

# HANNAH ELIZABETH HERDE

Fysiska institutionen, Hus K, K326 · Professorsgatan 1 · 22363 Lund SWEDEN

📞 0000-0001-8926-6734 📠 +1 (203) 912-1242 ✉ [hannah.herde@cern.ch](mailto:hannah.herde@cern.ch)

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## WORK HISTORY & EDUCATION

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### Lund University, SE

2022-present

Associate Senior Lecturer in Experimental Particle Physics

June 2022-present

Research topics: Silicon tracking detectors (ATLAS Inner Tracker Strips upgrade for High Luminosity LHC); readout electronics for calorimeters (LDMX); track reconstruction using ACTS (ATLAS); Top & Higgs physics with colliders (ATLAS); dark matter searches (LDMX, ATLAS).

### SLAC National Accelerator Laboratory, US

2020-2022

Research Associate in High Energy Experimental Particle Physics (ATLAS)

August 2020-May 2022

Research topics: Top & Higgs physics with colliders (top Yukawa coupling measurements), silicon detector design and construction.

Supervisor: Dr. Charles YOUNG

### Brandeis University, US

2014-2020

Ph.D. in High Energy Experimental Particle Physics

August 2020

M.S. Physics

August 2015

Thesis: *“Improved measurement of the mass of the Higgs boson in the four leptons final state produced in pp collisions with the ATLAS Detector in Run-2.”* [16](#)

Advisor: Prof. Gabriella SCIOLLA

### Wellesley College, US

2010-2014

Physics & Classical Civilizations, B.A. cum laude & Physics departmental honors

Honors thesis: *“Ultraviolet absorption properties of diatomic sulfur.”* [17](#)

Advisor: Prof. Glenn STARK

## AWARDS AND HONORS

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### GRANTS:

#### Lund ACTS for Effective Tracking (Crafoord Foundation)

2023

1 MSEK from the Crafoord Foundation for two years (2024, 2025) to improve track reconstruction for particle physics experiments using A Common Tracking Software (ACTS).

### POSTDOCTORAL RESEARCH:

#### First Place, SLAC Science Slam

2021

[Science communication competition](#) where scientists within six years of their Ph.D. present their research in under three minutes for a general audience. A panel of judges and the audience rank Slammers on the clarity of their scientific message and performance. SLAC ATLAS department nominee; SLAC competition winner; advanced to Bay Area Research Slam (October 2021) [53](#). Prize-winning talk: [54](#)

### DOCTORAL RESEARCH:

#### US ATLAS Outstanding Graduate Student Award

2018

“In recognition of your exceptionally broad and noteworthy contributions to the ATLAS Experiment. In particular, we recognize your numerous contributions to muon reconstruction and performance, searches for Beyond the Standard Model physics in the dilepton final state, measurement of the Higgs boson in the four lepton final state, and for key contributions and leadership in the ATLAS Inner Tracker Strips Phase II Upgrade.” [Citation from US ATLAS] Award talk: [62](#)

**Brookhaven Women in Science Renate W. Chasman Scholarship** 2017  
Scholarship intended as financial and moral support for women seriously pursuing a new career in science; in memory of Renate Chasman, a brilliant physicist who spent her most productive years at Brookhaven National Laboratory. Awarded annually to women graduate students at accredited educational institutions doing research at the Lab in the STEM disciplines (science, technology, engineering, or mathematics). [Description from Brookhaven Women in Science] Award talk: [55](#)

**U.S. Department of Energy Office of Science Graduate Research Fellowship** 2016-2017  
Fellowship to work in-residence at Brookhaven National Lab on proposed project, “Developing Staves for the ATLAS Phase-II Inner Tracker Silicon Strip Detector.”

**American Physical Society Division of Particles and Fields Student Travel Award** March 2016  
Travel award to present at the APS April Meeting 2016. Related presentation: [32](#)

**Young Scientist Fellowship, La Thuile 2016** February 2016  
Grant offered by the Istituto Nazionale di Fisica Nucleare (INFN) to attend the *XXX Rencontres de Physique de la Vallée d’Aoste* conference.

UNIVERSITY SCHOLARSHIPS FOR GRADUATE STUDY, BRANDEIS UNIVERSITY:

**Ted and Florence Baumritter Endowed Fellowship in Physics, Brandeis University** 2015-2016

**Martin A. Fisher Endowed Fellowship in Physics, Brandeis University** 2014-2015  
Named donor-funded fellowships awarded based on recommendations from faculty.

EXCELLENCE IN TEACHING:

**Brandeis University Outstanding Teaching Fellow Award, Brandeis University** 2015

**David Falkoff Graduate Teaching Prize, Brandeis University** 2015

Graduate School of Arts and Sciences and Physics Department awards based on graduate teaching fellow’s overall teaching excellence, student and course instructor evaluations, and letters from faculty.

UNDERGRADUATE AWARDS:

**Phyllis J. Fleming Award for Excellence in Physics, Wellesley College** 2014

Presented annually to select graduating Wellesley College physics majors for excellence in physics.

**Jerome A. Schiff Fellowship, Wellesley College** 2013

Granted on the basis of merit for an honors thesis project, one of 17 selected by Wellesley’s Committee on Curriculum and Academic Policy. Related papers and presentations: [9](#) [12](#) [17](#) [50](#) [71](#) [73](#)

## RESEARCH EXPERIENCE

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**Funding:** The Swedish Research Council generously supports ATLAS at Lund University through the Large Hadron Collider Consortium. The Knut and Alice Wallenberg Foundation supports LDMX at Lund University. The US Department of Energy has supported my research at Brandeis University and SLAC. Additional funding sources for particular projects are noted.

**Dark matter search LDMX Collaboration** 2022-present

The Light Dark Matter eXperiment proposes to strike an electron beam into a tungsten target to attempt to generate sub-GeV dark matter in a laboratory setting. My focus is in developing the hadronic calorimeter’s readout electronics.

