Dr Thomas Ostler

Sheffield, United Kingdom
Mobile: +447967444198
Website: tomostler.co.uk
Email: T.Ostler@shu.ac.uk

Brief Summary

My present research is focused on multiscale modeling of a wide range of physical phenomena involving magnetic materials, with a particular emphasis on magnetization dynamics. I am a leading scientist in the theoretical modeling of ultrafast magnetization dynamics and all-optical switching. I have developed open source (vampire.york.co.uk) and private codes, that utilize a hierarchical multiscale process.
During my PhD and postdoctoral research positions I have gained a large amount of experience in teaching across a broad range of topics in physics, as well as supervision of undergraduate, postgraduate and postdoctoral students/staff. Between 2012 and 2015 I was a project manager for a €4m FP7 EU project, responsible for scientific, administrative and financial aspects of the projects. I have published articles in a broad range of world leading interdisciplinary journals (including *Nature*, *Nature Communications*, *Physical Review Letters*, and *Scientific Reports*) and delivered a large number of invited and contributed talks at large international and national conferences, to industry and to postgraduate workshops on techniques in magnetism. I was recently appointed as a physics lecturer at Sheffield Hallam University as part of a new BSc in Physics.

Career History

MARCH 2015 – PRESENT Lecturer of Physics

Sheffield Hallam University, Sheffield, UK

Academic post involving both teaching and research.

Duties

- Module leader for “The Professional and Practical Physicist 1” (1st year module).
- Lecturer for “Quantum Mechanics” (2nd year module).
- Admissions tutor for physics.
- Research and grant funding applications.

OCT 2015 – FEB 2017 Incoming Marie Curie COFUND Postdoctoral Research Fellow

The University of Liège, Liège, Belgium

Multiscale modeling of multiferroic materials through *ab-initio* and combined spin and molecular dynamics.

Duties

- Scientific model development and parameterization of second principles Hamiltonians through ab-initio calculations.
- Writing journal articles and presenting scientific talks.
- Managing fellowship financial budget (travel, equipment, consumables, training).
- Development of a network of collaborative partners, both experimental and theoretical.

JUNE - OCTOBER 2015 Postdoctoral Research Fellow

The University of Exeter, Exeter, UK

Scientific research into the theory of (meta-)magnetic phase transitions. This involves working closely with experimental partners to provide insight into laboratory measurements.

Duties
- Computational modeling, numerical analysis and analytic theory.
- Writing journal articles and presenting scientific talks.

APRIL 2012 - MAY 2015 **Postdoctoral Research Associate/Project Manager**

The University of York, York, UK

Scientific research on condensed matter theory and management of a €4m EU project.

Duties
- Computational modeling, numerical analysis and analytic theory.
- Supervision of PhD students.
- Project management and coordinating the work undertaken by the 9 institutions involved in the consortium.
- Financial reporting.
- Writing reports and interfacing with EU representatives and external consultants.
- Managing project website.
- Teaching a range of physics and mathematics courses.

Achievements
- A number of invited and contributed talks at international conferences.
- Invited presentations at Hitachi Global Storage Technology (CA) and Seagate (CA).
- 7 published papers and 3 submitted.
- Articles published in *Nature Scientific Reports, Physical Review Letters* and a review article in *J. Phys. Cond. Mat* (selected as a highlight).

JUNE 2008 TO 2012 **PhD Graduate Researcher (EU funded)**

The University of York, York, UK

Scientific research on the theory of ultrafast magnetism in condensed matter.

Duties
- Computational modeling, numerical analysis and analytic theory.
- Teaching: computational physics, mathematics and various physics modules.

Achievements
- A large number of contributed and invited talks at international conferences.
- 5 published papers and conference proceedings.
- One paper in the prestigious journal *Nature* and one in *Nature Communications*.
- Research featured in a number of high profile publications; on The Daily Mail Online, Dutch Sunday newspaper NRC, a wide number of social media and German radio.

Selected Research Publications

- Strain induced vortex core switching in planar magnetostrictive nanostructures, *accepted at* ***Physical Review Letters*** **(2015)**.
- Ultrafast Heating as a Sufficient Stimulus for Magnetization Reversal. ***Nature Communications***, **3**, 666 (2012). *Technology highlight for the Daily Mail Online.*
- Transient Ferromagnetic-like State Mediating Ultrafast Reversal of Antiferromagnetically Coupled Spins. ***Nature***, **472**, 205-208 (2011). *Selected for the virtual journal of ultrafast science and covered in the Dutch national press.*
- VAMPIRE: Atomistic Spin Model Simulations of Magnetic Nanomaterials, ***Journal of Physics: Condensed Matte*****r**, **26**, 103202 (2014) (review article). *Selected as a J.*

Phys: Cond Mat highlight of 2014.

- Two magnon bound state causes ultrafast thermally induced magnetisation switching. ***Nature Scientific Reports***, **3**, 3262 (2013).

