

# Ross Knapman

✉ [ross.knapman@uni-due.de](mailto:ross.knapman@uni-due.de)

🌐 [www.rossknapman.com](http://www.rossknapman.com)

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## Personal Information

Date of Birth 15<sup>th</sup> July 1997  
Place of Birth Northallerton, United Kingdom  
Nationality British  
Last Updated March 2024

## Scientific Interests

Magnetism, spintronics, skyrmions, hopfions, micromagnetic modelling.

## Education

2019–Present **PhD**, *Johannes Gutenberg University Mainz*, Mainz, Germany.  
Title: Creation and Manipulation of Topological Magnetic Textures in Chiral and Frustrated Magnets  
Primary Supervisor: Prof. Dr. Karin Everschor-Sitte.  
Secondary Supervisor: Prof. Dr. Jairo Sinova.

2015–2019 **Master of Physics**, *Durham University*, Durham, United Kingdom, *First Class Honours*.  
Master's Project: Micromagnetic Simulations of Antiskyrmions.  
Master's Project Supervisor: Prof. Peter Hatton.

2013–2015 **A Levels**, *Paston Sixth Form College*, North Walsham, United Kingdom, *A\*A\*A\*Aaa*.  
Physics, Chemistry, Mathematics, Further Mathematics, AS Biology, AS Critical Thinking.

2011–2013 **GCSEs**, *Broadland High School*, Hoveton, United Kingdom, *7A\*, 3A*.

## Experience

### Work Experience

08/2022–  
Present **Research Associate**, *University of Duisburg-Essen*, Duisburg, Germany.  
Continuing work with the TWIST Group, now based at the University of Duisburg-Essen. Primarily involves the modelling of magnetic skyrmions using analytical and numerical methods.

07/2022–  
08/2022 **Research Stay in the Group of Ran Cheng**, *University of California, Riverside*, Riverside, CA, United States.  
Worked on a project investigating magnetic skyrmions in the path integral formalism.

08/2019–  
07/2022 **Research Associate**, *Johannes Gutenberg University Mainz*, Mainz, Germany.  
Carried out research activities in the frame of my doctoral work with the TWIST Group led by Prof. Dr. Karin Everschor-Sitte, as well as the INSPIRE Group, led by Prof. Dr. Jairo Sinova.

- 07/2018–**Computational Condensed Matter Physics Internship**, *Durham University*,  
08/2018 Durham, United Kingdom.  
Undertook a computational project under the supervision of Prof. Tom Lancaster, investigating the magnetic fields experienced by muons when embedded in skyrmion-like spin textures. The bulk of this was the development of a Python module in C++ to aid in quickly investigating various dipole moment structures.
- 06/2017–**DAAD RISE Research Internship**, *German Aerospace Center (DLR) Oberpfaffenhofen*, Weßling near Munich, Germany.  
09/2017 A highly competitive research placement funded by the DAAD, working as part of a small team developing a lidar system to detect atmospheric turbulence from aircraft. The work involved ground-based measurements and data analysis. Supervised by Dr. Jonas Herbst and Dr. Patrick Vrancken.
- 06/2016–**Galaxy Survey Visualisation Internship**, *University of Queensland*, Brisbane,  
08/2016 Australia.  
Production of virtual reality mobile apps to visualise galaxy redshift surveys. Worked primarily with C#, and participated in discussions with researchers in cosmology. Supervised by Dr. Ed Macaulay.
- 07/2014 **Work Experience in Post-Processing**, *Met Office*, Exeter, United Kingdom.  
Week-long work experience placement tasked with analysis of data using IDL, as well as teamworking activities.
- 10/2013–**Work Experience**, *John Innes Centre*, Norwich, United Kingdom.  
01/2014 Undertook weekly half-day work experience sessions, assisting with experiments and discussing ongoing research with experts in plant and microbial science, and genomics.

