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Michael Kobold, P.E., Ph.D.

Education

Ph.D., Ocean Eng, Florida Atlantic U dissertation: Background Structure Functions,	May 2024
Certificate, ASW, Naval Postgraduate School (Anti-Sub. Warfare) The Presidio,	Jun 2011
M.S., Electrical Eng (optics, ATR, RF) Air Force Inst, of Tech,, WPAFB, Ohio,	Sept. 2006
M.S., Physics (optics & Aero) University of Michigan, Ann Arbor, Michigan	May 1994
B.S., Physics and Math University of Texas, Arlington, Magna Cum Laude	Dec. 1984

Licensure
Clearance

Professional Engineer (Mechanical Engineering). License Number 6201043854 (Michigan)

Currently Secret. Top Secret information & granted access to sensitive compartmented information based on single scope background investigation completed 14Jan05. Debriefed to Secret 30Mar09.

Patents

US 9197822 Array Augmented Parallax Image Enhancement System & Method 24Nov15
US 9208386 Crowd State Characterization System and Method 8 December 2015
US 11431421 Caustic Expander & Local Waveguide to Improve Acoustic Comms 30aug22
US 11653125 Method [to Collect] Field-Based Data to Reduce Collected Data Error 16my23

Skills and Expertise

Automated Target Recognition, optics, sensors, EO/IR/LADAR/RADAR, Laser Vibrometry, **RF reflectarray & conventional antennas**, **adaptive** optics, *image processing through turbulence*, hydrodynamics, hull fouling analysis, and expression of proteins. *Underwater Acoustic **communication***, and *adaptive* acoustic comms; parallel processing of ATR and simulation; structural analysis, impact, sonic fatigue, dynamics, acoustics; Matlab, LaTeX, MathCad, Mathematica, and only commercially used structural codes such as NASTRAN, Patran, I-DEAS, old ABAQUS, and DYNA. [Interest in & some work with: xMidas, OPNET, nn, LabView, vxWorks, FPGA's, LEEDR, ANCHOR & HELEEOS].

Work Experience

Visited this 30 W laser communications demo in 2013 at the Kennedy Space Center small one mile range for the Center for Research in Electro-Optics and Lasers (CREOL) in Orlando. This Booze-Allen H. (BAH) test was run by colleagues Dr. Pedro Encarnación and Dr. Keith Blanks. The facilities are now with the Center for Directed Energy.

Equipment in "fish" like these provided data for acoustic communications analysis and wavefront propagation studies in conjunction with measurements from casts of sound speed profile instruments leading to the dissertation.
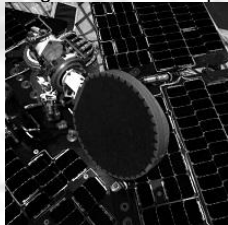
Aug. 2009 – present   US Navy civil service optics scientist & structural vibration engineer
NSWC PCD Code S-32   Panama City, Florida

Optical and radar using reflectarray antennas for transverse momentum modulation. Remote classification of seabed sediment. Radiolocation and Complex Ambiguity Functions for Precision Time and Navigation. Laser vibrometry and other sensors for seismic responses. Automated target recognition (ATR). Underwater (UW) acoustic communications (comms) to estimate range and throughput through naturally inhomogeneous sound speed profile (SSPs statistics using tech from atmosphere-based optical comms that is part of MODTRAN, LEEDR or HELEEOS for UW acoustic communication. Produced structure functions and acoustic coherence widths for acoustical comms forecasting and other results, showed the relationship of the latter to coherence break-up range. Showed why *randomized* SSPs can over-estimate range compared to natural tidal variations. See dissertation. ATR using polarimeters, UV, IR and EO and target recognition using FX imaging – success recognizing aged buried objects. Synthetic aperture sonar beamforming. Signal processing applications included shader functions related to persistent surveillance and plenoptic depth of field issues. Technical reports include atmospheric imaging at low height for shallow depression angle laser vibrometry of the ground, simulation of soil vibration above buried objects, and seismic spectral-based attenuation calculations based on geophysics methods – the use of the log of ratios of PSD's with respect to wavespeed and range differences. Signal-processing related to laser line scan to image further into seawater. Systems engineering on an instance of Bluefin-type sensor systems. Passive and semi-active sensing of vibration to remotely recognize containers. Showed target spectral elimination in laser vibrometry is not a problem for ID of vibration modes of manufactured (realistic) vehicles. Produced tool for hydrodynamics of simulated biological coatings. Sensor window material: Raman frequencies and atomic mode shapes for impurities of sintered/HIP'd powered sensor windows, and electron affinities.

