

# Dr. Paul A. Morton

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## **Personal Strengths**

- Extensive R&D background, from devices through system level architecture and design.
- International reputation for research on high-speed optoelectronic components.
- Technological innovator with strong leadership and team-building abilities and experience.
- Strong relationships and contacts in academia, professional societies, industry and funding agencies.
- Accomplished public speaker with considerable experience giving talks, seminars and tutorials.
- Broad industrial experience including research laboratory and entrepreneurial startup environments.

## **Experience**

### **Morton Photonics Inc.** West Friendship, MD, Oct 2002 - present

CEO/founder of successful photonics technology company, providing research and product development capabilities for government and industry projects on state of the art photonics components and sub-systems. Focus on silicon photonics devices and integration for advanced photonic sub-systems; analog RF photonics and advanced telecom systems. Additionally, supporting client photonic component and optical system companies in technology, product design, marketing and management leadership.

- Principal Investigator in DARPA MTO Phase I, Phase II and IIb SBIR program, ‘Highly-Integrable Microresonators with Fast Tunable Group Delay for Broadband RF True Time Delay’.
- Principal Investigator in Navy Phase I and Phase II SBIR program, ‘Low-Cost Ultra-Low-Noise Hybrid-Integrated Laser’.
- Principal Investigator in DARPA Phase I and Phase II STTR, with Prof. J. Khurgin at the Johns Hopkins University and Prof. M. Lipson at Cornell University, ‘Miniature Silicon WDM Modulators for Analog Fiber-Optic Links’.
- Principle Investigator in DARPA seed program ‘Cavity-Mode-Induced, Tailored-Ultra-High-Speed-Response, Directly Modulated Semiconductor Lasers’.
- Senior Advisor to the National Science Foundation, CISE Directorate, supporting the GENI program (Global Environment for Network Innovations), helping define physical layer requirements for this major research platform for the future Internet, including a nationwide optical network (2006–2008).
- Alphion Corporation; managed a program to develop low-cost packaging for next generation semiconductor optical amplifier (SOA) devices.
- Redfern Integrated Optics; worked as Chief Technology Officer (CTO). Provided overall strategic direction; technical leadership researching novel device, hands-on R&D and managing a team of engineers, marketing direction and management support.
- Infinera Corporation; a startup developing revolutionary Photonic Integrated Circuits (PICs), which form the heart of a disruptive new fiber optic communications system. Obtained government funding for forward looking research, and managed the research contracts. In under one year won five SBIR Phase I competitions; 3 DARPA; uncooled and linearized PICs and Electronic-Photonic Integration, plus 2 satellite communication SBIRs with the Air Force and Missile Defense Agency.
- Rohm-Haas Emerging Technologies: providing technical leadership on device design and system implications. Designed and built high-speed optical test lab, carried out device testing of their novel technology. Built partnerships with high-speed laser diode suppliers.
- Provide expert technical guidance on intellectual property (IP) issues, and provide technical guidance to a number of financial companies interested in the telecom marketplace.
- Technical auditor for Honeywell Advanced Technology Systems, auditing companies providing optical and optoelectronic components and systems to NASA.
- Played a major role as a consultant and as the founder member of the Technical Advisory Board in

the development of technology and product roadmaps for T-Networks Corporation. Provided initial ideas when the company was started.

- Provided system level perspective for a new photonic sub-system at a startup company. Led key technical discussions with major system and service provider customers (Lucent, AT&T, Sprint etc).
- Prepared and presented component and system level presentations, plus additional technical services to multiple telecom startup companies.

**CIENA Corporation** 920 Elkridge Landing Rd, Linthicum, MD, 21090.

**Technology Director, Office of the CTO** June 2001 to September 2002.

- Optical Component expert within CTO office, key voice for adopting new technologies.
- Analyzed all-optical network architectures using wavelength tunability and all-optical switching.
- Prepared internal white paper and gave presentations on wavelength tunability in optical networks.
- Created and led the Common Optics Team, a major team across all business units, responsible for Common Optical Interfaces (physical plus protocol issues) across CIENA products.
- Leader of team defining common 10 Gbps WDM pluggable module for use on all CIENA products.
- Member of CTO design team for next generation Metro system based on wavelength tunable lasers.
- Researched various system architectures for all-optical switches (MEMS, wavelength switches).
- Investigated next generation technologies, including integration at system and component levels.
- Championed C-Band tunable technologies and helped develop strategy for their use.
- Conducted optical transmission measurements of transmitters utilizing full C-Band tunable lasers.
- Championed suppliers of next generation technologies, including wavelength tunable components, integrated modules, MEMS and other optical switching technologies.

**Director, 40G Technology Program** Feb 2000 to May 2001.

- Initiated work at CIENA on 40 Gbps technologies, planned and managed the program.
- Obtained research components from suppliers around the world to create 40 Gbps test-beds.
- Created internal program to package and test 40 Gbps electronic IC's.
- Formed and managed partnerships with 40 Gbps IC manufacturers.
- Personally built the initial 40 Gbps testbed for evaluating research components (based on OTDM).

