Liouville Quantum Gravity in Even Dimension

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On large classes of closed even-dimensional Riemannian manifolds M, we construct and study the Copolyharmonic Gaussian Field, i.e. a conformally invariant log-correlated Gaussian field of distributions on M. This random field is defined as the unique centered Gaussian field with covariance kernel given as the resolvent kernel of Graham–Jenne–Mason–Sparling (GJMS) operators of maximal order. The corresponding Gaussian Multiplicative Chaos is a generalization to the $2m$-dimensional case of the celebrated Liouville Quantum Gravity measure in dimension two. We study the associated random GJMS operator, the higher-dimensional analogue of the $2d$ of the random Laplacian, and show that no higher-dimensional analogue exists of the Liouville Brownian motion. Finally, we study the Polyakov–Liouville measure on the space of distributions on M induced by the copolyharmonic Gaussian field, providing explicit conditions for its finiteness and computing the conformal anomaly.

The talk is based on the joint work *Conformally invariant random fields, quantum Liouville measures, and random Paneitz operators on Riemannian manifolds of even dimension* arXiv:2105.13925, with Ronan Herry, Eva Kopfer, Karl-Theodor Sturm.