

MARTIN PECKERAR, Ph.D.

Dr. Peckerar is a specialist in the areas of materials science and technology. He has worked in microcircuit process development (primarily high resolution patterning, for which he was named a fellow of the IEEE in 1994), in non-volatile memory design and process development and in battery technology. He has taught microelectronic circuit design at the University of Maryland (College Park, MD) since 1980. More recently, he has directed his professional efforts to the development of power sources and power systems for low power electronics. Notable accomplishments include:

1. Lead process engineer on the Westinghouse Electric BORAM (Block oriented random access memory) – the first military grade non-volatile memory used in combat situations
2. He invented the plasma radiation source used in EUV and in x-ray lithography. This is a core technology for the Intel-led EUV consortium.
3. Dr. Peckerar led the NRL team that was the world's first to demonstrate and to exploit self-assembly (SA) in lithographic patterning technology. The polysiloxane attachment chemistries he developed have been used as a paradigm for SA pattern development to this day. This preceded work done at Harvard, and elsewhere, that eventually used many of the same chemistries.
4. Dr. Peckerar has pioneered in the field of electron beam proximity effect correction, supplying the first mathematically rigorous approach to this critical area of mask making and direct-write technology.
5. Was the Navy's designated technical manager of the DARPA Advanced Lithography Program.
6. He led a design team that was the first to demonstrate neural-net based co- processor chips employing informational entropy regularization principles for optimal image reconstruction.
7. University lead in a joint project with Sandia Laboratories and NASA to create a computer-aided design base for producing integrated circuits that work at 4K (and below) in ionizing radiation environments.
8. He started and ran the Nanoelectronics Processing Facility (NPF) at the US Naval Research Laboratory. This activity merged with the crystal growth group to become the Interface and Thin Film Sciences Branch (also led by Dr. Peckerar.)
9. He was awarded the University of Maryland's outstanding invention of the year in physical science award (2008) for a flexible thin-film battery cell supplying more current per unit area than lithium. The cell is recyclable and environmentally benign.
10. Dr. Peckerar also received the Inaugural University System of Maryland Entrepreneurship Award in 2013 for advanced battery development.
11. He has Co-authored 2 books, one of which is a standard textbook used worldwide in semiconductor process technology. He has edited 4 other texts
12. Development of flat, flexible, non-toxic, non-flammable batteries for wearable electronic and for concealable nodes in ad hoc networks
13. Dr. Peckerar was founding partner in two start-up companies relating to these batteries
14. The first, FlexEl, is specializing in ultrathin membrane based batteries for biological applications

15. The second, VersaVolt, is specializing in underwater batteries for sonobuoys and for flight data recorder secondary batteries
16. He is the inventor of the deep-depletion CCD imager used in x-ray and in short wavelength IR imaging
17. He developed the first CCD imager and read-out electronics demonstrated to be radiation hard out to 1 MRAD:Si while operating at 77K. This has been enabling technology in satellite imaging
18. Dr. Peckerar holds 29 granted US patents.

Expert Witness work and Paid Consultancies:

1. Expert Witness, DRAM technology, Milbank, Tweed Hadley McCloy, 2007-2010 (patent infringement on the physical implementation of the DDR3 specification.) Working with Jim Klaiber, now at Pryor Cashman. ITC Trial designation: Certain Dynamic Random Access Memory Devices and Products Containing Same.) Investigation Number: 337-TA-595. **Deposed twice. Testified before the ITC for three days.**
2. Expert Witness, battery technology, Finnegan 2011 (relating to battery applications in power tool technology.) Working on **IPR** with Tom Irving, representing Hitachi. IPR
3. Expert Witness, Non-Volatile Memory Technology, Winston Strawn 2014. Working with Vivian Kuo, J.C. Mascullo, David Enzminger and Dave Martens. ITC Trial designation: In the Matter of Certain Non-Volatile Memory Devices and Products Containing Same. This work included simulations of the chemical-mechanical polishing process for wafer planarization in integrated circuit fabrication technology. Investigation Number: 337-TA-909. **Deposed twice. Testified before the ITC for two days.**
4. Expert Witness, Matters relating to the layout and design of static random access memories, nvidia vs Samsung, working for Latham Watkins. IPR2015-01065. POCs Thomas Yeh and Bob Rosenberg, begun May 2015 and concluded in May, 2016. **IPR. Deposed once.**
5. Expert Witness, worked on an IPR in the matter of Postec and the validity of Milwaukee Tools patent on a lithium battery powered power tool. I worked for Middleton and Reutlinger (Robert H. Eichenberger, lead attorney.) Concluded June, 2017.
6. Expert Witness, in support of Nikon Corporation, Nikon Precision Inc., and Nikon Research Corporation of America, Inv. No. 337-TA-1137, defending against claims by ASML Netherlands. Concluded February 2019. Lead attorney: Sorin Zaharia.
7. Technical Consultant, National Institute of Aerospace in the area of power distribution systems

