

Cameron Guy Robinson Geddes

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Education and Awards

Ph.D., Physics, University of California Berkeley, Berkeley CA, Spring 2005.

BA, Swarthmore College, Swarthmore PA, Spring 1997. High honors, Physics major, Polisci minor.

Honors and Fellowships

- Outstanding Performance Award, LBNL, 2005 and 2007.
- Am. Phys. Soc. Rosenbluth award for outstanding doctoral dissertation, 2006.
- Hertz Thesis prize for outstanding doctoral dissertation, 2005.
- Hertz Foundation Fellowship, 2000-2004.
- DoD NDSEG fellowship, 1999.
- Fellowships won but not accepted due to conflicts: DoE Fusion Energy Sciences, Princeton/Hertz, UC Dept. of Physics, MIT Compton, NSF honorable mention, 1999.
- Am. Phys. Soc. Apker award for best undergraduate thesis in physics, 1997.
- Elmore prize for outstanding work in physics at Swarthmore, 1997.
- Phi Beta Kappa, national honors society, 1997.
- DOE National Undergraduate Fellowship in Plasma Physics, 1995.
- Associate Member, Sigma Xi scientific research honors society, 1994.

Research Experience

- Staff physicist, LOASIS program, LBNL (8/08-Current; Research physicist 4/05-0/08). Experiments and simulations on controlled injection and guiding optimization for reproducible electron bunches from laser wakefield accelerators. Recent experiments demonstrated use of plasma gradient controlled trapping to stabilize beams and reduce energy spread. Obtained and executed INCITE and ATLAS grants for Mhour scale simulations, allowing realistic one to one 3D modeling, feedback to experiments including depletion analysis, and design of next generation multi -GeV stages. Recruited and supervised student projects on simulation analysis and interferometry, coordinated collaboration simulation activities, worked on THz radiation experiments. Supervisor: Wim Leemans.
- Ph.D. Student, LOASIS program, LBNL (6/00-3/05). Configured laser to pre-form and shape a target plasma (channel), allowing guiding of relativistically intense laser pulses for the first time. This produced the first high quality electron beams (10^9 electrons in percent energy spread) from a high gradient laser wakefield accelerator. Conducted particle-in-cell simulations showing physics behind production of high quality electron beams. Characterized acceleration with various gas jets and laser pulse shapes, and with plasma pre-ionization. Designed and built gas jet targets and a characterization interferometer with software. Developed a network PC control system for remote operation of the experiment and analysis software. Supervisor: Wim Leemans.
- Physicist, plasma group, LLNL (11/97 - 8/99). Constructed and used a Thomson scatter imaging system which measured ion waves from Brillouin scattering of lasers used in inertial confinement fusion, as well as products of wave decays which may limit Raman scattering. Built two backscattered light diagnostics for the Omega laser and used them for crossed-beam and hohlraum plasma experiments (see below). Built an interferometry system to metrologize cryogenic ICF targets. Supervisor: Peter Young.
- Physicist Contractor, Polymath Research (9/99 - 5/00). Analyzed crossed-beam experiments using backscatter diagnostics I developed at LLNL. Wrote data analysis and processing codes. Supervisor: Bedros Afeyan.
- B.A. thesis research, Swarthmore College (6/96-6/97). Built and used arrays of magnetic probes, including a precision calibration system, to study equilibrium states of spheromak plasmas and compare them to modeling. Wrote a grad Shafranov solver and fit code to compare modeling with experiments, as well as a code to infer current and pressure profiles from magnetic data. Supervisor: Michael Brown.
- Assoc. Scientist, LBNL (9/95-12/95). Modeled charge transport in silicon microstrip detectors, showing response to particle parameters, geometry, radiation damage, and magnetic field. Supervisor: James Siegrist.
- Research assistant, U of Wisconsin/PPPL (6/95-9/95). Built triple Langmuir probe and other diagnostics of plasma performance, and control systems, for the MEDUSA low-aspect Tokamak. Supervisor: Ray Fonck.
- Research assistant, Swarthmore College (6/93-6/95). Characterized output of Erbium doped fibers and leaky slab waveguides. Built temperature controller and instrument control software. Supervisor: Lynne Molter.

Teaching and Other Experience

- Mentoring and supervision of student projects in laboratory and simulation research settings.
- TA for honors intro. Electricity & Magnetism (Fall 00), mechanics lab (Fall 96), problem sessions (Spring 96)
- Programming: C, LabVIEW, IDL, MATLAB, BASIC, AVS, MEDICI, Lisp, Mathematica; Mac/Win/UNIX.

