

## RESEARCH INTERESTS OF FRANK DEN HOLLANDER

(update: 4 December 2025)

### 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  
random processes on random graphs  
spectra of random graphs  
preferential attachment random graphs  
static and dynamic random graphs and graphons  
friendship paradox on graphs  
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  
self-repellent branching random walks  
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  
frailty in aging and Gompertz law  
information aggregation in signal networks  
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.
- A. Greven, F. den Hollander and M. Oomen, *Spatial Populations with Seed-Bank: Renormalisation on the Hierarchical Group*, Memoirs of the American Mathematical Society, Volume 307, Number 1553, 207 pp., ISSN 0065-9266 (print), ISSN 1947-6221 (online).