Education:

1971-1975 Ph.D., University of Maryland

1968-1971 M.S, University of Maryland

1964-1968 B.S., SUNY Stony Brook

Professional Experience.

1. 2012-present Dr. Peckerar has co-founded two small businesses. The first, FlexEl LLC is a manufacturer of flexible electronic components and batteries. This company has partnered in the creation of non-flammable (lithium-free) power supplies for e-cigarettes and with medical electronics corporations for manufacturing ultrathin, flexible power sources. In addition, Dr. Peckerar was a co-founder of VersaVolt LLC, a company specializing in the creation of reserve batteries for underwater applications (such as extending the life of flight data recorders.)
2. 1981-2012 Professor, University of Maryland (College Park Campus). Dr. Peckerar is Professor of microelectronic process technology and analog systems design. He is author of the textbook Electronic Materials: Science and Technology (S.P. Murarka, co- author), the Korean Electronics Economy (with Mike Pecht) and Synthetic Microstructures for Biological Research (with Joel Schnur.) In 1980, Professor Peckerar was appointed lecturer in the ECE department. From 1981-2002, he was professor part-time, holding joint appointments at the university and at the Naval Research laboratory. He became tenured professor (full time) in 2002, and he is currently professor, emeritus.
3. 1981-2002 Branch Chief, Naval Research Laboratory, Washington, DC. Dr. Peckerar headed the Interface and Thin Films Branch. His responsibilities included management of the Nanoelectronics Processing Facility as well as the Laboratory for Advanced Materials Synthesis. Here, he developed sensor materials for visible, IR, UV and x-ray imaging. He also was Navy Manager of the DARPA Advanced Lithography Program. He pioneered in the development of e-beam proximity effect correction – an enabling technology for today's microelectronic patterning technology.
4. 1976-1981 Fellow Engineer, Westinghouse Corporation, Baltimore, MD. Dr. Peckerar headed the Advanced MOS Technology Group. He designed and developed non-volatile memory systems and radiation-hardened components. At Westinghouse he invented the plasma source for EUV and x-ray lithography.
5. 1973-1976 Physicist, Naval Research Laboratory, Washington, DC. Dr. Peckerar worked in the area of x-ray spectroscopy (largely aimed at detecting environmental pollutants.)
6. 1968-1973 Physicist, NASA Goddard, Greenbelt, MD. Dr. Peckerar performed component reliability studies for the first manned lunar program.

Personal Awards:

1. Fellow, IEEE 1994: For Contributions to and Leadership in X-ray and Microlithography.
2. Outstanding Invention of the year (2008) in physical sciences, presented by the Maryland Office Of Technology Commercialization: for a thin, conformable high energy storage density battery.
3. First place in the University of Maryland's \$75K Business Plan Competition for thin, flexible batteries (2009).
4. Maryland Technology Enterprise Institute (MTECH/SAIC) \$25K grants for battery development 2009
5. Maryland State Incubator Company (FlexEl Batteries, LLC) of the Year Award, May 2010

6. Inaugural University System of Maryland's Inaugural Entrepreneurship Award in 2013 for work developing FlexEl, LLC.

Awards to Student Under my Supervision:

Best Paper Awards:

1. Wei Zhao. Best student poster award, International Device Research Symposium, December, 2011.
2. Seokjin Kim. IEEE Autotestcon Best Graduate Student Paper award 2007 AND 2008 (we won two years in a row). This is the IEEE's primer conference on test and evaluation.
3. Sanaz Adl, IEEE Sensors Symposium 2007, best student paper award.
4. Nick Kratzmeier, James Weincke and Jeffrey Allnutt: Admission into the BS/MS program

Books authored.

