

CURRICULUM VITAE
KEITH H. WANSER, PROFESSOR OF PHYSICS
Department of Physics, California State University Fullerton

EMPLOYMENT AND ACADEMIC ESSENTIALS

Ph.D. in Condensed Matter Physics, 1982, M.A. in Physics, 1977
University of California, Irvine

University of Colorado, Boulder 1974-1976, Completed graduate core work in Physics
Research work in lasers, light scattering and geophysics.

B.A. in Physics, 1974, California State University, Fullerton

9/95-Present Professor of Physics, California State University Fullerton.

9/91-8/95 Associate Professor of Physics, California State University Fullerton.

9/88-8/91 Assistant Professor of Physics, California State University Fullerton.

Optical Sciences Division, Naval Research Laboratory, Washington DC. American Society for Engineering Education (ASEE)/Navy 10 week senior summer faculty fellowships, 1991 & 1992. Research on magnetostriction, polarization effects, and thermal noise in optical fiber sensors.

2/82 – 9/86 McDonnell Douglas Astronautics Senior Scientist, Fiber optics/Electro optics laboratory. Research and development of fiber optic interferometric sensing systems, primarily fiber optic gyroscopes, magnetometers, and acoustic sensors.

2/83 – 8/89 Dynamics Technology Inc. Consultant, half-time, & full-time employee. Research and development of fiber optic interferometric sensors and fiber magnetometers.

TEACHING RELATED ACCOMPLISHMENTS

Developed and taught 2 new upper division lecture classes since Fall 1988, *Fiber Optics and Photonics* and *Laser Physics and Optoelectronic Devices*. Developed 21 new experiments for new NSF supported Lasers, Fiber Optics, and Photonics Laboratory and upper division Experimental Physics laboratory, Spring 1991 - Spring 1997. Supervised and directed 16 undergraduate student Independent Study and Research (Phys. 499) projects in fiber optic sensing and photonics since 1991, 2 graduate 599's and 1 Master's thesis. Seven refereed and two non-refereed publications with *undergraduate student co-authors* since 1991 (out of a total of 28); additional undergraduate student co-authored papers in preparation. Taught new required upper division course on mathematical physics (Phys. 300) F93, S93, F94, F99, F2000, F2001, F2002. Developed and taught *Principles of Fiber Optics* lectures and laboratory for Boeing, June-Aug. 1999, 40 hours lecture, 20 hours lab.

RESEARCH INTERESTS AND INVESTIGATIONS

Primary emphasis is on development of novel and ultrasensitive optical fiber sensor devices, components, and techniques. Recent work has involved invention, characterization, and package designs of the *Elastica* fiber sensor for a variety of sensing applications. Fiber optic strain sensor developments for structural monitoring, particularly at high temperature, including field demonstrations in powerplants. All-mode wave optics calculations of backscattering and radiation/mode coupling phenomenon on curved optical waveguides, including highly multimode fibers. Development of computer tools for fiber/lens system/fiber and laser diode/lens/fiber coupling calculations, particularly ball and GRIN lenses. Development of low-cost fiber optic strain/displacement sensors. Research in condensed matter physics, especially micromagnetic techniques to study nonlinear dynamics of magnetization and magnetostriction in metallic glass ribbons from a fundamental point of view and nonlinear demagnetization and hysteresis effects. Other areas of condensed matter physics interest are in thermal noise processes in solids (theory and expt.), particularly fluctuations leading to phase measurement limits in optical fibers and magnetostrictive ribbons. Nonlinear processes of all types, particularly combining nonlinear gravity with electromagnetism in novel ways, such as "fields only" approaches to matter and mass. Other nonlinear interests are in calculations of phonon lifetimes in semiconductors due to anharmonicity. Additional interests

RECIPIENT OF SCHOOL OF NSM 1996 OUTSTANDING RESEARCH AWARD

include development of new theories of matter, including structure of the electron and study of rotation processes involving greater than the vacuum speed of light, and modeling dielectric response of matter in non-inertial reference frames. Non-exponential decay of quantum mechanical systems due to tunneling. Variable speed of light theories.

Ph.D. THESIS DISSERTATION (Professor Richard F. Wallis Thesis Advisor, Professors Alexi A. Maradudin and Douglas Mills, committee members)

"Harmonic and Anharmonic Properties of Diamond Structure Crystals With Application to the Calculation of the Thermal Expansion of Silicon", K. H. Wanser, Univ. of Calif. Irvine, (1981).

