# Dr. Jay M. Vincelli, PE

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**EDUCATION AND LICENSING**

**Professional Engineer License (PE), Mechanical Engineering**, Rhode Island: December 2015, New Hampshire: April 2025
**PhD, Electrical, Computer & Biomedical Engineering**, University of Rhode Island, Kingston, RI, August 2024
**MSc, Engineering Sciences**, Dartmouth College, Hanover, New Hampshire, June 2013
**BSc, Materials Science & Engineering**, University of Florida, Gainesville, Florida, May 2007

**Jay M. Vincelli, PhD, PE** is a cross-disciplinary engineer and researcher with a strong foundation in mechanical, biomedical, electrical, and materials engineering. His work integrates experimental and computational methods, with applications ranging from implant biomechanics and neural engineering to aviation failure analysis and underwater forensics. He holds a PhD in Electrical, Computer & Biomedical Engineering from the University of Rhode Island, where he developed novel high-resolution EEG electrodes, custom conductive gels, and a high-fidelity human EEG phantom for hardware testing. He also created the world's first non-invasive EEG system for octopuses and co-authored peer-reviewed research exploring cephalopod visual cognition.

At Dartmouth, his MSc research focused on wear quantification in over 500 metal-on-metal hip implants and he also performed research leading to his holding of a U.S. patent on a miniaturized cardiopulmonary bypass system. In professional consulting, he has analyzed over 100 medical device failures including orthopedic, cardiac, urological, neurological, surgical, drug delivery, reconstructive, and rehabilitation devices, led prototype development for wearable biosensors, and served as a designated expert witness in several legal cases. He has managed engineering labs, developed ISO 17025-compliant quality systems, and supervised technical staff. His industry experience spans aerospace, automotive, and electronics, including leading hermetic seal design for aerospace sensors and launching high-performance automotive shaft sealing systems.

Dr. Vincelli brings strong hands-on skills in software-hardware integration for biomedical and robotic systems, including custom Python and MATLAB GUIs, amplifier and motor control, and signal analysis pipelines for large scientific datasets. He has mentored senior design teams and other students in experimental design, data analysis, and technical communication. He has published with collaborators in neuroscience, biomedical engineering, forensic science, and naval aviation. With PE licenses in NH and RI, extensive R&D and industry experience, and a track record of translating innovation across fields, he is well-positioned to contribute to interdisciplinary teams at the intersection of research and applied engineering.

**CERTIFICATIONS**

NAMSA Training ISO 10993 Biological Evaluation of Medical Devices, ISO 9001 Lead Auditor Training, Six Sigma Green Belt, Hazardous Waste, Laboratory Safety, Blood Borne Pathogens, PADI Advanced Open Water Diver

**AWARDS & HONORS**

1. 2024 URI Three Minute Thesis (3MT) competition finalist - Minding Ethics - Non-Invasive Octopus EEG Recording
2. 2020 URI Electrical Computer and Biomedical Engineering Graduate Student Research Showcase - first place winner - Language Mapping using Tripolar Concentric Ring Electrode Electroencephalography
3. Recipient of the 2017 American Society of Photogrammetry and Remote Sensing John I. Davidson President's Award for Practical Papers for "Characterizing a Debris Field Using Digital Mosaicking and CAD Model Superimposition from Underwater Video," PE&RS, 82 (3), 223
4. 2012 John C. Woodhouse Engineering Design prize for innovation and ingenuity in developing the most inexpensive but effective experimental research equipment
5. 2012 Thayer Visionaries in Technology Artistic Image Contest Winner
6. 2006 Particle Engineering Research Center Undergraduate Research Scholarship

**SOCIETY AFFILIATIONS** – American Society for Testing and Materials International (ASTM), Society for Biomaterials (SFB), Sigma Xi Scientific Research Society (invitation only).

**EXPERIENCE**

**Postdoctoral Researcher,** October 2024 to present, Dartmouth College, Psychophysics & Cognitive Neuroscience Laboratory.
Developed the world's first non-invasive EEG measurement system for octopuses using tri-polar concentric ring electrodes.
Developed and performed tEEG experiments to study the visual perception, attention, cognition and behavior of octopuses.
Developed and performed human visual psychophysics tEEG experiments for comparison.

