

John L. Wallace

31 Border Lane, Bozeman, MT
406-586-2100 (home / answering machine)
jwallacq@gmail.com or jwallacq@hotmail.com

Education: PhD in Physics from the California Institute of Technology.

Security clearance: None currently, but had a DoD SECRET level as recently as 2005; and had a Top Secret prior to that.

Member: IEEE and the American Vacuum Society (AVS)

Career Summary: Extensive "hands-on" experience in Aerospace and Hi-Tech industry. Most prior work involved Materials Science and/or Electronics Engineering in addition to Physics. Main areas of expertise include:

- Thin film and vacuum deposition technology, (e.g. RF & DC magnetron sputtering, reactive sputtering, electron beam evaporation, vacuum arc technology, reactive ion etching, photolithography.)
- Development of sensors, instrumentation, and techniques for nondestructive testing - including eddy current, ultrasonic, magnetostrictive, optical, and Barkhausen techniques.
- Vacuum deposition of magnetic thin films and multilayer magnetodielectric composites. Deposition onto plastic substrates. Electron microscopy and surface analysis.
- Design, construction, and operation of high- and ultra-high vacuum equipment.
- Handling of cryogenic liquids, including Liquid Helium.
- Processing and characterization of semiconductors, including GaAs and other compound semiconductors. Anisotropic etching.
- Electromagnetic characterization of materials for low-observables ("Stealth") applications.
- Has written twelve winning SBIR proposals, including one Phase-2 award. Has authored or co-authored approximately 25 published papers.

Other skills: Fluent in Spanish. Some experience with Visual Basic, Python, C, and Linux. Hands-on familiarity with machine shop tools and techniques. Completed two classified courses at the Georgia Institute of Technology in 1988: "Radar Cross-Section Reduction" and "Low Observable and Window Materials Measurements at Centimeter and Millimeter Wavelengths. Holds an FCC Commercial Radiotelephone Operator License, (First Class w/ Ship Radar Endorsement).

Hobbies: Ham radio ("Amateur Extra" class, W2GNI). Amateur astronomy & photography. Car repair. Outdoor sports such as backpacking, canoeing, hunting & fishing, and non-technical mountain climbing.

Personal data: U.S. citizen with a current passport. Married with three children, ranging in age from 29 years to 14 years.

Employment History:

Nov. 2014 to Present

Freelance Technical Editor for Cactus Communications (www.cactusglobal.com)

This work primarily involves editing and polishing scientific documents that have been written by non-native-English speakers so that they meet the publication requirements of American and British scientific journals.

Jan. 2012 to Present

Owner of Lakehills Scientific, LLC, a scientific consulting company in Bozeman, MT. Consulting in Physics, Materials Science, and Electronic Engineering for various clients, I also do repair and some custom design of high-end audio, stereo, and home-theater equipment as well as custom scientific electronics and repair of vintage, tube-type radio equipment.

Sept. 2005 to Dec. 2011

Materials Scientist, Arcomac Surface Engineering, Bozeman, MT and American Eagle Instruments, Missoula, MT (sister companies).

The main business of Arcomac / American Eagle was the development of techniques to use Large-Area Filtered Cathodic Arc Deposition [LAFAD] and related technologies to vacuum-deposit thick coatings (erosion-resistant coatings, wear & corrosion-resistant coatings, thermal barrier coatings, etc.) on various substrates, such as turbine blades, dental instruments, biomedical implants, fuel-cell interconnects, and bearings. Dr. Wallace's main contributions during the six years that he worked there include:

- Designing specialized electronic equipment for use with the vacuum deposition system, such as pulsed power sources, high voltage bias supplies, RF matching networks, arc-suppression circuitry, magnetic deflection systems, optical pyrometry systems, and data acquisition networks.
- Developing methods for testing and characterization of the coatings, including techniques for quantitative sand-blasting and calibrated single-particle impact testing
- Report and Proposal writing.

In 2007, Dr. Wallace was the Project Scientist on a Phase-I SBIR contract from DARPA entitled: "Nanostructured Thermal Barrier Coating, Based on Filtered Arc Plasma Source Ion Deposition."

1995 – 2005.

