

Dan O. Harris, PhD

Curriculum Vitae

Education

- Master of Statistics, North Carolina State University, 2018.
- PhD, Electrical Engineering, North Carolina State University, 1990.
- MS, Electrical Engineering, North Carolina State University, 1987.
- Bachelor of Electrical Engineering, Georgia Institute of Technology, 1981.

Employment Chronology

- 2020-Present: Wake Forest University
 - 7/20-Present: Adjunct Associate Teaching Professor, School of Business
- 2018-Present: North Carolina State University
 - 8/18-Present: Lecturer, Department of Statistics
- 2008-2020: Corning Incorporated
 - 1/16-4/20: Sr. Strategy Manager, Corning Optical Communications
 - 11/12-12/15: Program Manager, New Business Development
 - 1/10-10/12: Director, Strategic Growth (wireless)
 - 2/08-12/09: Program Manager, Wireless Business Development
- 2009-2017: Lenoir-Rhyne University
 - 8/16-5/17: Adjunct Instructor of Mathematics
 - 8/09-5/10: Adjunct Assistant Professor of Physics
- 2002-2008: Actualize Technology, LLC: 6/02-2/08: Principal (consultant, contract executive)
 - 6/06-6/07: Copperweld: VP, Strategic Development; Board of Directors
 - 1/03-12/04: NanoPrecision Products: VP, Marketing and Business Development
- 1995-2002: Corning Incorporated
 - 11/01-6/02: Director, Network Technology and Market Development
 - 8/00-11/01: Director, Corning Innovation Ventures (Board of Directors of several start-ups)
 - 2/00-8/00: Director/Manager, Access Network Business Development
 - 8/97-2/00: Manager, Market Development Engineering & Analysis
 - 11/95-8/97: Market Development Engineering Manager, Local Access
- 1991-1995: Siecor Corporation (joint venture between Corning Inc. and Siemens AG)
 - 12/94-11/95: Staff Engineer, Quality Engineering
 - 6/91-12/94: Staff Engineer, Product Development
- 1994: Lenoir-Rhyne College
 - 1/94-5/94: Adjunct Instructor of Physics
- 1990-1991: University of Alabama in Huntsville
 - 8/90-5/91: Assistant Professor of Electrical Engineering
- 1986-1990: North Carolina State University
 - 8/87-8/90: PhD Student, Research and Teaching Asst. for Anthony VanderLugt
 - 1/86-5/87: MS Student, Teaching Assistant for J. Richard Jones
- 1983-1987: Siecor Corporation
 - 1/86-8/87: Applications Engineer (part-time to support graduate school)
 - 12/83-1/86: Supervisor, Quality Information Systems; Instrumentation Engineer
- 1980-1983: Georgia Institute of Technology
 - 12/81-12/83: Systems Analyst
 - 6/80-12/81: Student Assistant

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Academic Experience

Wake Forest University, Winston-Salem, NC

Adjunct Associate Teaching Professor, School of Business

- Teaching: teach graduate courses in the Master of Business Analytics program. Topics include Monte Carlo simulation, discrete element simulation, risk analysis, multivariate methods including principal components analysis, exploratory factor analysis, clustering, confirmatory factor analysis, and design of experiments.
 - BAN 7050 Simulation and Risk Analysis (Fall 2020)
 - BAN 7060 Multivariate Analysis and Experimental Design (Spring 2021)

North Carolina State University, Raleigh, NC

Lecturer, Department of Statistics

- Teaching: teach undergraduate calculus-based probability course for engineering students, and graduate courses for engineering and business/analytics students. Topics include probability, estimation, inference, model building and evaluation, design of experiments, and statistical learning, leveraging both R and JMP analysis tools
 - ST 371 Intro to Probability/Distribution Theory (Fall 2018, Spring/Fall 2019, Spring/Fall 2020)
 - ST 514 Statistics for Management II (Spring 2020, Summer 2020, Summer 2021)
 - ST 515 Experimental Statistics for Engineers I (Fall 2018, Spring 2019, Spring/Fall 2020, Spring 2021)
 - ST 516 Experimental Statistics for Engineers II (Fall 2019, Spring/Fall 2020, Spring 2021)
 - ST 542 Statistical Consulting (Spring 2021)