· **Publications:** 1 journal article [2](#), 2 conference talks [26](#) [27](#), 1 invited seminar [57](#)

**ATLAS Collaboration** 2014-present

As a member of the ATLAS Collaboration, I have worked in each of the three pillars of particle physics - [physics analysis](#), [detector physics](#), and [combined performance](#).

### PHYSICS ANALYSES

**Extracting top Yukawa coupling,  $Y_t$ , from  $t\bar{t}$  differential cross section** 2020-2022

*ATLAS Experiment*

*CERN (CH/FR)*

- **Leadership:** Analysis Contact (2020-2021); Common SMEFTsim Sample Generation Task Force
- **Publications:** 1 journal article in preparation [70](#)

### **Higgs boson decaying to the four lepton final state**

2016-2020

*ATLAS Experiment*

*CERN (CH/FR)*

- Led (ATLAS Analysis Contact, Internal Note Editor) the Higgs boson mass measurement at 13 TeV with the full Run-2 dataset ( $139 \text{ fb}^{-1}$ ) using per-event resolution methods. Produced conference note for Moriond 2020 and a journal article. (Dissertation: [16](#))
- **Leadership:** Analysis Contact; Internal Note Editor
- **Mentorship:** 1 doctoral student
- **Publications:** 7 journal articles [4](#) [6](#) [7](#) [8](#) [10](#) [11](#) [13](#), 2 seminars [59](#) [60](#), 6 conference notes [18](#) [19](#) [20](#) [21](#) [22](#) [23](#), 2 conference talks [30](#) [31](#), 4 ATLAS Week or workshop talks [38](#) [43](#) [44](#) [47](#)

### **Search for Beyond the Standard Model physics in the dilepton final state in Run-2**

2015

*ATLAS Experiment*

*CERN (CH/FR)*

- **Publications:** 1 journal article [14](#), 1 conference note [24](#)

## **DETECTOR PHYSICS - ATLAS INNER TRACKER (ITk) PHASE II UPGRADES**

### **ITk Strips: Endcap module quality control**

2022-present

*ATLAS Experiment*

*Lund University, Lund (SE)*

*Collaborating institutions:* **Lund U.**, Uppsala U., U. of Oslo, Neils Bohr Institute; ATLAS ITk Strips upgrade community

- **2022-present:** Local project lead and Inner Tracker Institute Board Representative
- Thermal-cycling silicon strip sensor/electronic units ('modules') in a climate-controlled chamber to assess their performance under duress and determine their suitability for use in the ATLAS ITk Strips subdetector.
- Daily module testing to assess their performance during long-term operations
- **Mentorship:** Local supervisor for 2 ATLAS authorship qualification projects (doctoral-level), technical supervisor for 2 ATLAS authorship qualification projects (postdoctoral-level), 2 masters students, 2 bachelors students
- **Publications:** 1 peer-reviewed proceedings [1](#), 1 poster at an international conference on behalf of the ATLAS ITk Collaboration [48](#)

### **ITk Strips: Production management coordination**

2022-present

*ATLAS Experiment*

*CERN (CH/FR)*

*Collaborating institutions:* Leadership team: U. Glasgow, IFIC, U. Liverpool, **Lund U.**, U. Sheffield

- Production management leadership team member coordinating ITk Strips "reporting," the work area responsible for comparing our yields, inventory, production rates, and quality with our expectations during the entire ITk Strips production (all work breakdown areas, 2023-2027).
- Answering directly to the ITk Strips Project Leader (equivalent to Activity Coordinator role)
- **Leadership:** Production Management Coordinator - Reporting

### **ITk Pixels: Inner System Module Loading**

2020-2022

*ATLAS Experiment*

*SLAC National Accelerator Lab, Menlo Park, CA (US)*

*Collaborating institutions:* Locally – Oklahoma State U., **SLAC**; Internationally – CNRS-IN2P3, CERN, INFN-Lecce, Rutherford Appleton Laboratory-STFC; ATLAS ITk Pixels upgrade community

- **Leadership:** Lead physicist for module loading
- **Mentorship:** 1 doctoral student, 1 post-baccalaureate student
- **Publications:** 1 colloquium **67**, 1 seminar **58**, 1 conference talk **29**, 2 ATLAS Week or workshop talks **36** **37**

**ITk Pixels: Inner System Production Database** 2020-2022  
*ATLAS Experiment* SLAC National Accelerator Lab, Menlo Park, CA, US  
*Collaborating institutions:* Argonne National Laboratory, U. California - Santa Cruz, Lawrence Berkeley National Laboratory, U. Massachusetts-Amherst, Oklahoma State University; ATLAS ITk Pixels upgrade community

- **Leadership:** US Pixels Production Database Representative (Non-Services Components); Inner System Loaded Local Supports Component Manager
- **Mentorship:** 1 undergraduate summer student

**ITk Strips: Module loading quality control** 2017-2019  
*ATLAS Experiment* CERN (CH/FR)

- **Leadership:** US-UK International Liaison for Quality Control Planning
- **Publications:** 1 ATLAS Week plenary **39**, 1 design review talk **40**, 1 ATLAS workshop talk **41**

**ITk Strips: Hardware assembly design** 2016-2017  
*ATLAS Experiment* Brookhaven National Lab, Upton, NY, US

- **Leadership:** Module loading designer and Brandeis lead student
- **Mentorship:** 3 doctoral students; 4 undergraduate students.
- **Funding:** US Department of Energy Office of Science Graduate Research Program; awarded the Renate W. Chasman Scholarship for substantial contributions at Brookhaven National Laboratory and commitment to advancing women in the field of science.
- **Publications:** 1 journal article **5**, 2 colloquia **67** **68**, 4 invited seminars **61** **62** **63** **64**, 3 ATLAS workshop talks **42** **45** **46**, 1 public talk **55**

