DUSTIN W. CARR, PhD

470-636-2770 | dwc5@cornell.edu | Alpharetta, GA

Physicist, Engineer, Innovator

Experience

Co-Founder

DarkViolet.ai | Alpharetta, GA | 2023-present

- Development of cutting-edge AI applications, with expertise in LLM programming and engineering to create innovative solutions.
- Designing and implementing advanced RAG-based chatbots that push the boundaries of conversational AI.
- Serving as systems architect for data-intensive web applications, ensuring scalability, performance, and reliability.
- Constructing with a robust tech stack consisting of Remix, React, Typescript, Redis, Supabase, Postgres, and AWS to build powerful and efficient systems.

Director of Advanced Systems and Software -

Luna Innovations, Inc. | Atlanta, GA | 2018-2022

- Redesigning the company's most critical component - a tunable laser multi chip module, resulting in 50% size reduction, improved performance, 10X reduction in build time.
- Designed, built, and programmed multiple laser assisted robotic manufacturing systems.
- Designing, programming, testing, and implementing a global remote interrogation system for hundreds of sensors.
- Constructing a serverless infrastructure for cloud-based sensor data distribution within the company.
- Innovating a new robotic laser manufacturing system, currently deployed with a 30X reduction in build time for complex components.
- Deploying embedded systems with large-scale bridge monitoring projects in Hawaii, utilizing optical vibration sensors of my own invention.
- Architecting and building a novel robotic manufacturing system for the precise laser forming of microstructures.

Chief Technology Officer

Micron Optics, Inc. | Atlanta, GA | 2015-2018

- Leading the components manufacturing group, identifying and resolving issues in yield and costs, ultimately establishing new processes that significantly decreased COGs and increased throughput.
- Establishing the technical roadmap for the company.
- Developing embedded edge data acquisition systems using Python and C.

Director of Product Development

Micron Optics, Inc. | Atlanta, GA | 2014-2015

- Directing the release of a new flagship embedded sensing product, which became the highest revenue generator in the company.
- Implementing agile approaches for managing our mixed hardware/software development team.
- Developing high speed spectral data acquisition for our embedded sensing systems in C (using MMX/SSE).

Product Development Engineer

Micron Optics, Inc. | Atlanta, GA | 2013-2014

- Developing a new fiber-optic accelerometer from concept to customer trials in just 6 months, opening up multiple large market opportunities for this technology that are now in an advanced stage of development.
- Supporting the continued development of leading-edge optical interrogation systems through hardware, firmware, and software enhancements.

Vice President and Chief Technology Officer

Symphony Acoustics, Inc. | Rio Rancho, NM | 2006-2013

- Developing a new optical platform for physical sensing, applying this successfully to acoustics, seismic, and gravity sensing applications.
- Modeling multiphysics extensively with Matlab and COMSOL.
- Introducing a new type of passive Fabry-Perot fiber-optic sensor, now deployed around the world.
- Extensive developing and programming advanced embedded systems in c and assembly for signal processing, system control, and data delivery.
- Working in all areas of product development, including packaging, electronics circuit design, fabrication, assembly, and testing.
- Conducting extensive mechanical design and simulation to achieve low-cost, quick-turn prototyping of integrated MEMS and NIR optoelectronic devices.
- Serving as the primary inventor on 13 patents issued to Symphony Acoustics.

Principal Member of Technical Staff

Sandia National Laboratories | Albuquerque, NM | 2003-2006

- Establishing a broad research program focused on deformable nanophotonic elements for sensor applications.
- Designing and fabricating nanophotonic devices that exploit novel optical properties not previously predicted in any system.

- Demonstrating anomalous behavior in near-field coupled gratings, enabling remarkable measurements of in-plane displacements (10 fm/Hz1/2), ideal for physical and chemical sensor applications.
- Recruiting and mentoring post-doctoral fellows from prestigious institutions such as Stanford University, MIT, and Georgia Tech.

Technical Manager - Bell Laboratories

Lucent Technologies | Murray Hill, NJ | 2000-2002

- Building a group for advanced MEMS device research and leading the development of large micromirror arrays for optical switching systems.
- Recruiting and managing the work of 4 PhD researchers, and guiding interactions with the silicon fabrication lab, now known as the New Jersey Nano Center (NJNC).

Member of Technical Staff – Bell Laboratories

Lucent Technologies | Murray Hill, NJ | 1999-2000

- Developing new MEMS fabrication techniques now in use for the fabrication of large-scale optical cross-connects. Setting up a lab for the measurement and characterization of the dynamic properties of MEMS mirror arrays.
- Playing a key role in the team that transitioned a research concept into a Lucent product in just 18 months.

Staff Scientist

Cornell Nanofabrication Facility | Ithaca, NY | 1997–1999

- Collaborating with scientists both within and external to Cornell to fabricate nanostructures using state-of-the-art electron beam lithography systems. Gaining experience on a wide variety of research programs involving nanotechnology.
- Primarily responsible for a state-of-the-art 100 kV electron beam lithography system.
- Working in all areas of nano and micro fabrication, including optical lithography, reactive ion etching, and wet etching.

Research Assistant

Cornell University | Ithaca, NY | 1995–1997

- Developing technologies for the fabrication and measurement of ultra-small silicon mechanical structures.
- Studying under Professor Harold Craighead in applied and engineering physics.
- Gaining worldwide recognition for the fabrication of the nanoguitar, emblematic of the pioneering research being conducted.

