

PETER E. BOSTED

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Married Age 54

EDUCATION

PhD Physics, January 1980, Massachusetts Institute of Technology. Thesis title: “Pion Photoproduction in the (3,3) Resonance Region”. Supervisor: Professor Aron Bernstein. Thesis describes measurements of total exclusive cross sections for pion production from carbon and lithium, and differential exclusive photoproduction cross sections from oxygen and boron.

B.S. Physics, June 1975, Massachusetts Institute of Technology.

POST-GRADUATE EXPERIENCE

January 1980 to July, 1980: M.I.T. Position: postdoctoral associate.

August 1980 to November 1999: The American University (at SLAC). Positions held: Postdoctoral associate (1980-1985); Associate Research Scientist (1985-1988); Research Associate Professor (1988-1997); Research Professor (1997-1999)

November 1999 to present: University of Massachusetts, Amherst. Position held: Research Professor (1999 to 2004); Adjunct Professor (2004 to present)

June 2004 to present: Senior Staff Scientist, Jefferson Lab.

RESEARCH SUMMARY

Jefferson Lab, 1980. Wrote two proposals for the SURA 4 GeV accelerator, now known as Jefferson Lab.

SLAC E133 and E121, 1980-1981. Participated in analysis of these SLAC experiments and was principal author of a paper on y -scaling from 2D , 3He , and 4He .

Coulomb Sum Rule, 1981. Participant in an experiment at the Bates Linear Accelerator to measure the Coulomb Sum Rule in giant resonance electron scattering.

SLAC E136, 1981-1984, 1993. Helped write SLAC proposal to measure elastic electron-proton scattering at very high Q^2 . Was responsible for the building of a set of wire chambers for the 8 GeV spectrometer and helping to refurbish the lead glass counter. Was on thesis committee for American University PhD student Alan Sill. In 1993 analyzed the threshold inelastic data from this experiment and wrote an article on the results.

SLAC E139, 1982-1984. Helped write the proposal to measure the A -dependence of inelastic electron scattering from nuclei. Was primarily responsible for the first pass data analysis and writing the article for Physical Review Letters (which presently has 381 citations). Was on thesis committee of American University PhD student Javier Gomez.

SLAC NE4, 1984-1988. Principal author of this proposal to measure electron scattering from deu-

terium at 180° . As spokesman, was responsible for coordinating the building of a new spectrometer system, writing a large fraction of the software used in online data taking and offline analysis, and was the principal author of the Physical Review Letter presenting the magnetic form factor results. Combined the project papers of the two A.U. graduate students into a Nuclear Instruments and Methods paper describing the apparatus in detail. Was the main author of the paper describing the quasielastic results from this experiment, and worked closely with a graduate student on a paper describing the threshold results. Was on the PhD committees for two students from American University (M. Petratos and M. Katramatou) and one student from the University of Massachusetts (M. Frodyma).

SLAC E140, 1985. Active participant in this experiment to measure R in deep inelastic electron scattering.

SLAC E141, 1986. Active participant in this experiment to search for axion particles.

SLAC NE8, 1987. Wrote a new data acquisition system for this experiment to measure the photodisintegration of the deuteron. Analyzed the data in parallel with the Argonne group.

Bates experiments, 1989-1990, 1997. Participated in a project to upgrade the instrumentation for a spectrometer at the Bates linear accelerator and to measure elastic scattering from ^{13}C . Participated in an experiment to measure threshold electrodisintegration of the deuteron using the upgraded detectors. In 1997 participated in an experiment to measure the magnetic form factor of ^3He at high Q^2 .

PEGASYS, 1987-1991. Was a major contributor to the PEGASYS proposal to build a gas target facility at the PEP storage ring at SLAC. Wrote two of the physics sections of the proposal and was the System Manager for the shower counter project. Although approved, this project never received funding.