April 2009 – July 2009   UCF CREOL OSE 6525 & sabbatical: Optical & Quantum Coherence
Univ. of Central Florida, Center for Research in Electro-Optics and Lasers   Orlando, FL
Working from a Mandel & Wolf textbook, gratis work included passive assist to the BAH Laser effort.

June 2008 – Mar 2009   BAE Systems - Technology Solutions & Services (AFTAC)
Remote Sensing Research, Modelling & Simulation, Data Analysis   PAFB, FL
DSP engineer for multidisciplinary signal processing at PAFB/AFTAC; Liaison for South American installations; Generated two BAE technical papers for crowd statistical mechanics / remote sensing and optical communication research.

Michael C. Kobold

Navy patent 9208386 uses enthalpy-entropy states measured from crowd data collected at AFRL for UAV surveillance studies.

Work on the Airborne Laser during classes at the Air Force Institute of Technology led to the technology used for the 2024 dissertation in Ocean Engineering.

2001 – June 2008 General Dynamics – Advanced Info. Systems (USAF/NASIC, AFRL/SN)
Remote Sensing Research, Modelling & Simulation, CID systems   WPAFB, Ohio
RF signal processing (ambiguity), radar, EO, IR, & laser return phenomenology; GPS transmission 4π sr radiation patterns (using data from Thomas.D.Powell @ aero.org); AFOSR remotely sensed vehicle dynamics; DARPA IXO SASO SPEYES acoustics, statistical mechanics of vibration signatures & crowd behavior using prior to Navy work on entropy that led to patent 9208386; Cooperative ID integration; Vehicle Intent analysis using remote sensing & structural dynamics; Radiometry for anti-aircraft missile plume threat warning analysis using *Matlab*; Multi-spectral, optical flow, & spectrum assessments, IR calibration; Image processing algorithms, SIMD parallel processing, Requirements Eng. Algorithms: Workflow, wireless communications simulation (Matlab based on OPNET), Warfare Modeling & Simulation software development, ATR; MASINT Sys. Engineering – Space-Based Infrared System, NASIC (subcontracted to Ball Aerospace and Technologies Corp.); Acoustic and Laser cross-spectral covariance for target ID and acoustic time lags. Research involves alternative hardware and algorithms**.**

High-Gain Antenna (HGA) Gimbal verification on the Mars Explorer Rovers Spirit & Opportunity. This HGA is a 30 year old reflectarray antenna design whose thickness provided range to Earth.

2000 - 2001   Ball Aerospace & Technologies Corp.
Senior Structural Engineer   Boulder, Colorado
NASA satellite imaging programs, NPOESS and JPL's Mars Explorer Rover (MER photo is the watermark of this résumé). SDRC I-DEAS simulation, including random vibration, MSC/NASTRAN and Matlab, Satellite instruments space physics and optics. The reflectarray High Gain Antenna Gimbal (HGAG) worked well for both Spirit and Opportunity. Program Manager Satish A. Krishnan (now at Raytheon) and JVacchio at jpl.nasa.gov. NPOESS SESS magnetometer and Langmuir probe Space Physics, system analysis; National Polar-orbiting Operational Environmental Satellite System (NPOESS) Cross-tracking infrared sounder (CrIS) Vibration, MER HGAG 60g landing shock validation.

1997 - 2000   Northrop Grumman Corporation (Joint STARS)
Senior Structural Engineer   Melbourne, Florida
USAF Joint STARS. Stress, Sonic Fatigue analysis (NASTRAN, PATRAN, "C", UNIX shell post-processors for NASTRAN, MathCad, Matlab). SGI IRIX, Shell scripts for Finite Element Analysis Systems integration; aerodynamic effects including sonic fatigue, vibration, noise; Stress, design changes, BOLD, FEA, corrosion, damage tolerance, crack propagation; Familiar with FAA procedures, military specs, Boeing stress reports, SEI4, Configuration Management (CM) system maintenance; Radar Systems software, problem tracking, metrics; BCWP, ACWP, effects on earned value, CM – build process issues; Joint STARS class library definition and build process documentation (CM); Conformal load-bearing RF, radiation patterns, selection, and location of slot antenna.

Structural, radio, and **radar** work on Joint STARS antenna integration into the E-8C.

