Laura Engelbrecht

Personal Info

Citizenship:	United States
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Education

2020 to Present — Postdoctoral Fellow, ETH Zürich, Zürich, Switzerland
Concentration: Particle-Astro Theory
Supervisor: Lavinia Heisenberg

2015 to 2020 — Ph.D. in Physics, Case Western Reserve University, Cleveland, OH
Concentration: Particle-Astro Theory
Thesis Advisor: Kurt Hinterbichler

2010 to 2015 — M.S. in Electrical and Computer Engineering, Cornell University, Ithaca, NY
Concentration: Atomic Physics
Thesis Advisors: David Hammer, Stephanie Hansen

2011 to 2012 — Budapest Semesters in Mathematics
Concentration: Mathematics

2006 to 2010 — B.A. in Mathematical Physics, Hendrix College, Conway, AR

Publications

Erin Blauvelt, Laura Engelbrecht, and Kurt Hinterbichler,
"Shift Symmetries and AdS/CFT," arXiv:2211.02055 [hep-th].

Claudia De Rham, Laura Engelbrecht, Lavinia Heisenberg, and Alice Lüscher,
"Positivity Bounds in Vector Theories," arXiv:2208.12631 [hep-th].

Laura Engelbrecht, Callum R. T. Jones, and Shruti Paranjape,
"Supersymmetric Massive Gravity," JHEP 10 (2022) 130, arXiv:2205.12982 [hep-th].

Laura A. Johnson, Callum R. T. Jones and Shruti Paranjape,
"Constraints on a Massive Double-Copy and Applications to Massive Gravity,"
JHEP 02(2021) 148, arXiv:2004.12948 [hep-th].

James Bonifacio, Kurt Hinterbichler, Laura A. Johnson, "Amplitudes and
4D Gauss-Bonnet Theory," Phys. Rev. D 102, (2020) 024029, arXiv:2004.10716 [hep-th].

James Bonifacio, Kurt Hinterbichler, Laura A. Johnson, Austin Joyce, Rachel A. Rosen,
"Matter Couplings and Equivalence Principles for Soft Scalars," JHEP 07 (2020) 056,
arXiv:1911.04490 [hep-th].

James Bonifacio, Kurt Hinterbichler, Laura A. Johnson, Austin Joyce, "Shift-Symmetric
Spin-1 Theories," JHEP 09 (2019) 029, arXiv:1906.10692 [hep-th].

Claudia De Rham, Kurt Hinterbichler, Laura A. Johnson, "On the (A)dS Decoupling Limits
of Massive Gravity," JHEP 09 (2018) 154, arXiv:1807.08754 [hep-th].

James Bonifacio, Kurt Hinterbichler, Laura A. Johnson, "Pseudo-Linear Spin-2
Interactions," Phys.Rev. D99 (2019) no.2 024037, arXiv:1806.00483 [hep-th].

Invited Talks

International Conference on Holography and its Applications, Dahmgan University, January 25-25, 2023

Heidelberg University, Joint Cosmology Seminar, November 29, 2022

University of Edinburgh, Higgs Centre Amplitudes Meeting, May 4, 2022

University of Amsterdam, String Theory Seminar, March 8, 2022

McGill University, Theoretical High-Energy Physics Seminars, November 22, 2021

Spring Workshop on Gravity and Cosmology, Jagiellonian University, May 25-29, 2019

University of Pennsylvania, High Energy Theory Seminar, October 29, 2019

Canadian Institute for Theoretical Physics, October 25, 2019

Leinweber Institute of Theoretical Physics at the University of Michigan, October 2, 2019

Columbia University, Theory Seminar, September 30, 2019

24th International Symposium on Particles, Strings, and Cosmology, Cleveland, OH, June 7, 2018

Conference Organization

Organizer for YOUNGST@RS Workshop - Rebuilding the Tower of Babel:
Bringing Together the Various Languages of Color-Kinematics Duality,
Mainz Institute for Theoretical Physics, Johannes Gutenberg University, April 11-13, 2022

Helped run the 24th International Symposium on Particles, Strings and Cosmology,
Cleveland, OH, 2018

Helped run Standard Model at 50 Years Conference, Cleveland, OH, 2018

Programs and Long Term Invited Visits

Saltire Emerging Researchers Visit, University of Edinburgh, May 2-13, 2022

Young High Energy Theorist Visitor Program, University of Michigan, October 1-5, 2019

Origins of the Universe Conference 2019, Simons Foundation, September 26-27, 2019

PhD Visitor Programme, Delta Institute for Theoretical Physics, Universiteit Van Amsterdam, March 10-25, 2019

TASI 2019 Summer School: The Many Dimensions of Quantum Field Theory

Origins of the Universe Conference 2018, Simons Foundation, September 20-21, 2019

Prospects in Theoretical Physics 2018 Summer School: From Qubits to Spacetime

Princeton Center for Theoretical Science, Princeton University, Princeton, NJ, August 7-10, 2016

Honors and Awards

Scottish Universities Physics Alliance Award 2022

Eastern Gravity Meeting prize for the best student talk 2018

Graduate Student Appreciation Award for work in organizing the Women's March on Cleveland 2017

Featured Student in Stewardship Science Academic Programs Annual 2014

One Year Cornell University Fellowship for Outstanding Academic Achievements 2010

Outstanding Presentation Award from American Institute of Physics 2010

Honorable Mention for Goldwater Scholarship 2009

Hendrix College Joe G. Robins Physics Award 2009

Academic Scholarship and Odyssey Honors and Distinction Award for Artistic Creativity 2006

Teaching Experience

Spring 2022 | *Proseminar Course on String Theory*
Supervisor, ETH Zürich
Supervisors are given four students who are assigned an individual topic. Supervisors discuss readings, teach them about their topic, and guide them in putting together a presentation for the class. Topics for students assigned to me were Conformal Symmetry, Basic Properties of CFTs, and Black holes in String Theory.

