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## Abstracts

Daniel Coutand (Heriot-Watt)
*Finite time singularity formation for moving interface Euler equations*

This paper establishes finite in time singularity formation for two types of moving interface problems involving the incompressible and irrotational Euler equations in the plane. The first problem considered involves the presence of a heavier rigid body moving in the perfect fluid for which well-posedness (until eventual contact) was recently established by Glass and Sueur. We first establish that the rigid body will hit the bottom of the fluid domain in finite time, therefore forming a cusp singularity in the fluid domain, which is obviously problematic for elliptic estimates. Next are established a set of strange and deep properties satisfied by the fluid velocity and pressure fields at the time of contact. The second problem considered is the two-phases Euler vortex sheets problem with surface tension for which is proved the finite time singularity of the natural norm of the problem for suitable initial data. This is in striking contrast with the case of finite time splash and splat singularity formation for the one phase Euler equations studied by various authors, for which the natural norm (in the one phase fluid) stays bounded all the way until contact (in the one phase case, no cusp is being formed in the fluid domain in a splash or splat singularity).

Alessio Figalli (ETH Zürich)
*Free boundary regularity in the parabolic fractional obstacle problem*

The parabolic obstacle problem for the fractional Laplacian naturally arises in American option models when the assets prices are driven by pure jump Levy processes. Most of the results in the latest years dealt with the stationary case, where the presence of frequency-type formulas allows one to study the fine structure of the free boundary. In this talk I'll give an overview of the problem and present new recent results about the regularity of the solution and the free boundary in the full parabolic setting, where no frequency formulas are available.

Patrick Gerard (Univ. Paris-Sud, Orsay)
*The Szegö flow on BMO and spectral properties of Hankel operators*

The BMO functions on the circle with nonnegative Fourier spectrum, are classically the symbols of bounded Hankel operators on the Hardy space of the disc. We prove that the Hamiltonian flow of the cubic Szegö equation, initially defined on the Dirichlet space, can be extended to this space, and we discuss the connection of this flow with inverse spectral problems for bounded Hankel operators. This talk is based on several collaborations with Sandrine Grellier (Orleans), Herbert Koch (Bonn) and Alexander Pushnitski (London).