**PhD Candidate**, September 2016 to August 2024, University of Rhode Island, Electrical, Computer, and Biomedical Engineering, Neural Rehabilitation Engineering Laboratory. Research included the development and testing of new and commercially available electrodes, amplifiers, and conductive gels for EEG recordings and brain stimulation, and developing the world's first non-invasive octopus EEG system. Developed software for controlling stepper motors to collect simulated EEG signals in a human head EEG phantom, integrated the software with a commercial amplifier, and added extensive functionality for rapid analysis of large EEG datasets in the time and frequency domains. Mentored senior design groups and provided technical guidance to students developing brain-computer robotic interfaces.

**Forensic Engineering Consultant**, **Laboratory Director,** June 2013 to August 2018**,** Materials Science Associates, LLC, North Kingstown, RI. Performed biomedical engineering, metallurgical, materials science & mechanical engineering consulting services and testing for government, hospital, legal, insurance, medical, and manufacturing needs. Performed failure analysis, materials and process evaluations, biomaterial and medical implant design and testing, professional reports, oral presentations & expert opinions, including patent infringement consulting. Led 110+ forensic investigations for medical device lawsuits (orthopedic implants, surgical mesh, IVC filters), delivering expert testimony in 5 depositions that contributed to over $340M in plaintiff settlements. Developed ASTM-compliant wear quantification algorithms for metal-on-metal hip implants. Authored a 62-page ISO 17025 quality manual and 21 ASTM test protocols (e.g., F2979 for implant wear analysis) and managed several technical staff. Prototyped a 3D-printed diabetic neuropathy insole using multi-material rubber printing. Developed wearable biosensor prototypes for sports applications.

**MSc Candidate**, Sept. 2011 to June 2013**,** Dartmouth Biomedical Engineering Center, Dartmouth College, Hanover, NH. Performed failure analysis on hip and knee implants. Developed numerical methods for quantifying wear in metal-on-metal hip retrievals. Developed numerical methods for quantifying the pore spacing in plasma-sprayed titanium coatings. Evaluated enzymatic degradation of the OrthoSpace rotator cuff balloon, which consisted of a biodegradable polycaprolactone (PCL) and polylactic acid (PLA) polymer using FTIR, DSC, visco-elastic analysis and tensile testing to aid regulatory clearance. Invented a patented miniaturized cardiopulmonary bypass circuit machine for transgenic mouse testing.

**Product Engineer and Project Manager**, Nov. 2009 to Sept. 2011, Freudenberg-NOK, Northfield, NH. Managed multiple product launches from initial design to production launch, including design, validation and production verification testing, following APQP procedures and leading a multidisciplinary team. Performed failure analysis on automotive components. Designed rotary shaft seals, molds and components for injection/compression molding, finishing & inspection. Developed new test methods in collaboration with axle manufacturers for the testing of rotary shaft seals and set up and performed the testing in-house. Obtained training in lean systems and Six Sigma methodology while participating in major and minor kaizens and Six Sigma investigations.

**Failure Analysis Engineer**, June 2008 to Nov. 2009, U.S. Naval Air Systems Command (NAVAIR), Cherry Point, NC. Performed metallurgical analysis used to complete a multitude of failure analyses involving engine blades/vanes, foreign object damage, corrosion, aircraft structures, wire bundles, bolts & fasteners, gearboxes, circuit boards, and hydraulic/pneumatic tubing. Updated the welder certification and inspection program; created process improvement updates to industry-wide, military-wide, Navy-wide, and local manuals/instructions and performed welding analysis and certification for Navy welders.

**Application Engineer**, June 2007 to June 2008, Elan Technology, Midway, GA. Supported 25 customers worth ~$1 million annually through feasibility analysis, quoting, purchase orders, production, shipping, and technical support of glass and ceramic components in the electronics industry. Received training in the ISO/TS16949:2002 and AS9000 quality systems to perform as an internal quality auditor.

## PATENTS

**Jay Vincelli**, David McClatchy, Stephanie Wolf, Ryan Halter (PhD), and James Yun (MD). U.S. Patent #9,561,315. "Miniaturized cardiopulmonary bypass circuit for a mouse model." This invention was created to allow researchers to study the serious side effects of cardiopulmonary bypass surgery in humans by using a transgenic mouse model.