Spring 2021 | *Proseminar Course on Physics of Leptons*
Supervisor, ETH Zürich
Topics for students assigned to me were Dirac Equation/Dirac Spinors/Discrete Symmetries, and Weyl/Dirac/Majorana Spinors and Spinor Technology.

Spring 2021 | *Proseminar Course on Open Questions in Particle Physics and Cosmology*
Supervisor, ETH Zürich
Topics for students assigned to me were Dark Energy/Modified Gravity, Black Holes and the Information Loss Problem, and AdS/CFT.

Fall 2015 to Spring 2017 | *Introductory Physics Laboratory*
Teaching Assistant, Case Western Reserve University
Assisted students in carrying out basic physics experiments and graded lab notes and reports.

Summer 2014 | *CURIE Academy*
Teaching Assistant, Cornell University
Curie Academy is a one-week summer program for high school girls. Taught participants to develop, build, and test Internet of Things devices, using Arduino micro-controllers, inspired by real world applications in health care, energy, and environmental conservation.

Fall 2013 | *ECE 3100: Probability and Inference*
Teaching Assistant, Cornell University
Taught two discussion sections a week, held office hours every week, and graded exams.

Fall 2008 to Spring 2010 | *Physics Tutor*
Hendrix College

Fall 2007 to Spring 2010 | *Mathematics Tutor*
Hendrix College

Fall 2008 | *General Physics Lab Assistant*
Hendrix College

Other Research Experience

May 2016 to December 2016 | *Two-Field Anamorphic Cosmology Research*
Advisor: Anna Ijjas,
Examined two-field anamorphic models to see if they have any advantages or disadvantages compared to the one-field model.

May 2016 to October 2016 | *Atomic physics effects for future precision CMB measurements*
Advisor: Glenn Starkman,
Looked at how including more levels of Helium would change the ionization fraction during recombination.

January 2013 to August 2015 | *Investigation of Quantum Effects on X-Ray Thomson Scattering Signals*
Advisor: Stephanie Hansen,
Developed a model that treats bound-free and free-free X-Ray Thomson scattering processes under a consistent formalism, offering a potential improvement over models that enforce an artificial distinction. Showed that using more realistic continuum wave functions instead of plane-waves can significantly alter the scattering signal.

May 2011 to December 2012 | *Atomic Absorption Spectra*
Advisor: Stephanie Hansen,
Developed code that numerically solves the Schrodinger equation to produce wavelengths and oscillator strengths of radiative transitions for various ionizations of aluminum and other types of atoms. The code also has the ability to create potentials using self-consistent field method to model various atoms. Used code to investigate various phenomena including ionization potential depression and compared results to the Eckart-Kroll and Stewart-Pyatt methods.

May 2010 to May 2011 | *Thermal Conductivities of Hydrogen in Extreme Conditions*
Advisor: Michael Desjarlais,
Produced calculations of thermal conductivity using linear response theory, which requires screening length as a parameter. Ran quantum molecular dynamics (QMD) simulations on super computers at Sandia National Laboratories. Compared results from these two methods to determine which screening lengths produced the most accurate results for thermal conductivities of hydrogen at various temperatures and densities.

May 2008 to May 2010 | *Total Production Rate for Neutrino-Induced Pair Creation in a Magnetic Field*
Advisor: Todd Tinsley,
Computed the production rate of an electron-positron pair from a high-energy neutrino, in a large magnetic field, a process we were interested in due to the sensitivity of supernova models to neutrino transport. Showed that the overwhelming majority of the production rate occurred in a minute size of momentum space, so limits of integration could just cover a small chunk of momentum space without losing much accuracy and that many of the terms used in the computation could be neglected, as their contribution was small.

National Lab Experience

Sandia National Laboratories Research Assistant, July 2014 to August 2015

Sandia National Laboratories Research Assistant, July 2010 to August 2011

Service and Memberships

Co-Founder of Theory Girls podcast and blog at theorygirls.com to to showcase women in physics/STEM, life as a physicist, and the amazing, fun science in the world around us to anyone curious and excited to learn, 2019-Present

Hosted a physics booth at the International Women and Girls in Science Day at The Cleveland Museum of Natural History, February 2018

Organized (with one other graduate student) and spoke at Women's March On Cleveland with 15,000 attendees, January 2017

Diversity Co-Chair of Physics Graduate Student Association, May 2017 to May 2018

Organized tour of CWRU Physics Department for a future prospective female physicist, age 10, Spring 2017

Organized and supervised visit for a prospective female physicist, age 10, to build cosmic-ray-muon detector and observe muons.

Society of Physics Students, August 2007 to May 2010, Co-President

Pi Mu Epsilon – Mathematics Honor Society, October 2007 to May 2010, President

Phi Beta Kappa - Academic Honor Society, April 2010 to Present

Member of the American Physical Society, January 2009 to Present

Cornell Expanding Your Horizons Volunteer 2011 and 2013