PUBLICATIONS

REFEREED ARTICLES PUBLISHED

(* denotes undergraduate student co-author)

- 1.) "Innovations in Optical Reflectometry Including OTDR", K. H. Wanser, R. Belansky, and *T. Pongetti*, *TDR 2001: 2nd International Symposium and Workshop on Time Domain Reflectometry for Innovative Geotechnical Applications*, C. Dowding, ed., Infrastructure Technology Institute, Northwestern Univ., Evanston, IL, 2001, pp. 22-37 (**Invited Keynote Paper**).
- 2.) "*Elastica* Fiber Optic Sensors for Structural Monitoring", K. H. Wanser, K. F. Voss, and *K. R. Francis*, K. R., *Fiber Optic Sensors for Construction Materials & Bridges*, F. Ansari, ed., Technomic Publishing, Lancaster, PA, (1998) pp. 231-242. (**Invited Book Publication**)
- 3.) "Fiber Optic Strain-Displacement Sensor Employing Nonlinear Buckling", K. F. Voss and K. H. Wanser, *Applied Optics*, vol. 36, no. 13, May 1, 1997, pp. 2944 - 2946.
- 4.) "Fiber Optic Strain Monitoring Inside a Power Plant Boiler", K. H. Wanser and K. F. Voss, *Intelligent Civil Engineering Materials and Structures*, F. Ansari, A. Maji, and C. Leung, ed., American Society of Civil Engineers, New York, (1997), pp. 213-228. (**Invited Book Publication**)
- 5.) "Anharmonic calculations of the optical-phonon lifetime for crystals with the diamond structure", E. Haro-Poniatoski, J. L. Escamilla-Reyes, and K. H. Wanser, *Physical Review B*, vol. **53**, May 1, 1996, p. 12121.
- 6.) "Near-Field Far-Field Transition of a Finite Line Source using Incoherent Light: A Student Laboratory Experiment", X. Yan, Y. Yu, L. Shen, and K. H. Wanser, *Am. J. Phys.*, **63**, Jan. 1995 pp. 47-54.
- 7.) "Novel Fiber Devices and Sensors based on Multimode Fiber Bragg Gratings", K. H. Wanser, K. F. Voss, and A. D. Kersey, *Proc. 10th International Conference on Optical Fiber Sensors*, Glasgow, Scotland, Oct. 11-13, 1994, pp. 265-268.
- 8.) "Theory of Thermal Phase Noise in Michelson and Sagnac Fiber Interferometers", K. H. Wanser, *Proc. 10th International Conference on Optical Fiber Sensors*, Glasgow, Scotland, Oct. 11-13, 1994, pp. 584-587. (see post-deadline papers for corrections).
- 9.) "Fiber Sensors for Monitoring Structural Strain and Cracks", K. F. Voss and K. H. Wanser, *Proc. 2nd European Conference on Smart Structures and Materials (ECSSM 2)*, Glasgow, Scotland, Oct. 12-14, 1994, pp. 144-147.
- 10.) "Multimode Fiber Bragg Gratings for Real Time Structural Monitoring using Optical Time Domain Reflectometry", K. H. Wanser, K. F. Voss, and A. D. Kersey, *Proc. Symposium and Workshop on Time Domain Reflectometry in Environmental, Infrastructure, and Mining Applications*, Northwestern University, Evanston Illinois, Sept. 7-9, 1994, U. S. Bureau of Mines Special Publication SP 19-94, pp. 472-483.

