] Mikhail Gorsky, Hiroyuki Nakaoka and Yann Palu, *Positive and negative extensions in extriangulated categories*, [arXiv:2103.12482](#).
- [HJS] Johanne Haugland, Karin M. Jacobsen and Sibylle Schroll, *The role of gentle algebras in higher homological algebra*, [arXiv:2107.01045](#).
- [HS] Johanne Haugland, Mads H. Sandøy, *Higher Koszul duality and connections with n -hereditary algebras*, [arXiv:2101.12743](#).
- [HKR] Ruben Henrard, Sondre Kvamme, and Adam-Christiaan van Roosmalen, *Auslander's formula and correspondence for exact categories*, Accepted for publication in *Advances in Mathematics* (2022) [arXiv:2011.15107](#), pages 1-36.

[INT] Nathan Ilten, Alfredo Nájera Chávez, and Hipolito Treffinger, *Deformation Theory for Finite Cluster Complexes*, arXiv:2111.02566.

[T] Hipolito Treffinger, *τ -tilting theory - an introduction*, to appear in Proceedings of the LMS Autumn Algebra School, CUP, arXiv:2106.00426.

JUNIOR TRIMESTER PROGRAM “NEW TRENDS IN REPRESENTATION THEORY”

SEPTEMBER 1 - DECEMBER 18, 2020

Group: Telescope-type problems in representation theory

Research areas: torsion pairs in module categories and their derived categories, finite-dimensional algebras, silting theory, generalised telescope conjecture

Group members: Rosanna Laking, Frederik Marks and Jorge Vitória

Group leader: Rosanna Laking

Overview: The members of the research project attended the Junior Trimester Program on *New Trends in Representation Theory* from 28 September 2020 until 18 December 2020. Despite the restrictions made necessary by the COVID-19 pandemic, the Hausdorff Institute for Mathematics was able to provide an excellent atmosphere for research including small group discussions and online seminars.

The theme of the research project was to investigate questions inspired by the famous Telescope Conjecture in the context of the representation theory of finite-dimensional algebras. In particular we aimed to understand whether certain torsion pairs (t-structures, co-t-structures and stable t-structures) in discrete derived categories of finite-dimensional algebras are determined by “small” objects.

Our work on this project was structured around regular group discussions and benefited from biweekly seminars whose speakers and topics were chosen to be closely related to our ongoing work. As well as these activities directly related to our project, we also attended online lectures as part of the Winter School “Connections between representation theory and geometry” and the Felix Klein Lectures 2020 on “Quiver moduli and applications” given by Markus Reineke (Bochum). We are very grateful to the Hausdorff Institute of Mathematics for facilitating a very positive research environment, despite the adverse circumstances.

Research outcomes: During the Junior Trimester Program we were able to answer a strong version of the central question in our project proposal. That is, we were able to show that discrete derived categories of finite-dimensional algebras satisfy the strongest possible telescope property: all torsion pairs with definable torsion-free class are generated by compact objects. We had expected to use the tools of Silting Theory to show such a result, but instead we could show that

this property is related to the fact that a certain dimension on these categories (Krull-Gabriel dimension) is defined.

Following on from this result, we began to investigate properties of t-structures in bounded derived categories with defined Krull-Gabriel dimension. We were able to establish strong structural results about the hearts of these t-structures its realisation as a quotient of a functor category such as the existence of simple objects and the fact their Krull-Gabriel dimension is bounded by that of the ambient category.

As such, we may ask whether we can axiomatise collections of objects that yield Krull-Gabriel filtrations of the hearts of such t-structures. In particular, in the case of Krull-Gabriel dimension zero, these collections should generalise the well-known simple-minded collections. We are currently working to develop these results into a paper that we expect to be completed in 2022.

Interactions with other groups: Even though the participants of the program were unable to meet all together during our time in Bonn, we had the opportunity to meet together with other participants in smaller groups. Rosanna Laking met with two groups to discuss connections between Bridgeland stability conditions/scattering diagrams and “large objects” in derived categories of finite-dimensional algebras: firstly with Jenny August, Matthew Pressland and Hipolito Treffinger and secondly together with Mikail Gorsky and Alexandra Zvonareva. The discussions with the latter group have led to an ongoing joint project. She also had stimulating discussions together with Ilke Canakci, Martin Kalck and Matthew Pressland on the topic of infinite rank cluster categories. Frederik Marks additionally engaged into productive mathematical discussions with Alexandra Zvonareva and Martin Kalck.