Lenoir-Rhyne University/College, Hickory, NC

Adjunct Assistant Professor, Adjunct Instructor

- Teaching: part-time instructor teaching introductory and advanced undergraduate courses
 - MAT 115 Introduction to Statistics (Fall 2016, Spring 2017)
 - PHY 473 Physics Research (Fall 2009)
 - PHY 320 Optics (Spring 1994, Spring 2010)

The University of Alabama in Huntsville, Huntsville, AL

Assistant Professor of Electrical and Computer Engineering

- Research: general interest in optical communication and signal processing systems. Topics include:
 - Acousto-optic switch in wavelength-division multiplexing environment
 - Acousto-optic switch with arbitrary signal fan-out
 - Beam deflectors for efficient fan-in in free-space switches
 - Efficient computation of near-field diffraction patterns
 - Non-intrusive measurements of aero-optic effects
- Teaching: taught graduate courses in optics, developed and taught a course in optical communication, and co-developed two senior lab courses:
 - EE/PH 541/461 Optics I, EE/PH 542/462 Optics II
 - EE 634 Optical Communications
 - EE 433 Optical Engineering Laboratory, EE 463 Electro-Optics Laboratory
- Service: gave presentations on optics to local area schools and served on the following committees:
 - Graduate Affairs, Undergraduate Optical Engineering Curriculum, Electro-Optics Working Group

North Carolina State University, Raleigh, NC

Master of Statistics

Graduate Course of Study

- Major Courses: Linear Models and Regression, Statistical Learning, Applied Bayesian Analysis, Applied Time Series Analysis, Data Mining, Statistics for Management I & II, Mathematical Statistics I & II, Statistical Programming (SAS and R), Statistical Practice

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- Additional Courses: Operations Research, Business Statistics (undergraduate course)

Doctor of Philosophy in Electrical Engineering

- Minor: Mathematics and Physics
- Thesis: *Acousto-Optic Photonic Switching*, under the direction of A. VanderLugt

Master of Science in Electrical Engineering

- Minor: Physics
- Thesis: *A Method of Characterizing Modal Dispersion in Optical Fibers for Digital Applications*, under the direction of J. R. Jones

Research Assistant and Teaching Assistant, Department of Electrical and Computer Engineering

- Research: Work centered on optical switching devices and computational methods. Topics include:
 - Acousto-optic switch: devised and built prototype of bulk acousto-optic deflecting switch that is non-blocking, has multicasting capability, requires only $O(N)$ hardware complexity, with signal degradation suitable for non-regenerative applications. First reported demonstration of an 8-port free-space optical switch with less than 10 dB insertion loss.
 - Diffraction modeling: developed a computationally efficient FFT-based algorithm using the Fresnel-Kirchoff equation to calculate near-field diffraction pattern for arbitrary apertures.
 - Modal dispersion: developed a new technique for characterizing modal dispersion in optical fibers that was significantly more repeatable and provided more relevant performance assessment for baseband digital application than conventional bandwidth measurements.
- Teaching: Grader for graduate level courses in optical signal processing and optical communications. Gave guest lectures in advanced graduate level acousto-optic signal processing course and introductory graduate level fiber-optic communication course.

