

CURRICULUM VITAE

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PERSONAL DATA

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U. S. Citizen, born in Baltimore, MD

PROFESSIONAL PREPARATION

Ph.D. (Condensed Matter Physics), December, 1978,
The University of Texas at Austin,
Austin, TX 78712. (Advisor: W.D. McCormick)

B.S. in Physics, June, 1969,
Case Institute of Technology ,
Case-Western Reserve University,
Cleveland, OH 44106.

Selected Other Credentials:

- Secondary School Teaching Certificate in the Physical Sciences and Mathematics, 1970-1973 in Ohio (#212-50-8721 4c), 1972-1975 in Maryland (#10-212-50-8721)
- NSF Summer Institute for Secondary School Teachers on Project Physics, 1971, Knox College, Galesburg, IL

REFERENCES:

Robert Bahruth
Department of Elementary Education & Specialized Studies
Boise State University
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SELECTED PROFESSIONAL EXPERIENCE

September, 2005 – present	Member, Editorial Board, <i>Constructivist Foundations</i> , < http://www.univie.ac.at/constructivism/journal/ >
October, 2005 – present	Audit Team Member, Science Teacher Preparation Programs, NSTA-NCATE Special Programs Recognition
April, 2005 – present	Review Panel Member, Science Teacher Preparation Programs, NSTA-NCATE Special Programs Recognition
November, 2005 – 2007	Research and Teaching Editor, <i>Journal of College Science Teaching</i>
December, 2004 – present	Member and Physics inquiry instructor, Science for Monks Project, teaching physics to Tibetan Buddhist monks in-exile in India, funded by the Sager Foundation, commissioned by His Holiness the 14 th Dalai Lama
January, 2004	Committee member to review the Idaho standards and rubrics for science teacher preparation,
Summer, 2003 – present	Member, Curriculum Committee, Treasure Valley Mathematics and Science Center, Boise and Meridian Public Schools
October, 2002	Member, State of Idaho Education Review Team at BYU-Idaho, Rexburg, ID

June, 2002 Writing Team, Rubrics for Science Teacher Preparation Foundation and Enhanced Standards, State of Idaho

May, 2002 Writing Team, Rubrics for Teacher Preparation Core Standards, State of Idaho

Spring, 2000 – present: Physics representative, Teacher Education Coordinators Council, Boise State University

May, 1995 – present: Member, Program committee, International Workshop on New Trends in Physics Teaching, Puebla, MX

May, 1994: Promoted to rank of Professor of Physics at Boise State University

January, 1992 - present: Member, Development Team for the Physical Science Instruction for Pre-service Elementary Teachers (PSI-PET) Project of AAPT, NSF grant: TPE-9154024, later this project became the Powerful Ideas in Physical Science (PIPS) Project of AAPT with continued funding from NSF: DUE-9554625. Authored three of the six modules. (information available on-line at url: <http://www.aapt.org/programs/pipsprod.html>)

March, 1990: Tenure at Boise State University granted by the Idaho Board of Higher Education

Sept., 1989 - January, 1994: Visiting Research Scientist, Center for the Design of Educational Computing, Carnegie Mellon University, Pittsburgh, PA

January, 1989 - January, 1992: Member At-Large, Executive Board of the American Association of Physics Teachers

Sept., 1987 - 1994: Associate Professor of Physics, Boise State University

Sept., 1985 - Aug., 1987: On-leave from Boise State University to the U.S. Army Research Institute for the Social and Behavioral Sciences (ARI) as a Research Scientist at its Boise/Gowen Field Training Technology Field Activity (TTFA)

May, 1982 - Jan. 1990: Advisory Editor in College Physics for John Wiley and Sons, Inc., New York, NY

Sept., 1981 - Sept. 1987: Assistant Professor, Department of Physics & Engineering, Boise State University, Boise, ID

Sept., 1978 - July, 1981: Assistant Professor and Introductory Laboratory Supervisor, Department of Physics, Oklahoma State University, Stillwater, OK

June, 1977 - Aug., 1978: Welch Foundation Pre-Doctoral Fellowship in Chemical Physics, The University of Texas at Austin

Jan., 1974 - June, 1977: Teaching Assistant, Department of Physics, The University of Texas at Austin

Sept., 1972 - June, 1973: Physics and Physical Science Teacher to grades 9 & 12, Middletown High School, Frederick County Board of Education, Frederick, MD

Sept., 1969 - June, 1972: Physics and Physical Science Teacher to grades 11 & 12, East Technical High School, Cleveland Public Schools, Cleveland, OH

Summer, 1969: Physicist, Metallurgy Division, Institute for the Study of Materials, National Bureau of Standards, Gaithersburg, MD

PUBLICATIONS

College Teaching and the Development of Reasoning, co-authored/edited with Robert Fuller, Thomas Campbell and Scott Stevens, Information Age Publishing: Charlotte, NC (final manuscript submitted: April, 2009)

“Conceptual development about motion and force in elementary and middle school students” with Dale R. Sweet, *American Journal of Physics* **77**(5): pages to be determined, Issue out in May, 2009.

“Put Another Way...” Open Peer Commentary, *Constructivist Foundations* **3**(2), to be published March, 2008. (downloadable from: <<http://www.univie.ac.at/constructivism/journal/articles/3.2.065.commentaries.pdf>>)

"Physics Classroom Engagement: constructing understanding in real time" *Latin American Journal of Physics Education* **2**(1): 1 – 5 (January, 2008). (downloadable from: <<http://journal.lapen.org.mx/jan08/LAJPE-Vol-2-No-1-2008.pdf>>)

"How we think about and prepare to teach physics...Why some like it radical," chapter in A. C. Cruz and J. Slisko (eds) *Nuevas Tendencias en la Enseñanza de la Física*, Benemérita Universidad Autónoma de Puebla: Puebla, Mexico (2007).

“Once more into the breach...” Open Peer Commentary, *Constructivist Foundations* **3**(1): 8 – 9 (November, 2007) (downloadable from: <<http://www.univie.ac.at/constructivism/journal/articles/3.1.001.saalmann.pdf>>)

“The Challenge of Understanding Radical Constructivism” *Constructivist Foundations* **2**(2-3): 50 – 57 (March, 2007), republished in R. Glanville & A. Riegler (eds) *The Importance of Being Ernst: Festschrift for Ernst von Glasersfeld*, WISDOM: Vienna (Nov., 2007)

“Science Education,” chapter in D. Gabbard (ed), *Knowledge and Power in the Global Economy: The Effects of School Reform in a Neoliberal/Neoconservative Age*, Lawrence Erlbaum: Mahwah, NJ (October, 2007)

“Discipline-Based Research in College Science Teaching” *Journal of College Science Teaching* **36**(1): 50 – 51 (2006).

