

# Sarah M. Cousineau

Section Head: Accelerator Science and Technology, Spallation Neutron Source

Spallation Neutron Source  
PO Box 2008, MS 6461  
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Phone: +1 865 406 0294  
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## Current Job Responsibilities:

- Lead the Accelerator Science and Technology section at the Spallation Neutron Source (SNS) accelerator:
  - Lead the production, measurement, understanding and analysis of the SNS 1.4 MW H<sup>-</sup> linac and ring proton beams
  - Define and oversee a robust R&D program targeted at high intensity, high power beams
  - Define and oversee an effective mechanical engineering design program that supports both beam operations and accelerator R&D
  - Manage the beam study program aimed at identifying, understanding, and mitigating accelerator performance limitations
  - Guide and facilitate strategic plans for accelerator performance improvements, and software tools for efficient modeling and analysis of the beam
  - Manage the section budget of \$10M
  - Serve as principal investigator in DOE or NSF supported project
  - Provide professional development opportunities for staff
  - Promote a strong culture of safety in all activities
  - Participate in outreach and professional community service roles
- Serve as the ORNL Subject Matter Expert (SME) for Accelerator Science and Technology
- Serve as Adjunct Professor in the Department of Physics and Astronomy at the University of Tennessee
  - Recruit and advise graduate students
  - Serve on graduate student committees

## Education:

- 2003 Ph.D. (Accelerator Physics), Indiana University
- 2000 M.S. (Accelerator Physics), Indiana University
- 1998 B.S. (Physics, *summa cum laude*), University of North Dakota

## Research Interests:

- Collective effects in high intensity beams, space charge and instabilities
- Novel injection methods for proton drivers
- Laser and ion beam interactions
- Code development and simulation of high intensity beams
- Novel beam diagnostics and measurement techniques
- High power beam collimation

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- High current and duty factor H- ion sources

### Professional Experience:

07/2020 – present	Section Head, Accelerator Science and Technology
01/2016 – 07/2020	Group Leader, Beam Science and Technology group, Spallation Neutron Source
02/2012 – 07/2020	Joint Faculty Professor, Department of Physics and Astronomy, University of Tennessee
08/2018 – 04/2020	Second Target Station Accelerator Systems Group Leader (WBS2)
01/2005 – 03/2016	R&D Staff, Accelerator Physics Group, Spallation Neutron Source
01/2003 – 01/2005	Postdoctoral Scientist, Accelerator Physics Group, Spallation Neutron Source
05/1999 – 02/2003	Graduate Research Associate, Indiana University Cyclotron Facility <i>(Thesis: Understanding Space Charge and Controlling Beam Loss in High Intensity Synchrotrons)</i>
08/1998 – 05/1999	Graduate Associate Instructor Department of Physics, Indiana University
08/1996 – 08/1998	Research Assistant, Department of Physics, University of North Dakota <i>(Optical and X-ray Analysis of Isolated Galaxy Pairs)</i>
06/1997 – 08/1997	Research Assistant, Department of Space Sciences, Cornell University
08/1995 – 06/ 1998	Teaching Assistant, Physics and Astronomy University of North Dakota

### Honors, Distinctions and Awards:

- Fellow, American Physical Society
- Keynote Speaker, 2018 Tennessee Science Bowl
- ORNL Significant Event Award for “Demonstration of Microsecond H- Laser-Assisted Stripping,” 2017
- Recipient of 2015 ORNL Annual Mentor of Student Research Award
- Mentor Excellence Award, U.S. Department of Energy Office of Science Undergraduate Research Activities, 2003 and 2008

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- Women in Science Fellowship Recipient, 1998 – 2002
- Indiana University Department of Physics Teaching Excellence Recognition Award, 1999