#### COMBINED PERFORMANCE - TRACK RECONSTRUCTION

**ACTS for ATLAS Inner Tracker Track Reconstruction** 2022-present  
*ATLAS Experiment* CERN (CH/FR)  
*Collaborating institutions:* ATLAS Tracking Combined Performance Working Group

- ACTS, [A Common Tracking Software](#): Collaborative, global project to create common software package for track reconstruction in High Energy Physics
- Supervising and assisting a doctoral student with implementing the ACTS Kalman Filter for track-based alignment in the ATLAS track reconstruction software and the ACTS grid-based approach for vertex seeding.
- **Mentorship:** 1 doctoral student

#### COMBINED PERFORMANCE - MUON RECONSTRUCTION AND PERFORMANCE

**Muon momentum calibration and performance** 2017-2018  
*ATLAS Experiment* CERN (CH/FR)

- **Publications:** 1 journal article **3**

## Muon selection and performance at high transverse momentum

*ATLAS Experiment*

2015-2017

*CERN (CH/FR)*

- **Publications:** 1 journal article [15](#), 1 conference proceedings [25](#), 1 conference talk [32](#), 1 poster [49](#)

## TABLETOP EXPERIMENTS (UNDERGRADUATE)

### Ultraviolet photoabsorption by sulfur-bearing molecules for atmospheric applications 2012-

2014

*Wellesley College*

*Wellesley, MA (US)*

- **Funding:** Jerome A. Schiff Fellowship.
- **Publications:** 2 journal articles [9](#) [12](#), honors thesis [17](#), 1 poster [50](#), 2 presentations [71](#) [73](#)

### Phase transitions in intermetallic iron-platinum

2013

*Research Experience for Undergraduates, U. California-Los Angeles*

*Los Angeles, CA (US)*

- **Funding:** US National Science Foundation
- **Publications:** 1 presentation [72](#)

## TEACHING EXPERIENCE

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### CLASSROOM EXPERIENCE

#### Course instructor, Experimental Tools - Electronics

Fall 2023

*Lund University*

*Lund (SE)*

- Instructor for electronics in the Experimental Tools course for physicists (~80% of course content).
- **Course development:**
  - Converted electronics classroom periods from traditional lecture to studio-inspired lessons focused on students experimenting with circuits on breadboards in class following a particular concept. Conversion based on past student feedback on the course and with live feedback during course.
  - Reorganised curriculum to focus on concepts, like amplification or switches, rather than individual electrical components.

#### Course instructor, Experimental Tools

Fall 2022

*Lund University*

*Lund (SE)*

- Instructor for two lectures in the Experimental Tools course on diodes, transistors, and operational amplifiers.

#### Head teaching fellow, Introductory electromagnetism laboratory

Spring 2015

*Brandeis University*

*Waltham, MA (US)*

#### Teaching fellow, Introductory Physics Laboratories

2014-2016

*Brandeis University*

*Waltham, MA (US)*

#### Guest lecturer, First Year Seminar

Spring 2015

*Brandeis University*

*Waltham, MA (US)*

#### Teaching assistant, Introductory Mechanics Laboratory

2012-2014

*Wellesley College*

*Wellesley, MA (US)*

#### Prototype laboratory writer, Introductory Mechanics Laboratory

2011

*Wellesley College*

*Wellesley, MA (US)*

**Peer educator - Departmental tutor (Physics)** 2011-2014  
*Wellesley College* *Wellesley, MA (US)*

**Grader (Physics)** 2012-2014  
*Wellesley College* *Wellesley, MA (US)*

#### CONFERENCES AND WORKSHOPS

- APR 11, 2024 – *Serious Game on Designing Money for Sustainability*, Community of Practice - Sustainability in Education, Lund University, Lund (SE).
- JUN 19, 2023 – *Teaching and Learning in the Era of ChatGPT*, Department of Physics, Natural Sciences Faculty, Lund University, Lund (SE).
- APR 19, 2023 – *Writing, Interpreting and Using Learning Outcomes*, Department of Physics, Natural Sciences Faculty, Lund University, Lund (SE).
- MAR 29, 2023 – *Inclusive Teaching*, Department of Physics, Natural Sciences Faculty, Lund University, Lund (SE).

#### FORMAL TRAINING IN EDUCATION

**Teaching and Learning in Higher Education - Theory and Practice (NMN0003F)** Spring 2023  
*Lund University* *Lund (SE)*

**Doctoral supervision at the Faculty of Science - A basic introduction** Autumn 2022  
*Lund University* *Lund (SE)*

#### MENTORED STUDENTS

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##### DOCTORAL STUDENTS

**Erik Wallin** (Lund U.) – co-supervisor, doctoral studies 2022-present  
*ATLAS Inner Tracker (ITk) Strips Phase II Upgrade: Si detector handling and testing, thermal cycling impacts on detector long-term reliability.*  
*LDMX hadronic calorimeter readout electronics characterisation.*

**Lara Čalić** (Lund U.) – co-supervisor, doctoral studies 2022-present  
*Tracking detector alignment with A Common Tracking Software (ACTS).*

**Sten Åstrand** (Lund U.) – co-supervisor, doctoral studies 2022-present  
*ITk Strips: Si detector quality control standards development and application with pre-production components.*

**Joshua Stewart** (Oklahoma State U.) – US ATLAS Center (ATC) Graduate Student mentor 2021-2022  
*ITk Pixels Phase II Upgrade: Module loading system design, procedure development, and documentation; silicon sensor handling techniques.*

**Jiayi Chen** (Brandeis U.) – academic year mentor 2018-2019  
*ITk Strips: Module loading record keeping for barrel local supports ('staves'), including production database object definition and interface development.*