## RESEARCH PUBLICATIONS

**J. M. Vincelli**, W. G. Besio, G. Caplovitz, M. R. Maechler, and P. U. Tse, "Octopus electroencephalography permits detection of light-induced steady state visually evoked potentials in *Octopus bimaculoides*," *Current Biology (manuscript prepared for submission)*.

**J. Vincelli**, *Development and evaluation of novel electrode designs and gels for use in electroencephalography*, PhD dissertation, University of Rhode Island, August 2024

**J. Vincelli**, F. Calakli, M. Stone, G. Forrester, T. Mellon, and J. Jarrell, "*Identification of a putative man-made object from an underwater crash site using CAD model superimposition*," Forensic Sci. Int., vol. 285, pp. 129–134, Apr. 2018.

**Vincelli JM**, *Development of Contact Metrology and Numerical Methods for Quantifying and Locating Wear in Metal on Metal Hip Retrievals*, Master's Thesis, Dartmouth, Hanover, NH, May 2013.

A. Kumar, M. Sapp, **J. Vincelli**, and M. C. Gupta, "*A study on laser cleaning and pulsed gas tungsten arc welding of Ti–3Al–2.5V alloy tubes*," *J. Mater. Process. Technol.*, vol. 210, no. 1, pp. 64–71, Jan. 2010.

**J. M. Vincelli**, F. Calakli, M. A. Stone, G. E. Forrester, T. Mellon, and J. D. Jarrell, "*Characterizing a Debris Field Using Digital Mosaicking and CAD Model Superimposition from Underwater Video*," *Photogrammetric Engineering & Remote Sensing*, vol. 82, no. 3, pp. 223–232, 2016.

**CONFERENCE ABSTRACTS AND POSTERS**

Holm Roeser, Kyle Forgetta, **Jay Vincelli**. *System for Evaluation of EEG Electrodes via Inverted Phantom*, 47th Northeast Biomedical Engineering Conference, March 2021.

**Vincelli JM**, Carlson EM, Currier JH, McHugh DJ, Van Citters DW, Collier JP. *Methodology and validation of taper wear measurements in hip arthroplasty retrievals*. 59th Annual Meeting of the Orthopaedic Research Society. San Antonio, TX. January 2013.

**Vincelli JM**, Tomek IM, Berton C, Carlson EM, Van Citters DW. *Optical profilometry comparison of the US and International ongrowth surface of a monoblock acetabular design*. 59th Annual Meeting of the Orthopaedic Research Society. San Antonio, TX. January 2013.

Carlson EM, Currier JH, Currier BH, McHugh DJ, Mayor MB, **Vincelli JM**, Collier JP. *Retrieved MoM implants provide evidence for hip distraction during swing phase*. Annual Meeting of the American Academy of Orthopaedic Surgeons. Chicago, IL. March 2013.

**SEMINAR PRESENTATIONS**

Tse PU, **Vincelli JM**, Caplovitz G, Besio WG. *Octopus electroencephalography permits detection of light-induced Steady State Visually Evoked Potentials*. Vision Sciences Society 2024. St. Pete Beach, FL. May 2024.

*Invited Speaker:* **Vincelli JM.** McHugh DJ, Carlson EM, Collier JP. *Numerical Methods for Quantifying Wear in Metal-on-Metal hip retrievals*. 2nd Seminar on Surface Metrology for the Americas 2012. Worcester Polytechnic Institute. October 2012.

**Vincelli JM**, McHugh DJ, Carlson EM, Van Citters DW, Collier JP. *Metal-on-Metal Hip Wear Measurement of Retrievals, Methodology and Validation*. Society for Biomaterials Annual Conference. Denver, CO. April 2014.

**Vincelli JM**, Jarrell JD, McHugh DJ, Carlson EM, Van Citters DW, Collier JP. *Metal-on-Metal Hip Wear Patterns of Explanted Components Do Not Match Simulator Results*. Society for Biomaterials Annual Conference. Denver, CO. April 2014.

**Vincelli JM**, McHugh DJ, Carlson EM, Van Citters DW, Collier JP. *Methodology and validation for accurate measurements of material loss in retrieved metal-on-metal hip components*. 2nd International Conference on Biotribology. Toronto, CAN. May 2014.