Graduate Course of Study

- Major Courses: Optical Signal Processing, Optical Fiber Communications, Computer Communications, Statistical Communications Theory, Statistical Pattern Recognition, Digital Image Processing, Digital Signal Processing, Random Signals and Noise, Solid State Physics, Optical Properties of Semiconductors, Electromagnetic Theory
- Minor Courses: Optics, Solid State Physics, Optical Electronics, Linear Algebra, Complex Analysis, Probability

Honors and Awards

- Recipient of an SPIE Scholarship in Optical Engineering
- Research recognized in *Optics* in 1989, *Optics News*, vol. 15, pp. 49-50, 1989.
- Member of Tau Beta Pi and Eta Kappa Nu

Publications

Archival Journal Publications

- D. O. Harris and J. R. Jones, "Baud rate response: characterizing modal dispersion for digital fiber optic systems," *Journal of Lightwave Technology*, vol. 6, pp. 668-677, 1988.
- D. O. Harris and A. VanderLugt, "Acousto-optic photonic switch," *Optics Letters*, vol. 14, pp. 1177-1179, 1989.
- D. O. Harris, "Multichannel acousto-optic crossbar switch," *Applied Optics*, vol. 30, pp. 4245-4256, 1991.
- D. O. Harris and A. VanderLugt, "Multichannel acousto-optic crossbar switch with arbitrary signal fanout," *Applied Optics*, vol. 31, pp. 1684-1686, 1992.
- D. O. Harris, "Efficient computation of near-field diffraction patterns by means of subsampled convolution," *Optical Engineering*, vol. 33, pp. 175-179, 1994.
- D. O. Harris and R. A. Throckmorton, "Azimuthal dependence of modal interference in closely spaced single-mode fiber joints," *Photonics Technology Letters*, vol. 6, pp. 1235-1237, 1994.

Conferences and Trade Journals

- Significant number of technical and commercial papers and presentations at industry conferences, as well as numerous commercial technology articles in commercial trade journals

Referee Activity

- Asked to review papers for several archival journals, including *Applied Optics*, *Optical Engineering*, and *IEEE Journals*.

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Professional Highlights

Technology

- Subject matter expert at Corning in statistical analysis and advanced analytics applied to strategy development, leading efforts for time series forecasting and regression/machine learning-based approaches to market sizing and business opportunity assessment.
- Leadership role on team that developed the first multi-fiber connectors for Corning; initiated and led statistically-based design of experiments and product/process evaluation approaches that enabled the team to produce product comparable to Japanese competitors that had an eight year head start.
- Discovered the azimuthal dependence of modal interference in closely spaced fiber-optic joints, which described previously unexplainable loss variability in a popular class of fiber-optic connectors; also enabled a means of minimizing loss in field deployments of these connectors.
- Designed and built a 4x4 optical crossbar switch based on acousto-optic technology that produced the lowest demonstrated switching losses for any optical crossbar at the time.
- Developed an efficient means of evaluating Fresnel Integrals based on FFT-based convolution and optimal sub-sampling of the original field functions.
- Developed a highly repeatable means to measure modal dispersion in optical fibers based on statistical analysis of data from conventional bandwidth measurements.
- Used statistical methods to develop a raw materials selection process for optical fiber cables that increased cable yield by more than 50%.

Business

- Identified and led initial phases of a program to establish a new business unit in the wireless telecommunications space within Corning Cable Systems; included identifying market space, establishing product requirements, securing internal investment of \$20M and hiring external domain experts to lead the business unit. This effort culminated with the successful acquisition of MobileAccess by Corning.
- As contract VP, Marketing and Business Development for start-up nanoPrecision Products (precision metal components supplier for optical connectors, disk drives, and medical devices), co-developed product strategy and business plan that secured \$2M strategic investment.
- As contract VP, Strategic Development and Director of privately held Copperweld (telecom materials supplier), co-developed product strategy, business plan, and identified potential buyers leading to successful acquisition by a major competitor.
- Co-founder of Corning Innovation Ventures (Corning Incorporated venture capital group); established relationships in the VC community, led deal flow, closed a majority of deals in the \$50M portfolio, served on venture boards; most companies in my portfolio navigated the “telecom bubble” and were acquired at a profitable return to the original investors.
- Key member of leadership team that commercialized LEAF optical fiber, one of the most profitable products in Corning Optical Fiber history; line responsibility for product value development and technical sales.

