

# Thomas D Swinburne

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## Employment

### October 2018 - Present, Centre Interdisciplinaire de Nanoscience de Marseille

- Tenured researcher as part of the CNRS (Centre International de Recherche Scientifique)
- Selection by international competitive ‘concours’ process (placed 3rd on shortlist of 120)

### September 2018, Culham Center for Fusion Energy

- Consultant with Rullion Engineering as materials modeling expert.

### April 2017 - September 2018, Los Alamos National Laboratory

- Postdoctoral scholar in theoretical division, T-1, under Danny Perez.
- Research on accelerated construction of Markov models for material evolution.
- Three months (09/17-12/17) as visiting scholar at Institute of Pure and Applied Mathematics, UCLA, USA.
- Four publications in peer-reviewed journals, all as first author.

### March 2015 - February 2017, Culham Centre for Fusion Energy

- EUROfusion research fellow, department of theory and simulation of materials.
- Visiting researcher in theoretical condensed matter physics at Imperial College London.
- Research focussed on models for stochastic defect dynamics in post-irradiation annealing.
- Five publications in peer-reviewed journals, three as first author. Five invited talks at international conferences.
- Active collaborations initiated with researchers in Warwick University, UK (J.R. Kermode), Shimane University, Japan (K. Arakawa) and CEA Saclay, France (M.-C. Marinica).

## Education

### PhD, September 2011 - March 2015, Imperial College London

- PhD candidate under Prof Adrian Sutton FRS and Prof Sergei Dudarev.
- Four publications during PhD, two as first author and one as sole author.
- PhD Thesis published by Springer with university and international award.
- Six contributed and two invited talks at international conferences.

### MSc, September 2010 - July 2011, Imperial College London (Distinction)

- MSc in the Center for Doctoral Training in the Theory and Simulation of Materials, top mark in year.
- Comprehensive grounding in computational materials science.
- Developed extensive experience in DFT, MD simulation codes (VASP/CASTEP/LAMMPS).

### MPhys, October 2006 - July 2010, Oxford University (1<sup>st</sup> Class)

- 4-Year Physics degree, with options in condensed matter and theoretical physics.
- Masters Thesis in soft condensed matter (wetting phenomena) with Prof Julia Yeomans FRS.
- Promotion to Scholar then Exhibitioner whilst undergraduate.
- Commendation from university for excellence of laboratory work.

## Community Service

- Lead organizer, COSIRES 2020 conference <http://sites.google.com/view/cosires2020>.
- Conference chair at MRS Fall 2017, Boston, USA.
- Referee for Nature Computational Materials, Physical Review (Letters, B, E, Materials), Acta Materialia, Journal of Alloys and Compounds, Nuclear Instruments and Methods in Physics Research B and Journal of Materials Research
- Organisation committee (finance / accounts), Hermes 2012 Conference, London.

## Awards

- Postdoc Scholarship, IPAM, UCLA, 2017.
- Postdoc presentation award, MRS Fall 2015.
- Eurofusion research fellowship award (in addition to CCFE fellowship), December 2015.
- Springer Outstanding PhD Thesis Award, June 2015.
- Johnson-Matthey Thesis Prize, June 2015.
- Blackett Laboratory Industry Thesis Prize, January 2015.
- Materials Design Advanced Graduate Research Prize, January 2014.
- Director’s prize for best overall result in MSc, October 2011.

## Publications in peer reviewed journals († = First/Sole Author)

- *Atomistic-to-continuum description of edge dislocation core: Unification of the Peierls-Nabarro model with linear elasticity*, M. Boleininger, T.D. Swinburne and S. L. Dudarev, Physical Review Materials, 2018
- † *Kink-limited Orowan strengthening explains the ductile to brittle transition of irradiated and unirradiated bcc metals*, T.D. Swinburne and S. L. Dudarev, Physical Review Materials (Editor's Suggestion), 2018
- † *Self-optimized construction of transition rate matrices from accelerated atomistic simulations with Bayesian uncertainty quantification*, T.D. Swinburne and D. Perez, Physical Review Materials, 2018
- † *Unsupervised calculation of free energy barriers in large crystalline systems*, T.D. Swinburne and M. C. Marinica, Physical Review Letters, 2018
- † *Computing energy barriers for rare events from hybrid quantum/classical simulations through the virtual work principle*, T. D. Swinburne and J.R. Kermode, Physical Review B, 2017
- † *Low temperature diffusivity of self-interstitial defects in tungsten*, T.D. Swinburne, P.W. Ma and S.L. Dudarev, New Journal of Physics, 2017
- † *Fast, vacancy free climb of dislocation loops in bcc metals*, T.D. Swinburne, K. Arakawa, H. Mori, H. Yasuda, M. Isshiki, K. Mimura, M. Uchikoshi, S.L. Dudarev, Scientific Reports, 2016.
- *A phenomenological dislocation mobility law for bcc metals*, G. Po, Y. Cui, D. Rivera, D. Cereceda, T. D. Swinburne, J. Marian and N. Ghoniem, Acta Materialia, 2016.
- † *Picosecond dynamics of a shock-driven displacive phase transformation in Zr*, T. D. Swinburne, M.G. Glavicic, K.M. Rahman, N. J. Jones, J. Coakley, D.E. Eakins, T.G. White, V. Tong, D. Milathianaki, G. J. Williams, D. Rugg, A. P. Sutton and D. Dye, Physical Review B, 2016.
- † *Phonon drag force acting on a mobile crystal defect: Full treatment of discreteness and nonlinearity*, T. D. Swinburne and S. L. Dudarev, Physical Review B, 2015.
- † *Stochastic dynamics of crystal defects*, T. D. Swinburne, Springer, 2015.
- *Theory of the deformation of aligned polyethylene*, A. Hammad, T. D. Swinburne, H. Hasan, S. Del Rosso, L. Iannucci, A. P. Sutton, Proc. R. Soc. A 2015.
- † *The classical mobility of highly mobile crystal defects*, T. D. Swinburne, S. L. Dudarev and A. P. Sutton, Physical Review Letters, 2014.
- *Thermally-activated non-Schmid glide of screw dislocations in W using atomistically-informed kinetic Monte Carlo simulations*, A. Stukowski, D. Cereceda, T. D. Swinburne and J. Marian, International Journal of Plasticity, 2014.
- † *Collective transport in the discrete Frenkel-Kontorova model*, T. D. Swinburne, Physical Review E, 2013.
- † *Theory and simulation of the diffusion of kinks on dislocation lines in bcc metals*, T. D. Swinburne, S. L. Dudarev, S. P. Fitzgerald, M. R. Gilbert and A. P. Sutton, Physical Review B, 2013.

