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Georg Hoffstaetter

Professor of Physics

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Diplom, 1991, Darmstadt University of Technology, Germany. M.S., 1992, and Ph.D., 1994, as NSCL Fellow and Natural Science Fellow, Michigan State University. Dr. habil. (doctor habilitatus), 2000, Darmstadt University of Technology. Research Associate, Deutsches Elektornen-Synchrotron (DESY), Hamburg, Germany, 1994-1996. Faculty, Darmstadt University of Technology, 1996-1998. Accelerator Physicist, DESY, 1998-2002. Associate Professor, Cornell University, 2002-2008. Professor, Cornell University, 2008-present. Fellow, German National Merrit Foundation.

Research Areas
Physics of Beams; Accelerator Technology

Current Research
The Physics of Beams is the study of accelerated beams as a special state of matter. It has many applications in particle accelerators, spectrometers, electron microscopes, and lithographic devices. These instruments have become so complex that an empirical approach to properties of the particle beams is by no means sufficient and a detailed theoretical understanding is necessary. Historically it has proved fruitful that studies in beam physics have been performed in the context of projects that developed or built one of these instruments, and I have worked on several such projects, on the 4 mile circular accelerator HERA in Hamburg, where I contributed to the understanding of the non-linear dynamics and long term stability of the stored particles, of polarization dynamics, and of space charge forces acting from one particle beam to another. I am coordinating the accelerator science work for an Energy Recovery Linear Accelerator (ERL) at Cornell where my interests concern nonlinear beam dynamics, multi bunch instabilities, space charge within a tightly focused beam, the creation of synchrotron light, and the back-reaction of coherently emitted light on the beam. X-ray beams from charged particle accelerators have become an essential tool in today's investigation of all types of materials, from airplane wings to cell membranes and from pollutants in leaves to matter under earth-core pressures. And ERLs can be used as novel x-ray light source with beams significantly better than those of the world's most advanced facilities. ERLs are also planned for high-energy Electron Ion Colliders, for electron coolers of ion beams, and for nuclear physics experiments,. At Cornell, we plan to build a test ERL to prototype components and to analyze effects important for these large-scale projects.

Accelerator Technology describes the technology used to accelerate large currents of tightly focused beams to high energies. These beams are then used to study elementary particles, to produce synchrotron light for analysis in biophysics, in crystallography, in surface physics, or in the material sciences, for cancer therapy, and for a variety of other applications. Studies with synchrotron light are currently performed by CHESS at Cornell. The technology involved in accelerators is very rich and I am currently mostly interested in the technology required for the Cornell ERL where the energy of accelerated particles is recovered in superconducting cavities in order to accelerate new particles. These particles are produced in a photo cathode electron gun which involves a very complex system of lasers. Subsequently they are accelerated in a superconducting radio-frequency (SRF) linac. I am head of Cornell's SRF laboratory, which is involved not only in SRF for ERLs but also for high-energy elementary-particle accelerators like the ILC, a muon collider, and Fermilab's Project-X.

Senior Research Associates
Ralf Eichhorn (ERL cryomodule, RF systems)

Research Associates
Christopher Mayes (Linear and Nonlinear Particle Optics, Coherent Synchrotron Radiation, ERL layout)
Mingqi Ge (SRF surface analysis, temperature mapping of high-Q cavities)
Fumio Furuta (High-accelerating-voltage SRF cavities, cryogenic cavity testing, advanced SRF cavity shapes)

Graduate Students
Steve Full (Ion instabilities in rings and ERLs)
William Lou (Charged-particle optics in FFAGs and ERLs)

Group meetings:
Tuesdays 10am, SRF students meeting, 311 Newman Lab
Tuesdays 11am, SRF group meeting, 311 Newman Lab
Thursday 2pm, Accelerator Projects meeting, 380 Wilson Lab

Further information can be obtained by contacting research associates at Wilson Laboratory and at http://www.lns.cornell.edu/accelphys/ and http://www.lepp.cornell.edu/Research/AP/SRF/WebHome.html

Graduate and undergraduate students interested in beam physics and the application of particle accelerators are encouraged to join this group. There are many opportunities for student involvement.