“The Science for Monks Project: Using inquiry to teach physics to Tibetan Buddhist monks” *Memorias*, XIV International Workshop on New Trends in Physics Teaching, Puebla, Mexico, May, 2006

“Against Realist Instruction: Superficial Success Masking Catastrophic Failure and an Alternative” *Constructivist Foundations* **1**(1): 49 – 60 (2005) (downloadable from <<http://www.univie.ac.at/constructivism/journal/1.1/>>)

“Why Teach Kinematics? An Examination of the Teaching of Kinematics and Force—I” submitted to *Physical Review Special Topics: Physics Education Research* December, 2004 (available on-line at: <http://www.boisestate.edu/physics/dykstra/WTK1.pdf>)

“Why Teach Kinematics? An Examination of the Teaching of Kinematics and Force—II” submitted to *Physical Review Special Topics: Physics Education Research* December, 2004 (available on-line at: <http://www.boisestate.edu/physics/dykstra/WTK2.pdf>)

“Conceptual Development About Motion and Forces in Elementary/Middle School Students” with Dale R. Sweet, submitted to the *PER Supplement of the American Journal of Physics*, November, 2002—passed review stages November 2004 (available on-line at: <http://www.boisestate.edu/physics/dykstra/SGER.pdf>)

“Radical, getting to the root: a review of *Curriculum Dynamics: Recreating Heart*” Essay review in *Journal of Curriculum Studies*, **36**(6): 725-733 (Fall, 2004)

“How we think about and prepare to teach physics” Proceedings of the 2004 Physics Education Research Conference, Sacramento, Ca, August 2004

- “Motion” and “Force”, two units of *Powerful Ideas in Physical Science—A Model Course*, American Association of Physics Teachers: College Park, MD (published on CD-ROM by AAPT, Summer, 2002).
- “On Fear Of Solipsism: Science, Radical Constructivism, And Science Education” Target Article 40 in the Karl Jaspers Forum, url: <<http://www.douglashospital.qc.ca/fdg/kjf/40-TADYK.htm>>
- "The Role of Scientific Terminology in Research and Teaching: Is Something Important Missing?" with Josip Slisko, *Journal of Research in Science Teaching* **34** 655 - 660 (1997)
- “Electricity” a unit of *Powerful Ideas in Physical Science—A Model Course*, (I am main author for the unit on Electricity and co-author of sections on research in physics education with John Layman), American Association of Physics Teachers: College Park, MD (First edition, 1995, Second edition, 1996)
- “Teaching Introductory Physics to College Students” Chapter 12 in *Constructivism: Foundations, Perspectives, and Practice*. Catherine Fosnot (Ed.), Teachers College Press: New York (1996) (This book was awarded the Significant Contribution award by the Constructivist SIG of AERA in 1999.)
- “Response to M. Vicentini’s Comments on “Studying Conceptual Change in Learning Physics”, with C. Franklin Boyle and Ira A. Monarch, *Science Education* **77**(3): 343 - 349 (1993).
- “The Challenge of Understanding Educational Implications of Radical Constructivism”. *Newsletter of the Subject Matter Knowledge and Conceptual Change SIG of AERA* **18**: 7 - 9 (1993)
- “Studying Conceptual Change in Learning Physics”, with C. Franklin Boyle and Ira A. Monarch, *Science Education*, **76**(6): 615 - 652 (1992)
- “Studying Conceptual Change: Constructing New Understandings”, in *Physics Learning: Theoretical Issues and Empirical Studies Proceedings of an International Workshop*, R. Duit, F. Goldberg, and H. Niedderer (eds.) published by the Institute for Science Education (IPN), University of Kiel, Kiel, Germany, January, 1992
- “A Constructivist Education, Conceptual Change, and the Role of Technology”, *Methodologia* 8, Vol. V, 39 - 56 (1991) (This is a quarterly journal published by the Society of Methodological-Operative Culture, via Senato 45, 20121 Milano, Italy.)
- “Conceptual Restructuring in History of Mechanics as a Model for Learning Mechanics”. with Ira A. Monarch, and C. Franklin Boyle, published in *Proceedings of The Third International Conference on the Learning Sciences*, Chicago, IL, August, 1991.
- “Using Knowledge Representation to Study Conceptual Change in Students for Teaching Physics”, with C. Franklin Boyle and Ira A. Monarch, in *Proceedings of the 12th Annual Conference of the Cognitive Science Society*, Lawrence Erlbaum Associates, Hillsboro, NJ, 1990.
- “Wondering About Physics... Using Computers and Spreadsheet Software in Physics Instruction”, in *The Conference on Computers in Physics Instruction: Proceedings*, John Risley and Edward Redish (eds.), published by Addison-Wesley, 1990
- Physics Vignettes* with Robert Fuller, a collection of vignettes on videodisc to support discussions in physics classrooms, published by John Wiley and Sons, January, 1990.
- What If...?* with Robert Fuller, a collection of videotape vignettes to support discussions in physics classrooms, published by John Wiley and Sons, September, 1988.
- Instructor’s Guide for What If...?* with Robert Fuller, published by John Wiley and Sons, September, 1989.
- Wondering About Physics... Using Spreadsheets to Find Out* with Robert Fuller, published by John Wiley and Sons, May, 1988.

Instructor's Guide for Wondering About Physics..., with Robert Fuller, published by Wiley and Sons, June, 1988.

TTCATs, Cost Analysis Spreadsheets for Distributed Training Technology Selection (on Lotus 123)

and the

User's Manual: Distributed Training Technology Selection Cost Analysis (TTCATs) with Joseph Hagman for the U. S. Army Research Institute, Summer, 1988

TECHSELECT, Expert System Software for Distributed Training Technology Selection

and the

User's Manual: Distributed Training Technology Selection Advisor (TECHSELECT) with Joseph Hagman for the U. S. Army Research Institute, April, 1988 (Research Product No. 88-11)

"Response to Comments on 'Science Education in Elementary School: Some Observations'", *Journal of Research in Science Teaching*, 24(7): 679 - 682 (1987).