- 11.) "Intrinsic Thermal Phase Noise Limit in Optical Fiber Interferometers", K. H. Wanser, A. D. Kersey, and A. Dandridge, Optics in '93 special issue, *Optics and Photonics News*, Dec. 1993, pp. 37-38.
- 12.) "Reflective Fiber Ring Resonator with Polarization Independent Operation", M. A. Davis, K. H. Wanser, and A. D. Kersey, *Optics Lett.*, vol. 18, May 1 (1993) pp. 750-752.
- 13.) "Distributed Fiber Optic Sensors for Civil Structures using OTDR", K. H. Wanser, *M. Haselhuhn*, *M. Lafond*, and *J. Williams*, *Applications of Fiber Optic Sensors in Engineering Mechanics*, F. Ansari, ed., American Society of Civil Engineers, New York, (1993), pp. 303-327. **(Invited Book Publication)**
- 14.) "High Temperature Distributed Strain and Temperature Sensing using OTDR", K. H. Wanser, *M. Haselhuhn*, and *M. Lafond*, *Applications of Fiber Optic Sensors in Engineering Mechanics*, F. Ansari, ed., American Society of Civil Engineers, New York, (1993), pp. 194-209. **(Invited Book Publication)**
- 15.) "Laser Doppler Velocimetry using a Bulk Optic Michelson Interferometer: A Student Laboratory Experiment", * R. Belansky * and K. H. Wanser, *Am. J. Phys.*, vol. 61, no. 11, (1993) pp. 1014-1019.
- 16.) "Measurement of Fundamental Thermal Phase Fluctuations in Optical Fiber", K. H. Wanser, A. D. Kersey, and A. Dandridge, *Proc. 9th International Optical Fiber Sensors Conference (OFS-9)*, ed. by A. Scheggi, IROE-CNR, Firenze, Italy, (May 4-6, 1993), pp. 255-258.
- 17.) "Polarization-Independent Reflectometric Fiber Ring-Resonator Configuration", M. A. Davis, K. H. Wanser, and A. D. Kersey, *Proc. 9th International Optical Fiber Sensors Conference (OFS-9)*, ed. by A. Scheggi, IROE-CNR, Firenze, Italy, (May 4-6, 1993), pp. 233-236.
- 18.) "Fundamental Phase Noise Limit in Optical Fibers due to Temperature Fluctuations", K. H. Wanser, *Electronics Lett.*, vol. 28, #1, Jan 2, 1992, pp. 53 - 54.
- 19.) "Effect of Parasitic Birefringence Modulation in Interferometric Fiber Sensor Transducers", A. D. Kersey, K. H. Wanser, and M. A. Davis, *Proc. 8th International Conference on Optical Fiber Sensors*, pp. 292 - 295 , Jan. 1992, Monterey, CA , OSA/IEEE press (1992).
- 20.) "Aberration Limited Coupling Efficiency from a Plano Convex Lens into an Optical Fiber", K. H. Wanser and * K. Lewotsky *, *Applied Optics*, vol. 30, #36, pp. 5266-5269, (1991).
- 21.) "Resonant Transfer and Excitation by Crystal Channeling", J. M. Feagin and K. H. Wanser, *Phys. Rev. A*, vol. 44, #7, pp. 4228-4231, (Oct. 1, 1991).
- 22.) "Single Mode Optical Fiber Diameter Measurements using Lloyd's Mirror", K. H. Wanser and * J. A. Anderson *, *Applied Optics*, vol. 30, #18, pp. 2422-2423, (June 20, 1991).
- 23.) "Resonant Transfer and Excitation in a Crystal Channel", K. H. Wanser and J. M. Feagin, *Nuclear Instruments and Methods in Physics Research*, B 56/57, pp. 145-148, (1991).
- 24.) "Coherence, modulation, and phase-noise effects in Sagnac interferometers", K.H. Wanser, *Selected Papers on Fiber Optic Gyroscopes*, R. B. Smith ed., SPIE Optical Eng. Press, Bellingham, 1989, pp. 124-131.
- 25.) "Remote Polarization Control for Fiber-Optic Interferometers", K.H. Wanser and N.H. Safar, *Optics Letters* 12, (1987), 217.

- 26.) "A Nonlocal Dipole Model for the Phonon Dispersion in Diamond Type Lattices", W. Goldammer, W. Ludwig, R.F. Wallis, K.H. Wanser and W. Zierau, *Phys. Rev. B* **36**, (1987), 4624.
- 27.) "Theory of the Anharmonic Damping and Shift of the Raman Mode in Silicon", E. Haro, M. Balkanski, R.F. Wallis and K.H. Wanser, *Phys. Rev. B* **34**, (1986), 5358.
- 28.) "Harmonic and Anharmonic Properties of Silicon", K.H. Wanser and R.F. Wallis, Proc. Int. Conf. on Phonon Physics, 1981. *J. De Physique*, **C6** 128, (1981).
- 29.) "Anomalous Thermoelastic Effect in Silicon", K. H. Wanser and R. F. Wallis, *Sol. St. Comm.* **39**, (1981), 607.
- 30.) "Elastic Distortion of a Conducting Surface in the Vicinity of a Point Charge", K.H. Wanser, *Surface Science* **102**, (1981), 227.
- 31.) "Vibrational and Optical Properties of the Mixed Crystal $\text{NaCl}_{1-x}\text{Br}_x$ ", K.H. Wanser and R. F. Wallis, *Sol. St. Comm.* **32**, (1979), 967.
- 32.) "Making Sense of Fiber Optic Sensors", K.H. Wanser and R.E. Wagoner, *Photonics Spectra*, (Oct. 1983) P. 61.

ARTICLES COMPLETED AND IN REVIEW

- 33.) "Nonlinear Magnetization in Ferromagnetic Amorphous Metal Ribbons", K. H. Wanser and J. Liu, *to be resubmitted to Phys. Rev. B*.
- 34.) "Observation of Fundamental Thermal Phase Noise Limit in Optical Fiber Interferometers", K. H. Wanser, A. D. Kersey, and A. Dandridge, *to be resubmitted to Phys. Rev. A*.

