

QGM highlights 2018



J.E. Andersen published joint with R. Kashaev the paper “The Teichmüller TQFT” in the Proceeding of the ICM, which is one of the worlds most prestigious channels in mathematics. The paper details their mathematical construction of the Topological Quantum field theory, which they have constructed from quantum Teichmüller theory. A theory anticipated some 30 year ago by Prof. E. Witten, but which resisted all prior attempts of construction.



C. Spotti worked with collaborators on aspects of log Kähler-Einstein metrics. With **M. de Borbon** he constructed local metric models near singularities and asymptotically conical model for singularities formations. In a work w. P. Gallardo and J.M. Garcia he described the first explicit compactifications of moduli of log K-stable/log KE Fano varieties.



G. Bérczi focused on the geometry of Hilbert scheme of points in higher dimensions. In a joint project with D. Brotbek he studied the distribution of monomial ideals among the components of the punctual Hilbert scheme and used these results with A. Szenes to develop a new method to calculate tautological integrals over Hilbert schemes.



M. Kontsevich, together with Y. Soibelman, found a new approach to Fukaya categories based on contact geometry and Symplectic Field Theory. Also, he worked out the notion of Calabi-Yau category with corners applicable both in algebro-geometric and in symplectic settings. Together with K. Penson he found a new integral identity for algebraic hypergeometric functions.



A. Swann developed a notion of toric geometry for manifolds of holonomy G_2 via the concept of multi-moment map in a way that the orbit space is homeomorphic to smooth four-manifold. Many local examples may be constructed. For known complete examples the leaf space is homeomorphic to R^4 . These results were also extended to manifolds of holonomy “Spin (7)” - A flow construction for nearly Kähler manifolds with T^2 symmetry.



S. Arkhipov obtained results related to: “Barr-Beck-Lurie theorem for DG-categories” (with T. Kanstrup and T. Logvinenko), Quantum groups at $q=0$ (with M. Mazin), “Logarithmic differential forms and affine Hecke category” (with **S. Ørsted** and V. Baranovsky) and “Homotopy descent” (with **S. Ørsted** and D. Poliakova).

M. Bökstedt constructed, with PhD stud. **E. Minuz**, an isomorphism between the homology of a certain DGA and the start page of a spectral sequence converging to the cohomology of a configuration space.



H. Ooguri completed a 175 pages paper with D. Harlow in which he clarified the definition of global symmetry in quantum field theory and used it to prove in the context of the AdS/CFT correspondence that a consistent quantum theory of gravity cannot have global symmetry, whether symmetry group is discrete or continuous. He also proved that in a gravitational theory with gauge symmetry G , all finite dimensional unitary representations should appear in the Hilbert space of the theory.



D. Pei proposed with collaborators a new relation between quantum invariants of 3-manifolds and the moduli space of wild Higgs bundles. With **S. Gukov**, P. Putrov and C. Vafa, D. Pei further studied a new class of invariants of 4-manifolds. With **J.E. Andersen** and J.C. Jantzen, he proved a formula relating the Poincare polynomials of two Coxeter groups, one being a parabolic subgroup of the Weyl group of a simple Lie algebra, another being the corresponding parabolic subgroup in the affine Weyl group.



A. Ritter has been working jointly with M. McLean on using Floer theory to study the generalised McKay Correspondence. Having published a paper that proves the conjecture by these methods for isolated singularities, they are now working on the non-isolated case. A. Ritter further published a paper with G. Benedetti on computing Floer cohomology for magnetic cotangent bundles by using deformation arguments in Floer theory.



A. Malusá constructed two joint projects; The first, with **J.E. Andersen** and **G. Rembado** on a version of the Hitchin-Witten connection for Kähler quantisation of the genus-one $SL(2, C)$ -Chern-Simons theory and its interplay with the circle action on the moduli space of Higgs pairs. Second, joint with F.B. Aribe and E. Pigué-Nakazawa, he computed the quantum A-polynomial for the Andersen-Kashaev invariant of some twist.



W.E. Mistegård focused on the large level asymptotic of quantum invariants of three manifolds. Joint w. **J.E. Andersen** he improved previous results on the asymptotic expansion conjecture for mapping tori. Using resurgence analysis they showed that quantum invariants of Seifert fibered three manifolds are related to complex Chern-Simons theory.

Statistics

Publications: 59 journal articles, 1 conference proceeding, 7 book chapters, 2 books, 5 PhD theses, 33 preprints, 4 Master theses *Activities:* 1 conference, 38 seminars, 1 retreat, 2 Masterclasses, 127 international visitors

In 2018 QGM published four papers in “Journal of Differential Geometry” and three papers in “Advances in Mathematics”

New employees



Ass. Prof.
G. Bérczi



Postdoc
A. Soibelman



PhD stud.
L. Engberg