



Interdisciplinary Applications of Ion Beam Analysis



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Chemistry and
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Education and experiences

Ph.D., State University of New York (1987)

A.B., Princeton University (1981)

Hope College, Associate Professor (1994-)

Areas of expertise

Nuclear Chemistry, Environmental Chemistry

Grants and awards

NSF-RUI: Multifaceted Opportunities in Nuclear Physics for Undergraduates at Hope College (2004-2006)

NSF MRI/RUI: Acquisition of a Nuclear Microprobe System for Interdisciplinary Research and the Integration of Research and Undergraduate Education at Hope College (2003-2005)

NSF-MRI: Acquisition of an ICP for environmental metals analysis for undergraduate training (2001-2003)

"Stakeholder of the Year" award from Macatawa Watershed Project (2005)

"Hope Outstanding Professor Educator" (H.O.P.E.) award (2000)

Recent publications

P. Boutachkov, et al., "Doppler Shift as a Tool for Studies of Isobaric Analog States of Neutron-Rich Nuclei: Application to ${}^7\text{He}$ ", *Phys. Rev. Lett.* **95**, 132502 (2005).

R.H. Howes, et al., "Fabrication of a modular neutron array: A collaborative approach to undergraduate research", *Am. J. Phys.* **73**, 122 (2005).

G.V. Rogachev, et al., "Isobaric analog states as a tool for spectroscopy of exotic nuclei", *Nucl. Instrum. Methods Phys. Res.* **B241**, 977 (2005).

P.A. DeYoung, et al., "Two-neutron transfer in the ${}^6\text{He} + {}^{209}\text{Bi}$ reaction near the Coulomb barrier", *Phys. Rev.* **C71**, 051601 (2005).

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We use the new Hope College Ion Beam Analysis Laboratory to study a wide range of research projects ranging from materials analysis, environmental chemistry, electrochemistry, biochemistry, paleontology and forensic science. The specific applications of Particle-Induced X-ray Emission (PIXE) spectrometry, Rutherford BackScattering (RBS) analysis and Proton Elastic Scattering Analysis (PESA) are used to explore new areas of interdisciplinary research. For example, we have recently developed a joint PIXE and PESA technique on dried electrophoresis gels to quantitatively measure the type and number of metals in metalloproteins. These proteins are first separated by gel electrophoresis, and then the amount of protein and the number of metal centers are independently measured to provide a routine method to determine, for the first time, the metal to protein stoichiometry in metalloproteins.