Seminar: Together with the group working on non-commutative motives, we organised an online research seminar. Despite the very specific nature of the series of talks, we had a reasonable attendance record, not only among HIM participants, but also from mathematicians in other institutions (we had approximately 15 participants in each talk). Our research group invited the following speakers to speak about topics related to our project:

- Mike Prest (Manchester), *Krull-Gabriel dimension, m -dimension and Cantor-Bendixson rank in the Ziegler spectrum.*
- Jan Stovicek (Charles University, Prague), *The smashing spectrum of a valuation domain.*
- Lidia Angeleri Hügel (University of Verona), *Silting complexes over hereditary rings.*
- Michal Hrbek (Czech Academy of Sciences in Prague), *Telescope conjecture and its variants in derived categories of commutative rings.*

Report of
Pieter Belmans and Paul Wedrich

group leaders for
“Categorification, Hall algebras and quantum cohomology”

in the Hausdorff Junior Trimester Program
New Trends in Representation Theory

Our group had three thematic focus points: Categorification (C), Hall algebras (H) and quantum cohomology (Q). Due to the coronavirus pandemic, some members were not able to travel to Bonn but chose to participate remotely in the program.

- Pieter Belmans (Q, remotely)
- Giordano Cotti (Q, on site)
- Anton Fonarev (Q, on site)
- Nicolle Sandoval González (C, remotely)
- Mikhail Gorsky (H, on site)
- Amit Hazi (C, remotely)
- Maxim Smirnov (Q, remotely)
- Louise Sutton (C, partly on site)
- Daniel Tubbenhauer (C, on site)
- Paul Wedrich (C, on site)
- Jieru Zhu (C, on site)

1 Description of the work and activities

The activities of our group were mostly conducted online or in a hybrid format and many recordings of talks are available on the HIM website. Most of these activities had more participants than HIM activities in a normal trimester due to the improved accessibility of the online and hybrid modes.

1.1 Categorification

Our research towards categorification during the trimester had two directions: tilting modules for algebraic groups and quantum groups, and applications of modified traces in algebra and representation theory.

Events organised To support our research activity, we organised:

- A learning seminar on tilting modules, aimed at HIM JTP members and mathematicians in Bonn, with talks given by our group members.
- A learning seminar on modified traces, aimed at a worldwide audience, with sequences of talks given by the external speakers Marco De Renzi and Jonathan Kujawa. This was continued after the trimester in collaboration with researchers from the University of Hamburg with talks by Bonn mathematicians Thorsten Heidersdorf and David Reutter.
- A week-long research workshop on “Monoidal and 2-categories in representation theory and categorification”, aimed at a worldwide audience and with talks by: Chris Bowman, Juliet Cooke, Ben Elias, Inna Entova-Eizenbud, Iva Halacheva, Thorsten Heidersdorf, Matt Hogancamp, Lars Thorge Jensen, Mikhail Khovanov, Martina Lanini, Vanessa Miemietz, Victor Ostrik, Laura Rider, Raphael Rouquier, and Monica Vazirani.
- A graduate seminar by Catharina Stroppel and Paul Wedrich on “Knot homology”, aimed at students in Bonn and HIM JTP members.

1.2 Quantum cohomology

Our research during the trimester focused on Dubrovin’s conjecture, relating the semisimplicity of quantum cohomology (which relates to the symplectic geometry of a variety) to existence of a full exceptional collection in the derived category (which relates to the algebraic geometry of a variety).

Events organised We organised an internal discussion and learning seminar over Zoom. Topics covered were: weighted projective lines, symmetric quotient stacks, quantum periods and Lagrangian Grassmannians. We had originally planned to organise other events, including a week-long school and conference, but because of the pandemic this was not possible to arrange.

During the semester there was also a graduate student seminar, in which Till Wehrhan (now PhD student at the Max Planck Institute) and Pieter Belmans (group leader) gave a series of talks on the basics of quantum cohomology of partial flag varieties (with one talk given by Ji Zekun, now PhD student at the University of Amsterdam). After the Christmas break we continued with talks on cutting edge topics:

- Nicolas Perrin: Quantum cohomology of cominuscule Grassmannians
- Catharina Stroppel: Fusion rings, Verlinde algebras and quantum cohomology
- Maxim Smirnov: The isotropic Grassmannian $\text{IGr}(2, 6)$
- Pieter Belmans: Lefschetz collections and the Kuznetsov–Smirnov conjecture

1.3 Connecting activities

Pieter Belmans and Paul Wedrich (group leaders) organised the Felix Klein Lectures, given by Markus Reineke (University of Bochum) on the topic of moduli of quiver representations. This was a *very* successful hybrid event, with the lecturer and a small in-person audience in Bonn and a large (150+ participants) online audience for a lecture series of 4 lectures.

Mikhail Gorsky, representing the *Hall algebra* focus point of this group, interacted with many other participants of the Junior Trimester Program on various topics

2 Outcome

Several publications were produced during and after the trimester, supported by the various discussions we had within our group. Names of program members are in **bold**.