**Prajita Bhattarai** (Brandeis U.) – summer mentor 2019  
*Final state radiation Monte Carlo event generation comparisons and their implications for the Higgs mass measurement in the 4ℓ final state.*

**Zachary Schillaci** (Brandeis U.) – summer mentor 2018  
*ITk Strips: Interpreting electrical stave testing results.*

**Laura Bergsten** (Brandeis U.) – spring, summer mentor 2017  
*ITk Strips: Module loading system design and calibration, machine vision analysis, silicon sensor handling techniques; thermomechanical stave prototype loading and testing.*

**Alyssa Garcia** (Brandeis U.) – summer mentor 2017  
*ITk Strips: Glue handling dispensing protocols for stave module loading.*

#### MASTERS STUDENTS

**Eduardo Torres Reoyo** (Lund U.) – MSc. thesis supervisor 2023-2024  
*ITk Strips: Environmental chamber commissioning for module thermal cycling.*

**XU Xiangyu** (Lund U.) – MSc. thesis supervisor 2022-2023  
*ITk Strips: Detector metrology and SmartScope programming.*

#### POST-BACCALAUREATE STUDENTS

**Neha Singh** (California State U. - East Bay) – project mentor 2020  
*ITk Pixels: SE4445 glue handling and dispensing protocols for ring module loading.*

**Prajita Bhattarai** (Brandeis U.) – ATC post-baccalaureate student project mentor 2017  
*ITk Strips: Module loading techniques and thermomechanical stave testing.*

#### BACHELORS STUDENTS

**Alexandra Murphy** (Lund U.) – BSc. thesis supervisor 2024  
*ITk Strips: Module quality and cold noise module test beam analysis.*

**Adib Shaker** (Lund U.) – BSc. thesis supervisor 2024  
*ITk Strips: Module long-term reliability testing development.*

**Aksel Mihailov** (Lund U.) – BSc. thesis supervisor 2023  
*LDMX hadronic calorimeter readout electronics pulse amplitude calibration. Presented a poster at Fysikdagarna 2023.*

**Robert Howey** (U. California-Davis) – SULI summer student mentor 2021  
*ITk Pixels: Loaded local supports production database object definition and record keeping; detector physics principles. Presented a talk. Remote student.*

**Catherine Nicoloff** (Wellesley College) – summer project mentor 2017  
*ITk Strips: Module loading camera pixel-to-micron conversion using FFT.*

**Ruoshi Liu** (Brandeis U.) – summer project mentor 2017  
*ITk Strips: Module loading image pre-processing for camera pixel-to-micron conversion. Presented a poster. Remote student.*

**Nolan Wheeler** (Brandeis U.) – summer project mentor 2017  
*ITk Strips: Module loading camera working height calibration. Presented a poster. Remote student.*

**Brendon Bullard** (Brandeis U.) – spring project mentor Spring 2017  
*ITk Strips: Module loading stave-gantry coordinate system calibration.*

## COMMUNITY INVOLVEMENT & OUTREACH

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#### ACADEMIC LEADERSHIP AND MENTORSHIP

##### Mentorship programmes in the role of Mentor

- 2023-PRESENT LHC Early Career Mentorship Program (1 mentee)

**Division of Particle and Nuclear Physics leadership** 2022-present  
*Lund University* *Lund (SE)*

- 2023-PRESENT Member, Trivelsgruppen (Work and social environment)

- 2022-PRESENT Member, Infrastructure planning working group

#### DIVERSITY, EQUITY, AND INCLUSION

<b>ITk Strips Early Career Senior Contact</b> <a href="#">33</a> <a href="#">34</a> <a href="#">35</a>	2023-present
<i>ATLAS Experiment</i>	<i>CERN (CH/FR)</i>
<b>Member, APS-IDEA SLAC local chapter</b>	2021-2022
<i>SLAC National Accelerator Lab</i>	<i>Menlo Park, CA (US)</i>
<b>Organising committee member, U.S. LHC Users' Association Newcomers' Club</b>	2015-2017
<i>U.S. Particle Physics community</i>	<i>CERN (CH/FR)</i>
<b>Organising committee member, March for Science - Geneva</b>	2017
<i>Online</i>	<i>Geneva (CH/FR)</i>
<b>Organising committee leader, Women's March NYC - Wellesley College contingent</b>	2017
<i>New York City</i>	<i>New York City, New York (US)</i>
<b>Member, Brookhaven Women in Science</b>	2017
<i>Brookhaven National Lab</i>	<i>Upton, NY (US)</i>
<b>Board member, Brandeis Women in Science Initiative</b>	2014-2016
<i>Brandeis University</i>	<i>Waltham, MA (US)</i>
<b>Member, Wellesley College Multifaith Council</b>	2013-2014
<i>Wellesley College</i>	<i>Wellesley, MA (US)</i>

#### OUTREACH ACTIVITIES

<b>Digital art featuring particle cartoon characters</b>	2018-present
Art as a medium of accessible expression for the public, including set of Standard Model particle cartoon characters and animations, shared on social media with brief descriptions of each particle's role in nature and as a colouring book <a href="#">53</a> <a href="#">54</a> , <a href="https://www.facebook.com/716140170/posts/10163927553765171/">https://www.facebook.com/716140170/posts/10163927553765171/</a> .	
<b>Presenter, Meet the ATLAS Experiment!, ATLAS International Masterclasses</b>	2023-2024
<i>International Particle Physics Masterclasses at Lund University</i>	<a href="https://physicsmasterclasses.org">https://physicsmasterclasses.org</a>
Preparing and delivering an overview talk on particle detector physics and the ATLAS Experiment for high school students (Feb 29, 2024; Mar 20 & 23, 2023)	
<b>Large Improv Collider</b>	2018-2020
<i>CERN</i>	<i>Meyrin (CH)</i>
· Co-president & facilitator/trainer	2019-2020
· Member	2018
The Large Improv Collider at CERN, born out of The Catalyst Project ( <a href="http://thecatalyst.ch/">http://thecatalyst.ch/</a> ) in Lausanne, Switzerland, trains scientists and STEM professionals in improvisational comedy techniques and storytelling. Scientists come away from the weekly workshops as more effective and engaging communicators, particularly through sustained, weekly repetition.	
<b>Letter writer</b>	2016-2019
<i>Letters to a Pre-Scientist</i>	<a href="https://prescientist.org/">https://prescientist.org/</a>
The pen pal program connects STEM professionals with fifth to tenth grade student pre-scientists in US low-income communities. I have traded quarterly letters with three students through this program, discuss higher education pathways, STEM career journeys, and overcoming obstacles.	

