J O H A N N E S E . M . M O S I G

PhD in Mathematics

✉ ██████████   @ ████████████

           ██████████   🔗 jem-mosig.com

Germany   📱 ████████████

Personal information

Full name	Johannes Ernst Manfred Mosig
Date of Birth	██████████ Germany
Languages	German (first language)
	English (fluent, 2014 TOEFL iBT 113/120)

— Career objective —

Driven by my curiosity and the desire to help people, I have successfully worked on a very broad range of topics from particle physics, via general relativity, to ocean modelling. I am now eager to enter the field of machine learning / AI, because I believe this is the field with the greatest impact on the future of our civilization and I wish to contribute to making this impact a positive one.

Career summary

— Degrees —

2014 – 2018   Doctor of Philosophy (PhD), Mathematics, University of Otago
*For my work on "Contemporary wave–ice interaction models" I received the **exceptional thesis award** from the University of Otago. During my time as a PhD student I investigated three distinct classes of mathematical models for the prediction of ocean wave / sea ice interactions, leading to **four articles** [1, 3, 5, 6] in high-impact journals of the field, as well as two conference papers [7, 8]. Furthermore, I have presented my work at six conferences in various countries, from New Zealand and Australia, to Croacia, Great Britan, and China. In addition to my PhD work, I also helped Christian Fräßdorf with a project about the electronic properties of graphene at the Free University of Berlin. Our work resulted in **two additional articles** in high-impact journals [2, 4].*

2011 – 2014   Master of Science (MSc), Physics, University of Potsdam / Max-Planck-Institute for Gravitational Physics
*I recieved the **best possible grade (1.0)** on my thesis about "Spin Fields and Hidden Symmetries in Curved Spacetime", where I explored mathematical methods that might help solve the stability problem of rotating black holes within the framework of general relativity. I spent most of the time working at the Max-Planck-Institute for Gravitational Physics.*

2007 – 2011   Bachelor of Science (BSc), Physics, Free University of Berlin / Uppsala University
*My desire to learn more led me to extend the usual physics curriculum with a **student exchange** to Uppsala University, financially supported by the ERASMUS programme of the European Union. Subsequently, I spent three months at the York University in Toronto, writing a program for the numerical calculation of effective scattering potentials of Beryllium–like ions. My stay was financed by the DAAD – RISE in North America programme. I later returned to Sweden to write my bachelor's thesis about chiral perturbation theory in particle physics, with Prof. Stefan Leupold. In my thesis, I calculated a certain scattering cross–section and compared the result with experimental data. The thesis received the **best possible grade (1.0)**.*

— Work experience —

2019   ABACUS tutor for mathematics in Berlin
*Presently, I self-study **machine learning** algorithms, **Bayesian statistics**, **information theory**, **Python**, and **Tensorflow**. Meanwhile, I am working as a private tutor for mathematics and physics for the ABACUS institute.*

2018   **Software developer** at the Forschungsgesellschaft für Energie und Umwelttechnologie (FGEU) mbH in Berlin
Here I implemented an upgrade to the 3D graphics module of the FGEU's software WinField, that is used to calculate electromagnetic fields of various facilities, such as landlines and transformer stations.

2018   **Tutor** for undergraduate physics at the Univeristy of Otago's Disability Information and Support Office

2018   **Teaching Fellow** at the University of Otago
In this position I taught the mathematics summer school on analysis.

2016 – 2017   "Technology Evangelist" for **Wolfram Research**
*Wolfram Research **recruited me** after their Software and Resource Development manager, Prof. Craig Bauling, had seen both my presentation and programming skills in action. As a Wolfram Evangelist I have demonstrated to researchers at the NIWA Institute in Christchurch how I use Wolfram's flag-ship product, **Mathematica**, for data analysis and problem solving.*

2015 – 2017   Tutor for mathematics at the University of Otago

2012 – 2014   Software developer at the FGEU mbH in Berlin
*The FGEU mbH **recruited me** as software developer (Delphi) and scientific adviser.*

2011 – 2013   Tutor for undergraduate physics at the University of Potsdam

— **Analytic, rational thinking** —

- With an exceptional **PhD in mathematics** and a Master of Science in theoretical **physics** I am highly trained in clear and abstract thinking.

- Since 2019 I am an active member of the Berlin Rationalist Community (Less Wrong Berlin), where I have organized a workshop on "overcoming bias". In response to the participants' positive feedback, I am currently organizing a second workshop of this kind.

— **Teamwork and leadership** —

- From 2015 to 2016 I was elected **head of the conference organising committee** for the New Zealand Mathematics and Statistics Postgraduate Conference (NZMASP'16). Participants rated the event with 4.7 out of 5.0 points.

- During the International Summer Student Programme at the Helmholtz Graduate School for Hadron and Ion Research in 2011 I was elected **chief editor** of the "Book of reports".

- Between 2016 and 2017 I **collaborated** with Christian Fräßdorf on a project about the electronic properties of graphene at the Free University of Berlin. Our work resulted in **two articles in high-impact journals** [2, 4].

- In 2018 I **joined** Prof. Mike Maylan and Prof. Luke Bennetts to **work** on a project during the "Mathematics of Sea Ice Phenomena" workshop in Cambridge. Our collaboration **resulted in a journal article** [3].

— **IT and software development** —

- Since 2018 I participate regularly in an Advanced **Machine Learning** study group in Berlin.