Detailed Employment History

Wake Forest University, Winston-Salem, NC

July 2020 - Present

School of Business

- Adjunct Associate Teaching Professor: Non-tenure track position teaching in the Master of Business Analytics Program.
 - Teach graduate courses in simulation and risk analysis, multivariate methods and experimental design.

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North Carolina State University, Raleigh, NC

August 2018 - Present

Department of Statistics

- Lecturer: Non-tenure track position teaching statistics to engineering and business students.
 - Teach an undergraduate probability course.
 - Teach graduate courses in statistics, with topics including probability, estimation, inference, regression, machine learning, and design of experiments.
 - Served on several committees for MS degree candidates.

Corning Optical Communications, Charlotte, NC and Hickory, NC

January 2016 – April 2020

- Senior Strategy Manager: Responsible for quantitative analyses using advanced analytics tools for division strategy and external development projects. Highlights include identification and quantification of high potential adjacent business segments, stochastic modeling and scenario analyses to support M&A activities, time-series analysis for forecasting, application of statistical and machine learning models for market sizing and forecasting, and mentoring junior strategy analysts.

Lenoir-Rhyne University, Hickory, NC

August 2016 – May 2017

- Adjunct Instructor of Mathematics: Taught MAT 115 Introduction to Statistics.
- Declined an offer to teach MAT 115 for the 2017-2018 academic year to focus on graduate studies.

Corning Incorporated, Corning, NY

November 2012 – December 2015

- Business Development Program Manager: Responsible for identification and early stage program management for potential new lines of business for Corning Incorporated. Primary programs included (a) strong, lightweight glass packaging and (b) interactive surfaces for home, office, retail, and industrial applications.

Corning Cable Systems, Hickory, NC

February 2008 – November 2012

- Director, Strategic Growth; Manager, IDAS Strategy and Business Development (1/10-11/12): Evaluation of future technology, product and business opportunities for the Corning wireless business unit, including market analysis, product conceptualization and value proposition, revenue/investment/profitability analyses, and engagement with potential partners.
- Program Manager, IDAS (6/08-1/10): Leadership of a multi-functional business team -- commercial, product line management, research and development, and manufacturing -- to develop a new line of business for Corning in wireless telecommunications. Guided the team through feasibility and early commercialization stages, secured ~\$20M in program funding over 30 months (including 2010 budget) through the formation of a new business unit and acquisition of MobileAccess.
- Business Development Manager (2/08-6/08): Evaluation of new business opportunities in wireless applications, including market analysis, product conceptualization and value proposition, revenue/investment/profitability analyses, and engagement with potential partners.

Lenoir-Rhyne University, Hickory, NC

August 2009 – May 2010

- Adjunct Assistant Professor of Physics: Taught PHY 473 Physics Research and PHY 320 Optics.

Actualize Technology, LLC, Hickory, NC

June 2002 - February 2008

- Corning Cable Systems: Consultant; business case modeling to assess impact of product deployment on customer business case, and business case analysis for entry into new markets. Product applications include fiber-to-the-premise, wireless, and data communications. Model outputs routinely used for business strategy decisions as well as regular reviews with senior management.
- Copperweld Bimetallics, LLC: Consultant, Vice President - Strategic Development, Director; strategy development for new product and market growth opportunities for bimetallic wire products

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in wireline, wireless, and data communications; utilities; and automotive applications. Co-developed acquisition strategy that resulted in successful acquisition by a major competitor.