#### Career panels

- JUN 23, 2021 – SLAC CORE (Committee for Outreach, Recruitment & Engagement) Science Institute



- 5th and 6th grade Science in the City students interviewed me about my life at SLAC and my path as a scientist as part of their week-long summer camp
- OCT 2, 2017 – Wellesley College Society of Physics Students Brown Bag with an Alum, Wellesley, MA (US).
- MAR 6, 2017 – Girls Inc. Career Panel, William Floyd Middle School, Moriches, NY (US).
- NOV 11, 2015 – Wellesley College Society of Physics Students Young Alum Panel, Wellesley, MA (US).

## Performances

- OCT 25, 2018 – Guest scientist speaker, The Catalyst CatCave9 monthly science improvisational comedy show, Lausanne (CH). <http://catcave9.thecatalyst.ch/catcave9-season-3-episode-8-25-10-2018-hellowee/>

## Press

- Johan Joelsson, “Partikelfysiker vill avslja universums hemligheter.” Lund University Magazine 2023/5, 26 Oct. 2023, 36 (2023). <https://www.lu.se/artikel/partikelfysiker-vill-avslja-universums-hemligheter>
- Goodman, Lawrence. “On the Frontline of the next Revolution in Physics.” BrandeisNOW, Brandeis University Office of Communications , 5 Aug. 2016, [www.brandeis.edu/now/2016/august/collider-higgs-particle.html](http://www.brandeis.edu/now/2016/august/collider-higgs-particle.html).
- Burrows, Leah. “We Are Brandeis Science: Hannah Herde.” ReAction, Brandeis University Office of Communications, 21 Apr. 2015, <https://blogs.brandeis.edu/reaction/2015/04/06/we-are-brandeis-science-hannah-herde/>.
- Burrows, Leah. “The Hunt for Dark Matter.” BrandeisNOW, Brandeis University Office of Communications, 7 Jan. 2015, [www.brandeis.edu/now/2015/january/dark-matter.html](http://www.brandeis.edu/now/2015/january/dark-matter.html).

## LIST OF PUBLICATIONS

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The publication list is ordered chronologically.

### **PA** **CP** **DP** **ATLAS Collaboration**

2015-present

**PA:** Physics Analysis

**CP:** Detector combined performance

**DP:** Detector physics and development

As a member of the ATLAS experimental collaboration, I co-authored 698 peer-reviewed journal articles. The full list is available here through INSPIRE-HEP: [link](#). The authorlist is always presented alphabetically.

The Collaboration also produces internally-reviewed “conference notes” in advance of conferences, so that we may discuss results with our colleagues in other experiments, the theory community, and the general public. The full list is available [here](#). Conference notes are removed from the list when their superseding peer-reviewed article appears on arXiv.

I list in this section the journal articles and conferences papers to which I contributed in a significant way.

### **Dark matter search** **Detector physics** **LDMX Collaboration**

2022-present

The Light Dark Matter eXperiment proposes to strike an electron beam into a tungsten target to attempt to generate sub-GeV dark matter in a laboratory setting. The authorlist is always presented alphabetically.

### **Tabletop** **Molecular Spectroscopy**

2012-2014

My undergraduate work at Wellesley College, Synchrotron SOLEIL, and NIST-Gaithersburg yielded two

papers, in addition to my undergraduate honors thesis. I contributed to the data collection, analysis, and paper writing. I am acknowledged as the second author on both papers as a mark of my contributions.

