

RESEARCH INTERESTS OF FRANK DEN HOLLANDER

(update: 28 January 2023)

Research interests – areas:

- Probability Theory
- Statistical Physics
- Ergodic Theory
- Population Genetics
- Complex Networks

Research interests – topics:

large deviation theory and variational principles
ergodic classification of random sequences
phase transitions for interacting particle systems
scaling in population genetics
random polymers
structure and functionality of random networks
spectra of random graphs
static and dynamic graphons
random-access wireless networks
metastability of interacting particle systems
transitions between Gibbs and non-Gibbs under stochastic dynamics
breaking of ensemble equivalence
random walks in static and dynamic random environments
parabolic Anderson model: intermittency in catalytic random media
branching processes in random environments
heat conduction and spectra in random domains
Wiener sausage
critical percolation and invasion percolation
interacting diffusions, measure-valued diffusions and Cannings processes
renormalisation
spatial populations with seed-banks
dormancy
T-cells in immunology
synchronisation
fluorescence in photosynthesis

A red thread through my research has been the application of *large deviation theory* and *potential theory* to interacting particle systems, random media, multi-type genetic populations and complex networks. A key focus has been the description of *critical behaviour* and *phase transitions* with the help of *variational techniques*.

Research monographs:

- F. den Hollander, *Large Deviations*, Fields Institute Monographs, Volume 14, American Mathematical Society, Providence RI, 2000, x + 143 pp., ISBN 0-8218-1989-5. (Second print in 2008.)
- F. den Hollander, *Random Polymers*, Lecture Notes in Mathematics, Volume 1974, Springer, Berlin, 2009, xiii + 258 pp., ISBN 978-3-642-00332-5.
- A. Bovier and F. den Hollander, *Metastability – A Potential-Theoretic Approach*, Grundlehren der mathematischen Wissenschaften 351, Springer, Berlin, 2015, xxi + 581 pp., ISBN 978-3-319-24775-5.