

THOMAS WINYARD

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EDUCATION

PhD in Mathematical Sciences - Durham University 2016
Thesis title - The Skyrme Model: Curved Space, Symmetries and Mass
Supervisor - Prof. Paul Sutcliffe
EPSRC Scholarship

ACADEMIC POSITIONS

Postdoctoral Fellow 2022 - current
School of Mathematics, University of Edinburgh *Edinburgh, UK*
Focus: Dynamics and lattices of chiral skyrmions and vortices
Supervisor - Prof. Bernd Schroers

Fixed Term Lecturer (Teaching) 2021 - 2022
Mathematics Department, University of Kent *Canterbury, UK*
Courses: Mathematical Methods, Numerical Methods,
Line manager: Prof. Stéphane Launois

Postdoctoral Fellow 2017 - 2021
Pure Mathematics Department, University of Leeds *Leeds, UK*
Focus: anisotropic superconductors,
Courses: Introductory linear algebra
Supervisor (and PI) - Prof. Martin Speight.

Post-Doctorate in Theoretical Physics 2016 - 2017
Theoretical Physics Department, KTH University *Stockholm, Sweden*
Focus: multicomponent superconductors
Supervisor (and PI) - Prof. Egor Babaev

FUNDING

Short Term Scientific Mission Grant 2025
Dynamics of magnetic skyrmions *University of Crete*
Funded a short project alongside several months visit to the university of crete. Associated with COST action CA23134.

LMS conference funding 2024
London Mathematical Society *University of Leeds*
Given for conference “Geometric Models of Matter”, co-led the funding application and served as a key organiser for conference at the University of Leeds with 60 participants from around the world. The LMS funds were matched by the University of Leeds. Topic: topological solitons and gauge theory.

Academic development fellow 2020 - 2021
postdoc position *University of Leeds*

Awarded a competitive fellowship to fund my post-doctoral studies for a year by the University of Leeds, included some teaching.

LMS Public Lectures

Series of Lectures for PhD students

2020
online

The LMS awarded myself (in collaboration with others) funding to record a number of lectures, aimed at incoming graduate students during COVID-19. These videos introduced solitons in different physical systems, details and recordings can be found at maths.leeds.ac.uk/~pmtcjh/LMSsoliton/

MISC. ACHIEVEMENTS

Soliton Solver Library

Public code library

2017 - current
Leeds, UK

Developed and maintained a public code package “Soliton Solver” which uses finite difference methods such as newton flow and dynamic evolution through Runge-Kutta to find static and dynamic solutions of field theories on compact and non-compact spaces. It can also implement the nudged elastic band method to study minimal energy paths and saddle points. Has been used by numerous academics, for multiple publications.

University of Kent outreach

Outreach activities aimed at A-level students

2021 - 2022
Canterbury, UK

Developed and organised fun outreach activities for several departmental open days, applicant days and outreach events. Information packs were developed for undergraduate team to explain mathematical concepts to students. Included soliton activities using a wave tank and vortex cannons, as well as 3D minimal surfaces using bubbles. Delivered a public outreach talk titled “Solitons: How studying Tsunamis lead to levitation.”

ACADEMIC INTERESTS

- Topological solitons
- Magnetic Skyrmions
- Vortices and Ginzburg-Landau
- The Skyrme Model
- Domain Walls and Kinks
- Numerical Methods
- Superconductivity
- Hopfions

ACADEMIC ACHIEVEMENTS

- Developed a numerical method for finding anisotropic soliton lattices, minimising w.r.t. the lattice geometry,
- Demonstrated hybridisation of length scales and that London penetration length does not exist for unconventional superconductors,
- Muon field distribution of nematic superconductors has a double peak structure (now found in experiment),
- $s + is/s + id$ superconductors exhibit spontaneous magnetic fields.

TEACHING & SUPERVISION EXPERIENCE

Module Leader and Lecturer

Linear algebra, Mathematical methods and Numerical methods

2018 - current
Leeds/Kent

I have run three modules while at Universities of Leeds and Kent. I produced all course materials, including lecture notes, problem sheets, online assessments (using NUMBAS and moodle), and final written exam. I have experience lecturing both in person and online.

PhD Co-supervisor <i>Alex Wormald (graduated) & Morgan Rees (submitted)</i>	2017 - current <i>Leeds/Kent</i>
Co-supervisor of Alex Wormald (graduated), Thesis title - Topological Defects in Anisotropic Multicomponent Superconductors, responsible for majority of contact hours. Currently co-supervising Morgan Rees on topological solitons with shared weekly meetings.	
MSc Co-supervisor <i>Jonathan Discenza (2024) & Joe Milarvie (2023)</i>	2022 - current <i>Edinburgh</i>
Designed the project, selected successful applicant and co-supervised in physics with Andrew Huxley.	
Postgraduate Certificate for Higher Education (PGCHE) <i>Completed the first half (2 modules)</i>	2021-2022 <i>Kent</i>
While at the University of Kent I have completed and passed all assessments for the first year (two modules) of this two year course.	
Graduate Courses <i>Topological solitons, High performance computing</i>	2017-current
Taught several non-credit bearing short graduate courses, aimed at MSc and PhD students ranging from 3 to 5 lectures.	
Undergraduate Final Year Project Supervisor <i>Topological Solitons</i>	2018 - current <i>Leeds/Kent/Edinburgh</i>
Supervised multiple final year projects (third and fourth year, and masters) in solitons and lead the oral exam.	
Module Tutor <i>Various Courses</i>	2014 - current
I have extensive tutoring experience having tutored most standard first and second year undergraduate courses, taking the form of small group interactive sessions.	

SELECTED RECENT INVITED TALKS

Topological textures in condensed matter (Budapest University of Technology) Chiral skyrmion lattices for general DMI and applied field	<i>May 2025</i> <i>Budapest</i>
Condensed matter seminar (Karlsruhe Institute of Technology) Dancing skyrmions: Dynamics of skyrmions and their collective coordinates	<i>May 2025</i> <i>Karlsruhe</i>
Nonlinear phenomena in soliton dynamics (Universidad de Salamanca) Geometry of chiral skyrmion lattices with general DMI term	<i>April 2025</i> <i>Salamanca</i>
Solitons and (non)-integrability in Geometry (Jagiellonian University) Experimental signatures of solitons in condensed matter	<i>June 2024</i> <i>Krakow</i>
SMSAS sustainability series (public outreach) Solitons: how studying Tsunamis led to levitation	<i>March 2022</i> <i>Canterbury</i>