

Ian J. Bentley

CONTACT DETAILS

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 Saint Mary's College
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EDUCATION

Ph.D. in Nuclear Physics **2004-2010**
University of Notre Dame (Notre Dame, IN)

M.S. in Physics **2004-2008**
University of Notre Dame (Notre Dame, IN)

B.S. in Physics, Astrophysics Option with Honors **2000-2004**
New Mexico Institute of Mining and Technology (Socorro, NM)
Minors: History and Mathematics

ACADEMIC POSITIONS

Associate Professor of Physics **2018-present**
Assistant Professor of Physics **2012-2018**
Saint Mary's College (Notre Dame, IN)

- Lead the college to establish bachelor's degrees in Physics, Physics and Applied Mathematics, and a minor in Physics.
- Developed, assessed, and revised curriculum for the new physics program.
- Served as Co-Chair for the Department of Chemistry and Physics in the spring of 2018.
- Engaged undergraduate students in various computational research projects on topics including image and video analysis, nuclear physics, quantum mechanics, and astrophysics.
- Principal duties include teaching undergraduate physics courses, advising undergraduates, and actively participating in college governance.

Adjunct Associate Professor of Physics **2018**
Adjunct Assistant Professor of Physics **2016-2017**
Guest Assistant Professor of Physics **2012-2018**
Postdoctoral Research Associate **2010-2011**
University of Notre Dame (Notre Dame, IN)

- Collaborated on research projects in nuclear structure and nuclear astrophysics.
- Taught calculus based introductory physics courses in the summer.

Visiting Assistant Professor of Physics **2011-2012**
Marquette University (Milwaukee, WI)

- Taught various physics courses to undergraduate and graduate students.

- Refined online homework problem set questions for introductory physics courses.

Adjunct Assistant Professor of Physics

2010-2011

Indiana University South Bend (South Bend, IN)

- Taught astronomy, algebra based physics and various introductory laboratories.

GRANTS AND AWARDS

Image Analysis of Paper Analytical Devices

2018

Marjorie Neuhoff Summer Science Research Communities, Saint Mary's College

Worked with three students and other faculty to test and validate existing image analysis codes, improve feedback provided to the user and determine the success rates of colorimetric comparisons (*approx. \$20,000, role: Co-PI*).

Nepal Paper Analytical Devices Grant

2015-2017

Mathile Family Foundation

Developed pharmaceutical sampling and feedback system with a student researcher and software engineer for deployment in Nepal (*\$150,000, role: Co-PI*).

Paper Analytical Devices and Genomics Grant

2014

Marjorie Neuhoff Summer Science Research Communities, Saint Mary's College

Advised two student researchers in the development of various prototype programs allowing for color sampling on regions of interest in digital photographs and the creation of color catalogs for future use (*approx. \$35,000, role: Co-PI*).

Women's Voices Course Development Grant

2013

Center for Academic Innovation, Saint Mary's College

Modified the standard narrative in a course on Modern Physics to include research projects on contributions from women scientists.

Research and Dissertation Award

2010

Department of Physics, University of Notre Dame

Awarded in recognition of exceptional thesis and defense.

Travel Grant

2008-2009

Japan-U.S. Theory Institute for Physics with Exotic Nuclei

Met with researchers at RIKEN to discuss approximate pairing calculations and at University of Tokyo to discuss fermionic to bosonic mapping techniques.

Outstanding Teaching Assistant Award

2006

American Association of Physics Teachers and Kaneb Center, University of Notre Dame

Awarded in recognition of exceptional work as a Teaching Assistant in introductory physics laboratories.