1985 – 1997   General Motors Corporation (GM Truck)
Senior Structural Analyst   Pontiac, Michigan

Stress, Vibration and Noise Lead Structural Analyst for NASTRAN FEA for Delphi on GM Corporate structural analysis and acoustics committees, I-DEAS, PATRAN, "C", UNIX, MSC/NASTRAN, HKS/ABAQUS, LST/DYNA, Comet/Acoustics, calculations per Roark. Simulation, structural analysis, hiring, supervision, mostly nonlinear analysis, acoustics analysis test (B&K) and boundary element analysis for acoustics, hand calculations, optimization, design sensitivity, mfg. design direction, Crash-worthiness, occupant simulation, side-impact air bag deployment door, CAE integration. Structural modification of body-in-white for mobility targets (noise and vibration); Suspension component FE modeling and analysis, UNIX, "C", NASTRAN. FROM 1986 TO 1990: Engineering Systems Engineer, Electronic Data Systems (division of GM), Engineering Analysis Support. Program Management, $5M P&L, computer (NASTRAN, FEM, storage). Doubled goals by mid-year; services for GM design groups on a contractual basis; I-DEAS; MSC/NASTRAN Structural analysis support: FEA, FEM, and consulting; Automated Electrical Engineering Systems, welding transformer, kick-less cable selection; Image processing coding for Automated Intelligence P5000 inspection system**.**

1990 – 1991 (between GM assignments)   Computer Sciences Corp., Falls Church, VA
Structural Analyst/Supercomputer Consultant   Warren, Michigan
Technology Assessment for Army engineering applications at the US Army Tank Automotive Research, Development and Engineering Center (TARDEC), Warren Michigan, using Cray2 and Connection Machine technology (UNIX, "C", FORTRAN90, PATRAN ABAQUS, internal Army code for metal fatigue, DADS multi-body, UNICOS, calculations per Roark); UNIX/FEA services: M1A2, Track and Chassis Group, ABAQUS stress and dynamics; Thermal (CO_2 laser) photo-acoustic imaging theory and simulation.
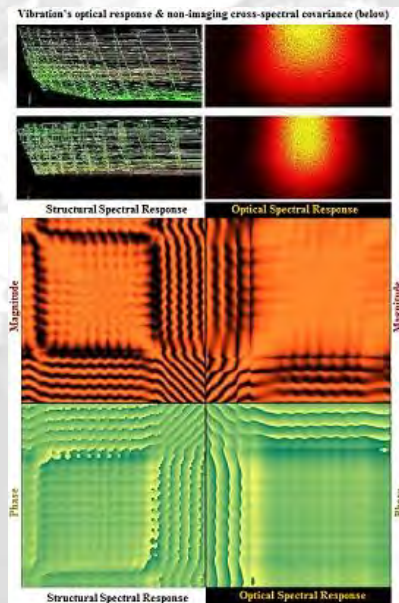
M. C. Kobold and D. D. Sternlicht, "Anomalous Amplitude Fade to remotely determine seabed components," submitted for a Navy patent application, U.S. Patent and Trade Office, Oct. 2025.

M. N. Le, M. C. Kobold, A. B. Earnest, S. N. Smith, J. T. Kowalczick, J. J. Dale, D. D. Sternlicht, "Preliminary Study Toward Hybrid Machine Learning for Remote Seabed Characterization." Proceedings MTS/IEEE OCEANS, pp. 1–6, September 2025.

M. C. Kobold, "Background Structure Functions, A Basis to Reduce Acoustic Power Requirements and Improve Images," Florida Atlantic University Dissertation, 04 May 2024. https :// proquest .com/docview/3054306477

Kobold, Michael C., & Pierre-Philippe Beaujean. "Acoustic error approximation due to Gouy phase in the sea," AIP Advances 13, 075310 (2023).

Kobold, Michael C., & Pierre-Philippe Beaujean. "Background Structure Functions for statistical acoustic propagation characterization." IEEE OCEANS 2022, Hampton Roads, pp. 1-10.

M.C. Kobold, "Vibration and Noise Response of Panels with Coatings and Laminates," Technical Report TR-2020-003, Naval Surface Warfare Center Panama City Division, 2020.

M.C. Kobold and M McKinley, "Remote Vibrometry recognition of nonlinear eigen-states, for object coverage of randomly large size," remote vibration sensing, J. Vibroengineering, 2020, https :// jvejournals .com/article/29591 (arxiv .org/pdf/2102.10273.pdf)

M.C. Kobold, "Observations of nonlinear eigenstates, localized v. non-imaging modal response of contact structures," remote vibration sensing, Cornell U Lib, arxiv.org/abs/1711.04217, 2018

M. Kobold, "Numerical Rationale to Choose Throughput over BER," Naval Surface Warfare Center, Panama City Division, Panama City, FL, Unclassified, Internal report 2017. (This extends the rate-distortion theory.)