Invited Talks

1. Multiscale modeling of magnetic materials – CCP9 Community Meeting – Clare College, Cambridge, UK, April 2017.
2. Towards Optimization of Thermally Induced Magnetization Switching – MMM 2016 – New Orleans, USA, November 2016.
3. Ultrafast Thermally Induced Magnetization Switching in Structured Systems – Sol-SkyMag 2016 – San Sebastian, Spain, June 2016.
4. Ultrafast Spin Dynamics in FeRh - Theoretical and experimental Magnetism Meeting (TEMM) 2016 – Abingdon, UK, June 2016.
5. Ultrafast Magnetism at Complex Interfaces – Ultrafast Magnetism Conference 2015 – Nijmegen, The Holland, October 2015.
6. Ultrafast Thermally Induced Magnetization Switching in Structured Systems – ICM Barcelona. July 2015.
7. Energy Efficient Thermally Induced Magnetization Switching by Tailoring the Electron and Phonon Dynamics – Intermag Beijing. May 2015.
8. Ultrafast Magnetization Dynamics at Complex Interfaces – Ultrafast Magnetism Conference (UMC) 2015.
9. Atomistic Modeling – Institute of Physics Postgraduate Workshop. December 2014, York, UK.
10. Ultrafast Magnetization Dynamics – Institute of Physics Postgraduate Workshop. December 2013, York, UK.
11. Atomistic Modelling of Ultrafast Magnetization Switching – Ultrafast Magnetism Conference (UMC) 2013. Strasbourg, France.
12. Optical Control of Magnetization – Institute of Physics Postgraduate Workshop. December 2012, York, UK.
13. (**Industry presentation**) Ultrafast Heating as a Sufficient Stimulus for Magnetization Reversal – Hitachi Global Storage Technologies. August 2012, San Jose, CA, USA.
14. (**Industry presentation**) Ultrafast Heating as a Sufficient Stimulus for Magnetization Reversal – Seagate Technology. August 2012, San Jose, CA, USA.
15. Ultrafast Heating as a Sufficient Stimulus for Magnetization Reversal – The Magnetic Recording Conference (TMRC). August 2012, San Jose, CA, USA.
16. Ultrafast Heating as a Sufficient Stimulus for Magnetization Reversal – Intermag Vancouver. May 2012, Vancouver, Canada.

Full list of invited (presenter and otherwise), contributed and poster presentations available at http://tomostler.co.uk/list-of-publications/conference-presentations/.

Research Techniques

Summary of Key Research Techniques

- Highly experienced in atomistic spin dynamics for a range of materials.
- Ten years' experience in the development of finite temperature micromagnetic approaches (Landau-Lifshitz-Bloch formalism).
- Experienced in ultrafast magnetization dynamics and optical switching.
- Numerical code development and implementation on graphics processing (CPU) platforms (Nvidia-CUDA).
- Using computational models and analysis to gain insight into experimental observations.
- Multiscale modeling from *ab-initio* to micromagnetic level.
- Ab-initio calculations – ABINIT
- Excellent knowledge of C, python, FORTRAN, Latex, CUDA, bash and awk.

Teaching Experience

Undergraduate

- Lecturer on Quantum Mechanics (second year module).

- Module leader for The Professional and Practical Physicist (first year module).
- First year tutorials – solid state, quantum mechanics, mathematics.
- Computational laboratory demonstration – high performance computing, second and third year computational laboratory.
- Marking – optics, mathematics, Newtonian mechanics.
- Workshops – Mathematics.

Postgraduate

- Day to day supervision of 3 PhD students and a postdoctoral research fellow during my postdoctoral time in York.
- Invited lecturer at the IOP postgraduate techniques workshop (2012, 2013 and 2014).

Other Information

Education	2004	'A' Levels (Maths A, Physics A, Chemistry A, Biology A) – Beverley Grammar Sixth Form College.
	2008	BSc Hons (1st class with distinction) Theoretical Physics – The University of York
	2012	PhD Physics – The University of York
Research Stays	2009	CSIC, Madrid (1 month)
Session Chair		"Ultrafast Magnetic Control", Ultrafast Magnetism Conference, Nijmegen, The Netherlands, 2015. "Spintronics and Spin Orbit Effects", Sol-SkyMag, San Sebastian, Spain, 2016.
Training		Computational modeling, numerical analysis, high performance computing, LaTeX, C++, FORTRAN, GPU programming (cuda, Python, MPI, Microsoft Office (Word, Excel, Powerpoint), Bash, Awk.
Software		VAMPIRE open source atomistic spin dynamics code.
Professional Services		**Referee** – Nature Scientific Reports, Physical Review Letters, Physical Review B, Journal of Applied Physics, Applied Physics Letters, Journal of Alloys and Compounds, Physical Review Applied, Physical Review E, Journal of Magnetism and Magnetic Materials, MMM Annual Conference Proceedings, IEEE Transactions on Magnetics. **Conferences** – International Program Committee for EMN Meeting on Ultrafast research.
Achievements		Patent pending for ultrafast magnetization reversal: WO Patent App. PCT/NL2012/050,912.

Full List of Research Publications

Published (in order)

[1] I. Radu *et al. "*Transient Ferromagnetic-like State Mediating Ultrafast Reversal of Antiferromagnetically Coupled Spins", *Nature*, **472**, 205-208 (2011).

