Niels Vanderloo

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Education

Massachusetts Institute of Technology **Cambridge, MA**
Doctor of Philosophy in Physics Sep 2023 – Present
- **Advisor**: Chikang Li
- Graduating in 2029

Oberlin College **Oberlin, OH**
Bachelor of Arts in Physics and Mathematics Sep 2019 – May 2023
- **Thesis**: "Gas-puff Z-pinch simulations using the FLASH code"
- **Advisors**: Rob Owen, Petros Tzeferacos
- Highest honors in physics

Professional Activities

MIT Plasma Science and Fusion Center **Cambridge, MA**
Graduate Research Assistant Jul 2023 – Present
- Studying ion Weibel instability formed in collisionless experiments on the OMEGA laser
- Studying magnetized shocks in the presence of radiative effects on OMEGA and LULI2000
- Magnetohydrodynamics and kinetic simulations of laser driven experiments

Lawrence Livermore National Laboratory **Livermore, CA**
Graduate Intern (2025, 2026) Jun 2025 – Aug 2026
- Worked in NIF and Photon Science & the HEDS Center
- Kinetic and magnetohydrodynamic simulations of current filaments in experiments on OMEGA

FLASH Center for Computational Science **Rochester, NY**
Undergraduate Intern May 2022 – May 2023
- Simulated a recent gas-puff Z-pinch experiment using FLASH culminating in an undergraduate honors thesis
- Developed extended-magnetohydrodynamic capabilities of FLASH, a publicly available radiation MHD code used by over 4000 scientists worldwide; work released in FLASH 4.7 (2023)

Teaching Experience

Head Instructor – Creative Coding **Oberlin, OH**
Experimental College, Oberlin College 2023
- Designed and taught an original, for-credit, undergraduate course in using programming for visual art

Teaching Assistant – Modern Physics **Oberlin, OH**
Department of Physics and Astronomy, Oberlin College 2022

Grader – Group Theory **Oberlin, OH**
Department of Mathematics, Oberlin College 2022

Publications

★ **N. Vanderloo,** M. Cufari, L. Russell, T.M. Johnson, J. Vargas, B.C Foo B.I. Buschmann, S.G. Dannhoff, A. DeVault, T.E. Evans, J.H. Kunimune, Y. Lawrence, J.A. Pearcy, B.L. Reichelt, C.W. Wink,

M. Gatu Johnson, R.D. Petrasso, J. A. Frenje, C. K. Li, "Image Plate Multi-Scan Response to Fusion Protons in the range of 1-14 MeV" *Review of Scientific Instruments* 95 093536, (2024).

G. D. Sutcliffe, **N. Vanderloo,** C. Bruulsema, V. Valenzuela-Villaseca, G. Swadling, M. Zhou, A. Bret, C. K. Li, J. S. Ross, J. Moody, "Sustained interpenetrating plasma flows for the investigation of late time kinetic instability evolution" *arXiv preprint* arXiv:2605.10773, (2026).

Y. Ijiri, J. A. Borchers, K. L. Krycka, A. Khelil, T. Coulson, S. Siegel, **N. Vanderloo,** S. A. Sabol-Pulling, N. J. Talmor, "Anisotropy-driven magnetic structures in manganese ferrite nanoparticle assemblies" *Physical Review B* 114, 134410, (2026).

T.M. Johnson, B. Lahmann, L. Russell, **N.L. Vanderloo,** M.J. Cufari, B.L. Reichelt, C.W. Chang, A. Birkel, N.V. Kabadi, G.D. Sutcliffe, P.J. Adrian, J.A. Pearcy, J.H. Kunimune, S.G. Dannhoff, T.E. Evans, M. Gatu Johnson, F.H. Séguin, R.D. Petrasso, C.K. Li, J.A. Frenje, "Monte Carlo toolkit for designing and validating step-range-filter spectrometer designs" *Review of Scientific Instruments* 96 2, (2025).

R. Kishimori, M. Cufari, E.Z.L. Zhong-Johnson, B.I. Buschmann, A.J. Sinskey, T.M. Johnson, **N. Vanderloo,** A. DeVault, B.C. Foo, J. Vargas, M. Gatu Johnson, F.H. Séguin, R.D. Petrasso, J.A. Frenje, "Impact of x rays on the sensitivity of CR-39 detectors to 2.4-MeV protons" *Review of Scientific Instruments* 96 7, (2025).

