

Profile

For the last eleven years I have been Director of Undergraduate Laboratories and a lecturer in the Department of Physics at the University of Nevada, Reno. As lab director I am responsible for managing all undergraduate physics laboratories, this includes five different laboratory courses for a total of 52 lab sections. In this role I am responsible for: scheduling, purchasing, budget, reporting, curriculum and managing the twenty-seven lab instructors. As the undergraduate lab director I also served as the vice-chair/interim chair of the department.

In addition to my responsibilities as lab director, I lecture at both the graduate and undergraduate level. At the undergraduate level I typically teach sophomore to senior level courses on: mathematical methods, optics, wave and oscillations, quantum mechanics and elementary particle physics. I also lecture the large level freshman courses (both non-calculus and calculus-based courses) as needed. A portion of my mathematical physics course has been published as a book: *A Student's Guide to Infinite Series and Sequences*, by Cambridge University Press.

As a member of the graduate faculty I teach courses on: mathematical methods, optics, wave and oscillations and particle physics. As a “DOG” (Director of Graduate Students) I oversee twenty-seven graduate instructors and the program of study for a number master and Ph.D. candidates.

During my summers I am involved in the support and development of various research programs. At the Nevada Terawatt Facility I am involved in the development of optical and x-ray diagnostics for two research programs. As a Co-Pi for the American Climber Science program I am involved with the development of optical instrumentation for field measurements of snow and ice.

Prior to my employment as Undergraduate Lab Director at the University of Nevada, I was owner and/or founder of two optical manufacturing firms. As a business owner I worked closely with various university research programs as well as foreign (ESA, DESY) and national laboratories (NASA, NIST, LBL, etc.). Optics that I have had a hand in designing and or fabricating have seen use in space flight programs — Scimachy, Venus Express Missions and the James Webb Telescope, for example —and in synchrotron beamlines, SRC, ALS, NSLS and DESY. . I still maintain close ties with industry, consulting with aerospace firms developing optical elements for space flight and aiding high-tech firms in developing novel optical instrumentation. From 2004–2005 I sat on the industrial advisory board for NSF's Engineering Research Center For Extreme Ultraviolet Science and Technology's

Education

Ph.D. **Physics, College of William and Mary, Williamsburg Va.** High-energy physics, Dissertation topic: The Search For Metastability of $2S$ Muonic Neon, 1995.

M.A. **Physics, College of William and Mary, Williamsburg Va.** 1991

B.A. **Physics, University of Colorado, Boulder, Co.** 1988

Teaching Experience

2007-Present: General and advanced physics laboratory, as well as graduate and undergraduate optics, graduate and undergraduate mathematical methods, quantum mechanics, waves and oscillations and elementary particle physics.

1989-1991: General physics Laboratory, at the College of William and Mary

Awards and Distinctions

1990: American Association of Physics Teachers Award.

Leadership and Management Experience

7/07 - Present: Director of Undergraduate Laboratories, University of Nevada at Reno. From 2007-2010, I managed the building and outfitting of the undergraduate teaching labs in the construction of the new Davidson Math and Science Center. Currently (2018-2020) managing the remodel of the physics department research laboratories in Leifson Physics.

9/12 - 9/13: Vice-Chair, Department of Physics at the University of Nevada, Reno.

3/03 - 7/07: Partner and Vice President, Bach Research Corp. managed the design, fabrication, and metrology of custom diamond turned, polished and diffractive optics for research and industrial applications.

6/02 - 1/03: Head of Holography, Zolo Technologies. Worked in the design, fabrication, and metrology of diffraction gratings for research and WDM applications.

6/95 - 6/02: Partner in Hyperfine Inc. Established the holography lab for the design, fabrication and metrology of polished and holographic optics for research and industrial applications. Sold Hyperfine Inc. to Zolo Technologies in June, of 2002.

Publications

Books

“A Student Guide to Infinite Series and Sequences”: Cambridge University Press, 2018.

Journal Articles

“Compact high-resolution space-borne echelle grating spectrometer with AOTF based order sorting for the infrared domain from 2.2 to 4.3 micrometers”, Dennis Nevejans et al., *Applied Optics* Vol. 45, No. 21, pg. 5191-5206, July 2006.

“Modern Echelons and Echelles for infrared spectroscopy”, B. Bach, K. Bach, Proc. SPIE Vol. 5901, *Solar Physics and Space Weather Instrumentation*; Silvano Fineschi, Rodney A. Viereck: Eds. pg. 184-190, August 2005.

“Novel faceted mirror for a pushbroom IR sensor”, Thomas U. Kampe, Bernhard Bach, Proc., SPIE Vol. 5523, *Current Development in Lens Design and Optical Engineering V*; Pantazis Z. Mouroulis, Warren J. Smith, R. Barry Johnson; Eds., pg. 85-89, October 2004.

“Evaluation of UV/Ozone Cleaning of Nickel Mirrors”, Roger Hansen and Benny Bach. University of Wisconsin-Synchrotron Radiation Center, TECHNICAL NOTE, HYPERLINK

“http://www.SRC.wisc.edu/facilities/src-tech-notes/tech_notes2003/src-201.pdf
www.SRC.wisc.edu/facilities/src-technotes/tech_notes2003/src-201.pdf March 2003.

“Characterization of diffraction gratings by use of a tabletop soft-x-ray laser”, Seminario, et al., *Applied Optics*, Vol. 40, No. 30, pg. 5530-5538, October 2001.

