

# Dr. Vernon Cupps, Ph.D

422 Park Ridge Lane, Unit E

Aurora, IL 60504

[vernon@drvernoncupps.com](mailto:vernon@drvernoncupps.com)

Business: (630) 840-6794 Residence: (630) 978-4518

## EDUCATION

- **Doctorate of Philosophy:** Indiana University-Bloomington
  - Ph.D. in Nuclear Physics
  - Minor in Solid State Physics
- **Master of Science:** University of Missouri-Columbia, Physics
- **Bachelor of Science with Honors:** University of Missouri-Columbia, Physics
- **Salutatorian:** Lebanon High School, Lebanon, MO

## WORK EXPERIENCE - OVERVIEW

- **Radiation Physicist:** Fermi National Accelerator Laboratory, Batavia, IL  
October 1988 – Present
- **Rutgers University Postdoctoral Position:** Los Alamos National Laboratory, Los Alamos, NM  
June 1987 – October 1988
- **Indiana University Postdoctoral Position:** Indiana University Cyclotron Facility, Bloomington, IN  
January 1987 – June 1987
- **Research Assistant:** Indiana University Cyclotron Facility, Bloomington, IN  
January 1980 – January 1987

## PROFESSIONAL PROFILE

- Published researcher with 73 publications, 18 of which are in referred journals
- Developed and implemented a world class radioisotope analysis facility
- Extensive, in-depth field experience with 28 years in Nuclear Physics, 20 years in Radiation Physics, and 20 years accelerator based Health Physics
- Directed and supervised a radiochemical analysis laboratory at Fermi National Accelerator Laboratory for 20 years
- Managed an environmental protection program at a Department of Energy (DOE) facility for one year
- Jointly taught Radiation Physics at Accelerators short course for the 1999 US Particle Accelerator School at Vanderbilt University
- Collaborator on Fermilab experimental Proposal #P877, Measurement of the Magnetically-Induced QED Birefringence of the Vacuum and an Improved Laboratory Search for Light Pseudoscalars
- Member of the Fermilab Tiger Team task force in 1992
- Administered and directed Fermilab's response to the DOE Waste Moratorium imposed in 1990. As a result, Fermilab was the only major facility to have the moratorium lifted by DOE
- Seven years experience managing programs to evaluate performance of weapons systems components
- Seven years experience in a Department of Defense (DOD) Materials Science laboratory as a Project/Senior Physicist

## TECHNICAL & COMPUTER SKILLS

\* Proficiency with a broad range of laboratory equipment and instrumentation - atomic beam ion sources, gamma and alpha ray spectrometers, liquid scintillation counters, charged particle magnetic spectrometers, scintillation and solid state detectors, neutron activation and fission detectors, multichannel analyzers, CO<sub>2</sub> and HeNe lasers

\* Familiarity with FORTRAN, MAC, DOS and IBM Windows operating systems for desktop/laptop computers

\* Familiarity with basic programming languages and UNIX command language for mainframe computer

## CONTINUING EDUCATION

- Completed short course in PERALS Counting Methodologies
- Completed short course in Radiochemistry Counting Techniques
- Completed short course in Advanced Radiation Detection and Measurement

- Completed short course conducted by Canberra Industries, Inc. in Environmental Radioactivity Quantification
- Completed National Safety Council short course for Lead Auditor and Root Cause Analysis Training
- Completed National Safety Council short course on OSHA Compliance Program
- Completed Fermilab Short course Lead Auditor Training
- Completed National Safety Council short course for Computer–Aided Management of Emergency Operations

## **PROFESSIONAL AFFILIATIONS & HONORS**

- Promotion to Radiation Physicist III
- Promotion to Analysis Team Leader
- Employee Performance Recognition Award for sustained excellence in radiochemistry analyses
- Personal letter of commendation for excellence in radioisotope assay from Director of Fermilab
- Member of American Physical Society Division of Nuclear Physics
- Member of American Physical Society Division for Instrument and Measurement Science
- Member of American Physical Society Division for Precision Measurement and Fundamental Constants
- Member of the American Association of Physics Teachers
- Fermilab Technology Award
- Full Scholarship to National Summer School on Nuclear Physics
- O.M. Stewart Scholar
- Pi Mu Epsilon Mathematics Honorary