M. Macon, B.I. Buschmann, M. Cufari, S.G. Dannhoff, A. DeVault, T.E. Evans, B.C. Foo, T.M. Johnson, J.H. Kunimune, Y. Lawrence, J.A. Pearcy, B.L. Reichelt, L. Russell, **N. Vanderloo,** J. Vargas, C.W. Wink, M. Gatu Johnson, J.A. Frenje, "Design of an in-vacuum manipulator for nuclear diagnostics development at the MIT linear electrostatic ion accelerator" *Review of Scientific Instruments* 96 8, (2025).

B. Nguyen, Y. Lawrence, C.W. Wink, T.M. Johnson, **N. Vanderloo,** B. Reichelt, A. Hennessy, D.T. Casey, D. Schlossberg, N. Masters, J. Milovich, A. Le, S. Craxton, M. Gatu Johnson, J. Frenje, "Modulated recoil-deuteron spectra observed with the Magnetic Recoil neutron Spectrometer at the National Ignition Facility" *arXiv preprint* arXiv:2509.06999, (2025).

M. Cufari, **N. Vanderloo,** B.I. Buschmann, A. DeVault, B.C. Foo, J. Vargas, S.G. Dannhoff, T.E. Evans, T.M. Johnson, J. Kunimune, Y. Lawrence, J.A. Pearcy, B.L. Reichelt, L. Russell, C.W. Wink, M. Gatu Johnson, R.D. Petrasso, J.A. Frenje, "Characterization of the image plate multi-scan response to mono-energetic x-rays" *Review of Scientific Instruments* 95 093535, (2024).

B.I. Buschmann, M Cufari, **N. Vanderloo,** J. Vargas, B.C. Foo, A. DeVault, S.G. Dannhoff, T.E. Evans, T.M. Johnson, J.H. Kunimune, Y. Lawrence, J.A. Pearcy, B.L. Reichelt, C.W. Wink, L. Russell, M. Gatu Johnson, R.D. Petrasso, J.A. Frenje, "Characterization of the response of radiochromic film to quasi-monoenergetic x rays through a cross-calibration with image plates" *Review of Scientific Instruments* 95 093531, (2024).

L. Russell, T.M. Johnson, Y. Lawrence, B. Reichelt, **N. Vanderloo,** M Cufari, B.I. Buschmann, S. Dannhoff, A. DeVault, E. Doeg, T. Evans, B.C. Foo, R. Frankel, J.H. Kunimune, J.A. Pearcy, J. Vargas, M. Gatu Johnson, J. Frenje, "Quantifying the effects of neutron fluence on proton signal retention in CR-39" *Review of Scientific Instruments* 95 103505, (2024).

T.M. Johnson, J. Shan, R. Kishimori, M.J. Cufari, P.J. Adrian, B. Buschmann, C.W. Chang, S.G. Dannhoff, A. DeVault, T.E. Evans, B. Foo, J.H. Kunimune, Y. Lawrence, J.A. Pearcy, B.L. Reichelt, L. Russell, G.D. Sutcliffe, **N. Vanderloo,** J. Vargas, C. Wink, M. Gatu Johnson, F.H. Séguin, R.D. Petrasso, J.A. Frenje, C.K. Li, "Intrinsic fluence non-uniformity in D3He backlit proton radiography" *Review of Scientific Instruments* 95 093520, (2024).

B. C. Foo, B. I. Buschmann, M. Cufari, S. G. Dannhoff, A. DeVault, T. E. Evans, T. M. Johnson, J. H. Kunimune, Y. Lawrence, J. A. Pearcy, B. L. Reichelt, L. Russell, **N. Vanderloo,** J. Vargas, C. W. Wink, M. Gatu Johnson, F. H. Séguin, R. D. Petrasso, J. A. Frenje, "Errors in the field reconstruction using CR-39 proton radiographs with high fluence variation" *Review of Scientific Instruments* 95 103527, (2024).

Talks, Posters, and Other Work

N. Vanderloo, G.D. Sutcliffe, V. Valenzuela-Villaseca, M. Zhou, C.J. Bruulsema, B.B. Pollock, G.F. Swadling, A. Bret, J.S. Ross, J.D. Moody, C.K. Li, **Poster:** "Evidence of a kink mode in ion Weibel-grown filaments in 3D particle-in-cell simulations" *NIF&PS Summer Scholar Poster Symposium* no. 18, (2026).

N. Vanderloo, E. Edwards, T. E. Evans, Z. Tessema, M. Cufari, S. G. Dannhoff, B. C. Foo, K. F. Bauer, N. N. Keer, B.I. Buschmann, A. J. DeVault, A. Lanzrath, Y. Lawrence, J. Vargas, C. W. Wink, N. R. Schwartz, Shahina, M. Gatu Johnson, C. K. Li, R.D. Petrasso, J. A. Frenje, **Poster:** "Evaluation of the high-performance CR-39 detector produced by Chiyoda Technol Corporation" *26th Topical Conference on High Temperature Plasma Diagnostics* 1.4.23, (2026).