NON-REFEREED PUBLICATIONS

- 35.) T. Clark and K. H. Wanser, "Ball vs. Gradient Index Lenses", *Photonics Spectra*, vol. 38, no. 2, February 2001, pp. 94-96.
- 36.) K. H. Wanser, K. F. Voss, and *K. R. Francis*, "Operational Characteristics of *Elastica* Fiber Optic Sensors", *Engineering Mechanics: A Force for the 21st Century*, H. Murakami and J. E. Luco, eds., American Society of Civil Engineers, New York, (1998) paper 8E, pp. 803-806.
- 37.) K. H. Wanser, K. F. Voss, and *K. R. Francis*, "*Elastica* Fiber Optic Sensors for Intelligent Structure Instrumentation", *Engineering Mechanics: A Force for the 21st Century*, H. Murakami and J. E. Luco, eds., American Society of Civil Engineers, New York, (1998) paper 7F, pp. 819-822.
- 38.) "Distributed Fiber Optic Sensors for Structural Health and Vibration Monitoring using Optical Time Domain Reflectometry", K. H. Wanser, K. F. Voss, and R. W. Griffiths, *Proc. First World Conference on Structural Control (IWCS)*, August 3-5, 1994, Pasadena, CA, pp. WA3-3-WA3-12.
- 39.) "Crack Detection using Multimode Fiber Optical Time Domain Reflectometry", K. H. Wanser and K. F. Voss, *Proc. SPIE* **2294**, *Distributed and Multiplexed Fiber Optic Sensors IV* July 27-28, 1994, San Diego, CA, paper 2294-06, pp. 43-52.
- 40.) "Interferometric Measurement and Calibration of DC Strain of a Fiber Optic Embedded Graphite Epoxy Composite Panel", K. H. Wanser and T. D. Wang, *Proc. SPIE* **1170**, (1989) paper 1170-44, pp. 405-415.

- 41.) "High Spatial Resolution Measurement Terminal for Monitoring Short Structures Using Fiber Optics", K. H. Wanser, S. A. Kingsley, and R. W. Griffiths, *Proc. SPIE* **1170**, (1989) paper 1170-45, pp. 416-434.
- 42.) "Polarization Fade Free Michelson Interferometer Using Ordinary Non-Birefringent Optical Fiber", K. H. Wanser, *Proc. SPIE* **891**, (1988) 204.
- 43.) "Propagator Theory of Polarization and Coherence for Fiber Optics with Application to the Fiber Gyroscope", K. H. Wanser, *Proc. SPIE* **891**, (1988) 179.
- 44.) "Closed-loop fiber optic magnetometer/gradiometer", C. M. Dube, S. Thordarson, and K. H. Wanser, *Proc. SPIE* **838**, (1987) 17.
- 45.) "Coherence, modulation, and phase-noise effects in Sagnac interferometers", K.H. Wanser, *Proc. SPIE* **838**, (1987) 121.
- 46.) "Interferometric Sensor Length Limitations Due to Distributed Phase Modulation", K.H. Wanser, *Proc. SPIE* **718**, (1986) 256.
- 47.) "Anharmonic Effects in the Raman Spectrum of Silicon", E. Haro, M. Balkanski, K.H. Wanser and R.F. Wallis, Proc. 2nd Int. Conf. on Phonon Physics, 1985, Budapest, Hungary (World Scientific Publishers).
- 48.) "Multi-Function Fiber Optic Magnetometer/Gradiometer", C.M. Dube, A.T. Lintz, S. Thordarson, and K.H. Wanser, Phase I Final Report, (July, 1986), Contract #NAS7-960.
- 49.) "Very Low Frequency Fiber-Optic Receiving Antenna (VLF FORA)", K.H. Wanser and D.H. Tubbs, Phase I Final Report, (July 1986), Contract #N62269-85-C-0013
- 50.) "Fiber Optic Sensor Components", E. Udd, R.J. Michal, K.H. Wanser and R.F. Cahill, Final Report, AFWAL-TR-84-1046, (March 1984).

CONFERENCE PRESENTATIONS, SEMINARS, AND INVITED TALKS

- 1.) K. H. Wanser, R. Belansky, and *T. Pongetti*, "Innovations in Optical Reflectometry Including OTDR", *TDR 2001: Innovative Applications of TDR Technology*, C. Dowding and K. O'Conner, eds., Northwestern Infrastructure Technology Institute, Sept. 5-7, 2001. (**Invited Keynote Address**).
- 2.) K. H. Wanser, "Non-Exponential Decay of Quantum Mechanical Systems Due to Tunneling", 2nd RATE Radioisotope Dating Conference, Santee, CA. **Invited Lecture** (May 20, 1998).
- 3.) K. H. Wanser, K. F. Voss, and *K. R. Francis*, "Operational Characteristics of *Elastica* Fiber Optic Sensors", ASCE 12th Engineering Mechanics Conference, San Diego, CA. *Engineering Mechanics: A Force for the 21st Century*, (May 20, 1998) paper 8E.
- 4.) K. H. Wanser, K. F. Voss, and *K. R. Francis*, "*Elastica* Fiber Optic Sensors for Intelligent Structure Instrumentation", ASCE 12th Engineering Mechanics Conference, San Diego, CA. *Engineering Mechanics: A Force for the 21st Century*, H. (May 20, 1998) paper 7F.
- 5.) "*Elastica* Fiber Optic Sensors for Structural Monitoring", K. H. Wanser, K. F. Voss, and *K. R. Francis*, K. R., NSF International Workshop on *Fiber Optic Sensors for Construction Materials & Bridges*, Newark, NJ, (May 5, 1998).
- 6.) "What do Galileo, Leibniz, James Bernoulli, Daniel Bernoulli, Leonard Euler, Coulomb, Stokes, Maxwell, Karl Voss, Keith Wanser, Variational Calculus, Nonlinear Differential Equations, General Relativity, Optical Tunneling, Quantum Mechanics, Electrical Power