### Reviews:

- Internal Review Committee, ORNL AI LDRD program (2021 – 2022)
- DOE Early Career Award Internal Review, Nuclear Physics (2022)
- Co-Chair, Conceptual Design Review of the Electron Ion Collider (2020)
- DOE Science and Technology Review for the Facility for Rare Isotope Beams (2021)
- Technical Advisory Committee, SNS Second Target Station project, (2020-2025)
- Management Advisory Committee, PIP-II Project (2017 – 2022)
- Thomas Jefferson National Accelerator Laboratory Biennial S&T Review (2020)
- Chair, Physical Review Accelerator Beams (PRAB) journal review (2019)
- Thomas Jefferson National Accelerator Laboratory Facility Operation Review (2018)
- Thomas Jefferson National Accelerator Laboratory Biennial S&T Review (2017)
- Internal and External Reviewer, NSF Comparative Review Panel (intermittently)

### Grants:

- “Machine Learning for Improving Accelerator and Target Performance,” DOE BES 2020-2022
- “Laser Stripping for High Intensity Synchrotrons,” DOE HEP, 2016-2018
- “Six-Dimensional Experimental Characterization of High Intensity Hadron Beams in Front End Systems,” NSF, 2015-2018
- “Laser Stripping for High Intensity Synchrotrons,” DOE HEP, 2013-2016

### Professional Service Activities:

Present	Past-Chair, APS Division of Physics of Beam
2021	Chair, APS Division of Physics of Beam
2020	Chair-Elect, APS Division of Physics of Beams
2019	Vice-Chair, APS Division of Physics of Beams

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2018	Scientific Program Coordinating Committee, North American Particle Accelerator Conference 2019
2017 – present	International Organizing Committee, ICFA High Intensity High Brightness Hadron Beam Workshop Series
2016 – present	Advisory Council Member, U.S. Particle Accelerator School (USPAS)
2015 – present	Chair, USPAS Curriculum Committee
2016 – present	IPAC Student Scholarship Award Committee
2015 – 2018	APS DPB Education and Outreach Committee
2012 – 2018	International Organizing Committee, International Computational Accelerator Physics Conference (ICAP)
2004 – present	Instructor, “Fundamentals of Accelerator Physics” U.S. Particle Accelerator School (2007, 2011, 2014, 2017, 2019, 2021)
2017, 2018, 2019	IPAC Student Travel Award Committee
2015 – 2021	IPAC Scientific Advisory Board
2013 – 2016	Editorial Board Member, Physical Review Accelerators and Beams (PRAB)
2015	USPAS Prize Committee
2010 – 2013	Member At Large, Executive Committee, American Physical Society Division of Physics and Beams
2006 - present	Member, American Physical Society Division of Beams

### **Other Service and Outreach Activities:**

2021 – present	Coordinator, Editorial Board for ORNL Review Research Insights
2018	2018 Tennessee Science Bowl Keynote Speaker
2016 – 2018	Organizing Committee, Women in Neutron Sciences (WINS), ORNL
2017	MCIDS STEM High School 2017 Annual Harbison Lecturer
2009 - 2010	Instructor, “SNS to the Classroom,” an ORISE workshop high school teachers
2007 – 2008	Vice-President, Committee for Women, ORNL
2005 – 2008	Member, Committee for Women, ORNL
2006 - 2009	Annual Tennessee High School Science Bowl volunteer

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2006 - 2009                      Annual ORNL Day of Science student panel chair  
2005                                "Einstein in the City" high school science fair organizer,  
2005 Particle Accelerator Conference