Senior Research Engineer, Karta Technologies, Inc., San Antonio, TX

Most work at Karta involved applied research & development in the areas of nondestructive testing technologies and sensor development. Examples include:

- Studying electromagnetic techniques to detect pitting and corrosion in reheater tubes at an electrical power-generating plant.
- Using optical methods to determine the position of a sensor head on a flat surface.
- Developing swept-frequency eddy current techniques for characterizing multilayer conductors.

- Studying residual stress distributions in ferromagnetic materials by means of magnetic anisotropy and Barkhausen measurements.
- Helping to develop methods to improve the eddy current penetration into ferromagnetic structures by application of a saturating DC magnetic field.
- Using ultrasonic methods to detect stress corrosion cracks and pitting on the inaccessible sides of boiler tubes.
- Helping to write proposals in the areas of non-contact ultrasonic NDT, corrosion detection, and non-contact, interferometric residual stress measurement.
- Developing an automated test station for characterizing eddy current probes.
- Developing a non-contact, optical method for measuring the torque in rotating shafts.
- Writing software to control a shake-table, and carrying out vibration analyses.
- Helping to write several proposals in the area of nondestructive testing of Low Observables materials.
- Modeling of Lightning-Protection systems and components for Phased-Array antennas.

1991 - 1995

Associate Professor of Physics at the Centro de Investigaciones y Estudios Avanzados (CINVESTAV), Merida, Yucatan, Mexico. Taught graduate courses in Thermodynamics, Advanced Laboratory, Preparation & Characterization of Materials, Solid State Physics, and Materials Science. His areas of research included magnetic materials, magnetometers, scanning tunneling microscopy, and corrosion-resistant thin films. His project "Design and Construction of a Vibrating Reed Magnetometer with a Tunneling-Tip Sensor" was funded by the Mexican National Council for Science & Technology (CONACyT). The sensor was successfully developed in this feasibility study. Other winning proposals that he wrote while at CINVESTAV include: "Silicon Nitride Layers on Steel as Diffusion Barriers in the Studies of High Temperature Corrosion" and "Design and Construction of a Facing Targets Sputtering Module".

1985 - 1991

Owner, founder, and chief scientist at Xi Magnetics, Inc., Coatesville, PA. Wrote eight winning SBIR proposals, including a Phase-2 award. Most of the research involved thin film deposition techniques, thin film processing, multilayer magnetic thin films, magneto-elastic amorphous films, and micromechanical silicon devices. The company fluctuated in size from seven to three employees, and its cumulative gross income approached one million dollars.

The customers included:

- The Department of Energy
- S.D.I.O
- The Defense Nuclear Agency
- Various DoD agencies.

1982 - 1985

Senior Scientist at Damaskos, Inc., Chadds Ford, PA. Damaskos, Inc. was a defense contractor specializing in R&D of electromagnetic scattering, thin films, radar systems, magnetic and solid-state physics, and microwave and IR measurements and materials. Dr. Wallace worked to develop materials with unusual electromagnetic

properties, mostly for application to Low Observables [Stealth] programs. He developed specialized vacuum deposition technologies based on Sputtering and electron beam evaporation, and he held a Top Secret clearance during that time. Within three years, he expanded the thin-film activities from a one-man operation to the largest single profit center within the company. In 1983-84 he was the Principal Investigator on a successful SBIR project sponsored by the Naval Air Systems Command entitled "A Novel, Low Cost Infra-red Absorbing Material." His department also worked on sputtered amorphous alloys for the Naval Surface Warfare Center.

1979 - 1982

Research Scientist at TRW, Inc., Philadelphia, PA. Worked on methods to process Gallium Arsenide semiconductor devices. He was primarily involved with gallium arsenide opto-electronic devices but also contributed in the areas of computer-aided manufacturing, fiber-optic systems, and ultrasonic transducers. Conducted a comprehensive paper study of the relative merits of metal-organic CVD versus molecular beam epitaxy for GaAs device fabrication.

1971 - 1979

Research Scientist at Airborne Instrument Laboratories (Later: A.I.L. division of Eaton Corp.) Developed processing techniques for Gallium Arsenide microwave devices, especially Schottky diodes and FET's. The main techniques included RF sputtering, electron beam evaporation, and photolithography. Dr. Wallace acquired first-hand experience with Scanning Electron Microscopy during this time.

