Biographical Sketch

James A. Ellison

Education:

Ph.D.	California Institute of Technology (Applied Mathematics)	1971
B.S. and M.S.	University of Wisconsin (Engineering Mechanics)	1964 and 1965
Ph.D. Advisor:	Professor T.K. Caughey, Cal Tech, Deceased	

Appointments:

1. Mathematics Faculty Member, UNM, 1970-present; currently Full Professor.
2. Guest Scientist at Deutsches Elektronen-Synchrotron (DESY) in Hamburg, May, 1997 to August, 1998 and summers of 1995 and 1996.
3. Guest Scientist at the Superconducting Super Collider Laboratory, 1/3 time academic years 1990-1993, summers 1991-1993 and full time academic year 1993-94.
4. Summer Research Appointments for Dynamical Systems Studies of Channeling, Naval Research Laboratory, Washington, D.C., Summers 1984 - 1988.
5. Guest Scientist, Institute of Physics, Aarhus University, Denmark, Academic year 1988-89 and Fall-Winter 1981-82. Particle Channeling in Crystals and Channeling Radiation.
6. Guest Scientist, CERN, Summer 1982. Channeling Radiation.
7. Guest Scientist, Physics Department, SUNY at Albany, 1976-77. Particle Channeling in Crystals.

Research Areas:

1. Mathematics of Beam Dynamics in Modern Particle Accelerators: Colliders, Light Sources and Free Electron Lasers.
2. Vlasov and Vlasov-Maxwell Equations: analysis, numerical analysis and scientific computing..
3. Coherent Synchrotron Radiation and related effects in accelerators.
4. Analysis of Spin Systems in Particle Accelerators.
5. Mathematics of Particle Channeling in Crystals with Applications in Materials Science and Particle Physics Technology.
6. Dynamical Systems with an emphasis on rigorous perturbation theory.
7. Stochastic Processes with an emphasis on random perturbation of dynamical systems, Ito SDEs and Fokker-Planck equations.
8. Applications of Ergodic Theory.

Selected Publications :

1. Orbital Eigen-analysis for Electron Storage Rings in *Handbook of Accelerator Physics and Engineering* edited by Alex Chao and Maury Tigner, 1999. An extensive revision is at `http://www.math.unm.edu/~ellison/HBN9.pdf`. J.A. Ellison, H. Mais, G. Ripken
2. Transformation of phase space densities under the coordinate changes of accelerator physics. *Phys. Rev. ST Accel. Beams* **13**, 104403 (2010). G. Bassi, J.A. Ellison, K. Heinemann, R. Warnock
3. Construction of Large-Period Symplectic Maps By Interpolative Methods. To be published in the proceedings of ICAP09, San Francisco, September, 2009. R. Warnock, Y. Cai, J.A. Ellison
4. Self Field of a Sheet Bunch: A Search for Improved Methods. To be published in the proceedings of ICAP09, San Francisco, September, 2009. G. Bassi, J.A. Ellison, K. Heinemann
5. Microbunching Instability in a Chicane: Two-Dimensional Mean Field Treatment. *Phys. Rev. ST Accel. Beams* **12**, 080704 (2009). G. Bassi, J.A. Ellison, K. Heinemann, R. Warnock
6. Monte Carlo Mean Field Treatment of Microbunching Instability in the Fermi@Elettra First Bunch Compressor. TU1PBI03 of PAC09 proceedings, a pre-press proceedings is available at `http://trshare.triumf.ca/~pac09proc/Proceedings`. Invited paper and talk. G. Bassi, J.A. Ellison, K. Heinemann, R. Warnock
7. Meshless Solution of the Vlasov Equation Using a Low-Discrepancy Sequence, Proceedings of EPAC 2008, Genova, Italy. R. Warnock, J.A. Ellison, K. Heinemann, G.Q. Zhang.