- Plants, and Steam Pipes have in common?? or Fiber Optic Strain Monitoring Inside a Power Plant Boiler". CSUF Physics Dept. Seminar, November 13, 1996.
- 7.) "Optical Fiber Sensors for the Classroom", Southern California Modern Physics Institute (SCAMPI) for High School Physics Teachers, **Invited Lecture/demonstration**, CSUF July 19, 1995.
 - 8.) "Novel Fiber Devices and Sensors based on Multimode Fiber Bragg Gratings", K. H. Wanser, K. F. Voss, and A. D. Kersey, Presented at *10th International Conference on Optical Fiber Sensors*, Glasgow, Scotland, Oct. 11-13, 1994.
 - 9.) "Theory of Thermal Phase Noise in Michelson and Sagnac Fiber Interferometers", K. H. Wanser, Presented at *10th International Conference on Optical Fiber Sensors*, Glasgow, Scotland, Oct. 11-13, 1994.
 - 10.) "Fiber Sensors for Monitoring Structural Strain and Cracks", K. F. Voss and K. H. Wanser, Presented at *2nd European Conference on Smart Structures and Materials (ECSSM 2)*, Glasgow, Scotland, Oct. 12-14, 1994.
 - 11.) "Applications of Distributed Fiber Optic Sensors", Rockwell CSUF Alumni Club, **Invited Lecture/demonstration**, Rockwell Anaheim, Sept. 21, 1994.
 - 12.) "Multimode Fiber Bragg Gratings for Real Time Structural Monitoring using Optical Time Domain Reflectometry", K. H. Wanser, K. F. Voss, and A. D. Kersey, Presented at Symposium and Workshop on *Time Domain Reflectometry in Environmental, Infrastructure and Mining Applications*, Northwestern University, Evanston Illinois, Sept. 7-9, 1994.
 - 13.) "Microbending, Kink Loss, Sensor Interaction Effects, and Localized Crack Detection using Optical Time Domain Reflectometry", K. H. Wanser, and K. F. Voss, Presented at Symposium and Workshop on *Time Domain Reflectometry in Environmental, Infrastructure and Mining Applications*, Northwestern University, Evanston Illinois, Sept. 7-9, 1994.
 - 14.) "Application of Optical Time Domain Reflectometry (OTDR) to Infrastructure Monitoring", R. W. Griffiths, K. H. Wanser, and K. F. Voss, Presented at Symposium and Workshop on *Time Domain Reflectometry in Environmental, Infrastructure and Mining Applications*, Northwestern University, Evanston Illinois, Sept. 7-9, 1994.
 - 15.) "Distributed Fiber Optic Sensors for Structural Health and Vibration Monitoring using Optical Time Domain Reflectometry", K. H. Wanser, K. F. Voss, and R. W. Griffiths, *Proc. First World Conference on Structural Control (IWCSC)*, August 3-5, 1994, Pasadena, CA.
 - 16.) "Crack Detection using Multimode Fiber Optical Time Domain Reflectometry", Keith H. Wanser and Karl F. Voss, *Proc. SPIE 2294, Distributed and Multiplexed Fiber Optic Sensors IV* July 27-28, 1994, San Diego, CA, paper 2294-06.
 - 17.) "Observation of Fundamental Thermal Phase Noise Limit in Optical Fiber Interferometric Sensors or Why Squeezed States of Light Won't Improve Measurements with Fiber Optic Sensors", CSUF Physics Dept. Seminar, Oct. 14, 1992.
 - 18.) "Distributed Fiber Optic Sensors for Monitoring Civil Structures using Optical Time Domain Reflectometry", **Invited Lecture/demonstration** (with phys. 499 student *Lisa Bubion*), CSUF American Society of Civil Engineers (ASCE) Student Club, Oct. 6, 1992.
 - 19.) "Effect of Parasitic Birefringence Modulation in Interferometric Fiber Sensor Transducers", A. D. Kersey, K. H. Wanser, and M. A. Davis, *Proc. 8th International Conference on Optical Fiber Sensors*, Jan. 30, 1992, Monterey, CA .
 - 20.) "Fiber Optics: Smart Structures and Sensors", **Invited Lecture/demonstration**, CSUF Institute of Management Sciences Student Club, Nov. 12, 1991.

