Title: Random geometry

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Abstract: Research is a dynamic activity: solutions to problems can appear out of nowhere via email! This happened to me a few weeks ago (not the first time this has happened to me, and not the most painful), and I will describe the problem and background.

About 15 years ago Wendelin Werner proved the existence and uniqueness of a natural notion of randomness (i.e. a measure) for self-avoiding loops in the complex plane. I will write down a formula of the physicist John Cardy for the measure of the set of all loops which go around an annulus in the plane. I will then describe howI have been going about trying to understand if this conjecture is plausible. The prerequisite for this is a little bit of knowledge about complex analytic functions, and the crux of the matter is to efficiently solve an optimization problem.

Recently I received an email informing me of a preprint which claims to have a proof of Cardy's formula. This proof is a spinoff of a massive international project involving random surfaces. If there is time, I will try to give the basic idea. The proof is so complex that I think my original project is worth continuing to pursue.

For my problem, see https://arxiv.org/abs/2401.03600. For an introduction to random surfaces, google What is a random surface by Scott Sheffield, or What is a Brownian sphere by John Baez