SLAC NE11, 1988-1994. Spokesman for this experiment to make measurements of the electric form factors of the proton and neutron. Was the main author on the proposal, coordinated all activities, including major changes to the 1.6 GeV spectrometer, and wrote most of the new data acquisition and analysis programs required. Completed a thorough analysis of the data, in parallel with a team of three graduate students, for whom was a principal adviser: Allison Lung and Lisa Andivahis from American University; and Linda Stuart from U.C. Davis. Was a major author on the six papers published.

SLAC E140x, 1991. Participated in this extension of experiment E140. Adopted data acquisition software used in NE11. On PhD thesis committee of two American University students: L.-H. Tao and C. Keppel.

SLAC NE17, NE18, 1991. Participated in these experiments to measure the photodisintegration of the deuteron and coincidence quasielastic scattering from heavy nuclei.

SLAC E142, 1992-1993. Worked on new data acquisition software for this experiment to measure the spin structure of the neutron using deep inelastic scattering of polarized electrons from polarized helium-3. Developed a fast data analysis package that allowed full statistics analysis within a few weeks of data taking. On thesis committee of two American University PhD students: M. Spengos and J. Dunne.

SLAC E149 (DIS-Parity), 1992-1993, 2003. Was the principal author and spokesman for a proposal to measure parity violation in deep inelastic scattering to test the Standard Model and measure a new combination of quark distribution functions. Proposal was deferred twice by program committee pending funding decisions. Co-author a Letter of Intent in 2003 in which a much higher figure-of-merit was proposed based on recent E158 experience. Although receiving a unanimous “excellent” rating from the reviewers, the experiment was not funded by SLAC.

SLAC E146, 1993. Worked on an experiment to study LPM and dielectric suppression in bremsstrahlung, relevant for high-energy air showers and detectors at LHC energies. Helped develop a special low-intensity

beam for this experiment. Refurbished a set of wire chambers for this experiment, and wrote the software to analyze the wire chamber data.

SLAC E143, 1993-1997. Worked on beam line alignment, data acquisition, and run plan optimization for this experiment to measure the spin structure functions of the proton and neutron using deep inelastic scattering of polarized electrons from polarized proton and deuterium targets. Was principally responsible for quick analysis of the data to help in planning remainder of experiment, and to have results in time for summer conferences. Principal author on first published paper on this experiment (on g_1^p , cited 428 times) and also principal author on a paper on the Q^2 -dependence. Adviser to American University PhD student J. Fellbaum.

SLAC E154, 1995-1997 This was an extension of E142 to a beam energy of 48.5 GeV. Wrote the software to monitor and control high and low voltages and spectrometer magnets. Wrote software to monitor the event data. Analyzed coincidence data between the two spectrometers. Adviser to American University PhD student D. Reyna.

SLAC E155, 1995-2001 This was an extension of E143 to a beam energy of 48.5 GeV. Designed a third spectrometer which was added to the existing two spectrometers. Responsible for precision alignment for the experiment. Worked extensively on a complete analysis of all the experimental results, in parallel with the graduate student team. Principle author of two of the four papers published from this experiment. Adviser to American University graduate student Terry Toole.

SLAC E155x, 1997-2001 This experiment used the same equipment as E155, but was specialized to a dedicated measurement of g_2 . In addition to setting up the experiment and helping take the data, did a complete analysis of the data, in parallel with a team of graduate students. Adviser to two of these students: Nawal Benmouna and Paul DePietro, from American University.

SLAC PEP-N, 1997-2001 I helped work on this Letter of Intent to study time-like form factors and other physics with a 0.3 to 0.8 GeV electron ring that would have collided with the 3 GeV positron ring at SLAC, if it had been approved.

SLAC E158, 1997-2004 This difficult experiment measured the parity-violating asymmetry in electron-electron scattering, with the aim of possibly discovering new physics beyond the Standard Model. Worked on the spectrometer design and optics, the magnet setup and calibration, and detailed calculations of backgrounds, including a complete simulation of the experiment with radiative corrections. Analyzed the low rate checkout data using a set of scintillator figures, and helped design a skew quad that was added to the A-line to reduce experimental fluctuations.