N. Vanderloo, G.D. Sutcliffe, V. Valenzuela Villaseca , M. Zhou, C. Bruulsema, B.B. Pollock, G.F. Swadling , A. Bret, G. Rigon, J.S. Ross, J.D. Moody, and C. K. Li, **Poster:** "Effects of the kink instability on the inverse cascade problem in HED experiments and astrophysics" *NIF and JLF User Group Meeting* W-21, (2026).

N. Vanderloo, G.D. Sutcliffe, G.F. Swadling, C.J. Bruulsema, B.B. Pollock, M. Zhou, V. Valenzuela-Villaseca, A. Bret, J.S. Ross, J.D. Moody, C.K. Li, **Contributed Talk:** "Investigation of the ion Weibel instability : kinetic simulations in support of a laser-driven experiment on OMEGA" *67th APS Division of Plasma Physics Meeting* PV14. 07, (2025).

N. Vanderloo, G.D. Sutcliffe, G.F. Swadling, C.J. Bruulsema, B.B. Pollock, M. Zhou, V. Valenzuela-Villaseca, A. Bret, J.S. Ross, J.D. Moody, C.K. Li, **Poster:** "Nonlinear evolution of the filamentation instability : particle-in-cell simulations of laser driven experiments" *NIF&PS Summer Scholar Poster Symposium* no. 15, (2025).

N. Vanderloo, G.D. Sutcliffe, G. Swadling, C. Bruulsema, B. Pollock, M. Zhou, J.S. Ross, J. Moody, C.K. Li, **Poster:** "Ion Weibel filaments : hybrid kinetic simulations in support of laser-driven experiments at OMEGA" *NIF and JLF User Group Meeting* W-36, (2025).

N. Vanderloo, G.D. Sutcliffe, G. Swadling, C. Bruulsema, B. Pollock, M. Zhou, J.S. Ross, J. Moody, C.K. Li, **Poster:** "Investigation of the ion Weibel instability-hybrid kinetic simulations in support of laser-driven experiments at OMEGA" *66th APS Division of Plasma Physics Meeting* BP12. 00144, (2024).

N. Vanderloo, M. Cufari, L. Russell, T.M. Johnson, J. Vargas, B.C. Foo, B.I. Buschmann, S.G. Dannhoff, A. DeVault, T.E. Evans, J.H. Kunimune, Y. Lawrence, J.A. Pearcy, B.L. Reichelt, C.W. Wink, M. Gatu Johnson, R.D. Petrasso, J. A. Frenje, C. K. Li, **Poster:** "Characterization of image plate response to mono-energetic protons" *25th Topical Conference on High Temperature Plasma Diagnostics* 3.2.42, (2024).

N. Vanderloo, M. Cufari, L. Russell, T.M. Johnson, J. Vargas, B.C. Foo, B.I. Buschmann, S.G. Dannhoff, A. DeVault, T.E. Evans, J.H. Kunimune, Y. Lawrence, J.A. Pearcy, B.L. Reichelt, C.W. Wink, M. Gatu Johnson, R.D. Petrasso, J. A. Frenje, C. K. Li, **Poster:** "Characterization of image plate response to mono-energetic protons" *15th Annual OMEGA Laser User Group Meeting* 3.2.42, (2024).

N. Vanderloo, G.D. Sutcliffe, **Invited Talk:** "The Weibel Instability and Astrophysical Shocks in the Lab" *Plasma Science and Fusion Center Showcase*, (2024).

N. Vanderloo. **Thesis:** "Gas-puff Z-Pinch Simulations Using the FLASH Code" *Oberlin College Honors Papers*, (2023).

Service

- **Steering Committee Member**: PSFC DEIA Working Group
- **Member**: MIT Physics Values Committee
- **Member**: Physics Graduate Student Council

Skills

- **Simulations**: EPOCH, OSIRIS, VPIC, FLASH
- **Programming**: Python, Fortran, C/C++, Javascript, Typescript, LaTeX
- **Tools**: High Performance Computing, VisIt, Git, Mathematica

Awards

LLF HEDS Fellowship — *Livermore Lab Foundation* 2025

Sigma Xi Honor Society 2023 – Present

Robert Weinstock Prize — *Oberlin College Department of Physics* 2022

Richard W. Bell '39 Scholarship — *Oberlin College Department of Physics* 2022