Michael Gerard Pecht
Professional Engineer

EDUCATION

Ph.D. Engineering Mechanics (1982); M.S. Engineering Mechanics (1979); M.S. Electrical Engineering (1978); B.S. Acoustics-Physics (1976); Univ. of Wisconsin, Madison.

EXPERIENCE

Faculty: George E. Dieter Chair Professor in Mechanical Engineering (1983–present), Professor of Applied Mathematics, Statistics and Scientific Computation (2008–present), and Professor in Systems Engineering at the University of Maryland (1990–1994). Adjunct Professor in Risk Management at Yokohama National University (2016), Visiting Professor of Electrical Engineering at City University of Hong Kong (2008–2010). Visiting Professor in Reliability Engineering at Beihang University—China (2005–2013). Visiting Professor in Physics at Shanghai—JiaoTong University (2004–2007). Managed over 200 programs funded by both government and industry. Developed 12 courses associated with electronics products and systems, and prognostics and systems health management, authored more than 30 books, and graduated over 100 M.S. and 50 Ph.D. students.

Founder and Director: Center for Advanced Life Cycle Engineering (CALCE), having consortia in both Electronic Products and Systems, and Prognostics and Health Management, and supported by over 150 industry and government members, with a budget of over $6 million/yr, and graduating over 30 M.S. and Ph.D. students per year.

National Academy of Science/Engineering (NAE/NAS) Committees (invited to participate): Committee for reliability growth; Committee to investigate printed circuit board manufacturing in the U.S.; Committee to examine research needs in materials engineering; Committee to investigate automotive sudden acceleration and reliability (gave presentation but declined to participate).

Expert for Congressional Investigations: Committee on Energy & Commerce to investigate automotive reliability issues: Toyota sudden acceleration (2009–2010); and GM ignition – air bag recalls and NHTSA responses (2014).

FDA Expert: Taught reliability and aided FDA in assessing the reliability capability maturity assessment of manufacturers of medical devices, the techniques used to qualify devices, and medical device reliability and safety. (Sept. 2007–Sept. 2008)

Editor in Chief:
- IEEE Access (2012–present): first editor of the journal; 2015 PROSE Award winner in the subject category of "Journal/Best New STM (Scientific, Technical, and Medical)." : Selected for Thomson Reuters Science Citation Index in 2015.
- SRESA Journal of Life Cycle Reliability and Safety Engineering (2012–present)
- Microelectronics Reliability, Elsevier (1996–2012)
- International Journal of Performability Engineering (2009–2012)
- IEEE Transactions on Reliability (1988–1997)

Vice President: PASS Inc., Initiated programs under both U.S. Army and Air Force contracts to determine the storage reliability of electronic equipment and to develop assessment methods for long term storage and dormancy reliability. Resigned as Vice President but still serves as a consultant (company is now called ERS Inc.) (1990–1993)

Vice President: Ramsearch Inc., Established company and awarded $1.5M to develop a concurrent electrical engineering decision support system. Won contracts to research temperature-dependent IC failures. Was bought out in 1991. (1988–1991)

Scientist: Engineering Research Center, Madison, WI: Worked on reliability assessment of Astro I Space Telescope. (1983)

Civil Service Electronics Technician: High Energy Physics at the University of Wisconsin and at the National Accelerator Laboratory in Batavia, Illinois. Developed electronics instrumentation. (1971–1975)

Selected Research and Organizational Accomplishments

- 2012, Selected to be the Editor in Chief of the new IEEE Access journal. This journal was awarded the 2015 PROSE Award in the subject category of "Journal/Best New STM (Scientific, Technical, and Medical)."

- 2010, Established a battery health management and prognostics research program at CALCE, with over $1M funding from NSF, U.S. Navy, and the CALCE members.

- 2008, Initiated prognostics and system's health management research at the City University of Hong Kong and within southern China. Received over US $3M in grant funding from the Hong Kong government.

- 2007, Established the CALCE Prognostics and Health Management Consortium at the University of Maryland. This was the first diagnostics, prognostics, and system health management consortium for electronics in the world.

- 2005, Developed a new paradigm for reliability prediction of electronics based on prognostics, whereby sensor data can be integrated with models that enable in-situ assessment of the deviation or degradation of a product from an expected normal operating condition and the prediction of the future state of reliability. Developed prognostics roadmap for inclusion in the ITRI semiconductor roadmap.

- 2005, Chairman for IEEE Organizational Reliability Capability Standard 1624, which defines the reliability capability of organizations and identifies the criteria for assessing the reliability capability of an organization.