2.1 Categorification

The most direct outcome of our joint work towards categorification is a joint paper on monoidal categories of tilting modules for quantum groups in mixed characteristic:

- **Louise Sutton, Daniel Tubbenhauer, Paul Wedrich, and Jieru Zhu**, wrote [12]

Other work of the participants on categorification topics related to this program include:

- Vyacheslav Krushkal and **Paul Wedrich** wrote [9]
- Matthew Hogancamp, David Rose, and **Paul Wedrich** wrote [7] and [8]
- **Daniel Tubbenhauer** wrote [13]
- **Daniel Tubbenhauer** and **Paul Wedrich** wrote [14] in the leadup to the program

2.2 Hall algebras

- Rose-Line Baillargeon, Thomas Brüstle, **Mikhail Gorsky** and Souheila Hassoun finished [1]
- Roger Casals, Eugene Gorsky, **Mikhail Gorsky** and José Simental wrote [3]
- **Mikhail Gorsky**, Hiroyuki Nakaoka and **Yann Palu** wrote [6]

2.3 Quantum cohomology

- **Pieter Belmans**, Alexander Kuznetsov and **Maxim Smirnov** wrote [2] in the leadup to the program
- **Giordano Cotti** wrote [5]
- **Giordano Cotti** wrote [4]
- **Maxim Smirnov** wrote [11]
- **Maxim Smirnov** and Nicolas Perrin wrote [10]

Other less tangible (at the time of writing) outcomes are new joint research interests of the group members, e.g. in the quantum cohomology of root stacks and symmetric quotient stacks, with a view towards Dubrovin’s conjecture.

Finally, for expository reasons Pieter Belmans (group leader) has created <https://www.grassmannian.info>, listing the state-of-the-art on the structure of partial flag varieties. This was an important tool in the aforementioned graduate student seminar, and is now publicly available as a research and expository tool.

References

- [1] Rose-Line Baillargeon, Thomas Brüstle, Mikhail Gorsky, and Souheila Hassoun. *On the lattices of exact and weakly exact structures*. 2020. arXiv: 2009.10024.
- [2] Pieter Belmans, Alexander Kuznetsov, and Maxim Smirnov. *Derived categories of the Cayley plane and the coadjoint Grassmannian of type F*. accepted for publication in Transformation Groups. 2020. arXiv: 2005.01989.
- [3] Roger Casals, Eugene Gorsky, Mikhail Gorsky, and José Simental. *Algebraic Weaves and Braid Varieties*. 2020. arXiv: 2012.06931.
- [4] Giordano Cotti. “Degenerate Riemann-Hilbert-Birkhoff problems, semisimplicity, and convergence of WDVV-potentials”. In: *Lett. Math. Phys.* 111.4 (2021), Paper No. 99, 44. ISSN: 0377-9017. DOI: 10.1007/s11005-021-01427-9. URL: <https://doi.org/10.1007/s11005-021-01427-9>.
- [5] Giordano Cotti. *Riemann-Hilbert-Birkhoff inverse problem for semisimple flat F-manifolds, and convergence of oriented associativity potentials*. 2021. arXiv: 2105.06329.
- [6] Mikhail Gorsky, Hiroyuki Nakaoka, and Yann Palu. *Positive and negative extensions in extriangulated categories*. 2021. arXiv: 2103.12482.
- [7] Matthew Hogancamp, David E. V. Rose, and Paul Wedrich. *A skein relation for singular Soergel bimodules*. 2021. arXiv: 2107.08117.
- [8] Matthew Hogancamp, David E. V. Rose, and Paul Wedrich. *Link splitting deformation of colored Khovanov-Rozansky homology*. 2021. arXiv: 2107.09590.
- [9] Vyacheslav Krushkal and Paul Wedrich. *$gl(2)$ foams and the Khovanov homotopy type*. 2021. arXiv: 2101.05785.
- [10] Nicolas Perrin and Maxim Smirnov. *On the big quantum cohomology of coadjoint varieties*. 2021. arXiv: 2112.12436.
- [11] Maxim Smirnov. *On the derived category of the adjoint Grassmannian of type F*. 2021. arXiv: 2107.07814.
- [12] Louise Sutton, Daniel Tubbenhauer, Paul Wedrich, and Jieru Zhu. *SL_2 tilting modules in the mixed case*. 2021. arXiv: 2105.07724.
- [13] Daniel Tubbenhauer and Pedro Vaz. *Handlebody diagram algebras*. 2021. arXiv: 2105.07049.
- [14] Daniel Tubbenhauer and Paul Wedrich. “The center of $SL(2)$ tilting modules”. In: *Glas. Math. J.* (2021). DOI: 10.1017/S001708952100001X. arXiv: 2004.10146.