SLAC E159, 2000-2004 Co-spokesman and principal author of this proposal to measure the high energy contributions to the GDH sum rule, using circularly polarized photons and longitudinally polarized protons and deuterons. Experiment currently on hold due to lack of funding.

SLAC E160, 2000-2004 Co-spokesman and one of the principal authors of the proposal to measure the A -dependence of charmonium photoproduction, with the goal of measuring the J/ψ -nucleon and ψ' -nucleon cross sections. Worked extensively on detailed engineering design of the spectrometer and simulation of backgrounds. Coordinated work on magnet re-furbishing and construction of the coherent bremsstrahlung beam line. Work was stopped in late 2002 due to lack of funding.

SLAC E156/E161, 1995-2004 In 1997 submitted a proposal to measure polarized open charm photoproduction from longitudinally polarized nucleons, with the goal of measuring the polarized gluon density. Was the principal author of the proposal and spokesperson for the collaboration of over fifty physicists. The proposal was not approved in 1997, but a revised version (E161) was approved in 2000 (with co-spokesmen

Steve Rock and Don Crabb). Worked on detailed simulations in 2001 and 2002, until experiment was put on hold for lack of funding (see E159 and E160).

Jefferson Lab Hall C experiments, 1994-present Participated in commissioning of Hall C spectrometers in 1994/5, and in 1995/6 helped take data on the lab's first two experiments (89-012, 91-011), which are similar to SLAC experiments NE17 and NE18 (see above), but with much higher statistical power. In 1996 participated in an experiment (94-014), to measure the E1/M1 multipole ratio for the $\Delta(1236)$ resonance, and the baryon transition form factor for the S_{11} resonance. Worked on an extension of the (γ, d) experiment (E96-003). In 1999, participated in E94-110, an experiment to make precise measurements of R in the resonance region. In 2000, participated in data taking for E99-118, which measured the A -dependence of inelastic electron scattering at low Q^2 . Calculated the external radiative correction calculations for this experiment. worked on the polarized target for an experiment (E01-006) in early 2002 that measured g_1 and g_2 in the resonance region.

In 2003, participated in the Spring '03 group of experiments: E00-002 (F_2 at low Q^2), E00-108 (Duality in Meson Electroproduction), E00-116 (Hydrogen and Deuterium Inclusive Resonance Cross Sections...), and E01-002 (Baryon Resonance Electroproduction at High Momentum Transfers). I was a run coordinator and am a co-spokesman for E01-002, and am currently advising four graduate students doing their PhD thesis on this experiment. I analyzed much of the data for E00-108 as a cross check. I did the radiative corrections for E00-116. In 2004 and 2005, helped collect data on a series of spectrometer experiments, including E03-008 (Sub-Threshold J/Psi Photoproduction), for which I am the principal spokesperson. I am advising a student doing a Masters thesis on this experiment, and was heavily involved in providing a new gas Cherenkov counter for the SOS spectrometer that was needed by this experiment. In 2005 and 2006 helped with simulations for the G0 experiment to measure the strange form factor of the nucleon using parity violating electron scattering. In 2007, participated in three more spectrometer experiments. Developed improved time-of-flight calibration software for these experiments. Adviser to PhD thesis student Georgie Mbianda, who is analyzing the results of two of the three experiments.

Currently participating in experiments E04-108 and E04-019 to measure G_E^p/G_M^p , and E07-002 to measure wide angle Compton scattering. Presently also working on beam tests of detectors for the upcoming Spin Asymmetries of the Nucleon experiment, and design and fabrication of equipment needed for this experiment, as well as some of the analysis software.

