

# Gay B. Stewart

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## Education

**University of Illinois, Urbana-Champaign**  
*Urbana, IL* Ph.D. Physics 1994, M.S. Physics 1990  
Thesis Supervisor: Bob I. Eisenstein;  
Title: Search for CP Violation in D-Meson Decays

**University of Arizona**  
*Tucson, AZ* BS Physics 1988  
minor: business

## Professional experience

**West Virginia University**  
Professor of Physics and Eberly Professor of  
STEM Education, Fall 2014-current  
**University of Arkansas, Fayetteville**  
Assistant Professor of Physics 1994-2000  
Associate Professor of Physics 2000-2011  
Professor, 2011-2014 (adjunct 2014-)

**University of Illinois, Urbana-Champaign**  
Graduate Teaching Assistant 1988-1989  
Graduate Research Assistant 1989-1994  
**University of Arizona, Tucson**  
Analyst of Educational Software 1987-1988  
**Arizona Range News, Willcox, AZ**  
Assistant Editor/Reporter 1980-1981  
Reporter 1979-1980

## Teaching Interests, Awards and Courses Taught

The NSF program officers felt it best that I continue to teach University Physics II (UPII) while it was funded. PhysTEC required a complete reworking of UPI, so I then taught that for 14 semesters. This, combined with Lab and Classroom Practices in Physics (PHYS 400V) and the independent study courses (teacher, and special topics, graduate and undergraduate) required all of my teaching time, with the exception of one summer Modern Physics course, one summer course for the College of Education and Health Professions (Science Teaching), one section of electromagnetic theory taught for students off sequence, and one Physics in Perspective taught specially for future teachers.

- University of Arkansas Alumni Association 2007 Teacher of the Year
- UA Advising Award, 2006; Honors College Fellowship Advising Gold Medal, 2003
- CASE Arkansas Professor of the Year, 2002
- Fulbright College Master Teacher, 2002; Fulbright College Outstanding Adviser, 1998
- Developed the new University Physics II class in 1994. Developed approximately 20 new activities for the class and reworked some existing laboratories to make them fit the course structure. Continued revision of the course and development of new materials with John Stewart.
- In 1997, adapted the UPII format to allow possible adoption in other courses.
- Reworked existing University Physics I laboratories and developed new activities and demonstrations to fit the course structure.
- Taught 14 semesters of UPII, (NSF funding 5.5 years).
- Developed and regularly teach “Lab and Classroom Practices in Physics” a dual-enrollment course.
- Developed a new MA degree for physics teachers, and helped revise the BA and BS degrees.
- Helped plan five new and revised courses to support the revisions to BA and BS degrees.
- Supervise independent study courses in modern physics and physics education at the graduate and undergraduate level as well as for area high school teachers unable to attend workshops.

## Current research interests

Since May 1995 this work is supported in part by NSF. My time has been spent more and more in managerial functions associated with large projects and significant time has been spent in mentoring and materials development. However, I have maintained some research presence:

- 20+ peer reviewed publications
- 30+ invited talks at national meetings dealing with physics or science education (such as AAPT, APS, AAC&U, NSF/UFE)

1) Curriculum Development: materials and class strategies effective for small and large institutions in the introductory calculus-based physics course covering electromagnetism and optics.

- Maintain five web sites, local PhysTEC, Preparing Future Faculty; K-12 teacher resources, research, and course materials.
- Developed activities for and involved in production of lab manuals for six introductory physics courses

2) Assessment and evaluation of students *and* curricula.

3) Preparing graduate students to join the professoriate and masters and undergraduate students to become physics teachers.

4) Goal setting for class development.

5) Transportability of Curricular Developments.