[2] T. A. Ostler *et al.* "Crystallographically Amorphous Ferrimagnetic Alloys: Comparing a Localized Atomistic Spin Model with Experiments", *Physical Review B*, **84**, 024407 (2011).

[3] T. A. Ostler *et al.* "Ultrafast Heating as a Sufficient Stimulus for Magnetization Reversal", *Nature Communications*, **3**, 666 (2012).

[4] M. O. A. Ellis, T. A. Ostler and R. W. Chantrell, “Classical Spin Model of the Relaxation Dynamics of Rare-Earth Doped Permalloy”, *Physical Review B*, **86**, 174418 (2012).

[5] U. Atxitia, T. A. Ostler, J. Barker, R. Evans, R. W. Chantrell and O. Chubykalo-Fesenko, “Ultrafast Dynamical Path for the Switching of a Ferrimagnet After Femtosecond Heating”, *Physical Review B*, **87**, 224417 (2013).

[6] J. Barker, U. Atxitia, T. A. Ostler, O. Hovorka, O. Chubykalo-Fesenko and R. W. Chantrell, “Two magnon bound state causes ultrafast thermally induced magnetisation switching”, *Nature Scientific Reports*, **3**, 3262 (2013).

[7] R. F. L. Evans, *et al., “*VAMPIRE: Atomistic Spin Model Simulations of Magnetic Nanomaterials”, *Journal of Physics: Condensed Matte*r, **26**, 103202 (2014).

[8] R. F. L. Evans, T. A. Ostler, R. W. Chantrell, I. Radu and Th. Rasing*,”*Ultrafast Thermally Induced Magnetic Switching in Synthetic Ferrimagnets”, *Applied Physics Letters*, **108**, 082410 (2014).

[9] T. A. Ostler, M. O. A. Ellis, D. Hinzke and U. Nowak, “Temperature Dependent Ferromagnetic Resonance via the Landau-Lifshitz-Bloch Equation”, *Physical Review B*, **90**, 094402 (2014).

[10] Z. Azim, X. Fong, T. A. Ostler, R. W. Chantrell and K. Roy, “Optical Interconnects Using Ultrashort Laser Induced Magnetization Reversal”, *IEEE Electron Device Letters,* **35**, 1317-1319 (2014).

[11] M. O. A. Ellis, R. F. L. Evans, T. A. Ostler, J. Barker, U. Atxitia, O. Chubykalo-Fesenko and R. W. Chantrell, “The Landau-Lifshitz equation in atomistic models”, *Journal of Low Temperature Physics/Fizika Nizkikh Temperatur,* **41**, N9 p 908-916 (2015).

[12] T. A. Ostler, R. Cuadrado, R. W. Chantrell, A. Rushforth and S. Cavill, “Strain Induced Vortex Core Dynamics in Planar Magnetostrictive Nanostructures”, *Physical Review Letters,* **115**, 067202 (2015).

[13] I. Radu *et al., “*Ultrafast and Distinct Spin Dynamics in Magnetic Alloys and Heterostructures”, *SPIN*, **5**, No. 3 (2015).

[14] U. Atxitia, T. A. Ostler, R. W. Chantrell and O. Chubykalo-Fesenko, “Unified criteria for ultra-low energy and ultrafast thermally induced magnetization switching”, *Applied Physics Letters*, **107**, 192402 (2015).

[15] C. Xu, T. A. Ostler and R. W. Chantrell, “Thermally Induced Magnetization Switching in Gd/Fe Multilayers”, *Physical Review B*, **93**, 054302 (2016).

[16] L. Atkinson, T. A. Ostler *et al.*, “The effects of Collective Excitations on the Relaxation Processes in Magnetic Nanostructures”, *Physical Review B*, **94**, 134431 (2016).

[17] T. A. Ostler *et al.*, “Modelling the Thickness Dependence of the Magnetic Phase Transition in Thin FeRh Films”, *Physical Review B*, **95**, 064415 (2017).

[18] C. Barton, T. A. Ostler *et al.*, “Substrate Induced Strain Field in FeRh Epilayers Grown on Single Crystal MgO (001) Substrates”, *Scientific Reports*, **7**, 44397 (2017).

[19] R. Moreno *et al.*, “Conditions for Thermally Induced All-Optical Switching in Ferrimagnetic Alloys: Modeling of TbCo”, *In press at Physical Review B.*

[20] M. Di Gennaro, A. L. Miranda, T. A. Ostler *et al.*, “Competition of Phonon and Magnon Effects in the Temperature Dependence of Spinwave Stiffness”, *submitted*.

[21] R. Cuadrado, L. Oroszlany, A. Deak, T. A. Ostler *et al.*, “Site-Resolved Contributions to the Magnetic Anisotropy Energy and Sperrimagnetic Nature of Fe/MgO Sandwiches”, *In preparation*.

Details of Grants/Awards

[1] Travel award under COST Action P19 (Multiscale Modeling of Materials) - €1750.
[2] Marie Curie Incoming (COFUND) Fellow at the University of Liège – salary (2 years) + €16K expenses (travel, consumables, equipment).