"Science Education in Elementary School: Some Observations", *Journal of Research in Science Teaching*, 23(9): 853 - 856 (1986).

"Providing Answers Is Not the Answer" *The Physics Teacher*, Nov. 1985, followed by an exchange of letters on the subject of the article published September, 1986

"Development: Cognitive and Conceptual", with James Minstrell of Mercer Island High School, WA, published in the *Proceedings of the Third Annual Conference on Reasoning, Piaget, and Higher Education*, September, 1982.

"Cross-Disciplinary Course on Teaching for GTAs", with John I. Gelder, *Journal of College Science Teaching*, May, 1982.

"A Learning Cycle on Exponential Growth and the Energy Crisis", *The Physics Teacher*, 245 - 246, April, 1982.

PRESENTATIONS

Selected Invited Presentations:

- "Deep Understanding of Science for All Students at All Levels: Reconsidering What It Means To Learn Science Through Inquiry" workshop co-presented with Andy Johnson at the Title I/Serve Idaho Conference, Boise, ID April, 2009
- "Evidence from a radical constructivist teaching practice" a four panel invited poster for the 2008 conference of the Association for Constructivist Teaching, Johnson City, TN, October, 2008
- "Experiences Sharing PER in Mexico," Targeted Poster Session A, Physics Education Research Conference, Edmonton, AB, Canada, July, 2008.
- "Seeing Physical Theory in Students' Minds in Real Time," XVI International Workshop on New Trends in Physics Teaching, Puebla, Mexico, May, 2008.
- "The Radical Constructivism Wars: a guide for realists," Festschrift in Honor of Ernst von Glasersfeld's 90th Birthday, International Heinz von Foerster Congress, Vienna, Austria, November, 2007.
- "Piaget & Vygotsky: sorting through fact and fiction," Foundations and Frontiers of Physics Education Research Conference, Bar Harbor, ME, August, 2007
- "The Centrality of Models in Making Sense of the Physical World," Physics Education Research Conference, Greensboro, NC, July 2007

- “Physics Classroom Engagement: constructing understanding in real time,” two-part conferencia, XV International Workshop on New Trends in Physics Teaching, Puebla, Mexico, May, 2007.
- “Disequilibrium-Driven Inquiry to Develop Understanding,” annual AAPT Summer meeting, Syracuse, NY, July, 2006
- “Seven weeks with Tibetan scholar monks: engaging other cultures in understanding physical phenomena” two-part conferencia, XIV International Workshop on New Trends in Physics Teaching, Puebla, Mexico, May, 2006.
- “Physics Teaching in Times of Change” Plenary presentation, Northwest American Physical Society Meeting, Tacoma, WA, May, 2006
- “What are we doing and how long have we known?” Colloquium, Physics Department, Appalachian State University, Boone, NC, March, 2006
- “Tibetan Buddhist Monks, Emptiness, Inquiry and Physics” Colloquium, Physics Department, Appalachian State University, Boone, NC, March, 2006, NC, March, 2006
- “Tibetan Buddhist Monks, Emptiness, Inquiry and Physics” Faculty Development Seminar, North Carolina Agricultural and Technological University, Greensboro, NC, March, 2006
- “Isn’t it about student understanding?” Faculty Development Workshop, North Carolina Agricultural and Technological University, Greensboro, NC, March, 2006
- “What are we doing and how long have we known?” Joint AAPT Section meeting (North Carolina & Atlantic Coast), Belmont, NC, March, 2006
- “Tibetan Buddhist Monks, Emptiness, Inquiry and Physics” Joint AAPT Section meeting (North Carolina & Atlantic Coast), Belmont, NC, March, 2006
- “Why teach physics?” Colloquium on Physics Teaching, Trinidad and Tobago Institute of Physics, Port of Spain, Trinidad, November, 2005
- “Against realist instruction” American Society for Cybernetics, Washington, DC, October, 2005
- “Physics for the Select Few” AAPT Summer Meeting, Salt Lake City, UT, August, 2005
- “A Zen of Physics Teaching: PER for the rest of us” AAPT Winter meeting, Albuquerque, NM, January, 2005
- “Making a Science of Physics Teaching” AAPT Winter meeting, Albuquerque, NM, January, 2005
- “Image formation by lenses” a three-week workshop for the Science for Monks Project for Tibetan Monks, Dehra Dun, India, December, 2004 – January, 2005. (with Andy Johnson)
- “Students making sense for themselves—a different paradigm in the classroom” round table discussion leader, Physics Education Research Conference, Sacramento, CA, August 2004
- “Electric Circuits” workshop given for teachers of the Mexico City Colegio de Bachilleres (high school teachers), Mexico City, Mexico, June, 2004
- “How we think about and prepare to teach physics—Problems & Solutions, Why some like it radical” a two session presentation at the 12th International Workshop on New Trends in Physics Teaching, Puebla, Mexico, May 2004
- “Is understanding really the point of physics teaching?” NYSS APS AAPT Spring Symposium 2004, Buffalo, NY, April 2004

