

Dr. Eric Bogatin

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CU faculty web site: <https://www.colorado.edu/faculty/bogatin/>

Current Activities:

Instructor, Univ of Colorado, Boulder, ECEE, <https://www.colorado.edu/faculty/bogatin/>

Teledyne LeCroy Fellow, <https://teledynelecroy.com/>

Technical Editor, Signal Integrity Journal <https://www.signalintegrityjournal.com/>

Publisher, Addie Rose Press <https://addierosepress.com/>

Contributing editor, Nuts and Volts Magazine, <https://www.nutsvolts.com/>

Areas of Expertise: Signal integrity, EMI and interconnect design, high frequency measurement and simulation tools and technology, microelectronics packaging and interconnect technologies; contact resistance, failure analysis, surface analysis and materials analysis; analog electronics; MEMs technology and sensor technology.

Professional positions held: President, CTO, VP of R&D, technical director, strategic marketing manager, product manager, technical program manager, principle engineer, senior member of the research staff, Adjunct Professor

Excellent communication skills: written 15 technical books, four of which are popular Signal Integrity text books used at over 10 universities, over 500 papers published, over 200 presentations at conferences, frequent invited speaker worldwide on signal integrity and interconnect technologies, 30 years of teaching technical classes, monthly columnist for four magazines with over 200,000 total circulation, syndicated blogger on signal integrity topics, former Distinguished Lecturer for IEEE EMC Society, technical editor of Signal Integrity Journal, contributing editor for Nuts and Volts Magazine.

Education:

Ph.D. in Physics, 1980, University of Arizona, Tucson. Dissertation title: "Three New high Precision Tests of Special Relativity and Mach's Principle"

M.S. in Physics, 1978, University of Arizona, Tucson

B.S. in Physics, 1976, M.I.T., Cambridge, Mass.

Funding received while instructor, Univ of Colorado, Boulder

2012-present: (all as gift donations or in-kind donations)

Cash gift donations

\$105k from Mentor Graphics

\$42k from NanYa Electronics

\$12.5k from AVX Corp

\$10k from Rogers Corp

\$10k from UBM award as Engineer of the Year, 2016
\$10k from Oxide Computers
\$8k from Teledyne LeCroy
\$5k from Polar Instruments
\$5k from Cisco
\$10k from Meritec
\$42.5k as contract from Siemens Corp
\$7.5k from Keysight
\$3k from Micron
\$10k from Averatek

Gifts in-kind:

\$2M as 25 seats of Ansys Electronic Desktop (\$80k x 25)
\$1.5M as 100 seats of Altium Designer (\$15k x 100)
\$1M as 25 seats of Mentor Graphics HyperLynx (\$40k x 25)
\$400k high speed scope and VNA instruments Teledyne LeCroy
\$375k as 25 seats of Simbeor software from Siberian (\$15k x 25)
\$12.5k as donated high speed scope probes from Keysight

Established the Teledyne LeCroy High-Speed Measurements Teaching Lab in the ECEE dept at CU, Boulder in Jan 2021 with a \$400k gift donation in equipment

Employment:

Lecturer, University of Colorado, Boulder, ECEE (2012-present)

Taught graduate classes in signal integrity. Created and taught two new graduate courses in Printed Circuit Board Design and Manufacturing

Bogatin Enterprises, Longmont, CO (Acquired in July 2011 by Teledyne LeCroy)

Jan 1988 to 2021 (retired as Teledyne LeCroy Fellow): President and Signal Integrity Evangelist

Created a new signal integrity training and education business based on presenting live public classes, onsite classes and online lectures streamed over the web. Clients include top electronics companies such as Intel, Motorola, TI, Agilent, nVidia, HP, National Semiconductor, Dell and Cisco.

Interconnect Devices Inc, Kansas City, KS

Jan 2004 to July 2006: Chief Technology Officer

Developed a corporate product and technology roadmap, developed and implemented a research program to control contact resistance in specialized connectors, lead the technical problem solving teams to meet numerous customers' requirements, positioned company as world leader in high bandwidth interconnects in the industry and with strategic accounts.

Ansoft Corp

Nov 96- Nov 98: Product Manager, Signal Integrity Products

Led the product marketing for all signal integrity related software tools

Silicon Light Machines (acquired by Cypress Semiconductor)

June 1995 to Nov 1996: Manager and Principal Engineer, Packaging Technology. Created and led the packaging team for a new MEMs based

optical device based on diffracting ribbons. Developed and implemented a new packaging technology for an optical MEMs device.

Sun Microsystems

Nov 1992 to June 1995: Manager, World Wide Operations Ball Grid Array Technology Implementation, Processor Modules, and New Technologies Group. Lead multiple, worldwide teams to introduce new packaging and

interconnect technologies into Sun product families, including MCMs and BGAs. Directed cross disciplinary projects with product groups, manufacturing, R&D teams and vendors.

Xinix Inc. (acquired by Luxtron)

May 1989 to May 1990: VP of R&D and Chief Technology Officer. Lead the new product development effort for a small company which manufactured instruments for real time, in situ monitor and control of IC manufacturing processes.

