Laura J. Fields

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Education

PhD, Physics	2009, Cornell University Supervisor: Ritchie Patterson Thesis: *A Study of D Semileptonic Decays to Pseudoscalar Mesons*
MS, Physics	2006, Cornell University
Certificate of Advanced Study in Mathematics	2002, University of Cambridge
BS, Physics and Math	2001, University of Arkansas Honors: *summa cum laude* and Phi Beta Kappa

Employment

- **January 2021 - Present**
  - Associate Professor, University of Notre Dame.
- **September 2017 - December 2020**
  - Scientist, Fermi National Accelerator Laboratory.
- **August 2015 - August 2017**
  - Associate Scientist, Fermi National Accelerator Laboratory.
- **January 2010 - July 2015**
  - Postdoctoral Associate, Northwestern University. Supervisor: Heidi Schellman.
- **February 2009 - January 2010**
  - Postdoctoral Associate, Cornell Laboratory for Elementary Particle Physics. Supervisor: Anders Ryd.

Research Experience

- **Research on the MINERνA Experiment (Jan 2010-Present)**
  - **Served as Co-Spokesperson of MINERνA Collaboration** (March 2017-Present). Duties include regular briefings with Fermilab management and the Department of Energy, management of analysis, operations and calibrations groups, oversight of publication process, and managing MINERvA collaboration personnel resources. Highlights of tenure include 14 publications, successful navigation of the DOE Portfolio Review and Fermilab Physics Advisory Committee Endorsement processes, and completion of MINERvA detector operations.

- **Served as Analysis Coordinator** (Jan 2014-Dec 2015). Responsibilities included guiding MINERνA physics analyses to publication, forming long term collaboration analysis plans, and ensuring that all needed infrastructure, calibration and reconstruction efforts were successful. This work resulted in more than ten publications.
- **Mentored Students and Postdocs** working on analyses of quasielastic scattering (Amit Bashyal (2017-Present), Cheryl Patrick (2012-2016), Jessie Chvojka (2010-2012)), pion production (Nishat Fiza (2018-2019), Aaron Bercellie (2015-Present), Ben Messerly(2018-Present)), and flux determination (Deepika Jena (2016-Present), Javier Rosas Torres (2019-present), Miguel Hernandez (2018-2019), Nuruzzuman (2018-2019), L. Ren (2013-2015)).
- **Performed analysis** that produced MINERνA's first two physics publications (both in PRL), studies of antineutrino and neutrino charged current quasi-elastic scattering, channels that is crucial to oscillation experiments.
- **Co-convened Exclusive States With Tracks physics group** that led all elastic and charged meson analyses (2011-2014).
- **Was Computing Infrastructure Coordinator**; this included leading an effort to transition from running MINERνA data analysis jobs as single interactive processes to executing thousands of jobs in parallel on the FermiGrid; also served as MINERνA's first batch processing expert.
- **Developed and maintained** automated data handling system for calibrating and archiving all MINERνA detector data.
- **Designed and created** MINERνA metadata for tracking information such as data quality, detector configuration, and software versions for over 300 TB of data and Monte Carlo; developed software for archiving this metadata in the SAM data catalog.

- **Research on the Deep Underground Neutrino Experiment (DUNE) (Dec 2012-Present)**
  - **Coordinated Beam Interface Working Group**, which is responsible for monitoring changes in the neutrino beam design and studying their impact on DUNE oscillation physics, and facilitates communication between the LBNF beamline project and DUNE physicists (2017-Present).
  - **Designed and implemented genetic algorithm** that has identified beam designs which increase DUNE's sensitivity to CP violation by more than 30% and have modest cost compared to alternatives such as increasing detector size. One of these beam designs was chosen for construction and eventual installation in LBNF (2014-2017).
  - **Served as Deputy Coordinator for DUNE Beam Optimization Task Force**, which was charged with further developing the beamline optimization, identifying recommended beam options, performing a basic cost-benefit analysis, and reporting results to the collaboration (2015 - 2017).
  - **Mentored Students** working on beam simulation and optimization: Jogesh Rout (2018-2019), Rowan Zaki, (2017-2018), Tyler Johnson (Summer 2016), Amit Bashyal (2014-2016).
  - **Convened DUNE Beam Simulation Working Group**, which develops and maintains DUNE's simulation of the LBNF beamline, and provides DUNE neutrino fluxes and systematic uncertainties to physics analyzers and working groups. This group produced both the fluxes and systematic uncertainties used by the DUNE Near

Detector Task Force, the latter of which were the first complete estimation of DUNE beam systematic uncertainties. (August 2015-Present).

