The Institute of Mathematical Sciences
**The Chinese University of Hong Kong**

數學科學研究所
香港中文大學

Phone: (852) 3943 8038 ● Email: ims@ims.cuhk.edu.hk
Unit 601, 6/F., Academic Building No. 1, The Chinese University of Hong Kong, Shatin, N.T., Hong Kong

# *Joint Harvard-CUHK-YMSC Differential Geometry Seminar*

# Counting invariant curves on a Calabi-Yau threefold with an involution

Abstract: Gopakumar-Vafa invariants are integers $n_\beta(g)$ which give a virtual count of genus g curves in the class beta on a Calabi-Yau threefold. In this talk, I will give a general overview of two of the sheaf-theoretic approaches to defining these invariants: via stable pairs a la Pandharipande-Thomas (PT) and via perverse sheaves a la Maulik-Toda (MT). I will then outline a parallel theory of Gopakumar-Vafa invariants for a Calabi-Yau threefold X with an involution. They are integers $n_\beta(g,h)$ which give a virtual count of curves of genus g in the class beta which are invariant under the involution and whose quotient by the involution has genus h. I will give two definitions of $n_\beta(g,h)$ which are conjectured to be equivalent, one in terms of a version of PT theory, and one in terms of a version of MT theory. These invariants can be computed and the conjecture proved in the case where X=SxC where S is an Abelian or K3 surface with a symplectic involution. In these cases, the invariants are given by formulas expressed with Jacobi modular forms. In the case where S is an Abelian surface, the specialization of $n_\beta(g,h)$ to h=0 recovers the count of hyperelliptic curves on Abelian surfaces first computed by B-Oberdieck-Pandharipande-Yin. This is joint work with Stephen Pietromonaco.

*By*
## Professor Jim Bryan
Department of Mathematics
University of British Columbia

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| **Date:** | **November 3, 2021 (Wednesday)** |
| **Time:** | **9:30am – 10:30am (Hong Kong Time)** |
| **Zoom Link:** | **https://cuhk.zoom.us/j/97402322256** |
| | (Meeting ID: 974 0232 2256; Passcode: 20211103) |

*All are Welcome*