### Grants Received

- WVUteach: The Pinnacle on a Mountain of Excellence, **\$1,450,000**, HHMI, 01/01/15-05/15/19, PI.
- Developing a New Model for PhysTEC sustainability, **\$180,000**, American Physical Society 08/01/15-07/31/18, CoPI.
- Math and Science Together, **\$500K**, Department of Education MSP, 9/1/2014-8/30/2017. (PI until summer 2015, then left project except as consultant)
- YouTeach Physical Science: Noyce Scholars Enhancing Technical Capacity in Arkansas, **\$1,199,198**, National Science Foundation (CoPI until summer 2015).
- UTeach Arkansas, Arkansas Workforce Cabinet, Michael and Susan Dell Foundation **\$0.9M**, 5/1/2012-4/30/2016 (with a goal of raising funds to be sustainable after 2016.) CoPI until left.
- College Ready in Mathematics and Physics Partnership, NSF, **\$7.3M**, 1/1/09-06/30/2015, PI
- ARK-PHYS - Physics Scholarships to Build Technical Capacity in Arkansas, NSF, **\$600K**, 6/1/2010-5/31/2015, CoPI.
- Robert Noyce Scholarship Program, NSF, **\$1,050K**, 9/15/2007-9/14/2015, PI.
- State MSP, Professional Development Opportunities in Physics and Physical Science, **\$350K**, June 2008-May 2011.
- TOPP: Taxonomy of Physics Problems, Improving Student Understanding In Introductory Physics, NSF, **\$150K**, 5/16/06-4/30/11, Co-PI.
- "Track 2, GK-12: Teaching the Science in Everyday Life" NSF, **\$1.86M** Oct 06- Sept 2014, Co-PI
- "GK-12: Inquiry and Innovative Thinking by Design," NSF **\$1.55M** June 02- May 2006, Co-PI
- One of six primary program institutions for the "Physics Teachers Education Coalition" NSF/FIPSE, (\$6.2M overall, **\$500K** to site), Aug 01-July 06, Site director. PI: AIP/APS/AAPT. Chosen for further participation upon NSF recommendation, **\$117K**, Aug 06-July 2008, Site director.
- "Implementing Interactive Laboratory-Based Learning Techniques in Second-Semester Introductory Physics." NSF/DUE-9455732, 15 May 95-30 Sept 2000, **\$231K**, PI.
- One of four pilot sites in physics for the "Shaping the Preparation of Future Science Faculty." NSF/AAPT, (\$5M overall, **\$40K** directly to site), July 99-June 01, Site director, PI: AAPT.
- "Preparing Future Physics and Physical Science Teachers." Arkansas Department of Higher Education, **\$32K**, Jan 01-Dec 01, PI.
- "Intensive TA Training: Improving Undergrad Education, and Preparing Grad Students for Employment." University of Arkansas Teaching Academy Grant, **\$2K**, May 96-Sep 97, PI.
- "Intensive TA Training: Improving Undergrad Education, and Preparing Grad Students for Employment." Society of College Science Teachers Minigrant Program, **\$1K**, May 96-Sep 97, PI.

- “Implementing Successful UPII Strategies in the First-Semester Course.” University of Arkansas Teaching Academy Grant, \$1K, Sep 98-Aug 99, PI.
- Several state SILO or university research grants for projects with undergraduates.