- **Convened ELBNF Beam Requirements & Optimization Task Force**, which identified DUNE beam requirements and upgrade options, and documented these in the DUNE Conceptual Design Report. (March - June 2015).
- **Convened LBNE Beam Simulation Group**, which studied beam design and optimization, developed the LBNF beam simulation software, and provided neutrino beam simulations and systematic uncertainties to the LBNE collaboration. Milestones achieved by group include a complete overhaul of GEANT4 beamline geometry, the first estimation of LBNF neutrino flux systematic uncertainties, and completion of many studies used to inform LBNF design choices (June 2013-Dec 2014).
- **Developed Interface** between beam and detector Monte Carlo simulations used for designing the DUNE experiment and preparing for physics analysis.

- **Research on the NA61 Experiment (2018-Present)**
  - **Coordinated Construction** of NuMI replica target and scintillator trigger that were installed in NA61 in summer of 2018.
  - **Served as** Fermilab representative to NA61 executive board and member of publication board of a recent cross-section publication.
  - **Primary Investigator** on DOE proposal for US contributions to an NA61 Upgrade.

- **Research on the Compact Muon Solenoid (CMS) Experiment (Feb 2009-Jan 2010)**
  - **Developed Simulations** of track-trigger design options for the SLHC upgrade of the CMS detector.
  - **Studied Potential Level 1 Trigger** electron ID algorithms and optimal detector configurations for achieving high efficiency and background rejection in a very high luminosity environment.

- **Graduate Research (2003-2009)**
  - **Made the world's most precise measurements of semileptonic form factors and branching fractions** in D semileptonic decays, using CLEO-c data and reducing systematic uncertainties by 10-60% over previous CLEO-c analyses.
  - **Measured π^0 reconstruction efficiencies** in the CLEO-c detector and estimated the systematic uncertainties on these efficiencies that were used by many CLEO-c analyses.
  - **Was CLEO-c drift chamber electronics expert** for the final three years of the CLEO-c program; primary responsibility was diagnostics and repair of Fastbus TDC crates; was also on-call expert for all drift chamber hardware and responsible for weekly drift chamber calibrations.
  - **Tuned tracking algorithms** used in neutrino reconstruction for use in CLEO-c charm analyses.
  - **Developed LabVIEW data-acquisition interface** for a prototype TPC detector used in International Linear Collider (ILC) research and development.
  - **Studied potential SUSY signatures at the ILC** in a focus point of mSUGRA (Minimal Supergravity model) parameter space.

Awards and Fellowships

- Department of Energy Early Career Award (2020).
- University Research Association (URA) Early Career Award (2019).
- Fermilab Intensity Frontier Fellow (2014).
- NSF Graduate Fellow (2001-2004).
- Barry Goldwater Scholar (2000-2001).
- University of Arkansas Fulbright College Presidential Scholar (1999-2000).
- University of Arkansas Sturgis Fellow (1997-2001).