### Selected Invited Talks:

- "Research Challenges at the World's Highest Power Proton Accelerator," Physics Department Colloquium, Illinois Institute of Technology, 2021.
- "Accelerator R&D as a Driver for Science", Opening Plenary, International Particle Accelerator Conference 2020
- "The World's Largest Scientific Tools," Keynote Opening Seminar, 2018 Tennessee Science Bowl
- "A Hitchhikers Guide to Accelerators and Life as an Accelerator Physicist," Annual Harbison Lecture, MICDS (St. Louis, 2017)
- "Laser Stripping: A Novel Method for Achieving High Density Beams in Future Accelerators," Opening Plenary, Southeast Conference for Undergraduate Women in Physics (Norfolk, 2016)
- "High Power Proton Facilities: Operational Experience, Challenges, and the Future," Closing Plenary, International Particle Accelerator Conference (Richmond, 2015)
- "The Spallation Neutron Source: A Hitchhikers' Guide," Colloquium, (University of Kentucky, 2015)
- "Preparations for a 10 $\mu$ s Laser Stripping Demonstration," Invited, 2014 International Particle Accelerator Conference (Dresden, 2014)
- "Benchmark of Space Charge Simulations and Comparison with Experimental Results for High Intensity, Low Energy Accelerators," Invited, Particle Accelerator Conference (Knoxville, 2005)

### Refereed Journal Publications:

1. M. Radaideh, L. Lin, H. Jiang, **S. Cousineau**, *Bayesian Inverse Uncertainty Quantification of the Physical Model Parameters for the Spallation Neutron Source First Target Station*, Results in Physics **36**, 105414, (2022)
2. J. Wong, A. Aleksandrov, **S. Cousineau**, T. Gorlov, Y. Liu, *Laser-assisted charge exchange as an atomic yardstick for proton beam energy measurement and phase probe calibration*, Phys. Rev. Accel. Beams **24**, 032801 (2021)
3. A. Aleksandrov, **S. Cousineau**, K. Ruisard, A. Zhukov, *First measurement of a 2.5 MeV RFQ output emittance with 1 part-per-million dynamic range*, Nucl. Instr. and Methods A, **987**,164829 (2020)

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4. K. Ruisard, A. Aleksandrov, **S. Cousineau**, A. Shishlo, V. Tzoganis, *High dimensional characterization of the longitudinal phase space formed in a radio frequency quadrupole*, Phys. Rev. Accel. Beams **23**, 124201 (2020)
5. M. Stockli *et al*, *Upgrading the LANSCE Accelerator with a SNS RF-driven H-Ion Source*, Review of Scientific Instruments **91**, 013321 (2020)
6. T. Gorlov, A. Alexander, **S. Cousineau**, Y. Liu, A. Rakhman, A. Shishlo, *Sequential Resonance Excitation for Laser Stripping for a H- Beam*, Phys. Rev. Accel. Beams **22**, 121601 (2019)
7. Z. Zhang, **S. Cousineau**, A. Aleksandrov, A. Menshov, A. Zhukov, *Design and Commissioning of the Beam Test Facility at the Spallation Neutron Source*, Nucl. Instr. and Methods A, **949**, 162826, (2019)
8. J. Holmes, **S. Cousineau**, N. Evans, T. Gorlov, and M. Plum, *Feasibility Study for Painting a Self-Consistent Beam into the Spallation Neutron Source Accumulator Ring*, Phys. Rev. Accel. Beams, Phys. Rev. Accel. Beams **21**, 124403 (2018)
9. B. Cathey, **S. Cousineau**, A. Aleksandrov, A. Zhukov, *First Six Dimensional Phase Space Measurement of an Accelerator Beam*, Phys. Rev. Lett., **121**, 064804 (2018)
10. **S. Cousineau**, A. Rakhman, M. Kay, A. Aleksandrov, V. Danilov, T. Gorlov, Y. Liu, C. Long, A. Menshov, M. Plum, A. Shishlo, A. Webster, and D. Johnson, *High efficiency laser-assisted H- charge exchange for microsecond duration beams*, Phys. Rev. Accel. Beams, **20**, 120401 (2017)
11. **S. Cousineau**, A. Rakhman, M., A. Aleksandrov, V. Danilov, T. Gorlov, Y. Liu, M. Plum, A. Shishlo, and D. Johnson, *First Demonstration of Laser-Assisted Charge Exchange for Microsecond Duration H Beams*, Phys. Rev. Lett., **118**, 078401 (2017)
12. Y. Liu, A. Rakhman, A. Menshov, A. Webster, T. Gorlov, A. Aleksandrov, and **S. Cousineau**, *Laser and Optical System for Laser Assisted Hydrogen Ion Beam Stripping at SNS*, Nuclear Instruments and Methods A, 857, p 171 (2017)
13. S. Henderson *et al*, *The Spallation Neutron Source Accelerator System Design*, NIM A 763 (2014)
14. J.A. Holmes, **S. Cousineau**, V. Danilov, L. Jain, *Comparison Between Measurements, Simulations, and Theoretical Predictions of the Extraction Kicker Transverse Dipole Instability in the Spallation Neutron Source*, Phys. Rev. ST Accel. Beams, **14**, 074401 (2011)
15. **S. Cousineau**, J.A. Holmes, M. A. Plum, W. Lu, *Dynamics of Uncaught Foil-Stripped Electrons in the Spallation Neutron Source Accumulator Ring*, Phys. Rev. ST Accel. Beams, **14**, 064001 (2011).
16. M. Plum, **S. Cousineau**, J. Galambos, S.H. Kim, P. Ladd, C.F. Luck, C.C. Peters, Y. Polsky, R. W. Shaw, R. J. Macek, and D. Raparia, *Stripper Foil Failure Modes*