PROFESSIONAL AFFILIATIONS

Member

APS, Pi Mu Epsilon, Sigma Pi Sigma

Referee

Acta Physica Polonica B, Advances in High Energy Physics, International Journal of Modern Physics E, Indian Journal of Physics, Physical Review C, Physical Science International Journal

COURSES INSTRUCTED

Title	Level	Institution
Algebra Based Physics I & II	100, 200	IUSB, MU, SMC
Astronomy	100	IUSB, SMC
Calculus Based Physics I & II	100, 200	ND, MU, SMC
Classical Mechanics	300	SMC
Mathematical Methods	300	SMC
Nuclear and Particle Physics	400	MU
Nuclear Science	200	SMC
Quantum Mechanics	400, 500	MU, SMC

UNDERGRADUATE MENTORING

Topic	Undergraduate Student	Year(s)
Computation of Chemical Equilibria	Olga Niyibizi	2015
Imaging of Paper Analytical Devices	Aubrey Houser	2018
	Kerrie Koller	2018
	Kailey Novack	2018
	Catalina Vajiac	2016
	Jenna Wilson	2014-2015
	Tabitha Rickets	2013-2015
Independent Study (Astronomy)	Haley Koth	2014
	Chelsea Wayant	2014
Independent Study (Lagrangians)	Kelly Gallagher	2018
Independent Study (Thermodynamics)	Liz Homer	2015
Marquette Positron Beam	Jeff Maltas	2012
Nuclear Structure	Sara Cunningham	2014
	Yeilyn Colón Rodríguez	2013
Nuclear Submarines	Kathleen Halloran	2017-2018
Nucleosynthesis	Sarah Hansen	2017-2018
Senior Comprehensive (Chemistry)	Yeilyn Colón Rodríguez	2014
	Haley Gordon	2013
Senior Comprehensive (Mathematics)	Olga Niyibizi	2016
Senior Comprehensive (Physics)	Sarah Hansen	2018
	Daisy Kupiec	2018
	Erin Patterson	2017
Tests of the Uncertainty Relation	Aubrey Houser	2017

COLLEGE SERVICE

Committee	Role	Years
Admission and Scholarship	Faculty Representative	2014-2017
Board of Trustees: College Relations	Faculty Representative	2017-2018
Board of Trustees: Finance and Budget	Committee Representative	2015-2017
Board of Trustees: Student Life	Committee Representative	2014-2015
Departmental Hiring	Member	2013, 2016
Faculty Compensation	Member (Chair 2016-2017)	2015-2018
Nominating	Member	2014-2016
Science Hall Renovation	Department Representative	2012-2014

PEER-REVIEWED PUBLICATIONS

12. L. Kloepper, and I. Bentley. Stereotype of group flight in Brazilian free-tailed bats. *J. Anim. Behav.* **131**, 123 (2017).
11. I. Bentley, Y. Colón Rodríguez*, S. Cunningham*, and A. Aprahamian. Shell structure from nuclear observables. *Phys. Rev. C* **93**, 044337 (2016).
10. I. Bentley, Particle-hole symmetry numbers for nuclei. *Indian J. Phys.* **90**, Issue 9, 1069 (2016).
9. B. Bucher, H. Mach, A. Aprahamian, G.S. Simpson, J. Rissanen, D.G. Ghiță, B. Olaizola, W. Kurcewicz, J. Äystö, I. Bentley, T. Eronen, L.M. Fraile, A. Jokinen, P. Karvonen, I.D. Moore, H. Penttilä, M. Reponen, E. Ruchowska, A. Saastamoinen, M.K. Smith, and C. Weber, New lifetime measurements in ^{109}Pd and the onset of deformation at $N=60$. *Phys. Rev. C* **92**, 064312 (2015).
8. I. Bentley, K. Neergård and S. Frauendorf. Nuclear masses near $N = Z$ from Nilsson-Strutinsky calculations with pairing corrections beyond BCS from an isospin conserving pairing force. *Phys. Rev. C* **89**, 034302 (2014) and Erratum: Nuclear masses near $N=Z$ from Nilsson-Strutinsky calculations with pairing corrections beyond BCS from an isospin-conserving pairing force. *Phys. Rev. C* **89**, 049901 (2014).
7. A. Aprahamian, I. Bentley, M. Mumpower, and R. Surman. Sensitivity studies for the main r process: nuclear masses. *AIP Advances* **4**, 041101 (2014).
6. I. Bentley and S. Frauendorf. Relation Between Wigner Energy and Proton-Neutron Pairing. *Phys. Rev. C* **88**, 014322 (2013).
5. S. Brett*, I. Bentley, N. Paul*, R. Surman and A. Aprahamian. Sensitivity of the r-process to nuclear masses. *Eur. Phys. J. A* **48**: 184 (2012).
4. I. Bentley and S. Frauendorf. Microscopic Calculation of IBM Parameters by Potential Energy Surface Mapping. *Phys. Rev. C* **83**, 064322 (2011).
3. I. Bentley, S. Brant, F. Dönau, S. Frauendorf, B. Kämpfer, R. Schwengner and S. Zhang. Instantaneous Shape Sampling - a model for the gamma-absorption cross section of transitional nuclei. *Phys. Rev. C* **83**, 014317 (2011).
2. S.A. Colgate, H. Beckley, J. Si, J. Martinic, D. Westpfahl, J. Slutz, C. Westrom, B. Klein, P. Schendel, C. Scharle, T. McKinney*, R. Ginanni*, I. Bentley*, T. Mickey*, R. Ferrel, H. Li, V. Pariev, and J. Finn. High Magnetic Shear Gain in