#### University Societies

- 2018–19 **Co-President**, *Durham University Physics Society*.  
2018–19 **Secretary**, *Durham University Astronomical Society*.  
2017–18 **Treasurer**, *Durham University Astronomical Society*.  
2016–18 **Publicity Officer**, *Durham University Physics Society*.  
2016–17 **Webmaster**, *Durham University Astronomical Society*.

#### Awards

- 09/2021 **Third Place, IOP Publishing Emerging Leader Celebration 2021**.  
Awarded for my poster showing results from our work proposing a protocol to create H-shaped skyrmions, held on Twitter.
- 05/2021 **Studienstiftung des deutschen Volkes Doctoral Scholarship**.  
Doctoral scholarship given to students "who, because of their exceptional academic or artistic talents and personal qualities, can be expected to make an outstanding contribution to society as a whole". In addition to funding living expenses, the programme offers many opportunities for students to build their skills and network.
- 07/2019 **Florence Nightingale Prize for Graphical Excellence**.  
Prize worth £100, given to one student in each year group per year at Durham University. Awarded for excellence in the illustration of antiskyrmion resonance modes in my Level 4 project report.

04/2017 **DAAD RISE Scholarship.**

The Research Internships in Science and Engineering (RISE) scholarship awarded by the DAAD is a prestigious scholarship that funds research placements in Germany, including living expenses, a travel allowance, and a conference in Heidelberg.

02/2015 **Silver in 2015 UK Chemistry Olympiad.**

11/2014 **Silver in 2014 UKMT Senior Mathematical Challenge.**

09/2013 **Sir William Paston Scholarship.**

Scholarship awarded by The Paston College Foundation worth £500 in recognition of outstanding GCSE results.

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## Teaching

### Supervision

03/2022–  
05/2022 **Timon Tausendpfund**, Bachelor Thesis “From Skyrmions to Hopfions”.

### Courses

WS 2023–24 **Tutor**, *Electrodynamics*, Prof. Dr. Thomas Guhr.

WS 2020–21 **Tutor**, *Experimental Physics 5c (Condensed Matter Physics)*, Prof. Jure Demsar.

SS 2020 **Senior Assistant**, *Mathematical Calculation Methods*, Prof. Dr. Jairo Sinova and Dr. Karin Everschor-Sitte.

WS 2019–20 **Tutor**, *Experimental Physics 5a (Atomic and Quantum Physics)*, Prof. Randolf Pohl.

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## Publications

**arXiv:2305.07589**, R. Knapman, T. Tausendpfund, S. A. Díaz, and K. Everschor-Sitte.

Spacetime magnetic hopfions: from internal excitations and braiding of skyrmions

**Journal of Physics D: Applied Physics** **54**, 404003, R. Knapman, D. R. Rodrigues, J. Masell, and K. Everschor-Sitte.

Current-induced H-shaped-skyrmion creation and their dynamics in the helical phase

**Physical Review Applied** **16**, 014020, D. R. Rodrigues, J. Nothhelfer, M. Mohseni, R. Knapman, P. Pirro, and K. Everschor-Sitte.

Nonlinear Dynamics of Topological Ferromagnetic Textures for Frequency Multiplication

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## Workshops, Schools, and Conferences Attended

03/2024 **DPG Meeting of the Condensed Matter Section**, Berlin, Germany.

Talk: Spacetime Magnetic Hopfions from Internal Excitations and Braiding of Skyrmions

11/2023 **Numerical Methods for Topological Magnetic Textures**, Karlsruhe, Germany.

Talk: Modelling Skyrmions in Frustrated Magnets in MuMax3

09/2023 **Trends in MAGnetism 2023**, Rome, Italy.

Talk: Hopfions in Spacetime

05/2023 **Theorie-Kolloquium der Fakultät für Physik**, Duisburg, Germany.