- 21.) "Nonlinear Magnetization and Magnetostriction in Ferromagnetic Metallic Glasses, Fundamental Phase Noise Limit in Optical Fibers due to Temperature Fluctuations, and Development of Ultra Sensitive Fiber Optic Magnetometers", CSUF Physics Dept. Seminar, Oct. 23, 1991.
- 22.) "Resonant Transfer and Excitation (RTE) in a Crystal Channel", K. H. Wanser and J. M. Feagin, Nuclear Instruments and Methods B, **Invited paper IB 7**, presented at the Eleventh International Conference on the Application of Accelerators in Research and Industry, Denton Texas, Nov. 7, 1990. Bull. Am. Phys. Soc. 35, (1990), 1776.
- 23.) "Dawning of the Age of Light: Fiber Optics, Lasers and You". **Invited Lecture/demonstration** CSUF Continuing Learning Experience, Distinguished Lecture Series, October 2, 1990.
- 24.) "Temperature Dependent Scattering Properties of Optical Fibers from 77°K to 1200°K". Keith H. Wanser, *Michael Lafond*, and Richard W. Griffiths, presented at SPIE OE/FIBERS '90, SAN JOSE, FIBER OPTIC SMART STRUCTURES AND SKINS III, Sept. 20, 1990, paper #1370-30.
- 25.) "Applications of Total Internal Reflection; Waveguides, Retroreflectors, Solar Concentrators, Fiber Optics and Lloyd's Mirror", Lecture/demonstration, CSUF Physics 101 Lecture Series, Sept. 26, 1989.
- 26.) "Fiber Optic Smart Structures and Skins, Recent Developments in Fiber-Optic Sensors, Optical Interferometry and Optical Reflectometry", CSUF Physics Dept. Seminar, Sept. 13, 1989.
- 27.) "High Spatial Resolution Measurement Terminal for Monitoring Short Structures Using Fiber Optics", K. H. Wanser, S. A. Kingsley, and R. W. Griffiths, Proc. SPIE 1170, (1989) paper 1170-45. Presented at the OE/Fibers 89' SPIE Boston Symposium, Sept. 7, 1989. Session on Fiber Optic Smart Structures and Skins II.
- 28.) "Interferometric Measurement and Calibration of DC Strain of a Fiber Optic Embedded Graphite Epoxy Composite Panel", K. H. Wanser and T. D. Wang, Proc. SPIE 1170, (1989) paper 1170-44. Presented at the OE/Fibers 89' SPIE Boston Symposium, Sept. 7, 1989. Session on Fiber Optic Smart Structures and Skins II.
- 29.) "Theoretical Model for Cubic Anharmonicity in Diamond-Structure Crystals", K. H. Wanser, R. F. Wallis, M. Balkanski and E. Haro, Paper J9-4, Bulletin of the American Physical Society, **34**, 723, (March 1989). Presented at the APS March meeting.
- 30.) "Lattice Dynamical Calculation of the Gruneisen Tensor of the Raman Mode in Diamond Structure Crystals", K. H. Wanser and R. F. Wallis, Paper J9-13, Bulletin of the American Physical Society, **34**, 724, (March 1989). Presented at the APS March meeting.
- 31.) "General Overview of Sources of Error and Noise in Fiber Optic Rotation Sensors", **invited talk** to TRW Sensors Division, Redondo Beach, CA, April 13, 1989.
- 32.) "High Spatial Resolution Measurement Terminal for Structural Monitoring Using Fiber Optics", **invited talk** to Boeing Aircraft in Seattle Washington, Feb. 28, 1989.
- 33.) **Invited talk**, "Overview of Fiber-Optic Surveillance Sensors", & **Session Chair** of "Fiber-Optic Sensors for Defense Applications", MFOC '88 West, Dec. 8, 1988, Los Angeles.
- 34.) "New Developments in Fiber-Optic Interferometric Sensors, Passive Polarization Phase Conjugation", CSUF Physics Dept. Seminar, November 16, 1988.
- 35.) "Lattice Dynamical Calculation of Third Order Elastic Constants in Diamond Structure Crystals", K. H. Wanser, R. F. Wallis, J. Deppe, and E. Haro, Bull. Am. Phys. Soc. 33, (1988), 653.
- 36.) "Theory of Negative Gruneisen Parameters and Thermal Expansion of Silicon", K.H. Wanser and R.F. Wallis, Bull. Am. Phys. Soc. 26, (1981), 312.

37.) "Harmonic and Anharmonic Properties of Silicon", K.H. Wanser and R.F. Wallis, Proc. Int. Conf. on Phonon Physics, 1981. *J. De Physique*, C6 128, (1981).

Several additional presentations while in industry and to UC Irvine Solid State Physics group.

