

HARVARD UNIVERSITY  
17 Oxford Street  
Cambridge, MA 02138



## Mathematical Picture Language Seminar

Tuesday, June 22, 2021, at 10:00 (Boston)  
15:00 (UK/Eire) 16:00 (C.Europe) 22:00 (China)

Zoom at: <https://harvard.zoom.us/j/779283357?pwd=MitXVm1pYUJlVzZqT3lwV2pCT1ZUQT09>

**“Invariant differential forms, graph complexes, and Feynman integrals”**

**Francis Brown**, All Souls College, Oxford University

**Abstract:** The commutative graph complex, defined by contracting edges in graphs, was introduced by Kontsevich in 1993. Recently, Chan-Galatius-Payne have shown that its cohomology can be identified with a piece of the cohomology of moduli spaces of curves, and Willwacher showed that graph cohomology in degree zero is related to the Grothendieck-Teichmüller Lie algebra. Nevertheless, the cohomology of the graph complex remains mysterious, and little is known explicitly.

In this talk I will explain how to use invariant trace forms to construct differential forms on a moduli space of metric graphs. By integrating these forms, one can canonically assign integrals to graphs, which are very closely related to Feynman integrals in perturbative quantum field theory, but have the property that they always converge. A Stokes formula enables us to deduce some information about the cohomology of the graph complex, and leads to new predictions about its structure, and its relation to physics.