- “Is it really about students understanding...?” Joint ID-UT AAPT/IAS Meeting, Pocatello, ID, March 2004
- “The Ultimate Chapter: *Student Understanding-Driven* Instruction versus *Content-Driven* Instruction” conferencia given at the XI International Workshop "Nuevas Tendencias en la Enseñanza de la Física" May, 2003, Puebla, México
- “Designing the Preparation of Physics Teachers: PER-based Rationale and Fundamental Building Blocks” conferencia given at the XI International Workshop "Nuevas Tendencias en la Enseñanza de la Física" May, 2003, Puebla, México
- “When we teach physics, who learns what?” colloquium presented at SUNY, the University at Buffalo, Physics Department, February, 2003
- “Long-term use of a conceptual diagnostic to compare PER-based instruction with the *status quo*” break-out session at the Physics Education Research Conference, Boise, ID, August, 2002
- “Assessment for *Student Understanding-Driven* Instruction,” presentation in a session on Alternative Assessment Strategies, Summer meeting of AAPT, Boise, ID, August, 2002.
- “The 2-Sigma Problem,” short-course given at Colegio de Bachilleres de Mexico, D. F., June, 2002
- “*Student Understanding-Driven* Instruction” two conferencias given at the X International Workshop "Nuevas Tendencias en la Enseñanza de la Física" May, 2002, Puebla, México
- “Why teach kinematics?” APS Northwest Region Meeting, Banff, CANADA, May, 2002
- “Why teach velocity?: Instructional design for learning instead of habit” conferencia given at the IX International Workshop "Nuevas Tendencias en la Enseñanza de la Física" May, 2001, Puebla, México
- “How can the acceleration be zero when it is not moving?” Interaction of words and thought about physical phenomena” conferencia given at the IX International Workshop "Nuevas Tendencias en la Enseñanza de la Física" May, 2001, Puebla, México
- “Imaging Inquiry” two-hour short-course given at the Regional NSTA meeting, October, 2000, Boise Idaho
- “On the mythical role of Edwin Hall: Who says there are two kinds of charge?” conferencia given at the VIII International Workshop "Nuevas Tendencias en la Enseñanza de la Física" May, 2000, Puebla, México
- “Science Education or... Vocational Filtering & Indoctrination?,” presentation at the Northern Rocky Mountain Educational Research Association Meeting, Jackson, WY, October, 1999
- “Studying the Effect of Science Teaching,” conferencia given at the 7th International Workshop on “Nuevas Tendencias en la Enseñanza de la Física” in Puebla, MX, May, 1999
- “Examining Science Education-As-It-Is: Considering Science Education-As-It-Could-Be”, a workshop presented at the Association for Constructivist Teaching Conference, Oakland, CA, October, 1998
- “Doing Science: Reading the World to Read the Word,” a workshop presented at the Rocky Mountain Regional International Reading Association Conference, Boise, ID October, 1998
- “Teaching Science As If Understanding Was The Point For ALL Students”, in-service workshop for teachers in the Meridian School District, Meridian, ID, August, 1998
- “Constructivism: Explaining the research and our classroom experience” presented to the Curriculum Development Department of the Colegio de Bachilleres de Mexico, D. F., June, 1998

- “Considering Learning & Teaching: an alternative view, constructivism” a series of three presentations given at the 6th International Workshop on “Nuevas Tendencias en la Enseñanza de la Física” in Puebla, MX, May, 1998
- “Deep Structure Change in Science Instruction: heuristic approach”, presented at the Idaho Academy of Sciences Meeting, Boise, ID, April, 1998
- “Making Schools As-They-Could-Be Instead of Fixing Schools As-They-Are” presented at the Center for Science Teaching, University of Maryland, April, 1998
- “What students ‘see’ in physics problems...What we ‘see’ in their solutions” presented at the Physics Department, University of Maryland, April, 1998
- “Preconceptos en Biología y Física”, a mini-course on conceptual change given at El Colegio de Ciencias y Humanidades de Universidad Nacional Autónoma de México, in Mexico City, MX, January, 1998
- “Considering Learning & Teaching ...the research and a view”, presented at both sessions of the second Summer training session of the CPU Project, San Diego State University, June & July, 1997.
- “What students ‘see’ in physics problems”, 5th International Workshop on “Nuevas Tendencias en la Enseñanza de la Física” in Puebla, MX, and at Taller Internacional sobre Enseñanza de la Física in Morelia, MX, both in June, 1997
- “Uses and Abuses of Problem-Solving Research”, 5th International Workshop on “Nuevas Tendencias en la Enseñanza de la Física” in Puebla, MX, and at Taller Internacional sobre Enseñanza de la Física in Morelia, MX, both in June, 1997
- “A possible view...Physics Education as-it-is...and what it might be”, 5th International Workshop on “Nuevas Tendencias en la Enseñanza de la Física” in Puebla, MX, and at Taller Internacional sobre Enseñanza de la Física in Morelia, MX, both in June, 1997
- “Some Dilemmas in the Teaching of Physics: What’s a Physics Department to Do?”, Seminar presented to the Physics Department, University of Texas at Austin, Austin, TX, February, 1997
- “Whither Discovery?” Seminar presented to interdisciplinary group of faculty, University of Texas at Austin, Austin, TX, February, 1997
- “On the ‘wisdom’ of teaching large classes”, colloquium presented at Boise State University, Boise, ID, January, 1997
- “On the ‘wisdom’ of teaching physics to pre-service elementary school teachers in large classes”, Annual Winter Meeting of AAPT, Phoenix, AZ, January, 1997
- “Some Controversial Issues in Physics Education”, Physics Colloquium, Iberoamericana University, Mexico City, MX, June, 1996
- “Constructivism and Ethical Issues in Physics Teaching”, three part presentation, University of Michuacan, Morelia, MX, June, 1996
- “Powerful Ideas in Physical Science and Other Issues in Teaching Physics”, three part presentation, BUAP, Puebla, MX, June, 1996
- “Discussant’s Comments: Studies on Learning Processes”, Annual NARST Meeting, St. Louis, MO, April, 1996
- “Rethinking the teaching of simple electric circuits: thoughts from the development of the PSI-PET Electricity Unit”, Winter AAPT meeting, Reno, NV, January, 1996

- “Student Conceptions in Geometric Optics and Related Instructional Methods”, three part presentation, BUAP, Puebla, MX, May, 1995
- “Student Conceptions in Physics and Their Implications”, Physics Colloquium, Center for Instrumentation, UNAM, Mexico City, MX, May, 1995
- “Constructing New Ideas About Light And The Formation Of Images”, Annual NARST Meeting, San Francisco, CA, April, 1995
- “On the role of research in student conceptions...”, Annual Winter Meeting of the AAPT, Orlando, FL, January, 1995.
- “Trying to Make Sense of Conceptual Change”, CRMSE Seminar, San Diego State Univ, July, 1994
- “Considering a Taxonomy of Conceptual Change”, Dickinson College Workshop Physics Summer Program, Carlisle, PA, June, 1994
- “Examining Unspoken Assumptions About Physics Teaching”, Dickinson College Workshop Physics Summer Program, Carlisle, PA, , June, 1994
- “Toward a Taxonomy of Conceptual Change”, Science Education Seminar, University of Wisconsin, Madison, WI, May, 1994
- “Toward a Taxonomy of Conceptual Change”, Science Education Seminar, University of British Columbia, Vancouver, BC, CANADA, April, 1994
- “Teaching Physics for Conceptual Understanding Across the Grades”, Science Education Seminar, University of British Columbia, Vancouver, BC, CANADA, April, 1994
- “Using a Computer Program to Investigate and Teach Problem Solving in Physics”, Joint APS/AAPT Meeting, Crystal City, VA, April, 1994
- “A Constructivist Approach to Teaching About Forces and Motion”, Physics Department Seminar at Towson State University, Towson, MD, April, 1994
- “Learning About Motion in Elementary/Jr. High Classrooms”, with Dale Sweet, National Science Teachers Association Regional Conference, Denver, CO, October, 1993
- “Motion for K- 9”, with Dale Sweet, Idaho Science Teachers Association Conf., Jerome, ID, October, 1993
- “Linking Conceptual Understanding and Problem-Solving Skills in Physics”, Artificial Intelligence and Education Conference 1993, Edinburgh, SCOTLAND, August, 1993
- “Assessing Standards, Assessment, and Teacher Education”, Summer National AAPT Meeting, Boise, ID, August, 1993
- “Physical Science Instruction for Pre-Service Elementary Teachers (PSI-PET): Work in Progress”, Summer National AAPT Meeting, Boise, ID, August, 1993
- “On the Effects of Student Conceptions on Physics Problem-Solving Behavior”, with C. Franklin Boyle, Winter AAPT Meeting, New Orleans, LA, January, 1993
- “Developing a Physics/Physical Science Course for Elementary Education Majors”, History and Philosophy of Science and Science Teaching Conference, Queens Univ., Kingston, Ont., CANADA, May, 1992
- “Considering Categories of Conceptual Change to Guide Instructional Design”, History and Philosophy of Science and Science Teaching Conference, Queens Univ., Kingston, Ont., CANADA, May, 1992