ARTICLES IN PREPARATION FOR SUBMISSION TO PEER REVIEWED JOURNALS¹

- 1.) "Calculation of Optical Fiber LP Modes using Fourier Bessel Series", K. H. Wanser, *To be submitted to the American Journal of Physics or Journal of Lightwave Technology*.
- 2.) "Transmission loss of Single Mode Fiber *Elastica*", K. H. Wanser and R. H. Belansky, *To be submitted to Optics Letters*.
- 3.) "A fields only calculation of charged particle stability using nonlinear Newtonian gravity and electrostatics", K. H. Wanser, *To be submitted to Foundations of Physics*.
- 4.) "A Note on Gravitation as a Strong Force", K. H. Wanser, *To be submitted to the American Journal of Physics*
- 5.) "Modal Excitation of Graded Index Multimode Fiber by a Step Index Single Mode Fiber Junction", K. H. Wanser. *To be submitted to Applied Optics*. Theory and numerical calculations completed 7/98.
- 6.) "Non-Exponential Decay in the Delta Function Barrier Model", K. H. Wanser. *To be submitted to the American Journal of Physics*. Theory completed and report written, 7/98.
- 7.) "Apparent Transmission Non-Reciprocity in Intrinsic Multimode Fiber Optic Displacement Sensors due to Mode Depopulation", K. H. Wanser, *K. Francis*, and K. F. Voss, *To be submitted to Applied Optics*. Experiments and data completed 8/97
- 8.) "Scaling Properties of *Elastica* Fiber Optic Sensors", K. H. Wanser, K. F. Voss, and *K. Francis*, *To be submitted to Applied Optics*. Experiments and data completed 6/97.
- 9.) "Inertial Balance using a Fiber Optic Displacement Sensor: A Student Laboratory Experiment", *K. Francis* and K. H. Wanser, *To be submitted to the American Journal of Physics*. Experiments and data completed 3/97.
- 10.) "Measurement of submicron sol-gel film thickness using spectrophotometry", J. Olmsted and K. H. Wanser, *To be submitted to Thin Solid Films or Applied Optics*. Theory completed 5/97.
- 11.) "Sonic Anemometry: A Student Laboratory Experiment" K. H. Wanser and *K. Francis*, *To be submitted to the American Journal of Physics*. Experiments and data completed 10/96.
- 12.) "Nonlinear Magnetostriction in Ferromagnetic Amorphous Metal Ribbons; Low Frequency Response and Origin of Residual Signals", K. H. Wanser and J. Liu, *To be submitted to Phys. Rev. B*.
- 13.) "Nonlinear Magnetization in the Amorphous Ferromagnet $\text{Fe}_{74}\text{Ni}_4\text{Mo}_3\text{B}_{17}\text{Si}_2$ ", K. H. Wanser and F. Bucholtz. *To be submitted to Phys. Rev. B*.
- 14.) "Multistage Depolarizers for Fiber Optic Gyroscopes: Angular Tolerance Limits to Degree of Polarization", K. H. Wanser. *To be submitted to Electronics Letters*.
- 15.) "Lower Bound to the Complex Degree of Coherence from Dispersive Propagation in Two Beam Interference", K. H. Wanser. *To be submitted to Optics Letters*.
- 16.) "Symmetry Constrained Gaussian Approximation of the Fundamental Mode in Elliptical Core Optical Fibers", K. H. Wanser. *To be submitted to Applied Optics*.
- 17.) "Differential Cross Section for Resonant Transfer and Exchange in a Fermi Gas Metal". K. H. Wanser and J. Feagin. *To be submitted to Phys. Rev. A*.

¹ The crucial and major part of the work for these articles has already been completed, they await blocks of time to finish writing them up. Documentation of the state of completion of this work is available to interested parties.

- 18.) "Bike Racing and Wind Drag: Nonreciprocity on the Race Course", K. H. Wanser and R. J. Crowley. *To be submitted to the American Journal of Physics.*
- 19.) "Analysis of Near and Far Field Two Lobe Radiation Patterns Emitted from a Two Mode Elliptical Core Optical Fiber", K. H. Wanser. *To be submitted to Journal of Lightwave Technology.*
- 20.) "Nonlinear fluctuations of magnetization and strain in an amorphous ferromagnetic ribbon near saturation", *B. Mathews* and K. H. Wanser. *To be submitted to Physica Status Solidi or J. Magnetism and Magnetic Materials.*
- 21.) "Driven oscillator with delayed feedback", K. H. Wanser. *To be submitted to the American Journal of Physics.*
- 22.) "Wave Optics Analysis of Fiber Optic Extrinsic Fabry Perot Interferometers (EFPI) including near field effects", K. H. Wanser. *To be submitted to Journal of Lightwave Technology.*
- 23.) "Phase-strain relationship in chirped optical fiber Bragg gratings", K. H. Wanser. *To be submitted to Applied Optics.*
- 24.) "Adiabatic Constitutive Equations for Magnetization in Metallic Glass Ribbons: effects of nonlinear strain, arbitrary anisotropy axis direction, and remanent magnetization", K. H. Wanser and J. Liu. *To be submitted to Journal of Applied Physics.*
- 25.) "Diffraction from phase slits and phase holes in transparent media", K. H. Wanser. *To be submitted to American Journal of Physics.*
- 26.) "Optimal coupling of collimated elliptical beams into single mode optical fibers with rotationally symmetric lenses", K. H. Wanser, *To be submitted to Applied Optics.*