### **National Service**

- APS Board of Directors (2014 [inception]-2016)
- APS Council Steering Committee (2014 [inception]-2016)
- APS Executive Board (2011-2012)
- APS Councilor (2009-2014) Council of Representatives (2014 [inception]-2016)
- APS Forum on Education Executive Committee (elected positions, 1999-2006, 2009-2016), (AAPT liaison, then vice-chair and chair of numerous subcommittees, chair, past chair and chair of fellowship committee)
- Acting council representative, APS Forum on Outreach and Engaging the Public and Topical Group on Physics Education Research (2015-2016)
- AIP Governing Board (2011-2014)
- AAPT Executive Board (2011 vice pres., 2012 president elect, 2013 president, 2014 past president.)
- Physics Education Research Advisor, AAPT Physics Teacher Resource Agents (one of the largest collections of professional development materials for physics teachers in the country 2007- 2012).
- Advisory Board, AAPT PTRA (2007- 2012)
- APS Committee on Education (2002-2005, appointed by APS executive officer)
- PKAL Physics task Force (1998- )
- PKAL Faculty for the 21<sup>st</sup> Century (1998- ) (Helped organize 2004 national meeting.)
- AP Physics Curriculum Development and Assessment Committee (2008-2011; co-chair 2012-2016)
- AP Physics Review Advisory Panel (2008)
- AP Physics Test Development Committee (1997-2003), Chair for 2000-2003
- College Board Science Advisory Committee (2002-2012), Chair 2003-2009
- College Board Academic Assembly Council (2003-2009)
- Co-Chair AP Physics Redesign (2006-2007)
- Appointed by joint agreement of professional societies, College Board, and NSF to AP Physics Instrument Development Panel and Content Validation Panel (2005-2006)
- Served on the Review Panel for the NSF CCD-DUE grant proposals. Did mail review of both physics and DUE proposals. Review Panel for NSF director’s award for Distinguished Teacher Scholars, 2004. Review Panels for CCLI; MSP; TUES; DRK-12; ATE.
- Helped organize national PTEC conference on Physics and Physical Science Teacher Preparation, held at University of Arkansas campus, March 2006. Approximately 100 attendees.
- PhysTEC Leadership Council [created 2004] (2004-08)
- PhysTEC Steering committee [created 2006] (2006-10)
- PhysTEC Programmatic Review Board [created 2010] (2010-).

### **University and Department Service**

- Co-Director, WVUteach (2014- )
- Director, WVU Center for Excellence in STEM Education (2014- )
- Undergraduate physics major advisor To 11 WVU students (2015- )
- Co-Director (senior adviser), UAteach (2012- 2014)
- Engineering College Task force on Retention (2006-2008)
- Chancellor’s Task Force for Recruiting and Retention (1999-2001 )
- Teaching Assistant Effectiveness Advisory Committee (2001- 2014)
- Premedical Advisory Committee (2004-2009)
- Organized regional AAPT (AOK section) meeting, 2001
- Other normal university and departmental committees
- Undergraduate Mentor, advisor to 60+ undergraduate physics majors (1994-2014)
- Chair or member of Departmental Undergraduate Affairs Committee (1994-2006)

- Supervise graduate students
- Honors Council Representative (2006-2009)
- Supervised ~20 undergraduate honors research projects, sat on many committees
- Prepared and taught summer workshops for area middle and high school physics teachers
- AP-Physics Liaison for the Department/University
- Advisor to University Museum Discovery Room (University has since shut down museum!)
- Prepared “Science Saturdays” for University Museum, did two summer workshops for children through the University Museum.
- Freshman mentor (University F.A.S.T. program), fall 1995.
- Teacher Assistant Mentor (1994-2014)
- Organized, developed and taught departmental TA training program (1996-7, 2002-2005).
- Consulted and prepared materials for departmental TA training program (1998 -2001, 2006-2014).
- Two newsletters produced each year (1995- 2011), each to over 300 high school teachers.
- High School Physics Day: Attendance has increased by a factor of 10 since assumed in 1995.
- Public School Liaison: Do demonstrations for local area elementary and middle schools. Do presentation for area teachers for University Day. Worked with the University Museum for coordinating demonstrations and programs. Provided resources to interested teachers and parents for demonstrations and elementary school science fairs. Organize judges and demonstrations for junior high and high school science fairs. (1994-2014)
- K-12 Resources: <http://www.uark.edu/depts/physinfo/>
- Secondary Education Adviser for Physics (2001-2014)

### **Additional professional activities**

- Editorial Board: *Journal of Science Education and Technology* (1999- )
- Review “reform” textbooks
- Reviewer: *Journal of Women and Minorities in Science and Engineering*, Begell House, Inc. Virginia Tech. (1996-2000)

### **Professional society affiliations**

- American Physical Society (elected APS Fellow, 2009)
- American Association of Physics Teachers (Presidential line, 2011-2014)