Michael C. Kobold, "Parallel Target Recognition performance metrics using FX," Naval Surface Warfare Center Panama City Division, TR16-001, Technical Library, Code 1033, NSWC PCD Code X-12, 110 Vernon Ave, BL 110, Panama City, FL, USA 32407-7001, September 2017. This 94 page 47 figure report may be available through DTIC in 2019.

Michael C. Kobold and Keith M. Aliberti, " Littoral Acoustic Modem Protocol Statistics," Naval Surface Warfare Center Panama City Division, TR16-006, Technical Library, Code 1033, NSWC PCD Code X-12, 110 Vernon Ave, BL 110, Panama City, FL, USA 32407-7001, September 2017. Part of this report became part of my dissertation.

M. C. Kobold, "Modal insensitivity limits for laser vibrometry, spectral reduction requires super-symmetry," physics-optics, Cornell University Library, arXiv .org/pdf/1408.2267.pdf, Aug 2014

M. C. Kobold, and H R Suiter, "Seismic attenuation estimate using linearity in frequency of spectral ratios at different ranges," NSWC PCD Tech. Note TR-13/016, Sep 2013. ADB406167

M. C. Kobold, "Optics detection, classification, and identification of soil surface vibration above buried objects" NSWC PCD Technical Note TR-13/013, 2013-09-01 DTIC: ADB399579

M. C. Kobold, "Scintillation response sensitivities; effects of turbulence on laser sensing of soil surface vibration," NSWC PCD Technical Report, TR13/012, September 2013.

M. C. Kobold, "Shear deflection estimate of Soil vibration above a buried object," NSWC PCD Technical Note TN-13-004, September 2013.

M. C. Kobold, "Large spot size laser vibrometry insensitivity occurs in 1-D vibrations only," SPIE Defense and Security Symposium Paper 6968-58 Orlando 19 Mar 2008

M. C. Kobold, "*Laser Covariance Vibrometry* for Unsymmetrical Mode Detection," Air Force Institute of Technology, WPAFB, Ohio, M. S., Electrical Engineering, Sep 2006 (Remove spaces to activate.) www .dtic .mil/dtic/tr/fulltext/u2/a456716.pdf ADA456716

Atindra K. Mitra, M. C. Kobold, Tom Lewis, & Rob Williams, "Theoretical radar-Doppler models for pivoting mechanical and biological objects-of-interest," SPIE Proc., Vol. 6237, 17 May 2006

M. C. Kobold, "videst.m based on NATO data in the 2003 Swedish dissertation the Andreas Olsson," AFRL SNAT report, WPAFB, OH, 2005. (Unclassified Matlab ROC code used to propose laser vibrometry to DARPA, videst.m shows that simple application of high error modes (fundamental) provide highest P_d and lowest P_{fa}.)

M. C. Kobold, "Laser and Acoustic Exploitation Concept for Unconventional Target Covariance," Internal Conference, WPAFB, OH, 2005.

M. C. Kobold, "Image and Acoustic Crowd Characterization," AFRL STAR Conference, WPAFB, OH, 2005.

M. C. Kobold, "Ocean Wave Earth Diffraction Antenna, post processing in 'n' time, " IMAC XIX, Orlando, FL, April 2001.

M Kobold, "Stability, Stabilizability, and Stabilization, using state variable linear sys approach to 'move' a structural design to desired vibration response," IMAC XIX, Orlando, Apr '01.

M. C. Kobold, "Ocean Wave Earth Diffraction Antenna, post processing in 'n' time, " SPIE AEROSENSE, July 2000.

M. C. Kobold, "Stability, Stabilizability, and Stabilization, using state variable linear systems approach to 'move' a structural design to desired vibration response," AEROSENSE, July '00.

M. Kobold, "Linear Correction of Buckled Panels using Optimization, MSC User's Conf. CA,'98.

US Navy Vet. Spanish and French, some Thai and American Sign Language. Amateur Radio KO4WZK. Open Water Diver certified, Wright-Patterson AFB Air Club ground school June – Aug 07. (delphi .web .runbox .net) Remove spaces to activate.

Tank armor nonlinear clattering sensed by laser imaging. Time evolution of modes analyzed for covariance of the spectra – structural (left) vs. optical (right) for magnitude (copper) vs. phase (green). "*Laser Covariance Vibrometry …*" thesis.