

# QGM highlights 2017



This year QGM managed to publish four papers in the absolute top journals within Mathematics:

- **M. Kontsevich's** construction of Canonical bases for cluster algebras joint with M. Gross, P. Hacking and S. Keel in *Journal of the American Mathematical Society*
- **G. Masbaum's** application of TQFT to modular representation theory joint with P.M. Gilmer in *Inventiones Mathematica*
- **J. Ellegaard Andersen's** results on the asymptotic of the Witten-Reshetikhin-Turaev invariant for links in finite order mapping tori joint with B. Himpel, S. Jørgensen, J. Martens and B. McLellan and further Q. Li's result on the Asymptotics of Higgs bundles in the Hitchin component joint with Collier both appeared in *Advances in Mathematics*

**J.E. Andersen** was in 2017 jointly with **R. Kashaev** solicited to contribute a paper on their construction of the Teichmüller TQFT to the most prestigious "Proceedings of the ICM", which is published only every fourth year, this one for the International Congress of Mathematicians in Rio de Janeiro 2018.



QGM research was world leading in the latest major developments in the field of topological recursions and its generalisations via the following three arXiv postings:

- **M. Kontsevich** and Y. Soibelman: "Airy structures and symplectic geometry of topological recursion" provided a new viewpoint on topological recursion, which also implies the recursion has a meaning in finite dimensions.
- **J.E. Andersen**, G. Borot, L. Checkov and N. Orantin: "The ABCD of Topological Recursion" explored implications of Kontsevich and Soibelman's new viewpoint on Topological Recursion and gave many examples.
- **J.E. Andersen**, G. Borot and N. Orantin: "Geometric Recursion" provided a vast generalisation and categorification of Kontsevich and Soibelman's new version of topological recursion.



**S. Gukov**, in a joint work with **D. Pei**, P. Putrov, and C. Vafa proposed new q-series invariants of 3-manifolds that are q-series expansions inside the unit disk with integer powers and integer coefficients and have WRT invariants as radial limits at roots of unity.



**A. Sheshmani** developed jointly with S.-T. Yau and A. Gholampour the theory of Nested Hilbert schemes which led to the correspondence between DT invariants of local-surface threefolds, and Seiberg-Witten invariants of surfaces. This result was also formulated using Gauge theory reductions in his joint collaboration with **S. Gukov**, M. Liu and S.-T. Yau.



**E. Frenkel** formulated jointly with M. Aganagic and A. Okounkov a two-parameter generalization of the geometric Langlands correspondence and proved it for all simply-laced Lie algebras.

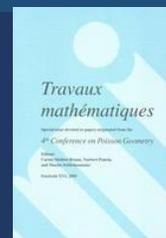


**D. Joyce** defined a graded Lie bracket on the homology of large classes of moduli spaces, in the style of Ringel-Hall algebras, which is important for understanding wall-crossing formulae for enumerative invariant problems in many contexts.

**C. Spotti** with **M. de Borbon** showed that under certain local "stability's conditions" conical CY metrics on surfaces with singularities along singular curves are asymptotic to PK cones, and discussed implications to BMY formulas.



**J.E. Andersen** arXived, with his PhD student **A. Malusà**, a paper where they introduced a version of the AJ-conjecture for the Teichmüller TQFT and proved it for the first two hyperbolic knots.



Travaux Mathématiques dedicated an entire volume to QGM's research efforts, publishing 7 papers by **J.E. Andersen**. Four of these are written with four of his PhD-students (**N. Poulsen**, **J.-J.K. Nissen**, **S. Marzoni** & **W.E. Petersen**) concerned with quantisation of moduli spaces. The further three are completed in close collaboration with H. Fuji, M. Manabe, **R.C. Penner**, C.M. Reidys and P. Sulkowski regarding applications of moduli space techniques in the study of folding of RNA and proteins.

## New employees



**Postdoc**  
Roberta  
Iseppi



**Postdoc**  
Martin de  
Borbon



**PhD stud.**  
Simone  
Siclari

## Further researchers join QGM

Three Prof./Associate Prof. & 2 PhD students from the Dept. of Mathematics, AU joined QGM in 2017: Andrew Swann, Marcel Bökstedt, Sergey Arkhipov, Giovanni Russo and Erica Minuz.

## Statistics

**Publications:** 64 journal articles, 2 conference proceedings, 2 PhD theses, 32 preprints, 3 Master theses  
**Activities:** 1 conference, 48 seminars, 1 retreat & 1 Summer School, 128 invited talks