PUBLISHED ORIGINAL ARTICLES IN REFEREE-ASSESSED INTERNATIONAL JOURNALS

- 1** *ATLAS ITk Strip Detector for the Phase-II Upgrade*, H. Herde on behalf of the ATLAS ITk Strips Collaboration, JINST 2024;19:C03018, <https://doi.org/10.1088/1748-0221/19/03/C03018>.
- 2** *Photon-Rejection Power of the Light Dark Matter eXperiment in an 8 GeV Beam*, H. Herde et al., J. High Energ. Phys. 2023, 92, arXiv:2308.15173 [hep-ex], DOI:[https://doi.org/10.1007/JHEP12\(2023\)092](https://doi.org/10.1007/JHEP12(2023)092)
- 3** *Measurement of the muon momentum reconstruction performance for the ATLAS experiment at the LHC utilising 139 fb<sup>-1</sup> of pp collisions produced at  $\sqrt{s} = 13$  TeV between 2015 and 2018.*, H. Herde et al., Eur. Phys. J. C 83 (2023) 686, [arXiv:2212.07338](https://arxiv.org/abs/2212.07338). DOI:10.1140/epjc/s10052-023-11584-x
- 4** *Measurement of the Higgs boson mass in the  $H \rightarrow ZZ^{(*)} \rightarrow 4\ell$  decay channel with  $\sqrt{s} = 13$  TeV pp collisions using the ATLAS detector at the LHC*, H. Herde et al., Phys. Lett. B 843 (2023) 137880, [arXiv:2207.00320](https://arxiv.org/abs/2207.00320) [hep-ex]. DOI: 10.1016/j.physletb.2023.137880
- 5** *The ABC130 barrel module prototyping programme for the ATLAS strip tracker*, H. Herde et al., JINST 15 (2020) 09, P09004, [arXiv:2009.03197](https://arxiv.org/abs/2009.03197) [physics.ins-det]. DOI: 10.1088/1748-0221/15/09/P09004
- 6** *Measurement of the Four-Lepton Invariant Mass Spectrum in 13 TeV Proton-Proton Collisions with the ATLAS Detector*, H. Herde et al., JHEP 04 (2019) 48, [arXiv:1902.05892](https://arxiv.org/abs/1902.05892) [hep-ex]. DOI: 10.1007/JHEP04(2019)048
- 7** *Measurement of the Higgs boson mass in the  $H \rightarrow ZZ^{(*)} \rightarrow 4\ell$  and  $H \rightarrow \gamma\gamma$  channels with  $\sqrt{s} = 13$  TeV pp collisions using the ATLAS detector*, H. Herde et al., Phys. Lett. B 784 (2018) 345, [arXiv:1806.00242](https://arxiv.org/abs/1806.00242) [hep-ex]. DOI: 10.1016/j.physletb.2018.07.050
- 8** *Constraints on off-shell Higgs boson production and the Higgs boson total width in  $ZZ \rightarrow 4\ell$  and  $ZZ \rightarrow 2\ell 2\nu$  final states with the ATLAS detector*, H. Herde et al., Phys. Lett. B 786 (2018) 223, [arXiv:1808.01191](https://arxiv.org/abs/1808.01191) [hep-ex]. DOI: 10.1016/j.physletb.2018.09.048
- 9** *Fourier-transform-spectroscopic photoabsorption cross sections and oscillator strengths for the  $S_2$   $B^3\Sigma_u^- - X^3\Sigma_g^-$  system*, G. Stark, **H. Herde**, B. R. Lewis, S. T. Gibson, J. Nave, J. Chem. Phys. 148, 244302 (2018). DOI: <https://doi.org/10.1063/1.5029929>
- 10** *Search for heavy ZZ resonances in the  $\ell^+\ell^-\ell^+\ell^-$  and  $\ell^+\ell^-\nu\bar{\nu}$  final states using proton proton collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector*, H. Herde et al., Eur. Phys. J. C 78 (2018) 293, [arXiv:1712.06386](https://arxiv.org/abs/1712.06386) [hep-ex]. DOI: 10.1140/epjc/s10052-018-5686-3
- 11** *Measurement of the Higgs boson coupling properties in the  $H \rightarrow ZZ^{(*)} \rightarrow 4\ell$  decay channel at  $\sqrt{s} = 13$  TeV with the ATLAS detector*, JHEP 03 (2018) 095, [arXiv:1712.02304](https://arxiv.org/abs/1712.02304) [hep-ex]. DOI: 10.1007/JHEP03(2018)095
- 12** *VUV pressure-broadening in sulfur dioxide*, J. R. Lyons, **H. Herde**, G. Stark, D. S. Blackie, J.C. Pickering, N. de Oliveira, Journal of Quantitative Spectroscopy & Radiative Transfer 210 (2018) 156-164. DOI: <https://doi.org/10.1016/j.jqsrt.2018.02.013>
- 13** *Measurement of inclusive and differential cross sections in the  $H \rightarrow ZZ^* \rightarrow 4\ell$  decay channel in pp collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector*, H. Herde et al., J. High Energ. Phys. (2017) 2017: 132, [arXiv:1708.02810](https://arxiv.org/abs/1708.02810) [hep-ex]. DOI: 10.1007/JHEP10(2017)132
- 14** *Search for high-mass new phenomena in the dilepton final state using proton-proton collisions at  $\sqrt{s}=13$  TeV with the ATLAS detector*, H. Herde et al., Phys. Lett. B 761 (2016) 372-392, [arXiv:1607.03669](https://arxiv.org/abs/1607.03669) [hep-ex]. DOI: 10.1016/j.physletb.2016.08.055

- 15** *Muon reconstruction performance of the ATLAS detector in proton–proton collision data at  $\sqrt{s} = 13$  TeV*, H. Herde et al., EPJ C **76** (2016) 292, arXiv:[1603.05598](https://arxiv.org/abs/1603.05598) [[hep-ex](#)].  
DOI: 10.1140/epjc/s10052-016-4120-y

## BOOKS, BOOK CHAPTERS

### Theses

- 16** *Measuring the Mass of the Higgs Boson in the Four-Lepton Final State with the ATLAS Detector*, H. Herde, ProQuest Dissertations Publishing, 28002752, 2020. [[ProQuest](#)]
- 17** *Ultraviolet absorption properties of diatomic sulfur*, H. Herde, Wellesley College Honors Thesis Collection, Paper 319. 2014.

## OTHER ARTICLES AND REPORTS PUBLISHED IN INTERNATIONAL JOURNALS

### Conference notes

- 18** *Measurement of the Higgs boson mass in the  $H \rightarrow ZZ^{(*)} \rightarrow 4\ell$  decay channel with  $\sqrt{s} = 13$  TeV pp collisions using the ATLAS detector at the LHC*, H. Herde et al., [ATLAS-CONF-2020-005](#).
- 19** *Search for a heavy Higgs boson in the ZZ to  $4\ell$  and  $ll\nu\nu$  final states at 13 TeV with the ATLAS detector*, H. Herde et al., [ATLAS-CONF-2017-058](#).
- 20** *Measurement of the Higgs boson mass in the  $H \rightarrow ZZ^{(*)} \rightarrow 4\ell$  and  $H \rightarrow \gamma\gamma$  channels with  $\sqrt{s} = 13$  TeV pp collisions using the ATLAS detector*, H. Herde et al., [ATLAS-CONF-2017-046](#).
- 21** *Measurement of the Higgs boson coupling properties in the  $H \rightarrow ZZ^{(*)} \rightarrow 4\ell$  decay channel at  $\sqrt{s} = 13$  TeV with the ATLAS detector*, H. Herde et al., [ATLAS-CONF-2017-043](#).
- 22** *Measurement of inclusive and differential cross sections in the  $H \rightarrow ZZ^{(*)} \rightarrow 4\ell$  decay channel at 13 TeV with the ATLAS detector*, H. Herde et al., [ATLAS-CONF-2017-032](#).
- 23** *Study of the Higgs boson properties and search for high-mass scalar resonances in the  $H \rightarrow ZZ^* \rightarrow 4\ell$  decay channel at  $\sqrt{s} = 13$  TeV with the ATLAS detector*, H. Herde et al., [ATLAS-CONF-2016-079](#).
- 24** *Search for new phenomena in the dilepton final state using proton–proton collisions at  $\sqrt{s} = 13$  TeV with the ATLAS detector*, H. Herde et al., [ATLAS-CONF-2015-070](#).

