Markov chain Monte Carlo methods play an essential role in many fields including Bayesian statistics, machine learning, statistical physics and computational chemistry. Mathematical challenges are to understand and quantify the convergence of the corresponding Markov processes taking into account the high dimensionality, multi-modality and/or multiscale behaviour that is present in many applications. Whereas traditionally, the focus has often been on methods corresponding to reversible Markov chains such as the Metropolis-Hastings algorithm or the Gibbs sampler, recently, methods breaking detailed balance have become more and more central both in theory and in practice.

Lectures by:
Francis Bach *INRIA and ENS Paris*
Arnaud Doucet *University of Oxford*
Tony Lelièvre *École des Ponts ParisTech*
Jesus María Sanz Serna *Universidad Carlos III de Madrid*
Aaron Smith *University of Ottawa*

This Hausdorff school is intended for motivated graduate and postdoctoral students who want to get acquainted with new approaches in Markov Chain Monte Carlo, mathematical tools for the analysis of these methods, and connections to related areas including stochastic analysis and optimization, molecular dynamics, and numerics for Hamiltonian systems.

The Hausdorff school will be preceded by tutorials on the weekend September 19/20. The tutorials will introduce basic MCMC methods and mathematical tools for studying the convergence to the invariant measure.