Winning Proposals written by Dr. Wallace (Mostly SBIR or Similar):

- "A Novel, Low-Cost Infra-red Absorbing Material." (FY-83) U.S. Navy.
- "Microlaminated Ferromagnetic Composites for Magnetic Switching." (FY-86) U.S. Department of Energy, Contract # DE-AC01-86-ER80359 (\$50,000).
- "High-Q VHF/UHF Miniature Inductors made from Micro-Laminated Ferromagnetic Composites." (FY-86) Commonwealth of Pennsylvania (\$35,000).
- "Very High Temperature / Very High Frequency Magnetic Materials Development." (FY-87) U.S. Air Force, Wright-Patterson AFB, Contract # F33615-87-C-5312 (\$70,043).
- "Amorphous Ferromagnetic Materials with Ultra-Low Eddy Current Losses." (FY-87) U.S. Department of Energy, Contract # DE-AC01-87-C-80486 (\$50,000).
- "Lithium Impregnated Armatures for Railguns." (FY-87) U.S. Air Force / SDIO Contract # F08635-87-C-0446 (\$59,999).

- “Micro-Laminated Ferromagnetic Composite Deposition.” (FY-87) Defense Nuclear Agency, Contract # DNA001-87-C-0093 (\$70,000).
- “Sputtered Metallic Glass for Accelerometers.” (FY-88) Naval Surface Warfare Center, Contract # N60921-88-C-0146 (\$62,906).
- “Practical Fabrication Techniques for Durable ‘Moth-Eye’ Optical Absorbers.” (FY-88) National Science Foundation, Contract # NSF-88-60197 (\$50,000).
- “Sputtered Metallic Glass for Accelerometers - Phase II.” (FY-90) Naval Surface Weapons Center, Contract # N60921-90-C-0011 (\$ 398,000).
- “Optical Torque Sensor for Electric Motor Controller Feedback in a Hybrid Electric Vehicle.” (FY-01) U.S. Department of Energy, Contract # DE-FG03-00ER83032 (\$ 99,883).
- “Nanostructured Thermal Barrier Coating Based on Filtered Arc Plasma Source Ion Deposition.” (FY-07) DARPA, Contract # W31P4Q-07-C-0057. (\$ 98,695).

Publications & Presentations authored or co-authored by Dr. Wallace:

V.I. Gorokhovskiy, P.E. Gannon, J. Wallace, D. VanVorous, C. Bowman, M.C. Deibert, & R.J. Smith, “Evaluation of SOFC Interconnects Made of Ferritic Steels with Nano-Structured Oxide-Ceramic Protective Coatings Deposited by the LAFAD Process.” *Journal of the Electrochemical Society*, Vol. 158, No. 5, pp. B526 – B535 (2011).

V. Gorokhovskiy, C. Bowman, J. Wallace, J. O’Keefe, V. Champagne, M. Pepi, and W. Tabakoff, “LAFAD Hard Ceramic and Cermet Coatings for Erosion and Corrosion Protection of Turbomachinery Components.” Presented at the ASME Turbo Expo-2009, Orlando, FL. (June 8 – 12, 2009).

V. Gorokhovskiy, C. Bowman, D. VanVorous, and J. Wallace, “Deposition of Various Nitride and Oxide-Ceramic Coatings by an Industrial-Scale LAFAD Process.” Presented at the 55th International Symposium of the American Vacuum Society, Boston, MA (Oct. 22, 2008); and also published in the *Journal of Vacuum Science & Technology – A: Vacuum, Surfaces & Films*, Vol.27, No.4, pp.1080-1095, (2009).

V. Gorokhovskiy, J. Wallace, C. Bowman, P.E. Gannon, J. O’Keefe, V. Champagne, and M. Pepi, “Large Area Filtered Arc and Hybrid Coating Deposition Technologies for Erosion and Corrosion Protection of Aircraft Components.” Proceedings of the 32nd International Conference & Exposition on Advanced Ceramics & Composites, Daytona Beach, FL. (Jan. 27 – Feb. 01, 2008).

M.R. Govindaraju and J. Wallace, “The Barkhausen Effect.” *Plant Services*, Vol. 22, #8, (Aug. 2001).

M. Govindaraju, J. Wallace, C. Duffer, and R. Tilley, "Detection and Evaluation of Corrosion-Fatigue Cracks in Waterwall Boiler Tubes by an Innovative Nondestructive Evaluation Technology based on Ultrasonic Guided Waves." *Proceedings of the Conference on Boiler Tube Failures and HRSG Tube Failures and Inspection*, Phoenix, AZ (Nov. 6-8, 2001).