- 2004, Developed the concept of physics-of-failure for electronics reliability and the Failure Modes, Mechanism and Effects Analysis (FMMEA), which became formalized in a series of JEDEC Standards, including: JEDEC-STD-148, titled "Reliability Qualification of Semiconductor Devices Based on Physics of Failure Risk and Opportunity Assessment;" JESD34, titled "Failure-Mechanism-Driven Reliability Qualification of Silicon Devices;" JESD47, titled "Stress-Test Driven Qualification of Integrated Circuits;" and JESD94, titled "Application Specific Qualification Using Knowledge Based Test Methodology."

- 2002, Established electronics prognostics and health monitoring program at CALCE Electronic Products and Systems Center. Developed prognostics and physics-of-failure techniques to prove (under 2 NASA contracts) that the electronics on a NASA space shuttle robot arm and on NASA booster rockets can survive additional missions after the completion of the 2001 designed-for life. This was used to certify future missions.

- 2002, Chairman for IEEE Reliability Prediction Assessment Guidebook #1413.1 (1999–2002).

- 2001, Established $4M lead-free electronics research program at CALCE. This was the only research program to assess the long-term (6 years +) reliability of lead-free devices and products.

- 1999, Established CALCE Electronic Products and Systems Center as the first academic research facility in the world to be ISO 9001 certified.

- 1999, Developed Pecht's Law, which provides an estimate of semiconductor device reliability trends and the requirements for accelerated testing.

- 1998, As IEEE chairperson, led the development of both the IEEE #1332 Reliability Program Standard, and IEEE #1413 Standard Methodology for Reliability Prediction and Assessment for Electronic Systems and Equipment. Received IEEE Standards Award in 2000.

- 1997, Developed the concept of "up-rating", which is the process to assess the capability of semiconductor devices to meet functionality and performance requirements outside the manufacturers' specification. The up-rating approach was institutionalized into IEC/PAS 62240: Use of Semiconductor Devices Outside Manufacturers' Specified Temperature Ranges, Edition 1, 2001; as well as GEIA 4900, 2001, and is currently used for all commercial avionics systems.

- 1996, Led program to develop production-quality design and reliability assessment methods and software used by Texas Instruments, Westinghouse, AlliedSignal, Lockheed, and Rockwell International.

- 1995, Won $4.8M in NSF contracts to enhance the research and educational programs in electronic products and systems development.

- 1995, Modeled IC endurance and assessed the risks of replacing ceramic IC packages with plastic packages for avionics and military applications. The studies (and book "Plastic Encapsulated Microcircuits" John Wiley Publishing), were fundamental to the use of plastic encapsulated microcircuits for the Boeing 777 and for the general use of commercial parts in military and aerospace applications.

- 1995, Formalized the concept of the physics-of-failure of electronic components, a methodology which includes modeling root-cause failure mechanisms and the impact of defects and loads on product reliability.

- 1993, Designed and fabricated an opto-electronics semiconductor package for the automotive industry (with Dr. David Bigio).

- 1992–1994, Guided the U.S. DoD to reform the military reliability standards, which led to the "Perry Memo" on Standards Reform. Pecht's work led to Army's establishment of a Physics-of-Failure Branch and their use of software generated by CALCE for military systems. Similarly, GM transitioned from military reliability standards and now requires the use of CALCE reliability software in their vehicles under GM specification GM-3172.

- 1992, Conducted physics-of-failure methodology for the reliability assessment of electronics in NASA's Zeno Space Shuttle Experiment. Demonstrated the applicability of the physics-of-failure approach in the design and assessment of the Zeno Program, as a replacement for Mil-Hdbk-217 and progeny.

- 1991, Developed techniques to monitor quality and logistics parameters and to aid in decision support during the design of electronic assemblies, under DARPA's Initiative in Concurrent Engineering (DICE). These techniques were incorporated into Texas Instruments' (Raytheon) CARMA software and commercially marketed.

- 1990, Conducted experimental study of AWACs cooling to determine the temperature profiles of AWACs convectively cooled electronic equipment and developed models for reliability design and assessment.

- 1988–1990, Developed microelectronic packaging design guidelines for the U.S. Air Force. This was the first document of its kind to incorporate physics-of-failure in design (DfR). These guidelines were extended to incorporate commercial and industrial microelectronic packaging trade-offs.

- 1987–1989, Developed reliability models for very high speed integrated circuit (VHSIC) devices and semiconductor packages for the U. S. Air Force.