- “Studying Physics Learning in Pre-High School: A University-School Collaboration”, with Dale R. Sweet, Summer AAPT Meeting, Orono, ME, August, 1992
- “Conceptual Restructuring in History of Mechanics as a Model for Learning Mechanics”. with Ira A. Monarch, and C. Franklin Boyle, The Third International Conference on the Learning Sciences, Chicago, IL, August, 1991.
- “Using Large Group Discussion for Conceptual Development: Engaging Students in the Sense-Making Process”, Dickinson College Workshop for College Professors of Physics, Carlisle, PA, June, 1991
- “Trying to Understand the Nature of Coming to Understand Physics”, Department of Physics and Astronomy, University of Kentucky, Lexington, KY, April, 1991
- “Implications of Research Results in Physics Education for Physics Teaching”, Physics Alliance Meeting, University of Kentucky, Lexington, KY, April, 1991
- “Modeling Understanding to Study Conceptual Change in Physics”, with C. Franklin Boyle and Ira A. Monarch, NSF/Volkswagen Foundation International Workshop on Research in Physics Learning: Theoretical Issues and Empirical Studies, University of Bremen, Bremen, GERMANY, March, 1991
- “Physics Teaching: Addressing the Constituencies”, Department of Physics and Astronomy, Michigan State University, East Lansing, MI, January, 1991
- “Understanding Science: Meanings and Implications for Educators”, Division of Science Education, College of Natural Sciences, Michigan State University, East Lansing, MI, January, 1991
- “Linking Conceptual Understanding and Problem-Solving Skills in Physics” with C. Franklin Boyle, Grant Holders Meeting, Research in Teaching and Learning Program, National Science Foundation, Washington, DC, October, 1990
- “Using Knowledge Representation to Study Conceptual Change in Students for Teaching Physics”, with C. Franklin Boyle and Ira A. Monarch, Cognitive Science Society Conference, Boston, MA, July, 1990
- “Using Large Group Discussion for Conceptual Development: Engaging Students in the Sense-Making Process”, Dickinson College Workshop for College Professors of Physics, Carlisle, PA, June, 1990
- “Philosophical Underpinnings of a ‘New’ Science Education: Implications of Student Conceptions in Science”, Rutgers University Physics Education Lecture Series, March 1990
- “The CONCEPT Project”, Rutgers University Physics Education Colloquium Series, March, 1990
- “Rethinking the Introductory Courses for All Constituencies”, University of Tennessee-Knoxville and NSF sponsored conference on Science, Mathematics, and Engineering Instruction at the Undergraduate Level, Knoxville, TN, February, 1990
- with Boyle, C. F. “Conceptual Change and the Diagnosis of Student Understanding in a Problem-Solving Environment”, Physics Colloquium at Boise State University, Boise, ID, February, 1990
- with Boyle, C. F. “Diagnosing Conceptions from Problem-Solving Behavior”, Center for the Design of Educational Computing, Carnegie Mellon University, Pittsburgh, PA, December, 1989
- “Diagnosing Conceptions from Problem-Solving Behavior”, Scientific Reasoning Research Institute Colloquium, University of Massachusetts, Amherst, MA, November, 1989
- “Conceptual Change: Toward an Understanding of Learning in Physics”, Physics Department Colloquium, Case Western Reserve University, Cleveland, OH, November, 1989

- *“to think, perchance to dream... a constructivist education and an intelligent computer tutor”*, NATO Advanced Study Workshop: Student Development of Physics Concepts: The Role of Educational Technology, Pavia, ITALY, October, 1989
- *“Wondering About Physics... An Introduction to Computational Physics”*, Conference on Computers in Physics Instruction, Raleigh, NC, August, 1988
- *“Wondering About Physics... Exploring More Realistic Problems with Spreadsheets”*, AAPT Summer Meeting, Ithaca, NY, June, 1988
- *“Doing Research While You Teach”*, for the Committee on Research in Physics Education, AAPT Summer Meeting, Bozeman, MT, June, 1987
- *“Using Computers in the Instructional Process in Physics”*, Dickinson/M.U.P.P.E.T. Conference on Computers in the Physics Curriculum, Carlisle, PA, Jan. 1987
- *“Development: Cognitive and Conceptual”*, session given with James Minstrell at the Third Annual Reasoning, Piaget, and Higher Education Conference, October 1982, in Denver, CO

Selected Contributed Talks:

