THOMAS WINYARD

Address	Flat 1F1, 48 Bruntsfield Gardens, Edinburgh EH4 1UJ	**Phone**	07713948803
		Email	twinyard@ed.ac.uk
Date of Birth	8^{th} November 1988	**Website**	twinyard.co.uk
Nationality	British	**Orcid**	0000-0002-7923-5739

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: Dr. Steffen Krusch

Academic Development Fellow 2020 - 2021
Pure Mathematics Department, University of Leeds *Leeds, UK*

Focus: vortex lattices in superconductors,
Courses: Introductory linear algebra
Line manager - Prof. Martin Speight.
Own funding acquired from the University of Leeds

Postdoctoral Fellow 2017 - 2020
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

PERSONAL FUNDING

Short Term Scientific Mission Grant 2025
Dynamics of magnetic skyrmions *University of Crete*

Funded a short project alongside several months visit to the FORTH institute of applied & computational mathematics and 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 research fellowship to fund my post-doctoral studies for one year by the University of Leeds. Project focussed on finding lattices of topological solitons in anisotropic systems, producing several publications with experimental signatures eventually found by experimentalists.

LMS Public Lectures 2020
Series of Lectures for PhD students *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 2018 - current
Public code library *Leeds, UK*

Developed and maintained a public code package "Soliton Solver" which uses finite difference methods such as newton flow and dynamic evolution through Runga-Kutta to find static and dynamic solutions of classical field theories on compact/non-compact spaces. Also implements nudged elastic band method to study minimal energy paths and saddle points. Used by other academics for multiple publications.

University of Kent outreach 2021 - 2022
Outreach activities aimed at A-level students *Canterbury, UK*

Developed and organised fun outreach activities for several departmental open days, applicant days and outreach events. Information packs were developed for an 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

- Classical field and gauge theories
- Topological solitons
- Magnetic Skyrmions
- Vortices and Ginzburg-Landau
- Moduli space dynamics
- The Nuclear Skyrme Model
- Domain Walls and Kinks
- Numerical Methods
- Superconductivity
- Cosmic strings

ACADEMIC ACHIEVMENTS

- Developed a general numerical method for finding anisotropic soliton lattices, minimising w.r.t. the lattice geometry, has now become a standard approach for anisotropic systems.
- Predicted experimental signature of fractional vortices in unconventional superconductors (published in PRL) that was subsequently found by an experimental team.
- Demonstrated previous effective models (London model), used to compare with experimental signatures, did not apply to vortices in modern unconventional superconducting materials. Along with signatures that would demonstrate the non-London behaviour now found in experiment.

TEACHING & SUPERVISION EXPERIENCE

Module Leader and Lecturer 2018 - current
Linear algebra, Mathematical methods and Numerical methods *Leeds/Kent*

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

PhD Co-supervisor 2017 - current
Alex Wormald (graduated) & Morgan Rees (submitted) *Leeds/Kent*

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 2022 - current
Jonathan Discenza (2024) & Joe Milarvie (2023) *Edinburgh*

Designed the project, selected successful applicant and co-supervised in physics with Andrew Huxley.

Postgrduate Certificate for Higher Education (PGCHE) 2021-2022
Completed the first half (2 modules) *Kent*

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 2017-current
Topological solitons, High performance computing

Taught several non-credit bearing short graduate courses, aimed as MSc and PhD students ranging from 3 to 5 lectures.

Undergraduate Final Year Project Supervisor 2018 - current
Topological Solitons *Leeds/Kent/Edinburgh*

Supervised multiple final year projects (third and fourth year, and masters) in solitons and lead the oral exam.

Module Tutor 2014 - current
Various Courses

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 CONFERENCE TALKS

Order parameters for topological textures (FORTH institute of mathematics) *Sept 2025*
Dancing skyrmions: Dynamics of skyrmions and their collective coordinates *Crete*

Topological textures in condensed matter (Budapest University of Technology) *May 2025*
Chiral skyrmion lattices for general DMI and applied field *Budapest*

Nonlinear phenomena in soliton dynamics (Universidad de Salamanca) *April 2025*
Geometry of chiral skyrmion lattices with general DMI term *Salamanca*

Solitons and (non)-integrability in Geometry (Jagiellonian University) *June 2024*
Experimental signatures of solitons in condensed matter *Krakow*

SMSAS sustainability series (public outreach) *March 2022*
Solitons: how studying Tsunamis led to levitation *Canterbury*