

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 (and PI) - 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,
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

LMS conference funding 2024
Geometric models of matter *University of Leeds*
Part of application for funds and then key organiser for a conference at the University of Leeds focussed on topological solitons and gauge theory.

Academic development fellow 2020 - 2021
postdoc position *University of Leeds*
Awarded a fellowship to fund my post-doctoral studies for a year by the mathematics department, included some teaching.

LMS Public Lectures 2020
Series of Lectures for PhD students *online*

The LMS awarded myself (in collaboration with two others) funding to record a number of outreach videos, aimed at incoming graduate students. 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

2017 - 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 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 open day outreach

2021 - 2022

Outreach activities aimed at A-level students

Canterbury, UK

Developed and organised fun outreach activities for several departmental open days and applicant days. 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:

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 anisotropic soliton lattices, minimising w.r.t. the lattice geometry,
- Demonstrated 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 field.

TEACHING & SUPERVISION EXPERIENCE

Module Leader and Lecturer

2018 - current

Linear algebra, Mathematical methods and Numerical methods

Leeds/Kent

I have run three modules while at Universities of Leeds and Kent. I produced all course materials, including lecture notes, problem sheets, quizzes, online assessments through NUMBAS and moodle, 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.

Postgraduate 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 at 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 TALKS

Solitons and (non)-integrability in Geometry (Jagiellonian University)	<i>July 2024</i>
Experimental signatures of topological solitons in condensed matter	<i>Krakow</i>
Nonlinear phenomena in soliton dynamics (Universidad de Salamanca)	<i>April 2024</i>
First order dynamics of magnetic skyrmions	<i>Salamanca</i>
Solitons and (non)-integrability in Geometry (Jagiellonian University)	<i>July 2023</i>
Dynamics of topological solitons in condensed matter	<i>Krakow</i>
Edinburgh Mathematical Physics Seminar (Maxwell Institute)	<i>November 2022</i>
Exotic vortex solutions in multicomponent superconductors and their experimental signatures	<i>Edinburgh</i>
University of Kent, mathematics public lecture	<i>March 2022</i>
Solitons: how studying Tsunamis lead to levitation	<i>Canterbury</i>

REFERENCES

Name	Bernd Schroers	Name	Martin Speight
Affiliation	University of Edinburgh	Affiliation	University of Leeds
Position	Head of Mathematics	Position	Professor of Pure Mathematics
Relation	Post-doctoral Supervisor	Relation	Previous supervisor
Contact	B.Schroers@ed.ac.uk	Contact	J.M.Speight@leeds.ac.uk
	Name		Egor Babaev
	Affiliation		KTH University
	Position		Professor of Theoretical Physics
	Relation		Physics collaborator
	Contact		babaev@kth.se