Curriculum Vitae — December 15, 2024

Prof. Heidi M Schellman
Department of Physics
Oregon State University
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Area of Interest: Experimental High Energy Physics

Education

B. S. Degree, June 1977, Stanford University (Mathematics)
M.A. Degree, June 1980, University of California. Berkeley (Physics)
Ph.D. Degree, December 1984, University of California. Berkeley (Physics)
Ph.D. Advisor: George Trilling

Employment

1978	Programmer, PEP Project, Stanford Linear Accelerator Laboratory
1979 - 1984	Research Assistant, Physics Division, Lawrence Berkeley Laboratory Mark II collaboration
1985 - 1988	Research Associate, Enrico Fermi Institute, University of Chicago CCFR Collaboration
1988 - 1990	Wilson Fellow, Fermi National Accelerator Laboratory E665 Muon Scattering Collaboration
1990 - 1995	Assistant Professor, Dept. of Physics and Astronomy, Northwestern University
1995 - 2000	Associate Professor, Dept. of Physics and Astronomy, Northwestern University
2000 - 2014	Professor, Dept. of Physics and Astronomy, Northwestern University
2000 - 2002	Associate Chair, Department of Physics and Astronomy, Northwestern University
2004 - 2007	Associate Dean for Research and Graduate Studies Weinberg College of Arts and Sciences, Northwestern University
2010 - 2014	Chair, Department of Physics and Astronomy, Northwestern University
2015 - 2021	Head, Department of Physics, Oregon State University
2015 - present	Professor, Department of Physics
2019 - 2024	Joint Appointment with Fermilab Scientific Computing

Awards and Honors

1988	Robert Rathbun Wilson Fellowship, Fermi National Accelerator Center
1991	Department of Energy Outstanding Junior Investigator Award
1993	A.P. Sloan Fellowship
2000	Elected Fellow of the American Physical Society
2000	Fermilab Employee Recognition Award for Neutrino Factory study
2015	APS Division of Particles and Fields Mentoring Award
2021	South Eugene High School Hall of Fame
2022	F.A. Gilfillan Memorial Lectureship, Oregon State University
2023	Elected to Chair line for APS Division of Particles and Fields

Professional Service

1991 - 1997	Spokesperson of Fermilab Experiment E665
1993 - 1995	Member, Fermilab User's Executive Committee
1996 - 1998	Member, APS Division of Particles and Fields Executive Committee
1996 - 1998	D0 Collaboration QCD convener
1996 - 1999	Member, Dept. of Energy High Energy Physics Advisory Panel
1997 - 2000	Member, Outstanding Dissertation Committee, URA
1998	Member, Director Search Committee, Fermilab
1998	Member, Dean Search Committee, College of Arts and Sciences, Northwestern
1998 - 2001	Member, Large Hadron Collider Committee, CERN
2000	Co-leader Fermilab Neutrino Factory Physics Study
2000 - 2001	Co-leader D0 software and computing project
2001	Member, Dean Search Committee, College of Arts and Sciences, Northwestern
2001 - 2005	Member, Fermilab Program Advisory Committee
2001 and 2021	Chair, APS Division of Particles and Fields Nominating Committee
2002 - 2004	D0 collaboration Luminosity Convenor
2003 - 2006	Member, Outstanding Postdoctoral Fellow Award Committee, Universities Research Association
2003	Member, Tanaka Dissertation Award Committee, APS
2005 - 2007	Member, DOE/NSF Neutrino Scientific Advisory Group (NUSAG)
2005 - 2012	Member of the Board, Fermilab Research Association
2007 - 2008	Chair, D0 Collaboration Institutional Board
2007 - 2009	D0 Collaboration Electroweak Convener
2008 - 2012	Chair, FRA Visiting Scholars Selection Committee
2008 - 2014	Computing Infrastructure Coordinator, MINERvA collaboration
2009 - 2015	D0 representative, Tevatron Electroweak Working Group (TEVEWWG)
2010 - 2013	Sanford Underground Research Facility Program Advisory Committee
2010	Co-leader for Strategic Partnerships in development of the NU Strategic Plan
2011	Member, APS Primakoff Prize Committee