- with Andy Johnson, *“Tibetan Buddhist Monks’ Developmental Pathways in Image Formation”*, poster presented at the AAPT Summer Meeting, Salt Lake City, UT, August, 2005
- *“PER-based Teacher Preparation”*, AAPT Summer Meeting, Sacramento, CA, August 2004
- *“Powerful Ideas and the Preparation of Middle School Teachers—I”* Summer AAPT Meeting at Boise State University, August, 2002
- with Dale Sweet, *“Powerful Ideas and the Preparation of Middle School Teachers—II”* Summer AAPT Meeting at Boise State University, August, 2002
- *“Essentialist Kinematics: A Road to a Newtonian View of Force”* Summer AAPT Meeting at Rochester, NY, July, 2001
- *“The Spectacular Failure of Science Education”* Colloquium given at Boise State University, May, 2001
- *“Do We Need to Teach Velocity?: Conceptual Underpinnings of Force”* Summer AAPT Meeting, Guelph, ON, Canada, August, 2000
- *“Assessments as diagnostics instead of as exams”* Annual Physics Education Research Conference, Guelph, ON, Canada, August, 2000
- *“Myth(s) of Physics Teaching”*, with Josip Slisko, Winter AAPT Meeting, Reno, NV, January, 1996
- *“Observing conceptual change about motion in the intermediate grades (4 - 8)”* Winter AAPT Meeting, Reno, NV, January, 1996
- *“Observed Effects of Student Conceptual Understanding on Problem-Solving Performance: Why Good Procedure is Not Enough”*, with C. Franklin Boyle, Summer National AAPT Meeting, Boise, ID, August, 1993
- *“A Teacher's Framework of Student Ideas About Forces & Motion”*, with C. Franklin Boyle and I. A. Monarch, Summer National AAPT Meeting, Boise, ID, August, 1993
- *“Elementary/Middle School Teachers Doing Research in Learning Physics”*, with Dale Sweet, at the 1992 Winter Meeting of AAPT, Orlando, FL, January, 1992

- “What Can Young Students Come to Understand About Kinematics and Forces?” with Dale Sweet, at the 1992 Winter Meeting of AAPT, Orlando, FL, January, 1992
- “What Do Physics Students Think Is Going on in Physics Problems?”, with C. Franklin Boyle, at the 1992 Winter Meeting of AAPT, Orlando, FL, January, 1992
- “Videotape Excerpts from Two Physics Learning Research Studies”, with Dale Sweet, part of a walk-in tutorial/workshop on Research in Physics Education, led by James Minstrell, Summer 1991 AAPT Meeting, Vancouver, B.C.
- “The Sense That Students Make of Physics Problems Involving Forces and Motion”, AAPT Summer Meeting, Minneapolis, MN, June, 1990
- “A Constructivist Approach to Linking Understanding and Problem-Solving Skills in Physics”, with C. F. Boyle, AAPT Winter Meeting, Atlanta, GA, Jan., 1990
- “Linking Conceptual Understanding and Problem-Solving Skills in Physics”, with C. F. Boyle, AAPT Winter Meeting, Atlanta, GA, January, 1990
- “We Owe It to Their Students”, AAPT Winter Meeting, Atlanta, GA, Jan., 1990
- “Forces and Motion with No Algebra”, Conference on Computers in Physics Instruction, Raleigh, NC, August, 1988
- “Listening to Students Talk About Physics Problems”, Summer AAPT Meeting, Ithaca, NY, 1988
- “A Conceptual Change Approach to Physics Teaching”, PNACP Meeting, Spokane, WA, April, 1988
- “Newtonian History in Introductory Physics Texts”, Idaho-Utah Section of AAPT annual meeting March, 1987 at Weber State College, Ogden, UT
- “Newtonian History in Introductory Physics Texts”, Pacific Northwest Association for College Physics annual meeting April, 1986 at Pacific Lutheran University, Tacoma, WA
- “Hidden Blocks to Student Understanding”, ISTA Annual Meeting, Boise, October, 1983.
- “Cognitive Development and Problem Solving”, Idaho Council of Teachers of Mathematics Annual Meeting, Boise, October, 1983.
- “Establishing a Newtonian Point of View”, AAPT Summer Meeting, Memphis, TN, June, 1983.
- “Physics Teaching and Learning Theories: Speculations and Applications”, AAPT Summer Meeting, June, 1982, Ashland, OR
- “Speculations on Learning Theories in the Classroom”, annual meeting AOK Section of AAPT, November 1980, Conway, AR
- “A Teaching Strategy for Cognitive Development in Large Class Settings”, Summer meeting of AAPT, June, 1980, Troy, NY
- “Observations of Cognitive Development in the Classroom”, Summer meeting of AAPT, June, 1979, Las Cruces, NM
- “A Learning Cycle on Exponential Growth and the Energy Crisis”, Annual meeting AOK Section of AAPT, November 1978, Ada, OK

Selected Workshops Developed and Presented:

- “Piaget Beyond Piaget,” Annual AAPT meetings, Syracuse, NY, July, 2006, Seattle, WA, Jan. 2007, Greensboro, NC, July 2007, Edmonton, AB, Canada, July 2008
- “The Nature of Inquiry: view from the physics class,” Teacher Institute on Inquiry, Boise State University, June, 2005, 2007, 2008
- With Andy Johnson, “Physics Inquiry Workshop on Color and Thermal Phenomena,” Science for Monks Project, Dehra Dun, India, December, 2005 – January 2006
- “Piaget and the Development of Reasoning” Annual Physics Education Research Conference, Salt Lake City, UT, August, 2005
- “Powerful Ideas in Physical Science” Professional Development Seminars, co-leader at seminars given at Gonzaga University, August, 1995, in Reno, NV, January 1996, in Denver, CO August, 1997, in San Antonio, TX August, 1999, in Orlando, FL January, 2000, in San Diego, January 2001, in Rochester, NY, July, 2001, Philadelphia, January, 2002, Boise, August 2002, and Austin, TX, January, 2003 at AAPT National Meetings.
- “How Students Learn Physics: Summary of Research and Implications for Instruction”, NSF Short Course for College Teachers, with Fred Goldberg, at San Diego State University, February, 1993
- “Image Formation by Lenses”: A workshop on the development of instruction from research in physics education. June, 1989 at Cal Poly in San Suis Obispo, CA, January, 1990, At Georgia Tech in Atlanta, GA, August, 1992 at the Univ. of ME in Orono, ME, in August, 1993 at Boise State, August, 1995 at Gonzaga Univ. in Spokane, WA, and in Boise, 2002 at AAPT national meetings sponsored by the AAPT Committee on Research in Physics Education
May, 1995, at Iberoamericana University, Mexico City, May, 1995
March, 1993 in McKinney, TX for the ACT Academy a special experimental school being started by the McKinney School system funded by the U. S. Dept of Education.
August, 1992 at Southern Connecticut State University in New Haven, CT for the Center for Constructivist Teaching.
June, 1990, June, 1991, and June, 1992 in abbreviated form for the FIPSE/NSF sponsored workshops at Dickinson College, Carlisle, PA
July, 1989 at Princeton University for the Woodrow Wilson National Leadership Foundation Program for Junior High/ Middle School Physical Science Teachers
December, 2004 at Cynthia Mann Elementary School, Boise, ID with 5th grade students and their teacher
December, 2004 – January, 2005 on the campus of the Selaqui Tibetan Children’s Village School for Gifted Students in Dehra Dun, India for 50 Tibetan scholar monks.
- “Forces and Motion” presented July, 1990 for the Woodrow Wilson National Leadership Foundation Program for Junior High/ Middle School Physical Science Teachers
- “Teaching and Learning Physics with Personal Productivity Tools” written and presented at the following AAPT meetings: Summer, 1986 at Ohio State, Winter, 1987 in San Francisco, Summer, 1987 at Montana State
- “Apple Game Paddle Port Interfacing” developed from the work of John Layman and Marvin De Jong, used in various forms, served as workshop manual editor for several years, led or co-led the workshop about a dozen times at Boise State, at national meetings of AAPT, and meetings in ID-UT and the Northern California sections of AAPT.