- Salira Systems, Inc.: Consultant; competitive value analysis for Ethernet PON data transmission products marketed for deployment into cable television networks. Identified product value and reinforced decision to enter cable television market.
- Digital Optics Corporation: Consultant; market analysis/value driver assessment for potential new products and entry into new markets for fiber-to-the-premise, display, and wireless handset applications. Market opportunity/profitability projections used in decision to forgo fiber-to-the-premise and display markets, and enter wireless handset market.
- Network Integrity Systems, Inc.: Consultant; business plan development, technical marketing, and assistance raising capital for start-up manufacturer of network security products. Developed comprehensive business plan as well as key economic rationale and marketing messages used to sell security products into government markets.
- CommScope, Inc.: Consultant; growth strategy development for cable television markets. Provided business case analysis facilitating successful product launches into fiber-to-the-premises markets.
- Corning Optical Fiber: Consultant; competitive analysis for fiber-optic products. Work successfully used to differentiate Corning products in the marketplace.
- nanoPrecision Products, Inc.: Consultant, Vice President - Marketing and Business Development; business plan development, product definition, and marketing strategy for start-up manufacturer of precision parts for fiber-optic, data storage, and medical device industries. Efforts key to securing \$2M from strategic investor.

Corning Incorporated, Corning, NY

November 1995 - June 2002

Corning Photonics Technologies

- Director, Network Technology and Market Development (11/01-6/02): Responsible for market analysis, system value understanding, and development of carrier market for full line of photonic products during a period of sharp decline in photonics markets. Provided key input to difficult decisions regarding refined market focus and product cuts.

Corning Innovation Ventures

- Director (8/00-11/01): General Partner and founding member of the Corning Incorporated venture capital group. Original fund target of \$50M investment/year in the optical telecommunications sector.
 - Quickly established relationships within the venture capital community and directed a team of five associates to get the group up and running in a short period of time.
 - Directed due diligence activity and closed two thirds of the deals in the portfolio. Typical investments were \$2-5M in A and B series.
 - Held board seats with Optium (Orlando, FL), OptXCon (RTP, NC), and was an active board observer with iolon (San Jose, CA), all telecommunications sector suppliers.
 - Deal activity with and contacts at several VC firms, including Battery Ventures, Boston Millennia Partners, HIG Capital, Kleiner Perkins Caufield Byers, and KPL Ventures.

Corning Optical Fiber

- Director/Manager, Access Network Business Development (2/00-8/00): Business strategy development for next-generation fiber-based local access network systems. Set product strategy and roadmaps based on innovative Ethernet-based architectures for telco and cable TV networks that are used for current product portfolio and marketing emphasis.
- Manager, Market Development Engineering and Analysis (8/97-2/00): Built a technical marketing team of 30 market analysts and engineers.
 - Corning fiber sales doubled to \$1B, division profits grew to represent a majority of corporate profits as technical marketing emerged as a key commercial function.
 - Management responsibility for system-level value propositions for all optical fiber products in public and enterprise network markets.
 - Key member of the leadership team that commercialized LEAF fiber, one of the most widely accepted and profitable products in Corning history.
 - Nominated for a .People Development Award.

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- Market Development Engineering Manager, Local Access (11/95-8/97): Responsible for creating value proposition, market positioning, and direct sales of Corning Optical Fiber products to Telcos, MSOs, CLECs, and other service providers in the local access arena. Established strong market position for Corning, and developed approaches for technical marketing that were widely adopted throughout Corning Incorporated.

Siecor Corporation, Hickory, NC (joint venture between Corning Incorporated and Siemens AG)

June 1991 - November 1995

Siecor Telecommunications Cable Plant

- Staff Engineer, Quality Engineering (12/94-11/95): Developed techniques for measuring attributes of cabled optical fiber and methods of statistical data analysis. Implemented fiber selection criteria necessary to efficiently allocate fibers to cables. This technique ultimately improved yield by 50% and enabled Siecor to meet customer demands and retain critical market share at a time when fiber availability was severely constrained. A portion of the work was presented at industry conferences.