- 1986–1988, Developed methodologies and computational techniques for derating and preferred parts selection for the U.S. Integrated Electronics Warfare Systems (INEWS) program.

- 1984–1986, Developed the first Reliability and Maintainability Computer Aided Design (RAMCAD) software. Lead to the development of RAMCAD software by more than ten commercial companies.

PROFESSIONAL SOCIETIES

Fellow	Institute of Electrical and Electronics Engineers (IEEE)
	American Society of Mechanical Engineers (ASME)
	Society of Automotive Engineers (SAE)
	Int'l Microelectronics and Packaging Society (IMAPS)
Senior Member	Institute of Environmental Sciences and Technology (IEST)
Member	Association for the Advancement of Artificial Intelligence (AAAI)
	Institute for Interconnecting and Packaging Electronic Circuits (IPC)
	American Society of Materials Int'l (ASM)
	ASM - Electronic Device Failure Analysis Society (EDFAS)
	Surface Mount Technology Association (SMTA)

PROFESSIONAL SERVICES

Board of Directors	Scientific Advisory Board: Alstom- France (2015 – present)
	Early-Bird Alert Inc. (2008–present).
	The Prognostics and Health Management Society (2009–2010).
	Energetic Technology Center, Maryland (2007).
	Airpax, a Subsidiary of Philips (1998)

Editor-in-Chief
- IEEE Access (2012–present)
- SRESA Journal of Life Cycle Reliability and Safety Engineering (2012–present)
- International Journal of Performability Engineering (2011–2012)
- Microelectronics Reliability International (1996–2012)
- IEEE Transactions on Reliability (1988–1997)
- The Wisconsin Engineer Magazine (1979–1980)

Associate Editor
- IEEE Transactions on Electronic Components, Packaging and Manufacturing Tech. (1995–2010).
- International Microelectronics Journal (1995–2002).
- SAE Journal of Reliability, Maintainability and Supportability (1993–1997).
- IEEE Transactions on Reliability (1987–1988).

Editor-at-Large
- Marcel Dekker: Electrical Engineering and Electronics (1991–1993)

Editorial Board
- Energies, MDPI AG, Switzerland (2015 – present)
- Journal of Electronic Measurement and Instrument (2014 – present)
- Editor from U.S. (2013–present).
- Chinese Journal of Aeronautics (2013–present)
- Journal of COMADEM, Honorary Regional (2013)
- Proceedings of the ICMR (2013)
- Journal of Systems Engineering and Electronics, China (2011–present)
- Journal of Reliability and Risk Analysis: Theory and Applications (2009)
- KSME International Journal, Korean Society of Mechanical Engineers (1997–2005)
- IEEE Spectrum (1993–1995)
- Journal of Electronics Manufacturing (1990–1999)
- Journal of Concurrent Engineering (1990–1992)

Chairperson
- IEEE Reliability Prediction Assessment Guidebook #1413.1 (1999–2002)
- IEEE Standard Methodology for Reliability Prediction and Assessment for Electronic Systems and Equipment #1413 (1995–1998)
- IEEE Reliability Program Standard #1332 (1995–1998)

Conference Chair
- Symposium on Solder Interconnect Reliability, National University of Singapore, Singapore, December 8 – 11, 2015,
- IEEE PHM 2015, 2015 Prognostics and System Health Management Conference, Beijing, China, October 21-24, 2015

- IEEE PHM 2014, 2014 Prognostics and System Health Management Conference, Zhangjiajie, Hunan, China, August 24–27, 2014
- IEEE Prognostics and System Health Management Conference, May 23–25, 2012, Beijing, China
- (General Chair, Founder, and Organizer) Battery Management Systems for High Operational Availability and Safety Conference, Shenzhen, China, May 21, 2012
- IEEE Prognostics and Systems Health Management Conf., May 24–27, Shenzhen, China, 2011
- International Conference on Reliability, Maintainability and Safety (ICRMS 2011), Guiyang, China, June 2011 (2011)
- 2nd International Conference on Reliability, Safety and Hazard-2010 (ICRESH 2010), New Mumbai, India, Dec. 14–16, 2010 (2010)
- IEEE Prognostics and Health Management Conference 2010 (PHM-2010 Macau), Macau, P.R China, Jan. 12–14, 2010 (2010)

Prognostics and Health Management, ASME 2009 DETC & CIE Conference, San Diego, CA, Aug. 30-Sept. 2, (2009)