Raychem Corp (acquired by Tyco Electronics)

July 1984 to May 1989: Director, Systems Engineering and Product Marketing.

Managed multiple R&D teams and projects on high performance interconnect products. Responsible for groups doing strategic marketing, technical marketing, product development and test engineering for new interconnect and MCM technologies.

AT&T Bell Labs

Aug 1980 to July 1984; Senior Member of the Research Staff; Created and implemented the manufacturing technology for a major component of a new interactive display device. Created sensors for the in situ monitor and control of PCB manufacturing processes.

College Teaching Experience:

Summer 1976, Instructor, Worcester Junior College, Worcester, MA, teaching third semester physics: Vibrations and waves with intro to quantum mechanics

1978-1980, Instructor, Pima Junior College, Tucson, AZ, Teaching first and second semester pre-calculus physics

1988-1995 Invited signal integrity short course instructor at numerous UC Extension programs: UC Berkeley, UC Santa Cruz, UCLA, on signal integrity topics, lasting from a 3 day intensive course to a semester long course

May 1990 to Nov 1992: Adjunct Associate Professor, San Jose State University, Center for Microelectronics and Materials Research, Taught graduate classes on signal integrity and interconnect design and conducted research and consulting on interconnect design.

1988-2019: Instructor, Bogatin Enterprises, providing intensive 1, 2 and 3 day short courses and web based distance learning modules on signal integrity topics to professional engineers

2016 Front Range Community College, Longmont, CO, 1st semester undergraduate physics instructor

2012-present, Instructor, University of Colorado, Boulder, ECEE dept.

Other:

- ❑ 10 patents awarded on microelectronics and packaging applications
- ❑ Engineer of the year award, DesignCon 2016
- ❑ MIT education councilor, 1983-present
- ❑ Distinguished Lecturer with IEEE EMC Society, 2009- 2013
- ❑ Co-chair of the Global SI/EMC University for the IEEE EMC Society World Wide Symposium, 2012- 2015
- ❑ Invited speaker at conferences and events, worldwide, 2001-present
- ❑ Spring 2021 Outstanding Teaching Award, ECEE, CU, Boulder
- ❑ Invited Keynote speaker at Altium Live 2018-present
- ❑ Presented > 100 industry webinars on best measurement practices with scopes and VNAs.
- ❑ Chair of task force 2 in the IEEE P370 specifications committee resulting in the release of the IEEE 370-2020 - IEEE Standard for Electrical Characterization of Printed Circuit Board and Related Interconnects at Frequencies up to 50 GHz

Publications: Books

Bogatin, E, Bogatin's Practical Guide to Breadboard and Printed Circuit Board Prototype Design with an Introduction to Signal Integrity, Artech, to be published in fall, 2021

Bogatin, E, Bogatin's Practical Guide to Design and Characterization of Transmission Lines for Signal Integrity, Artech, 2020

Bogatin, E., Signal and Power Integrity- Simplified, 3rd edition, Prentice Hall, 2018, translated into three languages.

Smith, Larry and Bogatin, Eric, Principles of PDN Design-Simplified, Prentice Hall, 2017

Bogatin, Eric, S is for Space, Addie Rose Press, 2019 (a science fiction novel)

Bogatin, Eric, Shadow Engineer, Addie Rose Press, 2016 (a science fiction novel)

Bogatin, Eric, Science Experiments with Arduinos, Addie Rose Press, 2019

Bogatin, Eric, Arduinos without Tears, Addie Rose Press, 2018

Resso, M., and Bogatin, E., Signal Integrity Characterization Techniques," Addie Rose Press, 2009

Bogatin, E., Signal Integrity- Simplified, 1st edition, Prentice Hall, 2008.

Bogatin, E, Packaging Technology Update, ICE, 2000

Bogatin, E., Roadmaps for Advanced Packaging Technology, ICE, 1998

Bogatin, E., High Performance Packaging Technologies, ICE, 1996

Monthly Columns:

Technical Editor and Columnist, Signal Integrity Journal, 2016- present (225 feature articles and blogs) posted here:

<https://www.signalintegrityjournal.com/search?q=bogatin>

Contributing editor to Nuts and Volts Magazine, 2012-present (9 feature articles) posted here: <https://www.colorado.edu/faculty/bogatin/nuts-and-volts>

Columnist for EDN Magazine 2012-2016 (103 columns and feature articles) some of them posted here: <https://www.colorado.edu/faculty/bogatin/rules-thumb>

Columnist for UBM publications, including EE Times, EDN, Test and Measurement World, Design Con Community and The Connecting Edge, 2012-2016 (75 articles and columns)

Signal Integrity column for Printed Circuit Design and Fabrication Magazine, 2004-2011 (85 columns)

Astrophysics in the News Column for Cosmic Messenger, 2009-2010

Altera Web Site Signal Integrity Column, 2008-2009

Advanced Packaging Technology Column for Semiconductor International Magazine and Electronic Packaging and Production Magazine, 2006-2008

Publications: refereed

Bogatin, E., and Radhankrishna, K., "Synthesis of high-speed channels from shorter elements", IEEE EMC Magazine.