## WORK EXPERIENCE - DETAILED

**Radiation Physicist:** Fermi National Accelerator Laboratory, Batavia, IL

October 1988 – Present

### November 1999 – Present

- Supervisor of Fermilab's Radionuclide Analysis Facility and Leader of the Analysis Team
- Member of the Fermilab Radiation Physics Team
- Directed the design, construction, and equipping of a new facility for the Radionuclide Analysis Facility
- Principal and continuing investigator for several activities at Fermilab, including:
  - Incident involving radioisotope contamination of a truck trailer bed
  - Monitoring of airborne radioisotope emissions
  - Estimation of yearly dose equivalent rates at boundary due to accelerator and research activities
- Served as lead auditor for internal appraisals related to the Fermilab Radiation Protection organization
- Applied activated material analysis to several projects to help solve difficult problems and failure analyses
- Designed, developed, and implemented a method for monitoring  $^3\text{H}$  in air emissions at Fermilab exhaust stacks
- **Assisted Japanese experimental collaboration T792 set-up their radiochemical separations of Phosphorus isotopes in order to quantify them as a benchmark for the MARS high energy particle transport code**
- Created and executed a plan for measuring the environmental half life of  $^3\text{H}$  in the NuMI enclosure
- Gathered and analyzed data to measure the time dependent diffusion of  $^3\text{H}$  out of a steel matrix
- **Refereed** several papers related to gamma ray spectroscopy for the Health Physics Journal

### March 1995 – November 1999

- Supervisor of Fermilab's Radionuclide Analysis Facility
- Responsible for all formal radioisotope assay and activation analyses performed, including:
  - Studies on radiation damage in silicon vertex detectors used in the CDF detector
  - Activation products induced in strontium ferrite permanent magnets for a proposed antiproton storage ring
  - Neutron fields generated at the Neutron Therapy Facility
  - Activation products induced in various materials by a 10.3 MeV  $^3\text{He}$  accelerator built for an University of Washington/LSU collaboration
  - Activation products induced in boring samples taken from Fermilab rock formations
- Performed safety analysis reviews, shielding reviews, and radiation protection program reviews, including evaluation of radiation hazards, shielding sufficiency for beamlines, and other new projects
- Participated in the pilot program for the Necessary and Sufficient standards proposal to DOE
- Aided with rewrite for the Radiological Control Manual to better reflect the changing regulatory climate
- Collaborator on experimental proposal P877, Measurement of the Magnetically-Induced QED Birefringence of the Vacuum and an Improved Laboratory Search for Light Pseudoscalars
- Appointed to Director's review panel for the MiniBooNE and 8 GeV beamline projects
- Developed new procedures and protocols for radionuclide assay at Fermilab

### July 1989 – July 1995

- Supervisor of the Radionuclide Analysis Facility – formally known as the Nuclear Counting Laboratory (NCL)
- Established a method for using the  $^{12}\text{C}(n,2n)^{11}\text{C}$  reaction as a monitor of high energy neutrons
- QA Officer for the Safety Section and Research Division Liaison Physicist
- Responsible for maintaining the Safety Section's QA program, including:
  - Act as lead auditor on monthly audits of Safety Section internal programs
  - Serve as program manager for Fermilab's response to the DOE imposed moratorium on waste shipments to disposal facilities

### October 1988 – July 1989

- QA Officer and Supervisor of the NCL
  - Assisted in the development, direction, and implementation of the QA program for the Environmental Protection Group
  - In charge of all radionuclide assays, including environmental sample and beam foil activation analyses
  - Responsible for all SARA-Title III compliance reporting, including inventory and release reports for

hazardous materials

- Acting group leader for the Environmental Protection Group
  - Oversight of the environmental monitoring program and the Hazardous Waste Storage Facility
- Served as backup Senior Environmental Protection Officer
- Developed equipment and methodology to enable an intrinsic HpGe detector to be used as a gamma ray spectrometer, which included extensive work on developing a reliable and reproducible method for determining the average solid angle subtended by the detector at sources having finite dimensions
- Developed new methods for monitoring and estimating radiation exposures due to Fermilab activities, including:
  - Performing calculations, using the AIRDOS-EPA code, to determine population exposures resulting from radioactive gas emissions
  - Conducting a series of measurements using a portable gamma ray spectrometer and a Bicron Analyst detector to assess the site boundary dose resulting from radioactive material storage

**Rutgers University Postdoctoral Position:** Los Alamos National Laboratory, Los Alamos, NM

June 1987 – October 1988

- Primary participant in the planning, execution, and data analysis of an experiment to study the reaction mechanism for pion absorption on  $^2\text{H}$ ,  $^6\text{Li}$ ,  $^{12}\text{C}$ ,  $^{27}\text{Al}$ ,  $^{58}\text{Ni}$ ,  $^{90}\text{Zr}$ ,  $^{118}\text{Sn}$ ,  $^{208}\text{Pb}$ , and  $^{238}\text{U}$  using the LAMPF BGO-ball  $4\pi$  detector and specially constructed neutron detectors
- Built the target holder for the BGO-ball and the neutron detectors for the pion absorption experiment
- Involved in extensive software development for data analysis and tedious calibrations of 30 different compound detectors
- Prepared a gas handling system for use with Multi-Wire Drift Chambers (MWDCs), calibrated the associated flowmeters, and served as operator of the liquid hydrogen target
- Helped setup MWDCs and beam scintillation counters which used fast state of the art photomultiplier tubes for an absolute measurement of the differential cross sections for the  $\text{H}(p,p')\text{H}$  reaction from 400 to 800 MeV to a precision of 1%
- Participated in a series of experiments designed to measure the spin response of the nuclear continuum for polarized proton scattering from  $^{12}\text{C}$ ,  $^{48}\text{Ca}$ , and  $^{208}\text{Pb}$ : the  $^{208}\text{Pb}$  measurements being partially performed at the TRIUMF accelerator facility in Canada
- Performed measurements of the neutron background in the Low Energy Pion channel at LAMPF using indium and pilot B activation counters and a Bismuth fission counter