### Conference proceedings

- 25** *Muon Reconstruction Performance in ATLAS at Run-II*, H. Herde, PoS(EPS-HEP2015)285, e-Print. <https://pos.sissa.it/234/285/pdf>

## CONFERENCES

### Conference talks on behalf of the LDMX Collaboration in national and international meetings

- 26** AUG 24, 2023 – *LDMX: The Light Dark Matter eXperiment*, EPS-HEP2023; Hamburg (DE).
- 27** JUL 7, 2022 – *LDMX: The Light Dark Matter eXperiment*, ICHEP2022; Bologna (IT).

### Conference talks on behalf of the ATLAS Collaboration in national and international meetings

- 28** JUN 14-16, 2023 – *Preparing ATLAS for the future*, Swedish Physical Society annual meeting Fysikdagarna2023, Stockholm (SE).
- 29** JUL 12-14, 2021 – *Module Loading for the ATLAS Phase-II Inner Tracker Pixel Detector*, DPF2021; Online (US).
- 30** JUN 19-24, 2017 – *Cross section and coupling measurements with the ATLAS detector for the 125 GeV Higgs boson*, WIN2017; Irvine, CA (US).

- 31** JAN 28-31, 2017 – *Measurement of fiducial and total cross section for Higgs boson production in the four-lepton decay channel in pp collisions at  $\sqrt{s}=13$  TeV with the ATLAS detector*, APS April Meeting 2017; Washington, D.C. (US).
- 32** APR 15-19, 2016 – *Muon Reconstruction Performance in ATLAS at Run-II*, APS April Meeting 2016; Salt Lake City, UT (US).

**Important ATLAS-internal presentations at workshops or collaboration meetings**

- 33** NOV 17, 2023 – *Early Career Researchers' Visibility and Voice in ITk Strips* (plenary), ATLAS Upgrade Week - Strips Highlight Talk, CERN (CH).
- 34** NOV 13, 2023 – *Proposals from the conversation on Early Career Researchers' Visibility and Voice*, ATLAS Upgrade Week, CERN (CH).
- 35** SEP 12, 2023 – *Early Career Researchers' Visibility and Voice: Cultivating scientific spirit in Production*, ATLAS Inner Tracker Week, CERN (CH).
- 36** APR 25, 2022 – *RD53a ring prototype: Loading and testing experience at SLAC*, US Pixels Weekly Meeting; Online.
- 37** MAR 7, 2022 – *RD53a prototypes for Inner System - Loading status*, ATLAS Inner Tracker Week; Online.
- 38** FEB 28, 2020 – *Higgs mass status ( $4\ell$ , diphoton)* (plenary), ATLAS Week; CERN (CH).
- 39** OCT 11, 2018 – *Inner Tracker Strips highlights* (plenary), ATLAS Week; CERN (CH).
- 40** OCT 2, 2018 – *Loaded local supports: Quality assurance and design verification*, Inner Tracker local supports and module loading preliminary design review, CERN (CH).
- 41** JUN 18, 2018 – *Loaded local supports: Quality assurance and control* (plenary), ATLAS Inner Tracker Full Strips QA/QC Workshop; Oxford (UK).
- 42** APR 17, 2018 – *Progress on US Thermomechanical Stave*, ATLAS Upgrade Week; CERN (CH).
- 43** APR 13, 2018 – *Leptons and the Higgs mass measurement*, ATLAS  $H \rightarrow ZZ^{(*)}$  Workshop 2018; Oxford (UK).
- 44** APR 10, 2018 – *Fantastic codes and where to find them: Guidelines for efficacy and efficiency in the HZZ Software ecosystem*, ATLAS  $H \rightarrow ZZ^{(*)}$  Workshop 2018; Oxford (UK).
- 45** FEB 14, 2018 – *Stave loading and thermal tests*, ATLAS Inner Tracker Week; CERN (CH).
- 46** NOV 14, 2017 – *US stave module loading*, ATLAS Upgrade Week; CERN (CH).
- 47** APR 29, 2016 – *Study of lepton isolation in the fiducial volume*, ATLAS  $H \rightarrow ZZ^{(*)}$  Workshop 2016; Munich (DE).

**Posters**

- 48** JUN 25-29, 2023 – *ATLAS ITk Strip Detector for the Phase-II Upgrade*. Poster presented at: International Workshop on Radiation Imaging Detectors (iWoRID) 2023; Oslo (NO).
- 49** JUL 22-29, 2015 – *Muon Reconstruction Performance in ATLAS at Run-II*. Poster presented at: EPS Conference on High Energy Physics; Vienna (AT).
- 50** JAN 17-19, 2014 – *Ultraviolet absorption properties of diatomic sulfur and sulfur dioxide for atmospheric applications*. Poster presented at: Northeastern APS CUWiP; Stony Brook, NY (US).