2012 - 2021	Secretary, Vice Chair and Chair, C11 Committee (Particle Physics) International Union for Pure and Applied Physics
2013	Fermilab Deputy Director Search Committee
2014	Review of the Physics Department at University of Nebraska, Lincoln
2014 - 2018	Jefferson Laboratory Program Advisory Committee
2015	Brookhaven Laboratory Nuclear and Particle Physic Program Advisory Committee
2015	Member, NSF/DOE Nuclear Science Long Range Planning Working Group
2015 - 2020	CERN Scientific Policy Committee
2016	External review of the Dept. of Physics at the University of Kansas
2017	External review of the Dept. of Physics at Utah State University
2018 - 2021	Member (ex-officio), International Committee on Future Accelerators
2018	External review of the Dept. of Physics at the University of Pittsburgh
2017 - 2018	Computing Coordinator for the DUNE collaboration
2018 - 2024	Member ,DUNE collaboration executive board
2018 - 2025	Cottrell Scholar Selection Committee
2018 - 2021	Initiator and Member, International Neutrino Panel
2018 - 2024	Leader of the International DUNE Collaboration Computing Consortium
2019 - 2024	Member (ex-officio), World LHC Computing Grid (WLCG) Management Board
2020 - 2024	Member, Electron Ion Collider Detector Advisory Committee, BNL
2020	External review of the Department of Physics, College of William and Mary
2021-2023	Deputy Chair, DUNE Institutional Board
2021	Chair, APS Division of Particles and Fields Nominating Committee
2021 - 2024	Member, Dept. of Energy High Energy Physics Advisory Panel
2022 - 2025	Elected to the Chair line for the APS Division of Particles and Fields
2023	External review of the Department of Physics at the University of Illinois, Chicago
2024	Member, Sanford Underground Research Laboratory Strategic Advisory Committee
2024	External review of the Department of Physics and Astronomy, University of New Mexico

Publications and Reports

Co-Author on 723 publications with over 65,000 citations according to the InspireHEP database. High Energy Physics lists all contributors on all papers, as a result these numbers are larger than in other fields. The full list of publications is available at http://inspirehep.net.

Invited and Peer Selected Presentations

133 talks and presentations since 1984 including invited plenary talks at the American Physical Society Annual Meeting (1995), Deep Inelastic Scattering (1994, 2000, 2008), Lepton Photon Symposium (1997), Neutrino (2000), the conference summary at Rencontres de Moriond (2004), the APS Division of Particles and Fields (2008) and Computers in High Energy Physics (2019).

Grants and Contracts

Currently funded by the National Science Foundation and the Department of Energy Office of Science.

Project Title:	Traineeships for Computational High Energy Physics
Status of Support:	Current
Proposal/Award Number:	DE-SC-0023527
Source:	Dept. of Energy, Office of Science Subaward from UC Santa Cruz
Proposal/Active Project Start Date:	10/2022
Proposal/Active Project End Date:	09/2027
Amount to Oregon State:	$45,000

Project Title:	Essential computing and software development for the DUNE experiment (extension)
Status of Support:	Funded
Proposal/Award Number:	DE0280036
Source:	Dept. of Energy, Office of Science
Proposal/Active Project Start Date:	05/2024
Proposal/Active Project End Date:	04/2025
Project Amount:	$300,000, subawards to 3 institutions
Amount to Oregon State:	$75,218

Project Title:	Neutrino Physics at Oregon State
Status of Support:	Funded
Proposal/Award Number:2410721	
Source of Support:	National Science Foundation
Proposal/Active Project Start Date:	07/2024
Proposal/Active Project End Date:	06/2027
Project Amount:	$570,000

Project Title:	Subcontract for DUNE computing operations
Status of Support:	Under negotiation
Proposal/Award Number:718051	
Source of Support:	Fermi Research Associates
Proposal/Active Project Start Date:	01/2025
Proposal/Active Project End Date:	09/2025
Project Amount:	$47,900

Mentoring

Eight Doctoral Students Supervised at Northwestern

Panagiotis Spentzouris, 1991-1994, APS Fellow, Associate Laboratory Director for Emerging Technologies, Fermilab

Tacy Joffe-Minor, 1992-1997, Assistant Professor, University of Arkansas

Tracy Taylor-Thomas, 1992-1997, Director of Program Management at Cloudability, Portland, OR

Robert Snihur, 1994-2000, Scientific Data Processing programmer, IceCube Particle Astrophysics Center, University of Wisconsin

Geralyn "Sam" Zeller, 1995-2002, Senior Scientist, Fermilab, former Scientific Spokesperson for the MicroBooNE collaboration, Zeller is an APS Fellow and received a 2012 Dept. of Energy CAREER Award and the 2003 APS Tanaka Dissertation Award.