**Indiana University Postdoctoral Position:** Indiana University Cyclotron Facility, Bloomington, IN

January 1987 – June 1987

- Assisted in development of the K600 magnetic spectrometer and accompanying beam transport system
- Completed the angular distributions for the  $^{66}\text{Zn}(\vec{d}, p)^{67}\text{Zn}$  and  $^{67}\text{Zn}(\vec{p}, d)^{66}\text{Zn}$  reaction observables to serve as an experimental base for direct tests of intermediate energy reaction models

**Research Assistant:** Indiana University Cyclotron Facility Bloomington, IN

January 1980 – January 1987

- Designed a high voltage-high vacuum test system for investigating the feasibility of accelerating polarized deuterons to high enough energy to make the  $^3\text{H}(\vec{d}, n)^4\text{He}$  reaction adaptable for use in a low energy polarimeter
- Built and created a gas cell/ionization chamber, dual arm slit system, and gas handling system for study of the  $^3\text{He}(\vec{d}, d)^3\text{He}$  reaction
- Assisted in construction of a large butterfly table for doing out-of-plane scattering measurements of polarization observables
- Conducted and analyzed a series of experiments on the QDDM magnetic spectrometer to study the reaction mechanism for deuteron stripping at intermediate energies
- Developed a peak fitting program which would simultaneously fit peaks in five different spin states to a modified asymmetric Gaussian functional form

- Assisted in the development of a proton polarimeter for the high energy beam lines capable of measuring both longitudinal and normal components of the beam polarization
- Participated in planning and execution of several experiments to measure the spin rotation parameter,  $Q$ , for elastic proton scattering from  $^{12}\text{C}$ ,  $^{16}\text{O}$ , and  $^{40}\text{Ca}$ . Participated in planning and execution of a series of experiments to measure the polarization transfer coefficients for inelastic proton scattering from  $^{12}\text{C}$  and  $^{16}\text{O}$
- Actively involved in the early light ion radiative capture studies
- Developed a more accurate method of measuring thin solid target thicknesses through  $\alpha$ -gauging

**Senior Physicist:** Hazardous Materials Branch of the Naval Weapons Support Center (NWSC), Crane, IN  
1978-1980

- Managed, coordinated, and had technical cognizance over programs involving hazardous/energetic materials
- Devised and implemented test procedures and instrumentation for a study of the aerodynamic heating effects in aircraft borne ordnance
- Conducted thermal analyses on detonating cord explosive compositions
- Provided technical guidance on a laser method for simulated heating of explosives

**Project Physicist:** Materials Analysis Branch of the Naval Weapons Support Center (NWSC), Crane, IN  
1975-1978

- Applied theories and principles of physics to material investigations ranging from long-term projects to routine laboratory tests and short-run trouble shooting
- Managed projects having budgets ranging from \$5,000 to \$50,000 with project goals met in all cases
- Recommended and helped implement test method improvements for first article testing of gun sight polarizing filters
- Developed several new test and evaluation methods for detecting material degradation during simulated laboratory ageing of crashworthy fuel cells
- Coordinated efforts of a failure analysis team in the solution of a major aircraft prop control seal leakage problem
- Acted as liaison and advisor in coordinating laboratory and field evaluation of low reflective infrared paints
- Performed numerous short-run laboratory tests, which required modification of existing laboratory equipment and formulation of new test procedures
- Wrote programs for the Wang 700B mini-computer including a program for generating count rate tables for the decay of  $^{22}\text{Na}$  in Mk 161 Primers and a program for calculating C.I.E. coordinates from color measurements
- Devised a laser alignment method for a painted panel evaluation fixture on an infrared spectrophotometer.
- Certified in testing of explosive/energetic materials

**Physicist:** Materials Analysis Branch of the NWSC, Crane, IN  
1973-1975

- Conducted various material properties tests on components of naval weapons systems, including tensile strength tests, fatigue analysis, and viscosity tests

**First Lieutenant:** U.S. Navy, U.S.S. Cook (DE-1083)  
1971-1973

- Managed and supervised a division of approximately 30 men responsible for maintaining ship appearance, seaworthiness, and all shipboard gear related to anchoring, mooring, small boats, underway replenishment, and foul weather operation
- Planned and coordinated an underway replenishment
- Qualified Junior Officer of the Deck underway
- Qualified Command Duty Officer in port
- Secret clearance