**Vincelli JM**, Jarrell JD, McHugh DJ, Carlson EM, Van Citters DW, Collier JP. *Non-polar loading in metal-on-metal hip retrievals. 2nd International Conference on Biotribology*. Toronto, CAN. May 2014.

**MAGAZINE PUBLICATIONS**

Mong, D., **Vincelli, J.**, Jarrell, J., Magnan, T. "*Small Unmanned Aerial System Photogrammetry*". *Law and Order*. May 2016, Vol. 64, No. 5.

**TEACHING**

**BME 484 – Biomedical Engineering Capstone Design I – Team Mentor,** University of Rhode Island. Fall 2020.

**BME 485 – Biomedical Engineering Capstone Design II – Team Mentor,** University of Rhode Island. Spring 2021.

**Photogrammetry in Defective Products and Personal Injury**. University of Rhode Island Forensic Science Partnership Seminar Series. October 17, 2014.

**Structure from Motion in Accident Reconstructions.** University of Rhode Island Fall 2014 Traffic Accident Reconstruction Course. September 19, 2014.

**Photogrammetry Applications for Insurance Fraud**. National Insurance Crime Bureau Seminar. Lincoln, RI. November 2014.

**EXPERT WITNESS DEPOSITIONS**

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| 12/29/2014 | Christiansen v. Wright Medical Technology<br>(metal-on-metal hip system, wear measurements) | US District Court, N. Dist. Georgia<br>Firm: Pope, McGlamry, Kilpatrick, Morrison & Norwood, P.C. |
| 10/16/2015 | Tucker v. Wright Medical Technology<br>(metal-on-metal hip system, wear measurements) | California Superior Court, LA County<br>Firm: Pope, McGlamry, Kilpatrick, Morrison & Norwood, P.C. |
| 10/11/2016 | Zimmer Biomet Holdings v. Four Mile Bay<br>(IPR patent validity for bone ingrowth system) | U.S. Patent & Trademark Office<br>Firm: Four Mile Bay, LLC |
| 06/29/2017 | Estate of Marsha Jane Snider v. Wright Medical<br>(metal-on-metal hip system, wear measurements) | Circuit Court of Harrison County, WV<br>Firm: Saunders & Walker, PA |
| 05/07/2018 | Edward McAnneny v. Smith & Nephew<br>(metal-on-metal hip system, taper fretting corrosion) | US District Court, District of Connecticut<br>Firm: Law Office of Andrew J. Pianka, LLC |

**MEDICAL DEVICE EXPERIENCE**

Performed forensic analysis of devices from the following classes of devices involved in litigation. This included review of design history files including design drawings, manufacturing records, testing records, failure reports and marketing materials. SEM, FTIR, wear measurements, and other inspections were performed as necessary.

**Orthopedic Implants**

- Hip replacement systems (metal-on-metal, metal-on-polymer, ceramic-on-metal, ceramic-on-ceramic)
    - Modular neck and acetabular components
    - Surgical implantation and removal tools
    - Trunnions, femoral stems, and bone ingrowth surfaces
    - Knee replacement systems
- Spinal implant systems, including:
    - Spinal rods
    - Interspinous fixation devices
    - Spinal fusion systems
    - Cervical fixation systems (anterior plating and fusion devices)
- Bone plates and fixation devices:
    - Mandible locking plate
    - Clavicle rod
- Bone graft materials and biologic combination systems

**Urological & Gynecological Implants**

- Surgical mesh systems (POP and SUI mesh)
- Abdominal and hernia mesh (polypropylene and resorbable materials)
- Intrauterine devices (IUDs)

**Neurological Devices**

EEG recording systems and stimulation equipment

- EEG gels and pastes
- Laser and radiofrequency ablation systems
- Neurovascular microcatheters and embolic delivery systems
- Neurovascular embolization coils
- Aneurysm treatment systems

**Surgical Instruments & Assistive Devices**

- Suture-assist systems
- Surgical staplers
- Robotic-assisted surgical platforms

**Postoperative Recovery & Rehabilitation Devices**

- Cold therapy systems
- Compression therapy equipment

**Cardiovascular Implants & Devices**

- Inferior Vena Cava (IVC) filters
- Intra-aortic balloon pumps
- Mitral valve repair devices
- Implantable cardioverter-defibrillator (ICD) leads
- Cardiac pacing components