PATENTS GRANTED

- 1.) "A Fiber Optic Sensor Based Upon Buckling of a Freely Suspended Length of Fiber", 47 pages, 49 figures, 31 claims. U. S. Patent #5,818,982, filed 4/1/96, response to 2nd patent office action 11/25/97, granted 3/2/98, issued 10/6/98.
- 2.) "Fiber Devices and Sensors Based on Multimode Fiber Bragg Gratings", 60 pages, 9 figures, 13 claims. U.S. Patent #5,848,204, filed 9/8/95, response to third patent office action 4/1/98, granted 6/4/98, issued 12/8/98.
- 3.) "Strain Sensor for High Temperature Environments", 20 pages, 11 figures, 28 claims. U. S. Patent #5,661,246, response 1/28/97, granted 2/24/97, issued 8/26/97.
- 4.) "Strain Sensors Having Ultra-High Dynamic Range", 15 pages, 8 figures, 15 claims. U. S. Patent #5,668,324, response 1/29/97, granted 2/19/97, issued 9/16/97.
- 5.) "Method of Terminating an Optical Fiber", U. S. Patent # 4,834,493, issued 5/30/89.
- 6.) "Fiber Optic Earth Rotation Gyro Compass", U. S. Patent #4,712,306, issued 12/15/87.
- 7.) "Microbending Optical Fiber Accelerometer and Gyroscope", U. S. Patent # 4,743,116, issued 5/10/88.

Patents 1-4 are all in the field of fiber optic sensors and devices and were filed through the CSUF Foundation. The third one has already been successfully operated inside a Southern California Edison power plant boiler operating at ~1100°F for 6 months.

PRESS ARTICLES, RADIO INTERVIEWS, AND RELEASES ABOUT RESEARCH WORK

- 1.) "Working on Ideas", G. Robbins, Orange County Register, News, p. 8, Tues. June 25, 1996.
- 2.) "Fiberoptic sensors operate inside Southern California Edison power plant boiler", *Laser Focus World*, Feb. 1995, p. 9-10. Recognition of (1/95) installation of fiberoptic sensors inside Southern California Edison Power Plant Boiler

- 3.) "The Acid Test", BBC radio 5, Sunday Oct. 16, 1994. Interview about research work on fiber optic smart structures in connection with my conference presentation at the 2nd European Conference on Smart Structures, Glasgow, Scotland.
- 4.) "Fiber optic sensors may now save lives", Lisa Lambeth, *Daily Titan*, Thurs. Nov. 14, 1991, p. 1 & 5. Article discusses some of the work at CSUF related to high-temperature strain sensors and also other infrastructure uses of distributed sensors, including weld crack detection.
- 5.) "California State University Fullerton Researchers are Developing Fiber-Optic Sensors for Structural Monitoring and Other Applications", *Sensor Business Digest*, Dec. 1991. This article describes some of the fiber optic sensor research, development, and educational activities in the CSUF Physics Department.
- 6.) "Technical Advances in Fiber-Optic Sensors: Theory and Applications", Peter Adrian, *Sensors*, pp. 30-31, Sept. 1991. Describes some of the work performed at CSUF in our laboratories under contract.
- 7.) "CSUF Physics Prof. Developing 'Smart Buildings' Sensor System", *Fullerton Observer*, No. 183, p. 15, Oct. 15, 1991.
- 8.) *Can Fiberoptic Sensors Read Military Minds?*, J. Hecht, *Lasers and Applications*, P. 22, Nov. 1986.

A List of Contract and Grant Awards is available to interested parties

Over \$1,000,000 in numerous funded contract awards as Sole Principal Investigator since 1989.

SUPERVISION OF MASTER'S THESIS

Belansky, R. H., Aug. 2001, *Curvature Effects in Single Mode and Multimode Optical fibers and Fiber Bragg Gratings*, M.S. Thesis, California State University Fullerton, Fullerton, CA.

ADDITIONAL RESEARCH REPORTS AND ARTICLES

- 1.) "Single Mode Fiber to Fiber Coupling using Ball and GRIN Lenses", K. H. Wanser, Research report and computer calculation tools for Deposition Sciences Inc., January 2000.
- 2.) "Laser Diode to Single Mode Fiber Coupling using Ball and GRIN Lenses, K. H. Wanser, Research report and computer calculation tools for Deposition Sciences Inc., March 2000.
- 3.) "Choosing Ball or GRIN Lenses", T. Clark and K. H. Wanser, Deposition Sciences Inc., 2001.
- 4.) *In Six Days: Why 50 Scientists Choose to Believe in Creation*, J. Ashton, ed., New Holland, Sydney, 1999, pp. 90-97. Invited article.
- 5.) "God and the Electron", K. H. Wanser, *Creation Ex Nihilo*, **21**, No. 4, Sept.-Nov. 1999, pp. 38-41. Interview.
- 6.) "Non-Exponential Decay of Quantum Mechanical Systems Due to Tunneling", K. H. Wanser, Final report of intramural grant to Chancellor's Office, June 1998.
- 7.) Finding Good Technical People, *Laser Focus World*, August, 2000, p. 107, Letter to the editor.