Dissertation:

“Phase Transitions in Potassium Hexachlorostannate(IV) by AC Calorimetry”, University Microfilms, Inc. Ann Arbor, MI, 1979

HONORS

-American Association of Physics Teachers Distinguished Service Citation, January, 2008

“Teaching Introductory Physics to College Students” Chapter 12 in *Constructivism: Foundations, Perspectives, and Practice*. Catherine Fosnot (Ed.), Teachers College Press: New York (1996) (*This book was awarded the Significant Contribution award by the Constructivist SIG of AERA in 1999.*)

-Selected as a 1994 “Distinguished Faculty Member” by Peter Sinclair, a 1994 BSU Alumni Association Top Ten Scholar

-Selected as one of two finalists for the 1994 BSU Foundation Scholar Award for Research and Creative Activity.

-Cited as the Faculty member "who in my opinion was most important in my academic achievement" by a PH 101/102 student initiated into Phi Kappa Phi at BSU, now a medical student at the University of Washington.

GRANTS AWARDED

National Science Foundation Grant: “Linking Conceptual Understanding and Problem-Solving Skills in Physics” MDR-8950313; September, 1989 - May, 1993 (co-funded with a companion grant to C. Franklin Boyle at Carnegie Mellon University), grant award: \$221,000

National Science Foundation Grant: “Conceptual Development About Motion and Forces in Elementary/Middle School Students” MDR-9154015, August, 1991 - August, 1993 (co-PI: Dale Sweet, Basin School, Idaho City, ID), grant award: \$50,000

National Science Foundation Grant: “Modeling Understanding to Study Conceptual Change in Learning Physics” MDR-9153989; September, 1992 - February, 1996 (co-funded with a companion grant to C. Franklin Boyle and Ira A. Monarch at Carnegie Mellon University), grant award: \$306,000

COURSE DEVELOPMENT AND TEACHING ACTIVITIES

Development

- PHYS 100: Foundations of Physical Science: Began the development of a new unit on Thermal Phenomena, Summer, 2004. First round teaching it, Fall, 2004. Assisted by a student, Rebecca Torek, in the writing and teaching of the materials.
- PHYSCI 497/597: Alternative Conceptions in Science: A three-credit course on the research findings and implications of student alternative conceptions in science. For secondary school science teacher candidates and science teachers in all of the sciences. Introduction of a new paradigm for science teaching.
- Developed PHYSCI 297 ST: Learning and Teaching Physical Science in Context: Seminar on the teaching of physical science and on learning, a one credit course for students simultaneously enrolled in PS 100. A collaboration with Dr. Robert Bahruth of the Boise State College of Education.
- Developed PH 497: Constructing Reality: perspectives from physics and research in learning, a two credit course drawing on sources from history and philosophy of science, philosophy, research in science education, communications, critical pedagogy, and other areas. An investigation of the nature of radical constructivism and its possible implications in various fields. A collaboration with Dr. William S. Smith and Francesca Monte-Pinto of the Boise State Physics Department.
- Developed PH 594: Concepts in Elementary Physical Science: Helping Students Understand, a two credit graduate course for in-service teachers, which is offered in the summer, often supported by State Eisenhower Grant funding. A collaboration with Dr. William S. Smith of Boise State

- Revised PHYS 100: Foundations of Physical Science, a four credit (with lab) general area studies course. While adhering to the traditional three hours a week "lecture" and two hour per week laboratory period, this course has as its central feature conceptual change in topics in physics. Lab is the core of the course and the text is an occasionally used, optional feature. It is a component in pre-service development of elementary teachers.
- Revised structure of PH 220 for Fall, 1985 by introducing a mastery approach to grading combined with a criterion based grading scale, by integrating the learning objectives into a coherent set, and by increasing the emphasis on conceptual change from the typical pre-instructional conceptualizations to scientists conceptualizations. Experimenting with possible lab activities for this course which has no lab. These activities make use of microcomputers. Outcomes: labs are included with this course now and microcomputer-based lab activities are a major component.
- Developed with dr. Ken Hill, Chairman, Teacher Education Department, BSU, a course titled: "Reasoning: the Essential Skill" taught, Fall 1985 at BSU
- Developed and taught, with Dr. Gary Mercer of the Department of Chemistry at Boise State, an introduction to computers titled Computer Fundamentals offered through the BSU Center for Continuing Education
- Rewrote PH 307, Laboratory Microprocessor Applications to use AIM-65 computers and to include more lab experience, a course for physics majors in which they learn assembly language level programming and principles of interfacing at the bit/bus level.
- Organized and taught a two day drive-in workshop on Science Teaching and the Development of Reasoning through the College of Education Extension Division at Oklahoma State given Spring, 1981.
- Organized and taught, with Dr. James Harmon of the Biology Department at Oklahoma State, a College of Arts and Sciences Honors Seminar on Science and "The Ascent of Man" given Spring, 1981.
- Developed and taught, with Dr. John Gelder of the Department of Chemistry at Oklahoma State, A&S 5990: Introduction to College Science Teaching for Teaching Assistants given Fall, 1980.
- Devised a lab experiment for PS 303-304 at the Univ. of TX at Austin, Fall, 1976. Participated in revisions of the text for the course from Spring 1984-Spring 1977.
- Devised and taught a course titled "Math for Science Students" to students at East Technical High School in Cleveland, OH, Fall 1972.