1. S.Murarka, M. Peckerar, Electronic Materials Science and Technology, Academic Press, 1989.
2. M. Pecht, J. Bernstein, Daemon Searles and M.Peckerar, The South Korean Electronics Industry, CRC Press, 1997.

Books edited.

1. M. Peckerar, M., J. Schnur and H. Stratton, Synthetic Microstructures in Biological Research, Plenum Press, New York, 1993. Re-issued in 2004.
2. M. Peckerar, "Electron-Beam X-Ray and Ion Beam Submicrometer Lithographies for Manufacturing II", Vol 1671 SPIE, San Jose, CA, 1992.
3. M. Peckerar, "Electron-Beam, X-Ray, and Ion Beam Lithographies For Manufacturing," SPIE Proc. Vol. 1465 SPIE, San Jose, CA, 1991.
4. M. Peckerar and M. Postek, "Nanostructure Science, Metrology and Technology," (With Mike Postek) SPIE Press, March 2002.

Chapters in books.

1. M.Peckerar, R. Neidert, "High-Speed Microelectronics for Military Applications in the IEEE Press Anthology VLSI Engineering, V. Wohlfarth, W. Grobman, eds. (1985)
2. C. Marrian, M. Peckerar and Y. Pati "Electronic Neural Nets For Solving Ill- Posed Problems With An Entropy Regulariser," (with C. Marrian and Y. Pati), in Maximum Entropy And Bayesian Methods, J. Skilling (ed.), D. Reidel, Dordrecht, pp. 371-376 (1989).
3. M. Peckerar, P.T. Ho, R. Chen, "High Resolution Lithography For Optoelectronics," in McGraw Hill Handbook On Optoelectronics, R. Waynant, Ed.(1992).

4. Martin Peckerar and Milton Rebbert, "Advanced Materials Processes for Bio- Probes," in *Synthetic Microstructures in Biological Research*, Plenum Press, Edited M. Peckerar, J. M. Schnur H. Stratton, Pages 3-16, 1992.
5. M. Peckerar, F. Perkins, E. Dobisz, and O. Glembocki "Issues in Nanolithography for Quantum Effect Device Manufacture," (with in, *The Handbook of Microlithography, Micromachining and Microfabrication* P. Rai-Choudhury, ed., SPIE Press (1997).
6. E. Dobisz, F. Perkins, M. Peckerar "E-Beam and Proximal Probe Processes for Nanolithography," in *Microlithography: Science and Technology*, J.R. Sheats and B.W. Smith, eds. Marcel Dekker, New York, 1998. Re-issued in 2007.
7. M. Peckerar, "Nanolithography With Electron Beams: Theory and Practice," in: *Direct-Write Technologies for Rapid Prototyping Applications*, A. Pique and D. Chrissey (eds.), Academic Press, San Diego, CA(2001)
8. F. Yesilkoy, C. Ropp, Z. Cummins, R. Probst, E. Waks, **B. Shapiro**, M. Peckerar*, "New Applications and Emerging Technologies", editor M. Feldman, chapter in "Nanolithography: The Art of Fabricating Nanoelectronic, Nanophotonic, and Nanobiologic Devices and Systems", Woodhead Publishing LTD, Cambridge, 2012.
9. **Yesilkoy F**, **Potbhare S**, Kratzmeier N, **Akturk A**, **Goldsman N**, **Peckerar M**, **Dagenais M**. A Mid-IR antenna integrated with a geometrically asymmetrical metal-insulator-metal rectifying diode *Rectenna Solar Cells*. 2147483647: 163-188, 2013 DOI: [10.1007/978-1-4614-3716-1_8](https://doi.org/10.1007/978-1-4614-3716-1_8)

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