### **Publications**

- Michaluk, L. M., DeVore, S., Stewart, G. B., & Stewart, J. C. (2016). New directions in educational research, methodology, and analytical techniques. In M. d' Souza (Ed). *Teaching and Learning in Higher Education: Emerging Trends*, pp.90-131. Anaheim, CA: United Scholars Publications.
- G. Stewart and J. Stewart, Invited: Case studies of successful preservice physics education programs: Physics teacher preparation at the University of Arkansas, in *Recruiting and Educating Future Physics Teachers: Case Studies and Effective Practices*, edited by C. Sandifer and E. Brewster (American Physical Society, College Park, MD, 2015), pp. 53-62.
- John Stewart, William Oliver III, and Gay Stewart, “Revitalizing an Undergraduate Physics Program: A Case Study of the University of Arkansas,” *American Journal of Physics*, 81, 943 (2013).
- John Stewart, Stephen Skinner, and Gay Stewart, “The leaf electroscope: a take home project of unusual depth,” *The Physics Teacher*, 51, 520 (2013).
- Using cluster analysis to identify patterns in students’ responses to contextually different conceptual problems, John Stewart, Mayo Miller, Christine Audo, and Gay Stewart, *Phys. Rev. ST Physics Ed. Research* 8, 020112 (2012).
- Using time-on-task measurements to understand student performance in a physics class: A four-year study; John Stewart, Gay Stewart, and Jennifer Taylor; *Phys. Rev. ST Physics Ed. Research*, 8 (010114), (2012).

- J. Stewart and G. Stewart “Correcting the Normalized Gain for Student Guessing”, *Physics Teacher*, **48**:194-196, March (2010).
- *College Ready: First Year Successes and Challenges*, Gay Stewart, Charles Stegman, Pete Joenks, NSF 2010 MSP Learning Network Conference, Washington, DC, January 2010. (Refereed by NSF committee and published on MSP-Net.)
- Patricia Heller and Gay Stewart, [Physics Standards for College Success: A Look to the Future](http://www.compadre.org/osp/items/detail.cfm?ID=10310), Retrieved September 6, 2010 from the ComPADRE OSP Collection Web site: <http://www.compadre.org/osp/items/detail.cfm?ID=10310>, (2010).
- The AAPT/APS/AIP Focus Group Report on the NRC-BOSE Draft Frameworks discussion was compiled into the following report which was transmitted to the NRC as a public response to the draft Frameworks. Stewart was one of the 13 members. The AAPT Executive Board also used the document as part of their discussions of the draft Frameworks. Available on the AAPT web site at <http://www.aapt.org/Resources/upload/100815-Focus-Group-Report-on-Draft-Frameworks.pdf>
- AP Physics 1 & 2 Curriculum Framework, one of 26 authors, published by The College Board, NY, NY, 2012, revised 2014, 242 pp.
- Science College Board Standards for College Success, one of 12 authors, published by The College Board, NY, NY, 2009, 211 pp.
- Gay B. Stewart and John C. Stewart, an invited Point of View article, “Pressures Lowering the Educational Value of Introductory Science Courses”, *Cell Biology Education*, it was accepted, then publication was delayed, then the feature was cancelled when the opposing point of view piece failed.
- “Using a Master Teacher's Unique Knowledge to Prepare TAs and Learning Assistants”, PTEC conference proceedings, 2008 ([www.ptec.org](http://www.ptec.org)). There are several similar to this, only one is included.
- John C. Stewart, Heather Griffin and Gay B. Stewart, "Context sensitivity of the Force Concept Inventory", *Physical Review Special Topics: PER*, **3** (1), (2007).
- Gay B. Stewart, “Changing to a student-centered learning environment”, *Project Kaleidoscope, Volume IV: What works, what matters, what lasts*, [http://www.pkal.org/template2.cfm?c\\_id=1419](http://www.pkal.org/template2.cfm?c_id=1419) (2006).
- “Work: pre, during and post class questions,” [SERC Pedagogic Service Project](#), comPADRE Pedagogic Library, August 2007 (These would have traditionally been submitted to *The Physics Teacher*, but this library has the potential to support a much larger readership, and the NSF requested the submissions be made to this venue. )
- [Understanding the Work Energy Theorem: In the lab or as lecture demonstration](#), [SERC Pedagogic Service Project](#), comPADRE Pedagogic Library, August 2007
- D. Bullock, V. LaBella, T. Clingan, Z. Ding, G. Stewart, and P. Thibado, “Enhancing the Student-Instructor Interaction Frequency,” *The Physics Teacher*, **40**:535-541 (2002).
- Gay B. Stewart and John C. Stewart, “Simply Measuring Earth's Magnetic Field,” *The Physics Teacher*, **38**:113-114, (2000).
- With the AP Development Committee, “A Consistent Sign Convention for Mechanical and Thermodynamic Work,” *The Physics Teacher*, **38**:160-161, (2000).
- Gay B. Stewart, Cover Article: “Build your own motor,” *Science Scope*, **22**:12-16 (1999).
- Gay B. Stewart, Cover Article: “Electrostatic Explorations,” *Science Scope*, **21**:10-13 (1998).
- Gay Stewart and Ditta Gallai♦♦, “More Electrostatic Explorations,” *Science Scope*, **21**:18-22 (1998).
- Gay Stewart and Ditta Gallai♦♦, “Pithy Problems,” *Science Scope*, **21**:18-19 (1998).
- Gay B. Stewart, John C. Stewart, Stephen Skinner and Crystal Bailey, “Using Linguistic References to Characterize Class Integration,” *Physics Education*, **34**:266 (1999).