8. Equilibrium Fluctuations in an N-Particle Coasting Beam: Schottky Noise Effects Proceedings of PAC 2007, Albuquerque. G. Bassi, J.A.Ellison, K. Heinemann

9. Self-Consistent Computation of Electrodynamic Fields and Phase Space Densities For Particles on Curved Planar Orbits. Invited talk and Paper, 22nd Particle Accelerator Conference, Albuquerque, June, 2007. http://accelconf.web.cern.ch/accelconf/p07/HTML/AUTHOR.HTM J.A. Ellison, G. Bassi, K. Heinemann, M. Venturini and R. Warnock

10. Polarization Fields and Phase Space Densities: Stroboscopic Averaging and the Ergodic Theorem. *Physica D* 234, 131-149(2007). J. A. Ellison and K. Heinemann.

11. A New Model for the Collective Beam-Beam Interaction. Invited article for a focus issue in *New Journal of Physics* 9, 32 (2007) 20 pages. J. A. Ellison, A.V. Sobol and M. Vogt.

12. Vlasov treatment of coherent synchrotron radiation from arbitrary planar orbits. *Nuclear Inst. and Methods in Physics Research*, A 558(2006) 85-89. R. Warnock, G. Bassi and J. A. Ellison

13. Coherent Synchrotron Radiation and Bunch Stability in a Compact Storage Ring, *Phys. Rev. ST Accel. Beams* 8, 014202 (2005). M. Venturini, R. Warnock, R.Ruth and J. A. Ellison (15 pages).

14. Impedance Description of Coherent Synchrotron Radiation with Account of Bunch Deformation, *Phys. Rev. ST Accel. Beams*, 8, 014402 (2005). R. Warnock, R.Ruth, M. Venturini and J. A. Ellison (11 pages).

15. First-Order Averaging Theorems for Maps With Applications to Accelerator Beam Dynamics. *SIAM Journal on Applied Dynamical Systems*, 3, 409-432, (2004). H. S. Dumas, J. A. Ellison and M. Vogt.

16. Quasiperiodic spin-orbit motion and spin tunes in storage rings, *Phys. Rev. ST Accel. Beams*, 7, 124002 (2004). D. P. Barber, J. A. Ellison and K. Heinemann (33 pages).

17. Equilibrium State of Colliding Electron Beams. *Phys. Rev. ST Accel. Beams* 6, 104401 (2003). R. L. Warnock and J. A. Ellison (16 pages).

18. Beam Extraction Studies at 900 GeV using a Channeling Crystal. *Phys. Rev. ST Accel. Beams* 5, 043501 (2002) [24 pages]. Fermilab collaboration.

19. Simulations of three 1-d limits of the strong-strong beam-beam interaction in hadron colliders using weighted macro-particle tracking. *Phys. Rev. ST Accel. Beams* 5, 024401 (2002) [21 pages]. M. Vogt, T. Sen and J. A. Ellison.

20. A Mathematical Theory of Planar Particle Channeling in Crystals, *Physica D*, 146(2000)341-366. H. S. Dumas, J. A. Ellison and F. Glose.

21. A general method for propagation of the phase space distribution,with application to the saw-tooth instability, *Proc. 2nd ICFA Workshop on High Brightness Beams*, UCLA, 1999, 322-348. R. L. Warnock and J. A. Ellison.

22. Orbital Eigen-analysis for Electron Storage Rings, in "Handbook of Accelerator Physics and Engineering", edited by A.Chao and M. Tigner, World Scientific, 1999, 53-55. (H. Mais, G. Ripken)

23. Accelerators and Probability: The Special Effect of Noise in Beam Dynamics. Invited paper for the proceedings of the workshop on "Nonlinear and Stochastic Beam Dynamics - A Challenge to Theoretical and Computational Physics", Lüneburg, 1997. DESY-Proceedings, 1998-03, 7-59.

24. From symplectic integrator to Poincaré map: spline expansion of a map generator in Cartesian coordinates, *Applied Numerical Mathematics*, 29 (1999)89-98. R. L. Warnock and J. A. Ellison.

25. Energy Dependence of the Stability Type of Periodic Orbits in a Two-Dimensional Channeling Model, *Physica D*, 106, 39-48(1997).(Saenz).