Professional Activities

- Member, Physics Advisory Committee (PAC) for the Japanese Proton Accelerator Research Complex (J-PARC) (2020-2024).
- Chair, Fermilab Summer Internships in Science and Technology (SIST) Program Committee (2017-Present).
- Group Leader, Neutrino Simulations group within Fermilab's Scientific Computing Division (Sep 2018-present).
- Member, NA61 Collaboration Institutional Board (Feb 2018-present).
- Leader, Fermilab Undergraduate Summer Lecture Series (2019-Present).
- Member, DUNE Collaboration Authorship and Publications Board (2019-Present).
- Organizer, Neutrino Event Generator Tools Workshop, Jan 2020.
- Session Chair, Precision Time Structure in On-Axis Neutrino Beams, Nov 2019.
- Organizing Committee Member, 19th International Neutrino Summer School, Aug 2019.
- Instructor, US Particle Accelerator School Neutrino Beams Course, Jan 2019.
- Committee Member, LBNF Near Site Requirements Review (Nov 20, 2018), SuperCDMS Operations Review (Jun 19-20, 2018), SuperCDMS CD2/3 Review (Jan 24-26, 2018), SuperCDMS DOE/SC Status Review (Jul 18-20, 2017).
- Reviewer, Natural Sciences and Engineering Research Council of Canada (NSERC) Subatomic Physics Discovery Grant (Dec 2018) and DOE Office of High Energy Physics Reviews (2019).
- Manuscript reviewer for five articles for Physical Review D and C (2018-2019).
- Member, DUNE Collaboration Executive Board (Jan 2018-2019).
- Organizer, LBNF Flux Spectrometer Workshop (May 2017).
- Chair, Fermilab Scientific Advisory Council (2016-2017), Member (2015-2017).
- Member, MINERνA Collaboration Executive Committee (2014-2016).
- Member, Fermilab Annual Lab Plan Computational Science Strategy Committee (2015-2016)

- Member, Three Fermilab Research Associate Search Committees (2015-2018).
- Founder, organizer and instructor for MINERνA 101(2014-2017).
- Northwestern University Representative, DUNE Institutional Board (2015).
- Organizer, NuINT 2012: The Eighth International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region (2012).
- Founder, organizer and instructor for MINERνA 101, a week-long course on MINERνA software and analysis for new students and collaborators (2014-2016).
- Contributor, Fermilab Quantum Diaries Blog (2011-2012).
- Workshop Leader for Cornell University's "Expanding Your Horizons" program, which brought talented female junior-high school students to campus for a day to engage in science workshops (2003-2007).
- President, Society of Physics Students, University of Arkansas Chapter (1999-2001).

Invited Talks

- *NA61 Measurements for Neutrino Experiments* 11th International Workshop on Neutrino Beams and Instrumentation, 23 October 2019.
- *Towards Precision Accelerator-Based Neutrino Physics* Fermilab User's Meeting, 12 June 2019.
- *Neutrino Event Generators and Models* ECT* Workshop on Testing and Improving Models of Neutrino Nucleus Interactions in Generators, 3 June 2019.
- *Optimization of the LBNF Neutrino Beam* High Power Targetry Workshop, 4 June 2018.
- *Pion Production Working Group Report* Neutrino Cross Section Strategy Workshop (NuPrint), 14 March 2018.
- *Recent Results from MINERvA* Rutgers University HEP Seminar, 4 December 2017.
- *MINERvA Status Report and Request for Antineutrino Running* Fermilab PAC Meeting, 10 November 2017.
- *Physics Performance of the Optimized Beam* LBNF Beam Optimization Review, 5 October 2017.
- *LBNF Hadron Production Needs and Plans* NA61 Beyond 2020 Workshop, 28 July 2017.
- *MINERνA Analysis and Statistical Methods* Workshop on Statistical Issues in Experimental Neutrino Physics (PhyStat-Nu), 19 September 2016.
- *Recent Results from MINERνA*, Neutrino 2016, 5 July 2016.
- *Prospects for the Fermilab Neutrino Beam* Third International Large Neutrino Infrastructure Meeting, May 2016.
- *Opportunities in Software and Computing* Neutrino - Latin America Workshop, 24 April 2016.