- Gay B. Stewart and Jon Osborn<sup>♦♦</sup>, “Closing the Gender Gap in Student Confidence: Results from a University of Arkansas Physics Class.” *Journal of Women and Minorities in Science and Engineering*, **4**:27 (1998)
- Gay B. Stewart, “Part I: Toward a System of Educational Engineering for Traditional Class Elements in Introductory Physics Courses.” *Journal of Science Education and Technology*, **6**:173 (1997).
- Gay B. Stewart and John C. Stewart, “Part II: A Computationally Based Modeling System for Class Elements Using Formal Observer-Based Experimental Connections.” *Journal of Science Education and Technology*, **6**:193 (1997).
- Gay B. Stewart, John C. Stewart, Sean Slape<sup>♦</sup> and Jon Osborn<sup>♦♦</sup>, “Optimally Engineering Traditional Introductory Physics Classes.” *Journal of Science Education and Technology*, **6**:297 (1997).
- Gay B. Stewart, “The Rail Gun,” *The Physics Teacher*, **34**:122-123, (1996).
- Macmillan Encyclopedia of Physics, John S. Rigden, Editor in Chief, Macmillan Publishing Company. Three articles contributed: Electric Susceptibility, Electric Moments and Electric Potential.
- “Search for CP Violation in D-Meson Decays,” *Thesis*. May 1994.
- “Persuade Colleagues at Large Universities that Substantive Changes are Necessary and Viable,” Project Proceedings, 1993 Summer Seminar *Teaching Introductory Physics Using Interactive Methods and Computers*, Dickinson College.
- “First Measurement of the Left-Right Asymmetry in Z Boson Production,” SLD Collaboration (R. D. Elia, et al.), *Mod. Phys. Lett.* **A8**, 2237 (1993).
- “First Results from SLD with Polarized Beams at SLC,” SLD Collaboration (M.J. Fero, et al.), SLAC Summer Institute Proceedings, 1992:341-358
- “First Measurement of the Left-Right Cross Section Asymmetry in Z Boson Production by Electron-Positron Collisions,” SLD Collaboration (K. Abe, et al.), *Phys. Rev. Lett.* **70**, 2515 (1992).
- “QCD Studies of Hadronic Decays of Z Bosons by SLD,” SLD Collaboration (D. Muller, et al.), Proceedings of the 26th Annual International Conference on High Energy Physics, 1992:892-898.
- “First Measurement of the Left-Right Cross Section Asymmetry in Z Boson Production at  $E_{cm}=91.5$  GeV,” SLD Collaboration (K. Abe, et al.), Proceedings of the 26th Annual International Conference on High Energy Physics, 1992:708-715.

<sup>♦</sup>Undergraduate Student    <sup>♦♦</sup>Graduate Student