

## Moduli of roots, top Chern classes and a deformation of their CohFT.....

In 1990, Witten conjectured that the generating series of intersection numbers of psi classes is a tau function of the KdV hierarchy. This was first proved by Kontsevich. In 2017, Norbury considered a collection of cohomology classes that form a (non semi-simple) 1-dimensional Cohomological Field Theory (CohFT) and formulated an analogous conjecture that predicts that their intersections with psi classes can be recursively calculated. These cohomology classes can be seen as a special case of Chern classes of the universal  $r$ -th root of the twisted log canonical bundle, which were calculated by Chiodo in terms of tautological classes. In joint work with N. Chidambaram and A. Giacchetto, we consider a family of semi-simple CohFTs, depending on a single parameter. When such a parameter tends to zero the CohFT specialises to Norbury's CohFT. Via Givental–Teleman reconstruction, we prove Norbury's conjecture and obtain polynomial relations among kappa classes, proving some recent conjectures of Kazarian–Norbury. Witten's conjecture and Norbury's conjecture correspond to  $r = 2$ .

Our work draws inspiration from joint work also with S. Charbonnier in which we (re)prove the  $r$ -spin generalisation of Witten's conjecture using the so-called topological recursion and its correspondence to semi-simple CohFTs, and establishes the analogue of both conjectures for general  $r$ , i.e. we study a family of  $(r - 1)$ -dimensional CohFTs that specialises to top Chern classes of  $r$ -th roots of the twisted canonical bundle, compute all the intersections with psi classes in all genera recursively and obtain new tautological relations (still to be explored).