Selected Papers

Full listing at <http://geddes.lbl.gov/>

- C.G.R. Geddes, K. Nakamura, G.R. Plateau, Cs. Toth, E. Cormier-Michel, E. Esarey, C.B. Schroeder, J.R. Cary, and W.P. Leemans, "Stable low momentum spread electron bunches from plasma density gradient injection," L V 100, 215004 (2008).
- C. G. R. Geddes, D. Bruhwiler, J. R. Cary, E. Cormier-Michel, E. Esarey, C. B. Schroeder, W. A. Isaacs, N. Stinus, P. Messmer, A. Hakim, K. Nakamura, A. J. Gonsalves, D. Panasencko, G. R. Plateau, Cs. Toth, B. Nagler, J. van Tilborg, T. Cowan, S. M. Hooker and W. P. Leemans, "Laser wakefield simulations towards development of compact particle accelerators," J. Phys. Conf. Series V 78 pg 12021/1-5 (2007).
- C. G. R. Geddes, Cs. Toth, J. van Tilborg, E. Esarey, C. B. Schroeder, J. Cary, W. P. Leemans, "Guiding of Relativistic Laser Pulses by Preformed Plasma Channels," Phys. Rev. Lett., vol. 95 no. 14, 2005, pp 145002-1 to 4.
- C. G. R. Geddes, Cs. Toth, J. van Tilborg, E. Esarey, C. B. Schroeder, D. Bruhwiler, C. Nieter, J. Cary, W. P. Leemans, "Production of high quality electron bunches by dephasing and beam loading in channeled and unchanneled laser plasma accelerators," Physics of Plasmas, vol. 12, 2005, pp 056709-1 to 10.
- C. G. R. Geddes, Cs. Toth, J. van Tilborg, E. Esarey, C. B. Schroeder, D. Bruhwiler, C. Nieter, J. Cary, W. P. Leemans, "High-quality electron beams from a laser wakefield accelerator using plasma-channel guiding," Nature, Sept 30 2004, pp. 538-41.
- C.G.R. Geddes, P.E. Catravas, J. Faure, C. Toth, J. VanTilborg, W.P. Leemans, "Accelerator optimization using a network control and acquisition system," AIP Conference Proceedings, no.647- Advanced Accelerator Conference, 2002, pp.796-801.
- C.G.R. Geddes, R.K. Kirkwood, S.H.Glenzer, K.G. Estabrook, C. Joshi, K.B. Wharton, "Observation of ion wave decay products of Langmuir waves generated by stimulated Raman scattering in ignition scale plasmas," Physics of Plasmas, vol.10, no.8, August 2003, pp.3422-25.
- C.G.R. Geddes, T.W. Kornack, M.R. Brown, "Scaling studies of spheromak formation and equilibrium," Physics of Plasmas, vol.5, no.4, April 1998, pp.1027-34.
- C.G.R. Geddes, A.U. Tran, G. Chong, L.A. Molter, M. Dutta, "Nonlinear Optical Slab Waveguide Devices in AlGaAs/GaAs," Proceedings of the Conference on Lasers and Electro Optics, Baltimore MD, 1995, pp.100-1.

Selected Presentations

- C.G.R. Geddes, "Computational Studies and Optimization of Wakefield Accelerators," SciDAC, Seattle WA, Jul. 2008 (*Invited*).
- C.G.R. Geddes, "Developing high energy, stable laser wakefield accelerators: particle simulations and experiments," Division of plasma physics, Philadelphia PA, Nov. 2006 (*Invited, Rosenbluth award talk*).
- C.G.R. Geddes, "Wakefield Accelerators for Ultrafast Particle and Radiation Sources Using Ultrashort-Pulse Lasers," Anomalous Absorption Conference, Jackson WY, June 2006 (*Invited*).
- C.G.R. Geddes, "Mono Energetic Beams from Laser Plasma Interactions," Particle Accelerator Conference, Knoxville TN, May 2005 (*Invited Talk*).
- C.G.R. Geddes, "High quality electron bunches from a plasma channel guided laser wakefield accelerator", Japan-US Workshop on High Irradiance Lasers, Osaka Japan, December 2004 (*Invited*).
- C.G.R. Geddes, "High quality electron bunches from a plasma channel guided laser wakefield accelerator," APS Division of Plasma Physics, Savannah GA, November 2004 (*Invited*).
- C.G.R. Geddes, "Nuclear activation experiments using laser wakefield accelerators," Workshop on Targetry and Target Chemistry (WTTTC), Madison WI, August 2004 (*Invited*).
- C.G.R. Geddes, "Laser Guiding At Relativistic Intensities and Wake Field Particle Acceleration in Plasma Channels," Advanced Accelerator Workshop, June 2004 (*Invited*).
- Geddes CGR, Sanchez J, Collins G, McKenty P. "Interferometric Characterization of Hydrogen Ice Layers in NIF Scale Targets," APS Division of Plasma Physics Meeting, New Orleans, Nov 1998.
- C.G.R. Geddes, "Spheromak Equilibrium Studies on SSX" APS Joint Mtg., Columbus OH, 1998 (*Invited*).