Talk: Construction of Topological Magnetic Structures

- 03/2023 **DPG Meeting of the Condensed Matter Section, Dresden, Germany.**  
Talk: Hopfions in Spacetime.
- 01/2023 **CENIDE Workshop Artificial Intelligence, Duisburg, Germany.**  
Workshop in which we discussed the relevance of artificial intelligence to a wide variety of research areas.
- 09/2022 **DPG Meeting of the Condensed Matter Section, Regensburg, Germany.**  
Talk: Current-Induced H-Shaped Skyrmion Creation and Their Dynamics in the Helical Phase.
- 03/2022 **Studienstiftung Natur- und Ingenieurwissenschaftliches Kolleg IX, Weimar, Germany.**  
Gave a talk on reservoir computing in this first workshop, will work on a reservoir computing project in subsequent workshops.
- 11/2021 **Studienstiftung Herbstforum Gesellschaft & Natur 2021 für Promvierende, Online.**  
Talk: Tying Knots in Magnets: Investigating Skyrmions and Hopfions.
- 10/2021 **Joint School on Spin Physics (JSSP), Apolda, Germany.**  
Poster Contribution: Current-Induced H-Shaped Skyrmion Creation and Their Dynamics in the Helical Phase.
- 10/2021 **Parallel Programming Workshop (MPI, OpenMP and Advanced Topics), Online.**  
Five-day workshop on parallel computing using MPI and OpenMP.
- 09/2021–  
10/2021 **DPG Meeting of the Condensed Matter Section, Online.**  
Talk: Current-Induced H-Shaped Skyrmion Creation and Their Dynamics in the Helical Phase.
- 07/2021 **Deep Learning and Acceleration with OpenACC on Nvidia GPUs, Online.**  
Four-day workshop covering the fundamentals of deep learning, using Horovod to distribute deep learning over multiple GPUs, as well as using OpenACC to accelerate C/C++ code on GPUs.
- 06/2021 **Vom Defizit zum Dialog: Einführung in die Wissenschaftskommunikation, Online.**  
Two-day Studienstiftung workshop on scientific communication with the public including lectures and group activities.
- 03/2021–  
04/2021 **Do Research Like a Munchkin, Online.**  
Workshop on Agile software development and clean code, with emphasis on applying these concepts to the broader topic of research, not necessarily just in software development.
- 02/2021 **Exciting Dynamics: How Electrons, Spins, and Phonons Interact, Online.**  
Poster Contribution: On-Demand Production of 3D Magnetic Textures by Electrical Means.
- 09/2020–  
10/2020 **2020 European School on Magnetism, Online.**  
Series of lectures on various topics within magnetism.
- 09/2020 **How to Shape Your Future: Career Planning for PhD Students, PhDs and Postdocs, Online.**  
Career planning workshop aimed primarily at early career researchers.
- 09/2020 **Intercultural Communication, Online.**  
Workshop by Alexia Petersen on overcoming the challenges faced during cross-cultural communication and the reasons behind such challenges.

12/2019 **British-German WE-Heraeus-Seminar: Skyrmions in Magnetic Materials**, *Bad Honnef, Germany*.  
Poster Contribution: Production of Magnetic Textures in Different Dimensions.

## Skills

### Programming

Python My go-to language for most tasks. Extensively use for data analysis and visualisation.  
Shell Extensively use for automation of tasks such as running simulations.  
C/C++ Intermediate knowledge for accelerating performance-critical parts of Python code and in hobby projects.

### Scientific Software and Graphics

MuMax<sup>3</sup> Micromagnetic simulation software written in Go. I often modify the source code for my research projects.  
ParaView For visualising micromagnetic simulation results.  
SageMath For computer algebra (a free, open-source alternative to Mathematica, for example).  
Blender Have made extensive use for scientific figures (often with the Python API), as well as data visualisation.  
POV-Ray Use for scientific figures and data visualisation.  
L<sup>A</sup>T<sub>E</sub>X Use professionally (e.g. for scientific manuscripts) and personally (e.g. for my CV).

### Web

HTML/CSS Use for making static websites.  
Hugo Use for simplifying the development of static sites such as my personal web page.

### Operating Systems

GNU/Linux Use on simulation workstations, as well as tinkering with as a hobby.

### Version Control

Git Use Git and GitHub extensively (including using GitHub Actions for unit testing).

### Languages

English Native  
German Conversational  
French Elementary