2009 8th International Conference on Reliability, Maintainability and Safety (ICRMS 2009), Chengdu, China, July 20–24, 2009

Int'l Conf. on Reliability, Maintainability and Safety 2007, Beijing, China (2007)

2004 Int'l Conf. on the Business of Electronic Product Reliability and Liability, Shanghai, China, April 27–30, 2004

IEEE Conf. on Business of Electronic Product Reliability and Liability, Hong Kong and Shenzhen, China, Jan 13–17, 2003

Member

Education committee; EDFAS- ASM (2015 – present)

Association for the Advancement of Medical Instrumentation: Cochlear Implant Committee

IEEE Publications and Strategic Planning Board (2012–present)

IEEE Standards Association (2000–2009)

U.S. Army Research, Development Engineering Command Reliability Focus Team (2008)

UL Standards Committee (2001–2008)

IEEE Representative to Int'l Reliability Standards Committee (1993–1995)

SAE Automotive Reliability Standards Committee (1990–1993)

Navy Electronics Manufacturing-Policy Committee (1992)

MEDIA PRESENTATIONS

1. CNN's Drew Griffin Investigates a Toyota Engineering Memo that Suggests an Electronic Problem in a Prototype Car, CNN Video, http://www.cnn.com/video/#/video/bestoftv/2012/03/02/ac-griffin-toyota-investigation.cnn; http://www.cnn.com/2012/03/01/us/toyota-acceleration-documents/index.html?iref=allsearch, March 1, 2012.
2. Zuga, L. and M. Pecht, "The Politicization of Counterfeit Electronics," Battlespace Update, Vol. 15, Issue 01, Jan. 5, 2012; "Misplaced Blame: The Politicization of Counterfeit Electronics," SLD (sldinfo.com) website, Dec. 14, 2011.
3. "Don't Blame the Chinese-Blame Raytheon," Letter to the Editor, Circuitnet website: (*http://www.circuitnet.com/articles/article_85572.shtml*), Nov. 23, 2011.
4. The Counterfeit Electronics Problem - Trying to Reach Harmony in a Storm, Int'l Conf. on Economics, Politics, and Security of China and the USA, Nov. 19, 2011 (televised live on Voice of America)
5. ACTUS, L'Offensive Made in China (*in French*), pp. 26-27, June 2011.
6. CNN, interviews on Toyota and sudden acceleration and congressional hearing, March 2, 2010.
7. NPR, Toyota Recalls Spur worries-Sudden Acceleration in Toyota Vehicles, Feb. 3, 2010.
8. History Channel Modern Marvels: Engineering Disasters, Tin Whiskers, March 22, 2006.
9. CNN with Lou Dobbs, China's Semiconductor Industry and exporting, Sept 16, 2004.
10. Newsnight Maryland, Maryland Public Television: Electronics Industry, June 8, 1998.

PATENTS

1. 3D RF Mems Biosensor for Multiplexed Label Free Detection, A. Vasan, M. Pecht and A. Kluger, U.S. Patent #9,151,723, Oct. 6, 2015 (USA).
2. Energy Harvesting Using RF MEMS, Ravi Doraiswami M. Pecht, A. Vasan, Y. Huang and A. Kluger, U.S. Patent #8,859,879, Oct. 14, 2014 (USA). US 8,878,667
3. Wireless Biosensor Network for Point of Care Preparedness for Critical Patients, Ravi Doraiswami M. Pecht, A. Vasan, Y. Huang and A. Kluger, U.S. Patent #8,878,667, Oct. 14, 2014 (USA).
4. Method to Extract Parameters from in-situ Monitored Signals for Prognostics, Vichare, N., and M. Pecht, U.S. Patent # 8,521,443, Aug. 27, 2013 (USA).
5. Prognostics and Health Management Implementation for Self Cognizant Electronic Products, M. Pecht, and J. Gu, U.S. Patent #8,494,807, Jul. 23, 2013 (USA).
6. MEMS Barcode Device for Monitoring Medical Systems at Point of Care, R. Doraiswami, M. Pecht, A. Vasan, Y. Huan, and A. Kluger, U.S. Patent # 8,424,765, Apr. 23, 2013 (USA).
7. A Prognostics and Health Management Method for Aging Systems, M. Pecht and S. Cheng, U.S. Patent # 8,423,484, Apr. 16, 2013 (USA).
8. Electromechanical Device Having a Plurality of Bundles of Fibers for Interconnection of Two Planar Surfaces, U.S. Patent # 7,220,131, May 22, 2007 (USA).

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