SHORT BIO

JAMES A. ELLISON

I joined the Math&Stat faculty at UNM in 1970 and have been a full professor there for many years. I have had sabbaticals and visiting positions at Sandia Labs Albuquerque, SUNY Albany, Aarhus University in Denmark, the Naval Research Laboratory in DC, CERN-European Organization for Nuclear Research , the Superconducting Super Collider (SSC), and Deutsches Elektronen-Synchrotron DESY in Hamburg.

My interest in science began in my Engineering Mechanics (the most theoretical of the engineering disciplines) studies at UW Madison. I received a BS in 1964 and an MS in 1965. During my MS work I became turned on to mathematics and decided to move from Engineering Mechanics to Applied Mathematics and was accepted to that PhD program at CalTech. The CalTech program was traditional applied mathematics at it's best and included perturbation methods, stochastic processes, numerical analysis and of course differential equations; areas I've continued to develop over the years. I started dissertation research in stochastic processes but the area I wanted to pursue had dried up and my dissertation involved proving existence, uniqueness and stability for an interesting class of nonlinear PDE's; both were excellent preparation for my life's work. My PhD was awarded 1970 and I have been on the faculty of UNM since then. I chose a Math Department because I wanted to continue my mathematical education, which I have; however, I also wanted to become deeply involved in an area of science. There are many views of what applied mathematics is. For me it's finding an area of science, learning the fundamental problems well and then applying the best of mathematics and statistics to these problems, either using known mathematics or developing what's needed.

In the mid seventies, I was attracted to particle channeling in crystals as it presented a beautiful class of low degree of freedom Hamiltonian systems with both deterministic and stochastic perturbations and had interesting applications. This led to a life long interest in the method of averaging, a rigorous perturbation theory, and a continued interest in stochastic processes. In addition to helping develop the basic mathematics of channeling and dechanneling, I worked on several applications including the study of dislocations using dechanneling and the study of channeling radiation, the radiation from channeled positrons and electrons. My study of dechanneling by dislocations surprisingly led me to an experiment at Fermilab on extraction using channeling in bent crystal planes (a bent crystal was half of an edge dislocation). This led me to join the SSC in 1990 where there was a movement to extract beam for fixed target physics using bent crystal channeling. The theoretical channeling issues were soon well in hand and I became attracted to beam dynamics issues which involved another beautiful class of Hamiltonian systems, with deterministic and stochastic perturbations.

After the SSC was killed, I spent several summers and a 15 month sabbatical at DESY where I was introduced, amongst other things, to the beam-beam interaction and spin dynamics and polarization. Also during this period, I was introduced to the fascinating and more complex area of collective effects in beam dynamics, an area in which I have worked since then. My current mathematical beam dynamics interests include Klimontovich-Maxwell and Vlasov-Maxwell systems, and applications to 3rd and 4th generation light sources e.g., X-Ray free electron lasers.

I find it interesting that my dislocation dechanneling work led me to beam dynamics and my current interest in radiating electrons in various beam dynamics problems is rooted in my early channeling radiation work. I have been fortunate and am very grateful to have had many great collaborators in the channeling, beam dynamics and mathematical communities and look forward to more of the same.

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