Simonovich, L., Bogatin, E. and Cao, Y., "Differential Via Modeling Methodology", IEEE Trans on CPMT, May 2011.

Bogatin, E. "Essential Principles of Signal Integrity", IEEE Microwave Magazine, Aug 2011, P. 34-42.

Bogatin, E., "A Closed Form Analytical Model for Electrical Properties of Microstrip Interconnects", IEEE TRANSACTIONS ON COMPONENTS, HYBRIDS, AND MANUFACTURING TECHNOLOGY, VOL. 13, NO. 2, JUNE 1990

Bogatin, E., "Design Rules for Microstrip Capacitance", IEEE TRANSACTIONS ON COMPONENTS, HYBRIDS, AND MANUFACTURING TECHNOLOGY, VOL. 11, NO. 3. SEPTEMBER 1988.

Jost, S., R., Bogatin, E., Weaver, J. C., "Detection of quantized vortex lines in superfluid helium at known pinning sites", Physics Letters A - PHYS LETT A. 01/1974; 49:147-148.

Refereed Conference Publications

Bogatin, E., "Essential Principles of Cross Talk and Mitigation Strategies", in 2018 IEEE Symposium on EMC/SI/PI

Smith, L., Bogatin, E., "Principles of Power Integrity for PDN Design", 2018 IEEE Symposium on EMC/SI/PI.

Deek, F., Picket-May, M., Bogatin, E., "Transfer Impedance Drop off in Power/Ground Plane Cavities", 2018 IEEE Symposium on EMC/SI/PI

Barnes, H., Bogatin, E., Moreira, J., "Development of a PCB kit for s-parameter de-embedding algorithms verification" in 2017 IEEE Int'l Symposium on EMC/SI/PI

Bogatin, E., et. al, "New Characterization Technique for Glass Weave Skew-part 2", DesignCon 2017.

Bogatin, E., Shlepnev, Yuriy, Wang Lee, Tim, "Back to Basics: the onset of skin depth effect in circuit board traces", DesignCon 2017. Best paper award

Bogatin, E., et. al., "New Characterization Technique for Glass Weave Skew-part 1", DesignCon 2016. Best paper award

Duffy, AP., Shang, G., Luk., Bogatin, E., Huang, CC, "Assessing techniques to compare signal integrity data for high-speed interconnects", 2016, IEEE Symposium on EMC

Resso, M., Bogatin, E., Vatsyayan, A., "A new method to verify the accuracy of de-embedding algorithms", 2016 IEEE MTT-S Latin America Microwave Conf, 2016

Bogatin, E., Simonovich, L., "Dramatic Noise Reduction using Guard Traces with Optimized Shorting Vias", DesignCon, 2013, best paper award

Bogatin, E., DeGroot, D., Huray, P., Shlepnev, Y., "Which one is better? Comparing Options to Describe Frequency Dependent Losses", DesignCon 2013

Bell, J., Blankman, A., Bogatin, E., Neves, A., Noh, G., Spadaro, M., "Robust Method for Addressing 12 Gbps Interoperability for High-Loss and Crosstalk-Aggressed Channels", DesignCon 2012

DeGroot, D., Blankman, A., Bogatin, E., "A Practical Approach for Using Circuit Board Qualification Test Results to Accurately Simulate High Speed Serial Link Performance", DesignCon, 2012

Bogatin, E., Loyer, J., Olufemi Oluwafemi, and Hall, S., "Rethinking How Signals Interact with Interconnects", DesignCon 2011.

Scogna, A.C, and Bogatin, E. "Analysis of return path discontinuities in multilayer PCBs and their impact on the signal and power integrity", in IEEE Int'l Symposium on EMC, 2010.

Bogatin, E., DeGroot, D., Gupta, S., Warwick, C., "Frequency Dependent Material Properties- so what?", DesignCon 2010, Best paper award

E. Bogatin, L. Simonovich, C. Warwick and S. Gupta, "Practical Analysis of Backplane Vias for 5 Gbps and Above," paper 7-TA2, DesignCon 2009., best paper award

Torres, M. and Bogatin, E. "Signal integrity parameters for health monitoring of digital electronics", 2008 International Conf on Prognostics and Health Monitoring

Andes, J., and Bogatin, E., "The socket response to current packaging and test trends", IEEE CPMT SEMI 29th Int'l Electronics Manufacturing Technology Symposium, 2004.

F. Perezalonso;B. Crawford;R. Bernard;R. Kaw;S. Thomas;E. Bogatin, "Electrical characterization of VLSI packages", Proceedings and 41st ECTC Conference, 1991.

Bogatin, E., Ghandi, P., Weihe, G, Szeto, S., Lofdahl, C., "Enhanced high speed performance from HDI thin film multichip modules", Proceedings, 7th IEEE/CHMT International Electronic Manufacturing Technology Symposium, Sept 1989