Eleonora Svanberg

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Research Interests

I am an applied mathematics student interested in studying the application of pure mathematical concepts on physics. As a result, I have explored different research projects to develop the skill of using mathematical theories to solve physics problems. For example, I recently joined a working group and I am currently studying the application of number theory in string theory. In particular, I find these areas interesting to work with in the future:

- number theory and harmonic analysis (ζ- and L-functions, modular forms etc), group/ring theory (sporadic groups, gauge and Galois theory etc), arithmetic/algebraic geometry (Calabi-Yau manifolds etc.),
- quantum field theory, string theory, supersymmetry

My existing research experiences demonstrate an ability to study and solve large research problems independently. Therefore, with a strong foundation in physics, I will spend my master's honing my mathematical knowledge geometry and numer theory, preparing me for a PhD in mathematical physics.

Education

St. John's College, University of Cambridge — Cambridge, UK
Master's in Applied Mathematics (Part III) — 2022 -
Modules: QFT, GR, Symmetries, Particles and Fields, String Theory, Supersymmetry etc.
Essay: Holographic CFT_2, classifying CFT_2 by their modular form and study how it relates to the thermodynamic behaviour of black holes in AdS_3.
Funding: Part III International Scholarship by the Faculty of Mathematics, Swedish Engineers Scholarship 2022 etc.

Stockholm University — Stockholm, Sweden
BSc Physics, ECTS: A ($> 90\%$), GPA: 4.0. Top of the class. — 2019 - 2022
Bachelor thesis: Higher-order time derivative theories and the Ostrogradsky ghost supervised by Dr. Fawad Hassan

Employments

University of Cambridge — Cambridge, UK
Summer Research Intern at Department of Applied Mathematics and Theoretical Physics (DAMTP) — Summer 2021
Funding: Philippa Fawcett Internship Programme 2021
Travel Grant: Swedish Astronomical Youth Association

Publications

1. **Svanberg, E.**; Cui, C.; Latter, H., MNRAS 2022 Wavelike nature of the vertical shear instability in global protoplanetary disks
2. **Svanberg, E**, DiVA/ArXiV 2022 Higher-order time derivative theories and the Ostrogradsky ghost

Research Projects

University of Tokyo/University of Cambridge — Remote, 2022 -
The project aims to explore the applications of number theory and algebraic geometry to physics, particularly string theory and black holes. I am currently studying ζ- and L-functions.
Supervisor: Dr. Abhiram Kidambi

University of Cambridge — Remote/Cambridge, 2021 - 2022
By using linear analysis and perturbation theory, I have examined the wave nature of the non-linear inertial waves in protoplanetary disks due to the vertical shear instability. Moreover, I verified the theory through high-performance simulations using Athena++.
Supervisors: Dr. Can Cui, Prof. Henrik Latter
Publication in MNRAS: https://doi.org/10.1093/mnras/stac1598

Stockholm University — Stockholm, Sweden, 2020
Project: Optimising modelling of supernovae 1a by different colour bands (computional work), ZTF telecope
Supervisor: Prof. Edvard Mörtsell

Royal Institute of Technology (KTH) and Atlas Experiment, CERN — Stockholm/Geneva, 2018
High School Thesis: Precision measurement of the mass of the z-boson and detector improvements
Supervisor: PhD Giulia Ripellino

Atlas Experiment, CERN — Geneva, Switzerland, 2017
Summer Student Project: Monte Carlo simulations of the small wheel upgrade of the muon spectrometer
Supervisor: Dr. Edoardo Farina

Awards, Grants and Honors

University of Cambridge Part III International Scholarship (£8,800) 2022
Handelsbanken Anna Whitlock Trust Master's Studies Scholarship (£8,000) 2022
The Society of Swedish Engineers in Great Britain/Swedish Embassy Award (£5,000) 2022
SEB Foundation (AAA) Award (£4,500) 2022
VANBRUUN Gold Scholarship (£950) 2022
Handelsbanken Gustaf Söderbergs Foundation Award (£300) 2022
University of Cambridge Philippa Fawcett Internship Programme (£4,000) 2021
Swedish Astronomical Youth Association Travel Grant (£300) 2021
The Swedish King's Foundation for Young Leadership Elected by H.M King for Compass Rose Scholarship (£4,500) 2021
The Swedish Federation of Young Scientists Member of the Year, for my work with Girls in STEM 2018
East Swedish Chamber of Commerce The Future Scholarship, for my high school thesis (£300) 2017
Swedish Astronomical Society Elected as the Swedish student for the annual ESO Astronomy Camp (£1,000) 2016
Oxford Royale Academy Thomas Garner bursary, for summer courses fees (£3,000) 2016

Academic and Public Talks

The Lise Meitner Days — Stockholm, Sweden, 2022
Talk about getting into physics research at a young age, for Swedish high school students.

The Almedalen Week — Gotland, Sweden, 2022
Sweden's annual democracy meeting. Participated in a debate about gender equality within scientific fields.

Summer Research Festival — Cambridge, UK, 2021
Presenting my mathematical research on astrophysical waves for the faculty and other students.

Coding Skills

Languages: Python, Mathematica, LaTeX (and Overleaf), Bash, C++, C#, SageMath
Libraries: numpy, matplotlib, snoopy, astropy, pandas etc.
Frameworks: PyROOT, HEASoft, PyXspec, Athena++ etc.
Other: Experiences with Linux environments and high-performance computing and simulations.

Outreach and Extracurricular

Science Communicator — Sweden/Remote

The last few years I have actively engaged in getting more people to study mathematics and physics, in particular young girls. I use social media (over 120k+ followers), visit schools and advise companies and organisations to achieve this. Some examples of what I have done: — 2019-

- Elected to write a piece on the future of technology by the Committee for Technological Innovation and Ethics (Komet), established by the Swedish Government (Paid)
- Recorded a web series to get more Swedish young girls to specialise in technology for high school, for Teknikföretagen (Paid)
- Book deal with Fri Tanke: I am currently writing a popular scientific book about mathematics, to get more young students in Sweden to study mathematics. Estimated to be released in autumn 2023 (Paid)
- Initiating a discord server with over 1000 members, for young students all over the world to share academic advise

For more details, please consider checking out my agency: http://infly.me/profiler/eleonora-svanberg.

Student Representative — Cambridge, UK

I was elected, by the committee, as the student representative for my course Part III of the Mathematical Tripos. — 2022 - 2023

Physics Student Ambassador for Stockholm University — Stockholm

Involved in marketing videos and produced content on their social platforms with the purpose of getting more people to study physics. — 2019 - 2022

Girls in STEM: Co-Founder — Sweden

A non-profit organisation aiming to close the gender gap in STEM (Science, Technology, Engineering and Mathematics) through role models, workshops and a community. — 2016 -

https://girlsinstem.se

The Swedish Federation of Young Scientists — Sweden

Project: Part of the organising group of the National Research Competition for Swedish High School Students 2020 — 2020