## Book Publications

- *Stochastic Dynamics of Crystal Defects*, T. D. Swinburne, Outstanding Thesis Series, Springer, 2015.

## Invited Presentations

- *Uncertainty-driven massively parallel sampling of defective crystals*, Energy Landscapes, Belgrade, August 2019.
- *Autonomous construction of Markov Models from accelerated sampling methods*, ICIAM Valencia, July 2019.
- *Multiscale materials modeling with sampling and statistical mechanics*, Computational Materials Design Seminar, MPIE Dusseldorf, May 2019.
- *Uncertainty quantification as a guide for massively parallel sampling*, Theoretical Chemistry Seminar, Cambridge University, February 2019.
- *Multiscale analysis of the Frenkel-Kontorova chain with obstacles*, Applied Analysis Seminar, Imperial College London, January 2019.
- *Using free energy calculations and statistical mechanics to probe the brittle to ductile transition of bcc metals*, MMM 2018, Osaka, October 2018.
- *Uncertainty quantification for rare event dynamics through Bayesian analysis*, Advances in Computational Statistical Physics, Centre International de Rencontres Mathématiques, Marseille, September 2018.
- *Autonomous and optimal exploration of defect energy landscapes over long timescales*, COSIRES, Shanghai, June 2018.
- *Optimal control and uncertainty quantification in multiscale materials modelling*, Quantification d'incertitudes en science des matériaux, Centre Henri Poincaré, Paris, May 2018.
- *Temperature accelerated rate matrix construction in the ParSplice framework*, Stochastic Sampling and Accelerated Time, IPAM, UCLA, October 2017.
- *Fast, vacancy free climb of dislocation loops*, Dislocations, Perdue University, September 2016.
- *Stochastic dynamics of crystal defects: glide and climb*, CNLS Seminar, Los Alamos National Laboratory, August 2016.
- *Using projection operators to understand dislocations*, Recent Advances in Nanoscale Phenomena, University of Michigan, August 2016.
- *Fast, vacancy free climb of dislocation loops*, University of Alicante, June 2016.
- *Stochastic dynamics of crystal defects: glide and climb*, Warwick University CMTH Seminar, March 2016.
- *Simulations of dislocation motion at experimentally realistic stresses*, TMS Annual Meeting, San Diego, February 2014.

## Funding Awarded

- 2020-2023: ANR JCJC project MeMoPAS €200448
- 2019-2020: EUROfusion WPMAT/IREMEV project €18125
- 2016-2017: IPAM Postdoctoral Residency (~\$12000)

## Teaching / Mentoring Roles

- 2018-Present: External mentoring of PhD Student (C. Lapointe) with M-C Marinica, CEA Saclay.
- 2017: Mentoring of PhD students during 12 week coding program at LANL.
- 2011-2014: Mathematics tuition, laboratory teaching and marking of assignments for physics undergraduates and joint supervision of MSc student (H Hasan) and PhD student (A Hamad) at Imperial College London.
- 2006-2013: Leading after school classes, both privately and for charity. Over 40 students (aged 16-21) in private tuition.

## Additional Skills / Employment

- Intermediate spoken and written French.
- Research for Isis Innovations, Oxford (2007-2009). Design of electromagnetic probes for fuel impurities.
- Founder and lead designer of rucksack company (Hawthorn Rucksacks).

## References

Prof S L Dudarev, Culham Centre for Fusion Energy  
Prof A P Sutton FRS, Imperial College London  
Dr M-C Marinica, CEA Saclay  
Dr D Perez, Los Alamos National Laboratory

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