- The **Wolfram Language** (a.k.a. **Mathematica**) is a multi-paradigm symbolic computation language that I have used to solve a wide range of tasks from creating vector-graphics and analysing data to solving integro-differential equations, abstract algebra and differential geometry tasks. Wolfram Research recruited me as Wolfram "Evangelist" and advertized for their software with my PhD thesis.

- Since 2018 I have learned **Python** and am now working solo on a larger machine learning project with Python and **Tensorflow**.

- During high school, I won the 2nd prize of the 23rd federal competition "Bundeswettbewerb für Informatik 2004/2005" for my **C++** application. I also developed 3D computer games using a language similar to **C**.

- I gained more than three years of experience in software development with **Delphi** at the FGEU mbH.

- Since before my time as a doctoral student, I am using **LaTeX** and **Git** on a regular basis.

- I am familiar with **Windows** as well as **Linux** (Ubuntu) operating systems.

— Presenting and teaching —

■ In 2018 I taught analysis as a **teaching fellow** at the University of Otago. To illustrate mathematical concepts, I created a sequence of **interactive simulations** using the Wolfram Language.

■ I have four years worth of experience in **tutoring** mathematics and physics at two different universities.

■ Throughout my PhD, I **presented** my work at eight conferences and multiple other occasions (department internal meetings, Abbey College).

■ In 2014 I **volunteered** as a demonstrator at the Dunedin Science Festival.

— Curiosity —

■ Curiosity motivated me to work successfully on projects about **quantum mechanics** (bachelor thesis), **atomic physics** (DAAD student exchange to York University in Toronto), **general relativity** (master thesis), **solid state physics** (graphene project with Chrsitian Fräßdorf), and **ocean / sea ice modelling** (PhD thesis).

■ In 2012 I participated in the Summer school on Complex Quantum Systems (CoQuS) at the University of Vienna.

RESEARCH OUTPUT

— Theses —

PhD   Exceptional thesis award on *Contemporary wave–ice interaction models*, at the University of Otago

MSc   **Best possible grade (1.0)** on *Spin Fields and Hidden Symmetries in Curved Spacetime*, at the University of Potsdam and the **Max-Planck-Institute** for Gravitational Physics

BSc   **Best possible grade (1.0)** on *Electromagnetic Processes with Hadronic Final State Pion, Kaon, Antikaon* at Uppsala University

— Journal articles —

[1] **Mosig, J. E. M.**, F. Montiel, and V. A. Squire. 2019. *"A transport equation for flexural-gravity wave propagation under a sea ice cover of variable thickness."* Wave Motion. Recently accepted.

[2] Fräßdorf, Christian, and **J. E. M. Mosig**. 2018. *"Keldysh Functional Renormalization Group for Electronic Properties of Graphene."* Physical Review B 95 (12). DOI: 10.1103/PhysRevB.95.125412.

[3] Meylan, M. H., L. G. Bennetts, **J. E. M. Mosig**, W. E. Rogers, M. J. Doble, and M. A. Peter. 2018. *"Dispersion Relations, Power Laws, and Energy Loss for Waves in The Marginal Ice Zone."* Journal of Geophysical Research: Oceans. DOI: 10.1002/2018JC013776.

[4] Fräßdorf, Christian, and **J. E. M. Mosig**. 2017. *"Chemical-Potential Flow Equations for Graphene with Coulomb Interactions."* Physical Review B 27 (23), DOI: 10.1103/PhysRevB.97.235415.

[5] **Mosig, J. E. M.**, F. Montiel, and V. A. Squire. 2016. *"Water Wave Scattering from a Mass Loading Ice Floe of Random Length Using Generalised Polynomial Chaos."* Wave Motion. DOI: 10.1016/j.wavemoti.2016.09.005.

[6] **Mosig, J. E. M.**, F. Montiel, and V. A. Squire. 2015. *"Comparison of Viscoelastic-Type Models for Ocean Wave Attenuation in Ice-Covered Seas."* Journal of Geophysical Research: Oceans 120 (9): 6072–90. DOI: 10.1002/2015JC010881.

— **Conference papers** —

[7] **Mosig, J. E. M.**, F. Montiel, and V. A. Squire. 2015. *"On the transport of energy by surface Flexural-gravity waves."* 32nd International Workshop on Water Waves and Floating Bodies IWWWFB 2017. Dalian, China.

[8] **Mosig, J. E. M.**, F. Montiel, and V. A. Squire. 2015. *"Rheological Models of Flexural-Gravity Waves in an Ice Covered Ocean on Large Scales."* 7th International Conference on Hydroelasticity in Marine Technology HYEL 2015. Split, Croatia.

— **Conference presentations** —

2018   3rd *Australian Conference on Wave Science* (KOZWaves), Auckland, New Zealand
2017   *Mathematics of Sea Ice Phenomena*, Isaac Newton Institute, University of Cambridge
2017   32nd *International Workshop on Water Waves and Floating Bodies* (IWWWFB), Dalian, China
2016   *New Zealand Mathematics and Statistics Postgraduate Conference* (NZMASP'16), Queenstown, New Zealand
2015   2nd *Australian Conference on Wave Science* (KOZWaves), Adelaide, Australia
2015   *New Zealand Mathematics and Statistics Postgraduate Conference* (NZMASP'15), Taupo, New Zealand
2015   7th *International Conference on Hydroelasticity* (HYEL), Split, Croacia
2014   *Mathematical Sciences Symposium*, Auckland, New Zealand