a Liquid Sodium Stable Couette Flow Experiment; A Prelude to an Alpha-Omega Dynamo. *Phys. Rev. Lett.* **106**, 175003 (2011).

1. S.Q. Zhang, I. Bentley, S. Brant, F. Dönau, S. Frauendorf, B. Kämpfer, R. Schwengner, and A. Wagner. Instantaneous-Shape Sampling for Calculation of the Electromagnetic Dipole Strength in Transitional Nuclei. *Phys. Rev. C* **80(2)**, 021307(R) (2009).

*Denotes undergraduate student researchers.

MISCELLANEOUS PUBLICATIONS

7. Jenna Wilson*, Tabitha Ricketts*, Ian Bentley, and Ewa Misiolek. Four-Square Fiducial Markers Used in the Analysis of Paper Analytical Devices. *Am. J. Undergrad. Res.* **13**, Issue 2, 15 (2016).
6. A.I. Georgieva, A. Aprahamian, I. Bentley, A. Teymurazyan, and A. Nystrom. Systematic Evaluation of the Nuclear Binding Energies in the Valence Shells. *Bulg. J. Phys.* **42**, 544 (2015).
5. R. Surman, M. Mumpower, J. Cass*, I. Bentley, A. Aprahamian, and G.C. McLaughlin. Sensitivity studies for r-process nucleosynthesis in three astrophysical scenarios. The 25th International Nuclear Physics Conference. *EPJ Web of Conf.* **66**, 07024 (2014).
4. S. Frauendorf and I. Bentley. Wigner term generated by isovector p-n pairing, Heavy Ion Accelerator Symposium. *EPJ Web of Conf.* **63**, 01003 (2013).
3. Ian Bentley and Stefan Frauendorf (Advisor) Wigner X Resolved and Photo-Reaction Cross-Section Predictions: Improvements for Astrophysical Calculations. Dissertation, University of Notre Dame (2010).
2. S. Q. Zhang, I. Bentley, S. Brant, F. Dönau, S. Frauendorf, B. Kämpfer, R. Schwengner and A. Wagner. Instantaneous Shape Sampling for Calculating the Electromagnetic Dipole Strength in Transitional Nuclei. *AIP Conf. Proc.* **1090**, 194 (2009).
1. Stirling Colgate, Howard Beckley, Hui Li, Richard Sonnenfeld, Dave Westpfahl, Ian Bentley*, Rocky Ginanni, Travis McKinney*, and Valadimir Pariev. A Liquid Sodium $\alpha \omega$ Dynamo Experiment. American Physical Society, 46th Annual Meeting of the Division of Plasma Physics (2004).

*Denotes undergraduate student researchers.