Jefferson Lab Hall A experiments, 1997-present In Hall A, participated in 89-019 and 94-012, which are similar to NE17 but measure recoil polarization in addition. Also in Hall A, I helped write a proposal (E99-114) to measure Real Compton scattering from the proton. I helped test the photon detectors, and participated in the data taking in early 2002. In late 2002, I helped with the data taking on E01-020, which focused on $(e, e'p)$ studies of the deuteron at high Q^2 . In 2005, I helped with data taking on the HAPPEX experiment. In 2005 and 2006, participated in data taking for HAPPEX (parity violation in electron scattering).

Jefferson Lab Hall B experiments, 1997-present In 1997 I joined the Hall B collaboration as a limited partner for run EG1 (experiments E91-023, E93-009, and E93-036), which has measured the g_1 structure function of the proton and neutron in the resonance region at lower Q^2 than probed by experiment E143. The first data run in 1998 was followed by a 6-month run in 2000-2001. I have worked on polarized target preparations, data taking (including serving as Run Coordinator), and data analysis (have taken responsibility for one of the background studies for inclusive proton and deuteron structure functions (which involves analyzing the entire data set), and taken on the major responsibility for the target-spin and double

spin asymmetries in exclusive ρ , ω , η , and $\pi^+\pi^-$ electroproduction from the proton. In 2006, was the principal author of a paper on spin duality based on the Eg1b results. Most recently, have nearly completed analysis of spin asymmetries in semi-inclusive deep-inelastic scattering from Eg1b, and am preparing a publication. In 2005, I helped with the BONUS experiment, and am on the PhD committee of one of the graduate students on this experiment: Narbe Kalantarians. In 2006, helped with the EG4 experiment (similar to Eg1 but at lower energies), serving as run coordinator and helping with the calibrations.

GLAST tests 1996, 1997, and 2000 Designed and help set up a tagged photon beam line to test a prototype of the Gamma-ray Large Area Space Telescope under construction at SLAC. For the 2000 test, designed and helped implement a proton test beam to supplement the photon and electron tests.

Cross Section Modeling Having been developing empirical fits to elastic form factors, and quasi-elastic and inelastic electron scattering since 1980. The primary goals are every improving codes to calculate radiative corrections for inclusive electron scattering experiments, and the dilution factor in polarized target experiments. More recently, have been working with the neutrino scattering community, for which improved modeling is needed to analyze neutrino oscillation experiments. Recently published a fit to world data on inclusive electron-deuteron scattering, and will soon be publishing a paper on cross section ratios from $^{15}\text{N}/\text{C}$, and $^4\text{He}/\text{C}$.

TEACHING EXPERIENCE

1. HUGS at CEBAF Summer School, June 1995. Gave a series of six lectures on “Probing Nucleon Structure with Polarized Electrons”.
2. “Inquiry into Physics”, Fall 2000. Undergraduate lecture course with demonstrations on introductory physics, at University of Massachusetts, Amherst.

SERVICE

1. Have been a referee for Physical Review Letters and Physical Review C since about 1987. Review between 2 and 5 articles per year.
2. Member of the Jefferson Lab Program Advisory Committee, September 2000 to January 2004.
3. Have served on International Advisory Board for several conferences, including GDH 2002, Baryons 2004, and GDH 2004.
4. Co-organizer of several conferences, including SIR05 at JLab and DNP07.

SEMINARS

1. Seminars on experiment NE4 (magnetic electron scattering from the deuteron) given at California Institute of Technology, S.L.A.C., University of Maryland, M.I.T., the University of Massachusetts, and the American University.
2. Seminar on experiment E139 (EMC effect) given at University of California at Berkeley.
3. Seminar on PEGASYS given at the American University.
4. Seminars on experiment NE11 (nucleon form factors) given at the American University, the University

of Washington, the International Center for Theoretical and Experimental Physics (Moscow, U.S.S.R.), the CEBAF 1991 Annual Users Meeting/Workshop (invited plenary talk), and Centre Etudes Saclay SPhN.