**Director, Active Photonics** May 1998 to May 2001.

- Created the Active Photonics group to carry out R&D and qualify components for CIENA systems.
- Built up a technically excellent and cohesive group, and a world class R&D lab.
- Obtained and characterized state-of-the-art component technologies from around the world.
- Supported all CIENA divisions, ensuring the success of new products.
- Established strong relationships with strategic suppliers and internal manufacturing groups.
- Led team to find, evaluate and qualify all key components in CIENA's first 10 Gbps WDM system.
- Pioneered the use of EMLs for 10 Gbps client interfaces, submitting as a 2 km standard to the ITU.

**Associate Principal Engineer, Photonic Technologies** Oct 1997 to April 1998

- Defined photonic components for CIENA's initial Metropolitan WDM transport system.
- Evaluated the feasibility of competing technologies and architectures for all-optical switching.

**Bell Labs/Lucent Technologies Optoelectronics Center** Breinigsville, PA, April 1996 to Oct 1997

**Member of Technical Staff, Photonic Components Research Department**

- Designed 40 Gbps electroabsorption modulators and associated high-speed packaging.
- Built up lab for testing 40 Gbps components and test-bed for 40 Gbps transport testing.
- Coordinated Lucent/Bell Labs effort to produce 40 Gbps devices for system level testing.
- Built test facilities for 10 Gbps devices and transport testing for the Optoelectronics Business Unit.
- Transferred research 10 Gbps EMLs and packaging to the Optoelectronics Business Unit.

**AT&T Bell Laboratories** Murray Hill, NJ, Jan 1991 to April 1996

**Member of Technical Staff, Semiconductor Device Research Department**

- Research into high-performance photonic devices; design, processing and characterization.
- Produced the world's fastest long wavelength directly modulated laser diodes (1992) using p-doped compressively strained MQW active regions - beating bulk-active region devices for the first time.
- Created new characterization techniques to better understand high speed laser operation.
- Demonstrated a packaged 1.55  $\mu\text{m}$  DFB laser with world record modulation bandwidth of 25 GHz.
- Demonstrated the first mode-locked laser using a semiconductor gain section and silica-waveguide external cavity with integrated Bragg reflector.
- Produced the first mode-locked pulse source using a fiber cavity with integrated Bragg reflector, called the 'Hybrid Soliton Pulse Source'.
- Developed a new class of mode-locked lasers with improved frequency range and stability, using a chirped fiber Bragg reflector.
- Created a fully packaged 'Hybrid Soliton Pulse Source', then used it in soliton transmission experiment with Linn Mollenauer showing transmission of 10 Gbps over 27,000 km.
- Hosted a colleague from the University of Gaziantep, Turkey, for the summer. Collaborated on modeling the 'Hybrid Soliton Pulse Source' operation and fitting simulations to measured results.
- Led a team to understand and improve EML device operation for use in long haul DWDM systems.
- Researched 10 Gbps EMLs and packaged prototypes for initial system demonstrations.
- Improved device characterization techniques to better understand laser temperature dependence.
- Established a team for computer modeling of semiconductor lasers, which grew into a major inter-departmental collaboration, and eventually its own department.
- Measured and modeled ultra-linear laser diodes for analog CATV transmission systems.

**University of California** Santa Barbara, CA, Sept 1988 to Aug 1990

**Post Doctoral Researcher** with Professor John Bowers

- Researched high-speed optoelectronic devices, and active mode locking of semiconductor lasers using novel devices and cavity geometries.
- Set up the research laboratory and supervised graduate students.
- Modeled external cavity modelocked semiconductor lasers; explained the production of multiple short pulse output due to a mechanism named 'Dynamic Detuning'.
- Demonstrated the first hybrid monolithic modelocked lasers, producing short single pulse output.
- Experienced the research program process for government agencies and the University of California - obtained UC Micro Grant and obtained parallel processing system through industrial partnership.

**Education and Professional Affiliations**

- BSc 1st class honors (1984), MEng (1985), Elect. and Electronic Eng., University of Bath, England.
- Ph.D. in Electrical and Electronic Engineering, August 1988, University of Bath, England.
- Fellow of the IEEE (2011), citation 'contributions to optical transmitters'. Fellow of the Optical Society of America (2005), citation 'fundamental contributions to high-speed optical transmitters and implementation into DWDM transmission systems'.
- Chair of the Fiber Optics Technology Group, Optical Society of America Science and Engineering Council. Experienced reviewer of papers for international journals. Previous Associate Editor of the IEEE Journal of Quantum Electronics. Broad experience reviewing for and organizing international conferences.
- Authored or co-authored over 100 technical papers and presentations, many invited, in major international technical journals and conferences. Author of two book chapters and holder of 6 patents (see separate publication list).
- Mini-MBA in General Management, 1995. (AT&T/Wharton School of Business, 2-week course).