Highlights 2023
DNRF Chair VIVEK SHENDE

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The year 2023 has been full of progress in many directions. The most interesting completed works with myself as an author are probably my results in the direction of skein-valued cluster transformations in enumerative geometry (two articles with my student Matthias Scharitzer, developing further some consequences of the higher genus curve counting theory), and my work on understanding the filtration in symplectic homology from a sheaf-theoretic viewpoint (an article with Bingyu Zhang and Chris Kuo). One very exciting piece of progress was made in a surprising new direction: with Adrian Petr and Tatsuki Kuwagaki, we discovered that the `nonexact' Lagrangian Floer theory in one manifold can be embedded into the `exact' Lagrangian Floer theory of the other. This is of great significance insofar as the 'exact' phenomena are very well understood by my previous work. This result should have direct applications to mirror symmetry and geometric Langlands; we are now in the progress of writing it down.

Postdoc I. Neithalath focused on calculations and applications of the skein lasagna 4-manifold invariant. He worked on calculations of this invariant for product of spheres, and for disk bundles over the sphere and is also working on an application of this invariant to counting associative submanifolds in G2 manifolds.

Postdoc A. Latyntsev finished a paper about the structure of factorisation quantum groups. He also started working on a sequel producing examples and his collaboration on W-algebras and quantisations of nilpotent orbits is closer to finishing. He started multiple collaborations: orbifolded 4d Chern Simons and CoHAs, interpreting Joyce's vertex algebra factorisably, and separately, explicitly computing it in examples.

Postdoc Daria Poliakova finished a paper about Hochschild polytopes with her co-author V. Pilaud. Where they construct the (m,n)-Hochschild polytope whose faces correspond to m-lighted n-shades, and whose oriented skeleton is the Hasse diagram of the rotation lattice on unary m-lighted n-shades.

PhD student Z. Zhang has been learning cluster algebras, stability conditions for the first half of the year. Then started to work on five term relations in Elliptic Hall algebras.

Publications published

- Preprint by T. Kuwagaki, V. Shende, "Adjoints, wrapping, and morphisms at infinity"
- Preprint by M. Scharitzer, V. Shende, "Skein valued cluster transformation in enumerative geometry of Legendrian mutation"
- Preprint by M. Scharitzer, V. Shende, "Quantum mirrors of cubic planar graph Legendrians"
- Preprint by C. Kuo, V. Shende & B. Zhang, "On the Hochschild cohomology of Tamarkin categories"
- Preprint by Latyntsev, A., "Factorisation quantum groups"
- Preprint by V. Pilaud & D. Poliakova, "Hochschild polytopes"

Awards

Vivek Shende received in collaboration with Tobias Ekholm and Lenhard Ng the new honorable **Frontiers of Science Award** at the International Congress of Basic Science for an excellent and outstanding scholarly achievement within the past five years.