Timothy Andeen, 2004-2008, CERN and d'Alembert Fellow, Associate Professor, University of Texas, Austin, TX

Sahal Yacoob, 2005-2010, Senior Lecturer, University of Cape Town, SA and Project Associate at CERN

Cheryl Patrick, 2010-2016, Springer Dissertation Award, STFC Ernest Rutherford Fellow, University of Edinburgh, UK, Scientific Spokesperson for the SuperNEMO Collaboration

Four Doctoral Students Supervised at Oregon State

Amit Bashyal, 2015-2021, Postdoc, Argonne National Laboratory

Jacob Capps, 2019-2022, Academy Professor, West Point

Sean Gilligan, 2018-present MS(2021)

Noah Vaughan, 2019-present, MS(2021)

Eight Postdoctoral Fellows Supervised at Northwestern

Iain Bertram, 1997-2000, Professor of Physics, University of Lancaster, UK

Lucyna de Barbaro, 1998-2001, Conservation Consultants, Pittsburgh, PA

Harald Fox, 2000-2004, Senior Lecturer, University of Lancaster, UK

Gregory Davis, 2004-2005, Senior Research Analysis,TENICA Global Solutions, Washington, DC

Jonathan Hays, 2005-2007, Professor of Physics, Queen Mary University, London, UK

Michael Kirby, 2007-2010, Scientist, Brookhaven National Lab.

Laura Fields, 2011-2015, Associate Professor, University of Notre Dame, Spokesperson for the MINERvA experiment. Universities Research Association Early Career Scientist Award and Dept. of Energy CAREER award

Leah Welty-Rieger, 2012-2014, GEANT4 Consultant, Chicago Area

Three Postdoctoral Fellows Supervised at Oregon State

Mateus Carneiro, 2016-2019, now staff at Brookhaven National Lab.

Jacob Calcutt, 2021-2024, now postdoc at Brookhaven National Lab.

Ethan Muldoon, 2024-present

Professional Biography

Research

Heidi Schellman's research focuses on the interface between electroweak and strong interaction physics and on large scale computing in support of high energy physics experiments. Her University of California dissertation was on meson production in e^+e^- collisions at the Mark II detector. Her tracking and simulation expertise played an important role in the first measurement of the B meson lifetime [1] for which Nigel Lockyer and John Jaros later received the Panofsky Prize. After three years at the University of Chicago as a member of the CCFR neutrino scattering experiment, studying neutrino interactions at energies of up to 500 GeV, she joined the E665 muon scattering experiment as a Fermilab Wilson Fellow. On E665 she led an effort to build a precision vertex drift chamber capable of running in a high-intensity muon beam. This new detector led to a factor of five improvement in the angular and momentum resolution of the E665 experiment and led to precision measurements of the proton and deuteron structure functions at very low scattering angles [2]. She was elected scientific spokesperson for the E665 collaboration in 1991 and served until the collaboration disbanded in the late 1990's.

She joined the faculty of the Department of Physics and Astronomy at Northwestern University in 1990 and, at the same time, the D0 proton-antiproton collider experiment at Fermilab. Her main research interest on D0 was the measurement of QCD and electroweak parameters at very high momentum transfer and their relation to lower energy measurements. Her technical contributions were development of the batch processing systems which allowed fast and fully reproducible processing of data for the top quark discovery [3] and the SAM data access system which is, after almost 25 years, still in use by most Fermilab experiments. Her work on D0 and on the E665 experiment was supported by a Department of Energy Outstanding Young Investigator Award and a Sloan Foundation Research Fellowship.