26. Transverse Beam Dynamics with Noise, *Particle Accelerators*, 54, 135-149 (1996). (Sen).

27. "The Method of Averaging in Beam Dynamics," invited paper in Accelerator Physics Lectures at the Superconducting Super Collider, AIP Conference Proceedings 326, edited by Yiton Yan and Mike Syphers (1995).

28. Effect of Betatron Motion on Particle Loss Due to Longitudinal Diffusion in High Energy Colliders, *Phys. Rev. Letters*, 71, 356- 359 (1993). (Newberger, Shih).

29. A Four-thirds Law for Phase Randomization of Stochastically Perturbed Oscillators and Related Phenomena, *Communications of Mathematical Physics*, 166, 317-336 (1994). (Cogburn).

30. Transcendentally Small Transversality in the Rapidly Forced Pendulum, *Journal of Dynamics and Differential Equations*, 5, 241- 277 (1993). (Kummer, Saenz).

31. A Stochastic Theory of Adiabatic Invariance, *Communications of Mathematical Physics*, Vol. 148 (1992) pp. 97-126. (Cogburn).

32. Axial Channeling, the Continuum Model and the Method of Averaging, *Annals of Physics*, 209, July 1991, (Dumas and Saenz).

33. Improved Nth Order Averaging Theory for Periodic Systems, *J. of Differential Equations*, 84, 383 (1990), (Saenz, Dumas).
34. Deflection of GeV Particle Beams by Channeling in Bent Crystal Planes of Constant Curvature, *Nucl. Phys. B* 318, 301 (1989)
35. Planar Channeling in Superlattices I: Theory, Ellison, Picraux, Chu, Allen, *Phy. Rev. B*, 37, 7290 (1988).
36. The Method of Averaging and the Quantum Anharmonic Oscillator, *Phy. Rev. Lett.*, 55, 1950 (1985). (A. Ben-Lemlih)
37. Channeling radiation from 2-55 GeV/C electrons and positrons. *Nucl. Phys. B* 254, 491 (1985). (CERN Collaboration)
38. Bending of GeV Particle Beams by Channeling in Bent Crystal Planes. *Nucl. Phys. B* 206 205 (1982).
39. Continuum Model Planar Channeling and the Tangent Squared Potential. *Phys. Rev. B* 18 5948 (1978).
40. Existence, Uniqueness and Stability of Solutions of a Class of Nonlinear Partial Differential Equations. *J. of Math. Anal. Appl.*, 51 1975. (T.K. Caughey)

Graduate and PostDoc Supervision:

1. Postdocs: Mathias Vogt, 2000-02, now at DESY, Hamburg; Gabriele Bassi, 2003-07, now at Cockcroft Institute, UK; Klaus Heinemann, 2010-Present.
2. Ph.D. Students: Abdelali Ben Lemlih,1986, Univ. of Fez, Morroco; H. Scott Dumas, 1988, Univ. of Cincinnati; Julian Tapia, 1991, Departamento de Posgrado de ESCOM del IPN, Mexico City; David Steinbach, 1992; Dan Endres, 1992, University of Oklahoma; Miguel Gutierrez, 1994; Irina Vlaicu, 2005; Andrey Sobol, 2006, Tech-X; Klaus Heinemann, 2010.
3. M.S. Students: Jing Su, 1982; Charles Seal, 1983; Khadija Ben Lemlih, 1986; Lee L. Emman-Wori, 1988; Vinay Boocha, 2003; Marc Salas, 2005.

Grant Support:

1. Department of Energy. Investigations of Beam Dynamics Issues at Current and Future Accelerators. grant. 1999-2011. Single PI.
2. Department of Energy. Coherent Synchrotron Radiation effects on Next Linear Collider. Supplement to above grant. 2003-2008.
3. Naval Research Laboratory Grant. Nonlinear Dynamics Problems in Channeling Crystals, 1985-1989. Single PI.
4. National Science Foundation. Theoretical Investigations of Particle Channeling in Crystals. 1980-1991. Single PI.