Courses Taught

- PHYSICI 497/597: Alternative Conceptions in Science. A three credit hour course for secondary science teacher candidates and secondary science teachers.
- PHYSICI 297: Special Topics: “Teaching and Learning Physical Science in Context”, a one credit hour seminar on learning in science for students in the PS 100 course.
- TE 660: Learning: guest instructor for a segment of this required course on learning processes for doctoral candidates in the Ed. D. program in Curriculum & Instruction.
- PH 497: Special Topics: “Constructing Reality: perspectives from physics and research in learning”, two credit seminar
- PH 594: Concepts in elementary Physical Science: Helping Students Understand, a two graduate credit course for in-service teachers of grades K - 8.
- PHYS 100: Foundations of Physical Science, a four hour lecture/lab course in physics at the conceptual level
- PH 220: Engineering Physics, a four hour lecture class in introductory physics using calculus, first of a three course series taken by engineers and science majors
- PH 297: Special Topics--The New Literacy: An Introduction to Computers, a two credit telecourse taught in conjunction with BSU's Center for Continuing Education and KAID-TV (educational television)
- PH 307: Laboratory Microprocessor Applications, a three hour lecture and lab course in 6502 assembly language and interfacing for science and math majors at Boise State University
- B 305/C 305/TE 305: Methods of Teaching Secondary Science, a three hour teaching methods class for secondary school science teaching students at Boise State University
- PH 422: Special Topics in Solid State Physics, a three hour lecture class in solid state physics for upper division physics majors at Boise State University
- PH 101-102: General Physics, a four hour lecture and lab, algebra-trig based course, two semesters, Boise State University
- PHYSC 1014: Descriptive Physics, a four hour lecture course for non-science majors at Oklahoma State
- PHYSC 1114-1214: General Physics, a four hour lecture and lab, algebra-trig based course, two semesters, at Oklahoma State
- PS 303-304: Matter and Energy, a guided discovery laboratory approach to physical science for non-science majors, two semesters, University of Texas at Austin
- Interaction of Matter and Energy: a ninth grade physical science course at Middletown Jr-Sr High in Maryland
- High School Physics: a course for seniors using traditional, PSSC, and Project Physics various years at Middletown Jr-Sr High and at East Technical High in Cleveland, Ohio.

PROFESSIONAL AFFILIATIONS and SELECTED ACTIVITIES

Member:

American Association of Physics Teachers (AAPT)
Idaho-Utah Section of AAPT
National Association for Research in Science Teaching (NARST)
American Educational Research Association (AERA)
Association for Science Teacher Education (ASTE)
National Science Teachers Association (NSTA)
American Society for Cybernetics (ASC)
International History, Philosophy and Science Teaching Group

Selected Service items in the above:

- member of the AAPT Committee on Physics in Pre-High School Education (2006 – 2009)
- member of the AAPT Committee on Teacher Preparation (2003 – 2006)
- List-owner of e-mail list established to support the international Research in Physics Learning community. Listname: The Physics Learning Research List, PhysLrnR@listserv.boisestate.edu
- Chair of the Research in Physics Education Committee of AAPT (1994 and 1995)
- Member, AAPT Task Force on National Standards in Science Teaching (1994 - 1995)
- Member of the Research in Physics Education Committee of AAPT (1993 - 1995)
- At-Large Member, Executive Board, AAPT (1989 - 1992)
- Chairman, AAPT Temporary Committee on Physics in Pre-High School Education (1989 - 1991), now a permanent committee of AAPT
- Member of the College-High School Interaction Committee (a joint committee of the AAPT and the American Physical Society) (Jan. 1989 - 1990)
- Member of the Computers in Physics Education Committee of AAPT (1988 - 1989)
- Steering Committee member, conference on Computers in Physics Instruction (1987 - 1988), held August, 1988 at NC State, Raleigh, NC.
- Member of the Nominating Committee for AAPT (1986-87)
- Member of the Research in Physics Education Committee of AAPT (1984-1987)

RELATED UNIVERSITY AND COMMUNITY SERVICE

Discovery Center of Idaho, Boise ID:

Member, Executive Committee of the Founding Board of Directors, (1987 - 1990)
Served as Chairman or member of the Policy, Site Selection, Building, and Exhibitory Committees in that time

Member of the Community Advisory Board of the Junior League of Boise to assist in the development of a participatory museum in science & technology (1982-1987), supervised the exhibit construction and development of one month demonstrations of the museum open to the public, (October, 1984 and April, 1986)

Omniplex, Oklahoma City, OK:

Consultant and part-time employee in exhibit planning and design (1979-1981)

Doctoral Committees:

Served on two Doctorate in Education committees for the College of Education

Renaissance Institute:

Instructor, Fall 2006

CONSULTING

Consultant for an NSF funded project at the Center for Research in Mathematics and Science Education at San Diego State University studying the effect of explanation processes on physics learning and problem-solving in the introductory calculus-based physics course.

Member of the Materials Development Team of the Physical Science Instruction for Pre-service Elementary Teachers Project, a joint project of AAPT and the American Institute of Physics funded by NSF.

Content and educational consultant, Magic School Bus program on current electricity: "The MSB Gets Charged," (original air date: 12/03/97).

REVIEWING

National Science Foundation: *ad hoc* reviews of various proposals, Panel member: Undergraduate Course and Curriculum Development Program, Undergraduate Science, Engineering, and Mathematics Education, February, 1991 and November, 1991, review panel member for the NSF Instructional Materials Development Program Oct. 2004

Journals: manuscript reviews for *American Journal of Physics*, *The Physics Teacher*, *Journal of College Science Teaching*, *Science Education*, *International Journal of Science Education*, *Journal of Research in Science Teaching*, *Northern Rocky Mountain Educational Research Journal*, *Science & Education*, *Physical Review Special Topics: Physics Education Research*, *Constructivist Foundations*

General textbook reviewing: reviewed over 30 textbooks, plus lab manuals, study helps, software, etc. items for courses for all levels of introductory physics. Mostly for John Wiley and Sons, but for a wide range of other publishers. The work for Wiley included major reviewing/advisory roles on textbook development.

American Educational Research Association, National Association for Research in Science Teaching, Association for the Education of Teachers in Science: session proposal reviewer most years since 1990.