She rejoined the NuTeV/CCFR collaboration in 1995 in order to measure electroweak parameters with neutrino beams. Graduate student Geralyn Zeller received the Tanaka Dissertation prize in 2003 for her doctoral work on the Weinberg Angle under Schellman's supervision [5]. Among Schellman's technical contributions to NuTeV was the translation of the CCFR pattern recognition code from FORTRAN to C and the introduction of modern batch processing methods.

She served as QCD Analysis convener for the D0 collaboration from 1996 to 1998, as the D0 Software and Computing Coordinator in 2000-2001, as D0 luminosity convener from 2002-2004, as Institutional board Chair in 2007-2008 and as Electroweak Physics group convener from 2007-2009. Her D0 work culminated in a 0.03% measurement of the mass of the W boson [6] with Northwestern students Sahal Yacoob and Tim Andeen and a precision measurement of the Weinberg angle via parity violation in Z boson production and decay [7] with USTC student Hang Yin.

Schellman is currently a member of the MINERvA and DUNE neutrino collaborations. On

MINERvA her research group has led the study of quasi-elastic neutrino and anti-neutrino scattering [8, 9, 11]. On DUNE her main effort has been leadership of the international computing effort [13] which brings together the computing resources of nine nations to simulate, process and analyze data from the protoDUNE and DUNE experiments.In mid-2024 she stepped down from this position and took on co-leadership of the training group. She was replaced by former Michael Kirby, now senior staff at Brookhaven National Lab.

Service to the Field

Schellman has served as consultant on technical issues related to high energy physics and computing for the U.S. Department of Energy. She has served on major advisory panels for the NSF/DOE (High Energy Physics Advisory Panel (twice) and the Neutrino Scientific Advisory Group), two US national laboratories (Fermilab, Jefferson Lab) and for CERN in Switzerland. At Fermilab, she co-led the first study for a Neutrino Factory [4] with Dr. Steve Geer. She served on the Board of Directors for the Fermi Research Alliance, the organization that manages Fermilab from 2005-2012.

She served as Secretary, Vice-Chair and Chair of the International Union for Pure and Applied Physics' Commission for Particle Physics (C11). In that role she helped organize the major conferences for the field and the bi-annual Early Career Scientist prize. One major initiative has been increasing inclusion in major conferences by monitoring the demographics of organizers, speakers and participants, making provision of child-care information a component of the bid process for conferences and supporting scientists in developing countries through remote participation and encouraging siting of major conferences in Africa and South America. In her role as Chair of IUPAP C11 she recently convened and participated in the Neutrino Panel, an international group of distinguished scientists who have produced a general overview of the field of neutrino physics[12]. She was recently elected to the Chair line for the APS Division of Particles and Fields Executive Committee which represents the field of Particle Physics within the American Physical Society. In this role her responsibilities include organization of the DPF conferences, notably the 40 sessions covering high energy physics at the APS April meeting. In 2025 she will be the Chair of the DPF executive committee.

Teaching

At Northwestern, she taught both undergraduate and graduate students and originated four courses, including "Computational Physics": a data analysis and programming course for sophomores intended to retain students in the major and to prepare students for research in their junior and senior years, "Extra Dimensions": an introduction to modern physics and astronomy for general students, and a new course on Research Conduct which she has continued at Oregon State. In 2013 she teamed with a professor of German and a professor of Electrical Engineering to develop a Humanities course "Einstein in the 20th Century" for non-scientists. At Oregon State she revived

the Particle Physics course PH495/595 which had not been taught for many years.

Contributions to Diversity

Her major contribution to diversity in Physics has come through a recognition that differences in prior preparation and life experience do not need to lead to inequality in outcomes. She has used of her influence as a mentor and administrator to put in place policies that reduce barriers to access. One example is her success recruiting and supporting students and postdocs who have had substantial breaks in their scientific careers due to military service, child-rearing or time working in the private sector. Returning students often struggle to be admitted and take time to readjust to academia. But in the long run they can use their superior maturity and experience to excel. After seeing a mature returning student initially struggle with written exams at Northwestern, Schellman initiated a "Qualifying Boot Camp": a course for all beginning graduate students that provided both peer encouragement and rigorous preparation for the Departmental Qualifying exam. That first student went on to earn the dissertation award in her field and is on the faculty at IIT. Another former student came back to Physics after ten years in the software industry and now leads a major nuclear physics experiment in the UK. At Oregon State Schellman recruited and supervised a Black officer who was on an Army sponsored 3-year program to get a PhD in Physics after combat service in Afghanistan and Iraq. Despite COVID lockdowns, which forced a redirection of his project to simulation as well as lab experimentation, his maturity and discipline allowed him to complete his dissertation in three years and take a faculty position at West Point.

