Eleonora Svanberg

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Research Interests

I am an applied mathematics student interested in combining pure mathematical concepts with 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 (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 in algebra and number 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, String Theory, Commutative Algebra, Algebraic Number Theory etc.
Funding: Part III International Scholarship by the Faculty of Mathematics, Swedish Engineers Scholarship 2022 etc.

Stockholm University — Stockholm, Sweden
BSc Physics, ECTS: A, 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

Research Projects

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

University of Cambridge — Remote/Cambridge
By using linear analysis and perturbation theory, I have examined the wave nature of non-linear (inertial) waves in protoplanetary disks, and verified the theory by simulations using the Fawcett cluster. — 2021 - 2022
Supervisors: Dr. Can Cui, Prof. Henrik Latter
Publication in MNRAS: https://doi.org/10.1093/mnras/stac1598

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

Royal Institute of Technology (KTH) and Atlas Experiment, CERN — Stockholm/Geneva
High School Diploma Project: Precision Measurement of the mass of the z-boson, ATLAS open data from 2015 — 2018
Supervisor: PhD Giulia Ripellino

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

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 2022 Higher-order time derivative theories and the Ostrogradsky ghost

Awards, Grants and Honors

University of Cambridge Part III International Scholarship (£8,800) 2022
The Society of Swedish Engineers in Great Britain (£5,000) 2022
VANBRUUN Gold Scholarship (£1,000) 2022
University of Cambridge Philippa Fawcett Internship Programme (£4,000) 2021
Swedish Astronomical Youth Association Travel Grant (£300) 2021
The King's Foundation for Young Leadership Compass Rose Scholarship (£4,000) 2021
The Swedish Federation of Young Scientists Member of the Year 2018
East Swedish Chamber of Commerce The Future Scholarship (£300) 2017
Swedish Astronomical Society ESO Astronomy Camp 2016 (£1,000) 2016
Oxford Royale Academy Thomas Garner Bursary 2016 (£3,000) 2016

Academic and Public Talks

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

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

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

Coding skills

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

Outreach

Physics 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) trough role models, workshops and a community. 2016 -
https://girlsinstem.se