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- and Cures at the Oak Ridge Spallation Neutron Source*, Phys. Rev. ST Accel. Beams, **14**, 030101 (2011)
17. T. Pelaia and **S. Cousineau**, *A Method for Probing Machine Optics By Constructing Transverse Real Space Beam Distributions Using Beam Position Monitors*, Nucl. Instr. and Methods A, accepted (2008)
  18. D. Jeon, J. Stovall, H. Takeda, S. Nath, J. Billen, L. Young, I. Kisselev, A. Shishlo, A. Aleksandrov, S. Assadi, C.M. Chu, **S. Cousineau**, V. Danilov, J. Galambos, S. Henderson, S. Kim, L. Kravchuk, E. Tanke, *Acceptance Scan Technique for the Drift Tube Linac of the Spallation Neutron Source*, Nucl. Instr. and Methods A, **570** (2), p. 297 (2006)
  19. **S. Cousineau**, *Space Charge and High Intensity Beam Issues in the Design and Commissioning of the Spallation Neutron Source Accelerator*, Nucl. Instr. and Methods A, **561** (2), p. 187 (2007)
  20. **S. Cousineau**, V. Danilov, J. Holmes, R. Macek, *Space-Charge-Sustained Microbunch Structure in the Los Alamos Proton Storage Ring*, Phys. Rev. ST Accel. Beams, **7**, 094201 (2004)
  21. V. Danilov, **S. Cousineau**, J. Holmes, S. Henderson, *Self-Consistent Time Dependent Two Dimensional and Three Dimensional Space Charge Distributions with Linear Force*, Phys. Rev. ST Accel. Beams **6**, 094202 (2003)
  22. **S. Cousineau**, V. Danilov, A. Fedotov, J. Holmes, S.Y. Lee, *Studies of Resonant Beam Behavior in the Proton Storage Ring*, Phys. Rev. ST Accel. Beams **6**, 074202 (2003)
  23. **S. Cousineau**, A. Fedotov, J. Holmes, J. Galambos, R. Macek, J. Wei, *Space Charge Induced Resonance Excitation in High Intensity Rings*, Phys. Rev. ST. Accel. Beams **6**, 034205 (2003)
  24. M. Henriksen and **S. Cousineau**, *An X-ray Survey of Galaxies in Pairs*, Astrophysical Journal **511**, 595 (1999)
  25. **S. Cousineau**, *Constructing a Celestial Calendar Wheel*, The Physics Teacher **37**, 477 (1999)