· QGM ·
Centre for Quantum Geometry of Moduli Spaces

Research mission

To become the world- leading centre *in quantum geometry of moduli spaces* at the crucial interface between mathematics and theoretical physics - with the view to contribute to the mathematical underpinnings of contemporary and future physical theories.

Scientific context

The role of mathematics in our understanding of nature has been recognized for millennia. Its importance is especially poignant in modern theoretical physics as the cost of experiments escalates and the mathematical complexity of physical theories increases.

Major challenges

- To define quantum field theory as a mathematical entity.
- To unify quantum theory with gravity.

Conceptual goals

- To significantly advance the understanding of moduli spaces and their quantization.
- To train the next generation of scholars and researchers to build the Centre into a world-renowned catalyst of collaborative, cutting-edge research

Specifically: To develop the quantum geometry of moduli spaces so as to provide complete, mathematical models for a number of quantum field theories.

Main research focus

- The Geometric Langlands Program and Higgs- bundle Moduli Spaces
- Toeplitz operators and geometric quantization of moduli spaces
- Combinatorial models for moduli spaces and quantum moduli spaces
- Quantum representation theory and perturbative invariants

Possible spin-off applications

- the protein folding problem in biology
- quantum computing in computer science/physics

Organisation

QGM is funded by the Danish National Research Foundation and led by professor Jørgen Ellegaard Andersen with its base at Aarhus University.

QGM has four permanent professors at Aarhus University and further includes

- Prof. Nigel Hitchin, University of Oxford
- Prof. Maxim Kontsevich, Institut des Hautes Études Scientifiques, Paris
- Prof. Nicolai Reshetikhin, University of California, Berkeley

At the centre, there will be seven to ten postdocs, most of whom will also spend time at Oxford, IHÉS or Berkeley. There will furthermore be a population of about fifteen PhD –students at the center, half of which will be based at Oxford or Berkeley.