Schellman has also led freshman seminars for students at both Northwestern and Oregon State, keeping in touch with many of her students for years after they graduate. As an administrator, educator and researcher she continues to work with students to overcome the barriers that stand in the way of success.

Administration

She served as Associate Dean for Research in the Weinberg College of Arts and Sciences from 2004-2007 and then as Chair of the Department of Physics and Astronomy at Northwestern from 2010-2014. As Associate Dean, she was able to reconfigure graduate funding packages to increase guaranteed support for graduate students in the Humanities and Social Sciences from four to five years. High points included assisting in the formation of the doctoral program in African American Studies and the revitalization of the graduate program in Spanish and Portuguese to emphasize Latin American culture. One of her major projects as Chair was improvements in support for students in the Introductory Physics courses, through the introduction of smaller course sections and drop-in tutoring.

She moved to Oregon State University in January 2015 as Head of the Department of Physics. As Head she increased the outreach activities of the Department (including the launch of the successful Astronomy Club) and encouraged initiatives to recruit and retain students across the

Physics curriculum. This includes expansion of peer instruction in introductory courses, a redesign of the sophomore major courses, support for the thriving Society for Physics Students and Physicists for Inclusion in Science and increased support for professional development of the non-tenured instructional staff. Most recently the Department has reformed the graduate program to make it less stressful and more inclusive by adding support in the first year and eliminating the high stakes comprehensive exam. Her main role in the Department was finding resources and championing the creative initiatives of faculty and students.

During her time as Head at OSU, competitive research awards increased by more than a factor of two to $2.7M (not counting the Physics Frontier Center award that arrived in 2021). She stepped down as Head in July 2021 to resume her teaching and research.

Selected Papers

[1] N. Lockyer *et al.* "Measurement of the Lifetime of Bottom Hadrons," Phys. Rev. Lett. **51**, 1316 (1983) doi:10.1103/PhysRevLett.51.1316 350 citations. Schellman wrote the tracking codes and developed the beam position monitors used in this work.

[2] M. R. Adams *et al.* [E665], "Proton and deuteron structure functions in muon scattering at 470-GeV," Phys. Rev. D **54**, 3006-3056 (1996) doi:10.1103/PhysRevD.54.3006 396 citations, Schellman led the experiment, developed the high precisions tracking systems and co-supervised the primary author, Ashutosh Kotwal.

[3] S. Abachi *et al.* [D0], "Observation of the top quark," Phys. Rev. Lett. **74**, 2632-2637 (1995) doi:10.1103/PhysRevLett.74.2632 [arXiv:hep-ex/9503003 [hep-ex]]. 3,534 citations. Schellman designed and led the offline data processing systems that performed the reconstruction and simulation used in this result.

[4] C. Albright, *et al.* "Physics at a neutrino factory," [arXiv:hep-ex/0008064 [hep-ex]]. 405 citations. Schellman co-led the study with Steve Geer of Fermilab.

[5] G. P. Zeller *et al.* [NuTeV], "A Precise Determination of Electroweak Parameters in Neutrino Nucleon Scattering," Phys. Rev. Lett. **88**, 091802 (2002) [erratum: Phys. Rev. Lett. **90**, 239902 (2003)] doi:10.1103/PhysRevLett.88.091802 [arXiv:hep-ex/0110059 [hep-ex]]. 860 citations. Dissertation project of doctoral student G. "Sam" Zeller.

[6] V. M. Abazov *et al.* [D0], "Measurement of the W Boson Mass with the D0 Detector," Phys. Rev. Lett. **108**, 151804 (2012) doi:10.1103/PhysRevLett.108.151804 [arXiv:1203.0293 [hep-ex]]. 198 citations. Dissertation project of students S. Yacoob and T. Andeen.