Siecor Hardware and Equipment Technology

- Staff Engineer, Product Development (6/91-12/94): Leadership role on team developing molded multiple fiber connectors for fiber-to-the-home applications in Japan.
 - Conceived and implemented innovative manufacturing and development processes that enabled a previously inexperienced team to produce products competitive and in some respects superior to those of Japanese manufacturers with eight years prior experience.
 - Quickly built a reputation within the corporation as the optical performance expert for fiber-optic connectors. Worked extensively with marketing groups to develop analytical product performance models used to successfully differentiate Siecor connector products.
 - Discovered the azimuthal dependence of modal interference, which was ultimately used to optimize optical loss performance in stubbed fiber-optic connectors. Various works published in archival journals and at industry conferences.

Lenoir-Rhyne College, Hickory, NC

January 1994 - May 1994

- Adjunct Instructor, Physics: Taught PHY 320 Optics

The University of Alabama in Huntsville, Huntsville, AL

August 1990 - June 1991

Department of Electrical & Computer Engineering

- Assistant Professor (8/90-6/91): Tenure track position at a leading university for optical science and engineering.
 - Taught introductory graduate-level optics courses.
 - Engaged in collaborative research with U. S. Army Missile Command.
 - Generated several proposals for funded research, and had several research papers accepted for publication in archival journals and conferences.

North Carolina State University, Raleigh, NC

January 1986 - August 1990

Department of Electrical & Computer Engineering

- Graduate Student (8/87-8/90): Awarded Doctor of Philosophy in Electrical Engineering, 8/90.
 - Teaching and Research Assistant.
 - Thesis under the direction of A. VanderLugt entitled “Acousto-optic photonic switch.” Work reported in multiple archival journal publications and conference presentations.
- Graduate Student (1/86-5/87): Awarded Master of Science in Electrical Engineering, 5/87.
 - Teaching Assistant.
 - Thesis under the direction of J. R. Jones entitled “A method of characterizing modal dispersion in multimode fibers” based on concurrent research performed for Siecor Corporation (see below). Work accepted for archival journal publication.

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Siecor Corporation, Hickory, NC and Research Triangle Park, NC

December 1983 - August 1987

Siecor Optical Cable Plant

- Senior Engineer (5/86-8/87): Part-time to support educational activities. Researched methods of characterizing modal dispersion to more accurately and repeatably predict application-specific field performance. Developed the “baud rate response” method, which was implemented within Siecor facilities and ultimately saved considerable time and money in rework and scrap.

Siecor Research Triangle Park

- Senior Engineer (1/86-5/86): Part-time to support educational activities. Analysis of various clock recovery technologies for optical data links. Work was aimed at differentiating Siecor products, and published at various trade conferences.

Siecor Optical Cable Plant

- Supervisor, Quality Information Systems (12/84-1/86): Supervised team of six engineers and technicians in implementing statistical quality control systems, enabling the Siecor factory to maintain worldclass efficiency during a four-fold expansion of the facility.
- Instrumentation Engineer (12/83-12/84): Responsible for development of automated QC measurement instrumentation for optical fiber cables. Co-developed many state-of-the-art measurement systems which later gained wide-spread industry acceptance.

Georgia Institute of Technology, Atlanta, GA

September 1977 - December 1983

Georgia Tech Engineering Experiment Station

- Systems Analyst (12/81-12/83): Project manager for hardware integration of safety parameter display systems installed in nuclear power plants.
- Student Assistant (6/80-12/81): Design, fabrication, and assembly of digital and analog hardware for real-time environmental control systems installed in factories and nuclear power plants.

School of Electrical Engineering

- Undergraduate Student (9/77-12/81): Awarded Bachelor of Electrical Engineering, 12/81.

Community Service

Hickory Soup Kitchen, Hickory, NC

- Member of Board of Directors (2004-2012).
- Treasurer (2005-2008).

Episcopal Church of the Ascension, Hickory, NC

- Lay Reader (2005-Present).
- Treasurer (2007-2008).
- Member of Vestry (2005-2007).
- Senior Warden (2006-2007).
- Member of various Diocesan committees (2006-2008).