G. Katragadda, D. Lewis, J. Wallace, and J. Si., "Swept Frequency Eddy Current Material Profiling using Radial Basis Function Neural Networks for Inversion", *Materials Evaluation*, Vol. 58, #1, (Jan. 2000), pp. 70-73.

M.R. Govindaraju, G. Katragadda, and J.L. Wallace. "Finite element analysis of a magnetic sensor to detect permeability changes due to residual stresses in ferromagnetic material", *SPIE Conference on NDE Technologies for Aging Infrastructure and Manufacturing '98 Symposium*, San Antonio, Texas, March 1998. Published in *Proceedings of the SPIE*, Vol. 3396, (March 1998), pp. 47-55.

G. Katragadda, J. Wallace, J. Lee, and S. Nair, "Neural Network Inversion for Thickness Measurements and Conductivity Profiling", *23rd Annual Review of progress in Quantitative Nondestructive Evaluation*, vol. 16A, Symposium held in Brunswick, Maine, (July 28 – Aug. 2, 1996), Proceedings © 1997, pp. 781-788.

R. Castro-Rodriguez, J. L. Peña, A. Zapata-Navarro, M. Zapata-Torres, and J. L. Wallace. "Large Grain size CdTe Films Grown on Glass Substrates at Low Temperature." *Journal of Vacuum Science & Technology-A*, Vol. 13, No. 6 (Nov./Dec. 1995), pp. 2994-2996.

F.J. Espinosa-Faller, and J. L. Wallace. "A Vibrating Reed Magnetometer, Based on an Inchworm® Motor and a Tunneling-Tip Sensor." *Measurement Science & Technology*, Vol. 6, No. 8 (Aug. 1995), pp. 1221-1224.

J.L. Wallace, "Corrosion Behaviour of Sputtered Amorphous Magnetic Thin Films, with and without Protective Overlayers." *Journal of Vacuum Science & Technology-A*, Vol. 12, No. 6 (Nov./Dec. 1994), pp. 3146-3148.

F.J. Espinosa-Faller, E. A. Mijangos, A. I. Oliva, J. L. Peña., and J. L. Wallace. "Análisis Teoretico-Experimental de un Sistema de Amortiguación Neumático para bajas Frecuencias." Presented at the Eighth Latin American Congress on Surface Science and its Applications, Cancun, Mexico (Sep. 19-23, 1994).

J.L. Wallace, "An Extremely Low-Cost Interface Between an Inchworm® Motor and a Personal Computer." *Measurement Science & Technology*, Vol. 5, No. 7 (July 1994), pp. 861-863.

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J.L. Wallace, "Broadband Magnetic Microwave Absorbers - Fundamental Limitations." *IEEE Transactions on Magnetics*, Vol. 29, No. 6 (Nov. 1993), pp. 4209-4214.

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J.L. Wallace, "Fast Fourier Transform Analysis of M-H Hysteresis Loops." *Journal of Applied Physics*, Vol. 73, No. 10 (May 15, 1993), pp. 6849-6851.

R.C. Fenn, M. J. Gerver, R. L. Hockney, B. G. Johnson, and J. L. Wallace. "Microfabricated Magnetometer Using Young's Modulus Changes in Magnetoelastic Materials." *S.P.I.E. Proceedings*, Vol. 1694 (1992), pp. 132-143.

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J.A. Calviello, J.,J. Taub, D.I. Breitzer, E.H. Kramer, and J.L. Wallace, "Advanced Devices and Components for the Millimeter and Submillimeter Systems." Presented at the AGARD Electro-Magnetic Wave Propagation Panel Symp., Munich, (Sept., 1978).

J.A. Calviello, J.L. Wallace, and P.R. Bie, "High-Performance GaAs Beam-Lead Mixer Diodes for Millimetre and Submillimetre Applications." *Electronics Letters*, Vol. 15, #17, (Aug. 16, 1979), pp. 509-510.

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J.A. Calviello, J.L. Wallace, and P.R. Bie, "High Performance GaAs Quasi-Planar Varactors for Millimeter Waves." *IEEE Trans. Electron Devices*. Vol.21 No. 10 (Oct.1974). pp. 624-630.

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