

# Branching Particle Systems with Selection and Free Boundary Problems

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The N-Branching Brownian motion is a particle system in which independent particles move on the real-line as Brownian motions, branch at rate one and the total population size is kept constant equal to  $N$  by removing the leftmost particle at each branching event. This model, which was introduced by Brunet and Derrida to study certain noisy reaction-diffusion equations, can also be seen as a model the evolution of a population under selection. Its hydrodynamic limit was shown recently to exist and satisfies a free boundary problem. I will present an analogous result in higher dimension (the so-called Brownian bees model) for which we can prove the existence of the hydrodynamic result, the global existence of the solution to the associated free boundary problem and describe the large time behaviour of the particle system and of its deterministic limit.

This is based on joint works with E. Brunet, J. Nolen and S. Penington.