- *LBNF Beam Modeling - Status, Plans, and Opportunities for Collaboration*, Proton Accelerators for Science and Innovation (PASI 2015), 12 November 2015.
- *Neutrino Beam Optimization*, International Workshop for the Next Generation Nucleon Decay and Neutrino Detector (NNN15), 31 October 2015.
- *Recent Results from MINERνA*, International Workshop for the Next Generation Nucleon Decay and Neutrino Detector (NNN15), 30 October 2015.
- *Intensity Frontier Geant4 Requirements*, Geant4 Technical Forum, 2 October 2015.
- *Status of the DUNE Experiment*, Fermilab User's Meeting 2015.
- *Recent Results from the MINERνA Experiment*, Harvard LPPC Seminar, 29 April 2015.
- *Neutrino Road Trip: Searching for CP Violation by Neutrinos*, New Mexico State University Physics Colloquium, 19 March 2015.
- *Neutrino Road Trip: Searching for CP Violation by Neutrinos*, University of Louisville Physics Colloquium, 10 March 2015.
- *Neutrino Road Trip: Searching for CP Violation by Neutrinos*, Iowa State University Physics Colloquium, 14 January 2015.
- *Recent Neutrino-Nucleus Scattering Results from MINERνA*, Argonne National Laboratory HEP Lunch Seminar, 9 December 2014.
- *Neutrino-Nucleus Scattering Results from MINERνA*, Massachusetts Institute of Technology LNS Lunch Seminar, 30 September 2014.
- *MINERνA Constraints on the NuMI Beam Flux*, 9th International Workshop on Neutrino Beams and Instrumentation, 26 September 2014.
- *Cross Sections And What They Tell Us*, Fermilab Intensity Frontier Summer Lecture Series, 10 July 2014.
- *Recent Results from the MINERνA Experiment*, Fermilab User's Meeting, 12 June 2014.
- *LBNE Neutrino Yields Versus Proton Energy*, Proton Improvement Plan II Collaboration Meeting, 4 June 2014.
- *LBNE Beam Simulations*, DOE LBNE Software and Computing Review, 14 May 2014.
- *Neutrino Cross Sections*, APS April Meeting, 7 April 2014.
- *Bringing Neutrinos into Focus for LBNE*, University of Mississippi Department Colloquium, 17 May 2014.
- *Quasi-Elastic Scattering at MINERνA*, Michigan State University HEP Seminar, 25 February 2014.
- *Quasi-Elastic Scattering at MINERνA*, Stony Brook University HEP Seminar, 19 February 2014.
- *Quasi-Elastic Scattering at MINERνA*, SLAC Experimental Seminar, 14 January 2014.
- *Quasi-Elastic Scattering at MINERνA*, Pittsburgh PAC Seminar, 9 January 2014.
- *Quasi-Elastic Cross Sections*, Flux Measurement and Determination in the Intensity Frontier Era Neutrino Beams (University of Pittsburgh), 7 December 2012.
- *Charged-Current Quasi-Elastic Results from MINERνA*, Northwestern University HEP Seminar, 5 November 2012.

- *CCQE Results From MINERνA*, NuInt12: Eighth International Workshop on Neutrino-Nucleus Interactions in the Few-GeV Region, 25 October 2012.
- *Neutrino Cross Sections*, PIC2012: The 32nd International Symposium on Physics in Collision, 13 September 2012.
- *MINERνA Status and Results*, Fermilab User's Meeting, 27 April 2011.
- *D Factories: Semileptonic D Decays*, Lattice QCD Meets Experiment Workshop, 29 April 2010.
- *Studies of $D \to \pi e \nu$ and $D \to K e \nu$ at CLEO-c*, Carlton University Physics Seminar, 1 December 2009.
- *Studies of $D \to \pi e \nu$ and $D \to K e \nu$ at CLEO-c*, University of Virginia High Energy Physics Seminar, 14 October 2009.
- *Charm Semileptonic Decays at CLEO-c*, SLAC Experimental Seminar, 29 September 2009.
- *Charm Form Factors at CLEO-c*, 10th Conference on the Intersections of Particle and Nuclear Physics, 29 May 2009.
- *Studies of $D \to \pi e \nu$ and $D \to K e \nu$ at CLEO-c*, Cornell Lab for Elementary Particle Physics Journal Club, 4 April 2009.
- *D Semileptonic Decays at CLEO-c*, 22nd Lake Louse Winter Institute, 24 February 2007.
- Numerous MINERνA, DUNE, CAPTAIN MINERνA, LBNE, CMS and CLEO collaboration meeting talks.