[7] V. M. Abazov *et al.* [D0], "Measurement of $\sin^2\theta^{\ell}_{\rm eff}$ and Z-light quark couplings using the forward-backward charge asymmetry in $p\bar{p} \to Z/\gamma^* \to e^+e^-$ events with $\mathcal{L} = 5.0$ fb^{-1} at $\sqrt{s} =$ 1.96 TeV," Phys. Rev. D **84**, 012007 (2011) doi:10.1103/PhysRevD.84.012007 [arXiv:1104.4590 [hep-ex]]. 87 citations. Paper co-authored with with Hang Yin (USTC) and Jadranka Sekaric (University of Kansas).

[8] L. Fields *et al.* [MINERvA], "Measurement of Muon Antineutrino Quasielastic Scattering on a Hydrocarbon Target at E$\nu\sim$3.5 GeV," Phys. Rev. Lett. **111**, no.2, 022501 (2013) doi:10.1103/PhysRevLett.111.022501 [arXiv:1305.2234 [hep-ex]]. 236 citations. Paper with postdoc Laura Fields.

[9] C. E. Patrick *et al.* [MINERvA], "Measurement of the Muon Antineutrino Double-Differential Cross Section for Quasielastic-like Scattering on Hydrocarbon at $E_\nu \sim 3.5$GeV," Phys. Rev. D **97**, no.5, 052002 (2018) doi:10.1103/PhysRevD.97.052002 [arXiv:1801.01197 [hep-ex]]. 61 citations. Paper with student Cheryl Patrick.

[10] M. F. Carneiro *et al.* [MINERvA], "High-Statistics Measurement of Neutrino Quasielastic-like Scattering at 6 GeV on a Hydrocarbon Target," Phys. Rev. Lett. **124**, no.12, 121801 (2020) doi:10.1103/PhysRevLett.124.121801 [arXiv:1912.09890 [hep-ex]]. 41 citations. Paper with postdoc Mateus Carneiro.

[11] A. Bashyal *et al.* [MINERvA], "Use of Neutrino Scattering Events with Low Hadronic Recoil to Inform Neutrino Flux and Detector Energy Scale," JINST **16**, P08068 (2021) doi:10.1088/1748-0221/16/08/P08068 [arXiv:2104.05769 [hep-ex]]. 17 citations. Paper with student Amit Bashyal.

[12] M. Sajjad Athar, S. W. Barwick, T. Brunner, J. Cao, M. Danilov, K. Inoue, T. Kajita, M. Kowalski, M. Lindner and K. R. Long, *et al.* "Status and perspectives of neutrino physics: Report of the IUPAP Neutrino Panel" Prog. Part. Nucl. Phys. **124**, 103947 (2022) doi:10.1016/j.ppnp.2022.103947 [arXiv:2111.07586 [hep-ph]]. 85 citations. Convened the IUPAP Neutrino Panel and wrote the sections on accelerators and neutrino cross sections.

[13] A. Abed Abud *et al.* [DUNE], "DUNE Offline Computing Conceptual Design Report," [arXiv:2210.15665 [physics.data-an]. 9 citations. Schellman served as project leader and lead editor for this report.

[14] B. Abi *et al.* [DUNE], "First results on ProtoDUNE-SP liquid argon time projection chamber performance from a beam test at the CERN Neutrino Platform," JINST **15**, no.12, P12004 (2020) doi:10.1088/1748-0221/15/12/P12004 [arXiv:2007.06722 [physics.ins-det]]. 160 citations. Schellman led the design of the offline data processing systems used for this experiment.

[15] A. Bashyal *et al.* [MINERvA], "High-Statistics Measurement of Antineutrino Quasielastic-like scattering at $E_\nu \sim 6$˜GeV on a Hydrocarbon Target," Phys. Rev. D **108**, no.3, 032018 (2023) doi:doi:10.1103/PhysRevD.108.032018 [arXiv:2211.10402 [hep-ex]]. 7 citations. Paper with student Amit Bashyal

[16] S. Hageboeck, A. Reinsvold Hall, N. Skidmore, G. A. Stewart, G. Benelli, B. Carlson, C. David, J. Davies, W. Deconinck and D. DeMuth, *et al.* "Training and Onboarding initiatives in High Energy Physics experiments," [arXiv:2310.07342 [hep-ex]]. 3 citations. Joint paper with international training group for the field.