“Characterization of diffraction gratings by use of a tabletop soft-x-ray laser”, M. Seminario, et al., SPIE Vol. 4419, 4th Iberoamerican Meeting on Optics and & 7th Latin American Meeting on Optics, lasers and Their Applications; Vera L. Brundy, Silvia A. Ledesma, Mario C. Marconi Eds. pg. 784-787, August 2001.

“Generation and application of high-average-power polarized soft-x-ray beam”, B. Benware, et al. *J. Opt. Soc. Am. B*, Vol. 18, No.7, pg. 1041-1045, July 2001.

“Large ruled monolithic echelle gratings”, K. Bach, et al., SPIE Vol. 4014, *Airborne Telescope Systems*, Ramsey Melugin, Hans-Peter Roser, Eds., pg. 118-124, June 2000.

“Muonic cascades in isolated low-Z atoms and molecules” K. Kirch, et al., *Phys. Review A*, Vol. 59, No. 5, May 1999, pg. 3375-3385.

“Metastabilty of Muonic Boron 2S state”, K. Kirch, et. al., *Phys. Rev. Letters*, Vol. 78, No. 23, June 1997, pg. 4363-4366.

“Exotic atoms and their electronic shell”, L. Simons, et al., *Nuclear Inst. and Meth.*, B87, 1994, Pg. 293-300.

“Low-energy Muon Beam from the PSI Anticyclotron”, P. DeCecco et al., *Hyperfine Interactions*, 76, 1993, pg. 275-280.

“Metastability of 2S Boron”, D. Abbott, B. Bach et al., PSI Nuclear and Particle Physics, *Annex I Annual Report*, pg. 51-52, 1993.

Presentations

I am a lecturer with the Nevada Museum of Art, public lecture series. In these lectures I discuss the science of light in art.

The Physics of Light in Art: The Immersive Light Installation Swell”

In this lecture I discussed the technology and science of light as it related to Anthony McCall's immersive light installation Swell. As an immersive light installation Swell draws floating sculptural objects made of light that change shape over time.

The Physics of Light in Art: Andante Green” In this lecture I discussed the optical and physiological effects that made Anne Lindberg's "Andante Green" a dynamic installation.

The Physics of Snow, Tahoe Silicon Mountain, Truckee CA, February 13^h 2017.

The Physics of Snow, Atmospheric Science, University of Nevada, March 16^h 2016

The Physics of Snow, UC Davis Tahoe Environmental Research Center, February 18th 2016

EMF is All Around Us, Implications for Science and Animal Welfare

AALAS National meeting November 14th.

The Economics of Climate Change KHOW radio talk show for investors 8/12

Modern Echelons and Echelles for Infrared Spectroscopy, SPIE annual meeting, Solar Physics and Space Weather Instrumentation, August 2005

Novel Faceted Mirror for Pushbroom IR Sensor T.U. Kampe, Ball Aerospace & technologies corp. B. Bach, Bach Research Corp. SPIE annual meeting on Optical Science and Technology, Current developments in Lens Design and Optical Engineering V, August 2004

Research Experience

9/18 -9/20: Co-Pi

5/12 -7/12: Co-Pi for the American Climber Science program expedition to the Cordillera Blanca. Developing instrumentation for visible and near-infrared spectroscopy for sensing snow and ice environments. Developing near-infrared fluorescents instruments for remote sensing applications

6/09 -Present: Associate Scientist at the Nevada Terawatt Facility. Developing optical, VUV, X-ray, laser and neutron diagnostics for implosion and shock physics experiments.

4/94 -6/95: Visiting scientist, Paul Scherrer Institut, Switzerland, worked on the formation and gamma and x-ray spectroscopy of exotic atoms.

Professional Development

3/2013: Fundraising Strategies for Academic Leaders and Advancement Professionals.

8/2011: Physic Teachers Education Coalition (PTEC) student learning assistant program.

8/2010: NASA Laboratory Astrophysics Workshop and Decadal meeting

Affiliations/Memberships

International Societies for Precision Engineering and Nanotechnologies

International Society for Optical Engineering

Elected member of the Optical Society of America

American Association of Physics Teachers

Academic Service

2018 - present: Chair of Building Committee for the remodel of Leifson physics research laboratories, University of Nevada, Reno.

2015 - 2018: Chair of Personnel Committee, Department of Physics, University of Nevada, Reno.

2013: Served on President's committee for economic development, president's office of the University of Nevada, Reno

2013: Chair of department long range planning and hiring committee.

2010 - 2013: Faculty advisor for the regional chapter of the Society of Physics Students.

2009 - 2011: Member of the Undergraduate curriculum committee

2012 – 2013: Vice-Chair Department of Physics

2012: Secured corporate donations to the Department of Physics

2012: Committee Chair for Atmospheric Sciences Faculty hire

2009 - 2012: Wrote the statewide high school physics exam as part of the university's outreach program.

2008 - 2011: Judge for the Graduate Student Association grant writing program

2009: Member of the Department of Physics bylaws committee

2009: Member of the Department of Physics space committee that assigned facility resources

Professional Service

2013: Worked with the Nevada Governor's Office on Economic Development on the Knowledge Fund bill.

2012 - 2013: Arranged for the monthly meetings of the local chapter of Optical Society of America to take place on UNR campus.

2004 - 2005: Industrial Advisory Board to the NSF Engineering Research Center for Extreme Ultraviolet Science and Technology.

1997: Industrial advisor to The Governor's Board for the formation of the Colorado Advanced Photonics Technology Center.

Civic Services

2012: Judge at local grade school science fair.

2012: Arranged for local high school and grade school to use undergraduate laboratories.

2011: Help with commissioning of the Redfield Observatory

2009: Secured donation for the science laboratories for a local high school and grade school.