5. Seminar on experiment E140X given at the University of Washington.
6. Seminar on the DIS-Parity Proposal (E149) given at the American University (1993) and Argonne National Lab (2002).
7. Seminars on E143 (Spin structure functions of proton and neutron) given at SLAC Experimental Physics Seminars Series, (Stanford, California, May 1994), CERN PPE Seminar Series (Geneva, Switzerland, August 1994), and Saclay DAPNIA Seminar Series (Paris, France, November 1994).
8. Seminar on the LPM effect given at the American University in 1995, and at the University of Massachusetts, October 2000.
9. Presentations on E156 given at the SLAC-2000 workshop (April, 1996), the SLAC Users Annual Meeting, June, 1996, the HEPAP Future Directions Sub-panel meeting at SLAC in June, 1997, and at the Jlab Charm Workshop in April 2000.
10. Seminar on the E154 and E143 experiments at the Fermilab weekly invited seminar series on experimental and theoretical physics, January 1997.
11. Seminar on the E155 and E155x experiments at the University of Illinois nuclear physics department weekly seminar series, October 1999.
12. Seminar given on SLAC E159, E160, E161 at the University of Massachusetts, October 2000, and at the SLAC DOE reviews in April 2001 and April 2002, for the SLAC Safety Overview Committees in 2001, to the SLAC Accelerator group in 2001, at Argonne Nation Lab in May 2002, and at Lawrence Berkeley Lab in November, 2002.
13. LNS Colloquium on “Spin Physics at SLAC and JLab” at MIT in May, 2003.
14. Invited seminar on E158 at Jefferson Lab, February 2004. Talk on E158 at QWeak Collaboration meeting at JLab, August 2004.
15. Invited talk on sub-threshold J/ψ photoproduction at the JLab Users Meeting, June 16-18, 2004. Talk on J/ψ photoproduction at Hall C Workshop August 2004 and Hall C Workshop, January 2006.
16. Talk on “Measurements of the Deuteron Elastic Form Factor $A(Q^2)$ ” at Hall C workshop, Jefferson Lab, January 2006.
17. Talks on cross section modeling at Hall B Users meeting, 2007.
18. Talks on spin asymmetries in SIDIS at DNP05 and DNP07.

BACKGROUND AND INTERESTS

Born in Lewisburg, Penn., and lived in England and Belgium while in grade school. Attended high school in Los Angeles. Played oboe semi-professionally in college and high school. Active rock-climber in graduate school. Principal hobby since 1980 is cave exploring and mapping. Have explored new caves mainly in California, New Mexico, Mexico, Malaysia, China, and Papua New Guinea, but have also studied caves in thirty other states in the U.S. and twenty other countries. Have written over hundred articles about caves and have drawn and published several dozen cave maps. Am a co-author of a widely used reference book on caves: *The Atlas of the Great Caves of the World*, published in June, 1989. Co-authored two chapters of the book “On Caves and Cameras”. Have won many awards for cave photography, and had photographs published in *Ranger Rick* (two issues), *Sunset Magazine*, *Kicks*, *Buzzworm*, *The Atlantic Monthly*, *Sports Illustrated*, *Chevron*, *Moterhome*, *National Geographic News Service*, *Associated Press*, *National Parks Magazine*, *Oskar*,

Odyssey, *TACA Airlines Magazine*, *National Speleological Society News* (ten issues, including seven color covers), a coffee-table book on Lechuguilla Cave, a book on Crystal Cave, CA, a book on Carlsbad Caverns, NM, a coffee-table book on Wind Cave, S. Dakota, the book *Secrets of the Earth*, the book *Creatures of the Dark*, the book "On Caves and Cameras", a *NOVA* television documentary, a book on Carlsbad Caverns national park, four textbooks, several newspapers, and six international caving calendars. Additional calendars in 1995, 1996, 1997, 1998, and 1999 entirely devoted to cave photos by myself and Ann Bosted were published and distributed world-wide by Avalanche Publications. Since 1998, specialize in 3D photography of caves (work can be viewed at www.cavepics.com).