On the Coulomb plasma

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Abstract

We are considering a gas or "plasma" of electrons in a plane, in the presence of an external field which is strong enough near infinity that the particles be confined to a finite portion of it. If we let the number of particles increase indefinitely, the gas will condensate on a certain compact subset of the plane, known as the "droplet". The shape of this droplet depends on the external field. The problem to determine the details of it is the Laplacian growth problem from fluid mechanics. This is what gives the classical equilibrium distribution of the plasma. Looking at the gas in further detail, the first thing to observe is that the repulsion between the electrons will cause a "very uniform distribution" in the vicinity of the droplet. One of our theorems assert that the fluctuations about the equilibrium converges to a Gaussian field on the droplet with free boundary conditions. If there is time, I will also mention a new kind of field approximations which we can use to justify much of the physical formalism of conformal field theory. Joint work with Hkan Hedenmalm, Nikolai Makarov, and Nam-Guy Kang, in different constellations.