POPULAR SCIENCE ARTICLES/PRESENTATIONS

- 51** FEB 28, 2024 – *Meet the ATLAS Experiment!*, 2024 ATLAS International Masterclass at Lund University, *Designed for Swedish high school students; focused on particle detector physics.*
- 52** MAR 20, 2023 & MAR 22, 2023 – *Meet the ATLAS Experiment!*, 2023 ATLAS International Masterclass at Lund University, *Designed for Swedish high school students; focused on particle detector physics.*
- 53** OCT 28, 2021 – *Who’s that Pokemon? Filling the Pokédex of Nature’s Building Blocks with the ATLAS Experiment*, Bay Area Research Slam presentation, Online. *Designed for a public, general audience.* <https://sites.google.com/lbl.gov/bay-area-research-slam/>
- 54** SEP 9, 2021 – *Who’s that Pokemon? Filling the Pokédex of Nature’s Building Blocks with the ATLAS Experiment*, SLAC Slam presentation, SLAC National Accelerator Laboratory, Menlo Park, CA (US). *Designed for a public, general audience. Online.*
- 55** AUG 2, 2017 – *Building an Olympian: Assembling the Next Generation of the ATLAS Particle Physics Detector*, Renate W. Chasman Award Ceremony, Brookhaven National Laboratory, Upton, NY (US). *Designed for a public, general audience.*

#### OTHER PRESENTATIONS

#### Seminars and invited talks

- 56** NOV 29, 2022 – *Silicon detectors for High Luminosity LHC*, Particle Physics and Theoretical High Energy Physics Joint Science Coffee, Lund University, Lund (SE).
- 57** OCT 24, 2022 – *LDMX: The Light Dark Matter eXperiment*, Santa Cruz Institute of Particle Physics (SCIPP) seminar series, Univ. of California - Santa Cruz SCIPP, Santa Cruz, CA (US).
- 58** MAY 13, 2021 – *ATLAS Pixel Module Loading at SLAC*, SLAC Fundamental Physics Directorate Management and US Department of Energy Office of High Energy Physics Virtual Meeting; Online (US). *Co-presented with Rachel Hyneman.*
- 59** JAN 9, 2020 – *Measuring the mass of the Higgs boson in the four-lepton final state with the ATLAS Detector*, Fundamental Physics Directorate Seminar, SLAC National Accelerator Laboratory, Menlo Park, CA (US).
- 60** JAN 7, 2020 – *Measuring the mass of the Higgs boson in the four-lepton final state with the ATLAS Detector*, Research Progress Meeting, Lawrence Berkeley National Laboratory, Berkeley, CA (US).
- 61** APR 5, 2019 – *US stave loading for ATLAS’ Inner Tracker Strips*, LBNL/Berkeley Friday Instrumentation Meeting, Lawrence Berkeley National Laboratory, Berkeley, CA (US).
- 62** AUG 1, 2018 – *Stitching together Inner Tracker Staves: ATLAS resolution today and tomorrow* (US ATLAS Outstanding Graduate Student talk), US ATLAS Summer Workshop; Pittsburgh, PA (US).
- 63** OCT 9, 2017 – *Building ATLAS’ Inner Tracker: a Silicon Detector for the High Luminosity LHC Era*, Brandeis ATLAS Group Mechanical Engineering Seminar, Brandeis University, Waltham, MA, (US).
- 64** SEP 12, 2017 – *Building ATLAS’ Inner Tracker: a Silicon Detector for the High Luminosity LHC Era*, High Energy Physics Seminar, Tufts University, Medford, MA (US).

#### Lectures at international schools

- 65** APR 26, 2023 – *Development of particle physics detectors*, HELIOS Day, HELIOS International Graduate School on Instrumentation, Hamburg (DE).
- 66** OCT 13, 2022 – *Inspiration: Development of particle physics detectors: A worldwide collaboration*, HELIOS Retreat, HELIOS International Graduate School on Instrumentation, Lund (SE).

#### Colloquia

- 67** NOV 17, 2021 – *Building an Olympian: Assembling the Next Generation of the ATLAS Detector for the High Luminosity LHC Era*, Physics Seminar, Ithaca College, Ithaca, NY (US) *Designed for undergraduate physics majors. Virtual.*
- 68** OCT 2, 2017 – *Building an Olympian: Assembling the Next Generation of the ATLAS Detector for the High Luminosity LHC Era*, Physics Seminar, Wellesley College, Wellesley, MA (US). *Designed for first year undergraduates.*

### Guest lecture for undergraduates

- 69** APR 27, 2015 – *Searching for the Invisible - the Hunt for Dark Matter*, Guest Lecture for Brandeis First Year Seminar “Exploring Dark Matter and Dark Energy in the New Universe,” Waltham, MA (US). *Pedagogical review of experiments searching for dark matter designed for first year undergraduates.*

### MANUSCRIPTS

- 70** *Extraction of the top Yukawa coupling to the Higgs boson from the  $t\bar{t}$  differential cross section measured in  $\sqrt{s} = 13$  TeV  $pp$  collisions using the ATLAS detector at the LHC*, H. Herde et al., *in preparation; new measurement for ATLAS.*

### UNDERGRADUATE PRESENTATIONS

- 71** APR 30, 2014 – *Ultraviolet Absorption Properties of Diatomic Sulfur*, Ruhlman Conference; Wellesley, MA (US).
- 72** AUG 23, 2013 – *Under Observation: Watching Iron-Platinum Phase Changes in a Transmission Electron Microscope*, UCLA REU Symposium; Los Angeles, CA (US).
- 73** APR 24, 2013 – *The Effect of Gas Pressure on Ultraviolet Absorption by Sulfur Dioxide*, Ruhlman Conference; Wellesley, MA (US).
- 74** APR 19, 2012 – *Generating Standing Wave Understanding: Designing an Introductory Physics Lab*, Ruhlman Conference; Wellesley, MA (US).