PRESENTATIONS

18. “Automated Analysis of Swarming Bat Flight,” joint **contribution** with Laura Kloeppler, Faculty Technology Showcase, Saint Mary’s College (April 2016).
17. “Nuclear shell evolution,” short **contribution**, American Physical Society April Meeting, Salt Lake City (April 2016).
16. “Particle-hole symmetry in nuclei and empirical fits to the 4/2 ratio and binding energies,” short **contribution**, 7th Workshop on Shape-Phase Transitions and Critical Point Phenomena in Nuclei, Universidad de Sevilla (March 2014).

15. “Differences in observables as signatures for shape phase transitions,” short **contribution**, 7th Workshop on Shape-Phase Transitions and Critical Point Phenomena in Nuclei, Universidad de Sevilla (March 2014).
14. “Shell Structure,” science **colloquium**, Saint Mary’s College (November 2013).
13. “Exact and Approximate Pairing Models Applied to the Wigner Energy,” short **contribution**, 26th Annual Midwest Theory Get-Together, Argonne National Laboratory (September 2013).
12. “A Simple Pairing Approach on the Linear Symmetry Energy Near $N=Z$,” short **contribution**, 3rd International Symposium on Nuclear Symmetry Energy, Michigan State University (July 2013).
11. “Nucleosynthesis,” physics **colloquium**, Marquette University (May 2012).
10. “The Role of Deformation and Isovector Pairing on the Nuclear Symmetry Energy,” nuclear astrophysics **seminar**, Texas A&M University-Commerce (March 2011).
9. “Investigations of the Nuclear Symmetry Energy (Wigner Energy) and Mapping of Fermionic to Bosonic Deformation Energy Surfaces,” theory **seminar**, Argonne National Laboratory (December 2010).
8. “Microscopic Calculation of Low Lying Levels by Potential Energy Surface Mapping,” short **contribution**, 23rd Annual Midwest Theory Get-Together, Argonne National Laboratory (September 2010).
7. “Binding Energies in Nuclei Near $N=Z$: Wigner X Resolved,” nuclear **seminar**, University of Notre Dame (April 2010).
6. “Beyond BCS Pairing Applied to Symmetry Energy,” nuclear theory **seminar**, RIKEN Wako Institute (February 2009).
5. “Beyond BCS Pairing Applied to Symmetry Energy,” nuclear theory **seminar**, Tokyo University (January 2009).
4. “Wigner Energy,” short **contribution**, 21st Annual Midwest Theory Get-Together, Argonne National Laboratory (October 2008).
3. “Wigner Energy,” short **contribution**, JINA Special School on Nuclear Mass Models, Argonne National Laboratory (May 2007).
2. “Isospin and the Wigner Energy,” short **contribution**, 20th Annual Midwest Theory Get-Together, Argonne National Laboratory (October 2007).
1. “Wigner X,” short **contribution**, 19th Annual Midwest Theory Get-Together, Argonne National Laboratory (October 2006).

POSTERS

6. “Nuclear observables indicating the evolution of shell structure,” I. Bentley. American Physical Society Prairie Meeting, University of Notre Dame (November 2015).
5. “Nuclear shells, sub-shells and shell evolution,” I. Bentley. American Physical Society April Meeting, Baltimore Hilton (April 2015).

4. "Modeling Basic Shell Structure in Nuclei," I. Bentley. SciMixer 2, Saint Mary's College (February 2014).
3. "Evolution of Nuclear Shells and Consequences for Binding Energy Fits," I. Bentley, Y. Colon*, and A. Aprahamian. National Science Foundation Site Visit, University of Notre Dame (February 2014).
2. "Calculation of Nuclear Transitions by Potential Energy Surface Mapping," I. Bentley. SciMixer, Saint Mary's College (February 2013).
1. "Microscopic calculation of the IBM parameters by potential energy surface mapping," I. Bentley and S. Frauendorf. Nuclear Structure 2010, University of California Berkeley (August 2010).