

# Urbain Vaes

## Curriculum Vitae

180 Queen's Gate  
London SW7 2AZ  
United Kingdom  
☎ +44 (0)7 842 184 774  
✉ u.vaes13@imperial.ac.uk

### Current position

Since 08/2019 **Research Associate**, *Imperial College London*, United Kingdom.

- Postdoc advisers: Prof G. Pavliotis and Prof J. Carrillo.
- Research group: Applied and Numerical Analysis.
- Teaching: I will teach the course entitled “Computational Stochastic Processes” in the Spring term.
- Research interests: Numerical methods for Fokker–Planck–Kolmogorov equations; Stochastic methods in molecular dynamics; Mean-field equations for interacting diffusions; Ensemble Kalman methods for inverse problems.

### Education

2014 – 2019 **PhD in Applied Mathematics**, *Imperial College London*, United Kingdom.

- *Thesis*: Topics in multiscale modeling: numerical analysis and applications, supervised by Prof. G. Pavliotis and Prof S. Kalliadasis.

2013 – 2014 **MRes in Mathematical Sciences**, *Imperial College London*, United Kingdom.

- *Specialization*: Scientific computation.
- *Thesis*: Simulation of stochastic equations with multiple scales, supervised by Prof. G. Pavliotis.
- *Grade*: distinction (Taught component: 91/100, Research component: 96/100).

2011 – 2013 **MSc in Mechanical Engineering**, *Université catholique de Louvain*, Belgium.

- *Specialization*: Numerical methods for solid and fluid mechanics.
- *Thesis*: Discontinuous Galerkin method for the simulation of 4<sup>th</sup> order partial differential equations, supervised by Prof. J.-F. Remacle.
- *Grade*: Summa cum laude.

2011 – 2012 **Erasmus exchange**, *Delft University of Technology*, the Netherlands.

- *Grade*: 9/10.

2008 – 2011 **BSc in Electrical and Mechanical Engineering**, *Université catholique de Louvain*, Belgium.

- *Grade*: Summa cum laude.

2002 – 2008 **Secondary school degree**, *Collège du Christ-Roi*, Belgium.

- *Specialization*: latin, mathematics.
- *Grade*: Magna cum laude.

### Publications

1. *The generalized Langevin equation: long-time behavior and diffusive transport in a periodic potential* (with G. Pavliotis and G. Stoltz). In preparation (Dec. 2019).
2. *Wasserstein stability estimates for covariance-preconditioned Fokker–Planck equations* (with J. Carrillo). Submitted to *Nonlinearity* (Oct. 2019).
3. *Mean-field limits for interacting diffusions with colored noise: phase transitions and spectral numerical methods* (with S. Gomes and G. Pavliotis). Submitted to *Multiscale Model. Simul.* (May 2019).
4. *A linear, second-order, energy stable, fully adaptive finite element method for phase-field modeling of wetting phenomena* (with A. Aymard, M. Pradas and S. Kalliadasis). *J. Comput. Phys.* X, 2:100010 (2019).
5. *Spectral methods for multiscale stochastic differential equations* (with A. Abdulle and G. Pavliotis). *SIAM/ASA J. Uncertain. Quantif.* 5(1), pp. 720–761 (2017).

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## Scientific software

- A Python library for the Hermite spectral method. <https://github.com/urbainvaes/hermipy>.
- A FreeFem++ solver for the Cahn-Hilliard equation. <https://github.com/urbainvaes/cahn-hilliard>.

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## Presentations and posters

- 11/2019 **Seminar presentation**, *The generalized Langevin equation: long-time behavior and diffusive transport in a periodic potential*, Junior Applied Mathematics Seminar (JAMS), Imperial College London.
- 06/2019 **Conference presentation**, *Optimal control for equations of Fokker-Planck type*, The 28<sup>th</sup> Biennial Numerical Analysis Conference, University of Strathclyde.
- 06/2019 **Seminar presentation**, *The generalized Langevin equation in a periodic potential*, Applied Mathematics Seminar, École Nationale des Ponts et Chaussées.
- 11/2016 **Conference presentation**, *Comparison between the molecular dynamics and Cahn-Hilliard-Navier-Stokes approaches for the simulation of droplet coalescence and wetting phenomena*, Annual Meeting of the APS Division of Fluid Dynamics.
- 02/2016 **Seminar presentation**, *Hermite spectral method for multiscale SDEs and application to multiscale SPDEs*, Applied Mathematics Seminar, École Nationale des Ponts et Chaussées.
- 02/2016 **Conference poster**, *Hermite spectral method for multiscale SDEs*, COSMOS workshop: Computational Statistics and Molecular Simulation, École Nationale des Ponts et Chaussées.
- 12/2015 **Conference presentation**, *Hermite spectral method for multiscale SDEs*, Workshop on Challenges in Statistical Mechanics: from Mathematics to Molecular Dynamics to Technological Applications, Imperial College London.

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## Other workshops attended

- 06/2015 *New Perspectives in Markov Chain Monte Carlo*, Universidad de Valladolid.
- 07/2014 *Summer School on Stochastic Dynamics*, University of Warwick.

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## Research visits

- 06/2019 one-week collaboration with Gabriel Stoltz, *École Nationale des Ponts et Chaussées*.
- 02/2016 one-week collaboration with Gabriel Stoltz, *École Nationale des Ponts et Chaussées*.
- 06/2015 one-week collaboration with Assyr Abdulle, *École polytechnique fédérale de Lausanne*.

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## Awards

- 2015 **Prize for excellence in support of teaching and learning**.  
Faculty of Natural Sciences, Imperial College London
- 2008, 2013 **Plus grande distinction avec les félicitations du jury**.  
École polytechnique de Louvain

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## Languages skills

- Native French
- Fluent English
- Intermediate Dutch, Spanish

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## Software skills

- Proficient python, C, C++, java, MATLAB, git, L<sup>A</sup>T<sub>E</sub>X, GNU Make
- Intermediate HTML, php, gmsh, mpi, FreeFem++