**Perioperative & Surgical Environment Devices**

- Forced-air warming systems
- Heater-cooler units and temperature control devices
- Surgical waste and fluid management systems
- Ultrasonic cleaning and reprocessing systems

**Aesthetic & Reconstructive Devices**

- Breast implants
- Injectable dermal fillers (e.g., calcium hydroxylapatite-based)

**NAVAIR PARTIAL INVESTIGATION LIST**

The following is a partial list of failure analyses Mr. Vincelli has investigated during his engagement with NAVAIR. The range of services provided included chemical analysis to identify the composition of the metal used, metallurgical analysis including hardness testing and electrical conductivity testing, and analysis of the fracture surface to identify if the component slowly failed due to fatigue, or if a sudden failure due to overload occurred. A brief description of the services provided is included below.

**NAVAIR**, Cherry Point, NC

- Boeing AV-8B Harrier II Jet, Aluminum Panel - metallurgical analysis
- Titanium Tube Welding Dross – Visual characterization
- Bell Boeing V-22 Osprey Aircraft, Shaft Driven Compressor (SDC) Inlet - aluminum metallurgical and mechanical analysis
- Lockheed C-130 Hercules Aircraft, Hydraulic Motor - chemical, metallurgical, and fracture analysis
- McDonnell Douglas F/A-18 Hornet, Tie Rod, Air Bearing Shaft, and Nut – chemical and metallurgical analysis
- Boeing AV-8B Harrier II Jet, Port Hot Nozzle from Universal Yoke Assembly – visual analysis of nut and bolt system
- Rolls-Royce Pegasus Aircraft Turbofan (F-402), Compressor Blade - foreign object damage analysis
- Sikorsky CH-53E Super Stallion Helicopter, Main Gearbox Housing – chemical and fracture analysis
- Sikorsky CH-53E Super Stallion Helicopter, Rescue Hoist – chemical, metallurgical, and fracture analysis
- Bell Boeing V-22 Osprey Aircraft, Circuit Board Diode – visual analysis
- Bell Boeing V-22 Osprey Aircraft, Hydraulic Tube Assembly, Swage Fitting – dimensional, chemical, and visual analysis
- Sikorsky MH-60S Knighthawk Helicopter, Main Gearbox Dipstick Rivets – dimensional analysis
- Boeing AV-8B Harrier II Jet, F-402-RR-408B Engine, Low Pressure Compression Rotor Blades – foreign object damage, chemical and dimensional analysis
- Boeing AV-8B Harrier II Jet, Landing Gear Nitrogen Line – tube thread dimensional and visual analysis
- Boeing AV-8B Harrier II Jet, Web, Cascade Assembly – dimensional, chemical, metallurgical, and fracture analysis
- Sikorsky CH-53E Super Stallion Helicopter, Cargo Ring – chemical, metallurgical, and fracture analysis
- Boeing AV-8B Harrier II Jet, Hydromechanical Unit Wiring – dimensional and fracture analysis
- General Electric T-64 Turboshaft Helicopter Engine, Stage 1 Vane, Blade, and Inlet Guide Vane – dimensional, chemical, and visual analysis
- C-130 Trailing Edge Strip – chemical, corrosion, metallurgical, analysis
- McDonnell Douglas F/A-18 Hornet, Cooling Turbine Wheel and Housing – dimensional, chemical, metallurgical, fracture analysis
- Sikorsky MH-60S Knighthawk Helicopter, Air Cycle Machine (Turbine Shaft Bearing, Compressor and Turbine Wheels, Compressor Housing, Cooling Fan, and Fractured Blade) – chemical, metallurgical, and fracture analysis
- Rolls-Royce Pegasus Aircraft Turbofan (F-402), Nut Plate/Anchor Nut – chemical and metallurgical analysis
- General Electric T-64 Turboshaft Helicopter Engine, Stage 1, 2, 3, 4, and 6 compressor blades, Stage 1 retaining ring – foreign object damage, chemical, metallurgical, and fracture analysis
- Sikorsky SH-60B Seahawk, Engine Coupling Retainer Bolt, Shaft Screw, Unitorque Nut – Chemical, metallurgical, and fracture analysis
- Boeing AV-8B Harrier II Jet, RCS Duct Fastener Bolt – Chemical analysis