Education

Ph.D. in Physics, 2000
Cornell University | Ithaca, NY

- Dissertation research on nanomechanical structures in Silicon, under Professor Harold Craighead

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Master of Science in Physics, 1997
Cornell University | Ithaca, NY

Bachelor of Science in Mathematics, 1994
Oklahoma State University | Stillwater, OK

- Graduated with double major in mathematics and physics
- Outstanding senior award in both mathematics and physic departments
- 3.98 / 4.0 GPA

Publications

- H. B. Chan, Z. Marcet, Kwangje Woo, D. B. Tanner, D. W. Carr, J. E. Bower, R. A. Cirelli, E. Ferry, F. Klemens, J. Miner, C. S. Pai, Ja. A. Tayler. *Optical Transmission Through double-layer metallic subwavelength slit arrays*. **Opt. Let.** 31, 516 (2006).

- D. W. Carr, G. R. Bogart, B. E. N. Keeler, **Hilton Head 2004 Sensors and Actuators Workshop**, Hilton Head Island, June 6-10, 2004.

- B. E. N. Keeler, D. W. Carr, J. P. Sullivan, T. A. Friedmann, and J. R. Wendt, E*xperimental demonstration of a laterally deformable optical NEMS grating transducer.* **Opt. Lett.** 29, 1182 (2004).

- D. W. Carr, J. P. Sullivan, T. A. Friedmann. *Laterally deformable nanomechanical zero order gratings: Anomalous diffraction studied by rigorous coupled wave analysis*. **Opt. Lett.** 28, 1636 (2003) .

- V. A. Aksyuk, F. Pardo, D. Carr, H. B. Chan, M.E. Simon, A. Gasparyan, H. Shea, V. Lifton, C. Bolle, S. Arney, R. Frahm, M. Paczkowski, M. Haueis, R. Ryf, D. Neilson, J. Kim, R. Giles, J. Gates and D. Bishop. *Lucent Beam-Steering Micromirrors for Large Optical Crossconnects*. **J. Lightwave Tech.**, 21, 634 (2003).

- Guillorn, Carr, Tiberio, Greenbaum, and Simpson, *Fabrication of Dissimilar Metal Electrodes with Nanometer Interelectrode Distance for Molecular Electronic Device Characterization*. **J. Vac. Sci. Tech B**, 18, 1177 (2000).

- Chen, Calvet, Reed, Carr, Grubisha, and Bennett, *Electronic Transport through Metal-1,4-phenylene diisocyanide-metal Junctions*. **Chem. Phys. Let.**, 313, 741 (1999).

- Carr, D. W. and Craighead, H. G. *Fabrication of nanoelectromechanical systems in single crystal silicon using silicon on insulator substrates and electron beam lithography.* **J. Vac. Sci. Technol**. B 15, 2760 (1997).

- Carr, D. W. and Craighead, H. G. *Measurement of nanomechanical resonant structures in single-crystal silicon*. **J. Vac. Sci. Technol. B** 16, 3821 (1998).

- Carr, D. W., Evoy S., Sekaric, L., Craighead H. G., and Parpia J. M. *Measurement of mechanical resonance and losses in nanomechanical structures in silicon*. **Appl. Phys. Lett.** 75, 920 (1999).

- Evoy, S., Carr, D. W., Sekaric L., Okhovets A., Craighead H. G., Parpia, J. M. *Nanofabrication and electrostatic operation of single-crystal silicon paddle oscillators*. **J. Appl. Phys.** 86, 6072 (1999).

Patents

- U.S. Patent – No. 9,689,714 (D. W. Carr) Multiplexed fiber-coupled Fabry-Perot sensors and method therefor
- U.S. Patent - No. 7,894,618 (D. W. Carr) Apparatus comprising a directionality-enhanced acoustic sensor
- U.S. Patent - No. 7,626,707 (D. W. Carr) Dual cavity displacement sensor
- U.S. Patent - No. 7,583,390 (D. W. Carr) Accelerometer comprising an optically resonant cavity
- U.S. Patent – No. 7,495,775 (D. W. Carr) Optical displacement sensor comprising a wavelength-tunable optical source
- U.S. Patent – No. 7,359,067 (D. W. Carr) Optical displacement sensor comprising a wavelength-tunable optical source
- U.S. Patent – No. 7,554,674 (D. W. Carr) Optical displacement sensor
- U.S. Patent – No. 7,355,723 (D. W. Carr) Apparatus comprising a high-signal-to-noise displacement sensor and method therefor
- U.S. Patent – No. 7,355,723 (D. W. Carr) Optical Displacement Sensor
- U S. Patent – No. 7,339,738 (Carr, Bogart, Keeler) Nanomechanical near-field grating apparatus and acceleration sensor formed therefrom
- US. Patent – No. 6,515,751, Mechanically Resonant Nanostructures. Craighead, H. G., Carr, D. W., Sekaric, L.
- U.S. Patent –No. 6,442,307 (Carr, et al.), Solder-packaging optical MEMs device and method for making the same
- U.S. Patent – No. 6,519,075 (Carr, et al.), Packaged MEMs device and method for making the same

- U.S. Patent – No. 6,743,988 (Bao, Bishhop, Boie, Carr, Chandross, and Ho), Optically Controlled Switches.
- U.S. Patent – No. 6,900,575 (Olkhovets, Carr, Craighead, Parpia) Multiple mechanical resonator parametric device.
- U.S. Patent – No. 6,930,387 (Carr, Pardo) Dicing Tape and Die Ejection Method.
- U.S. Patent – No. 6,846,087 (Carr, et al) Micromirror having counterbalancing structures and method for manufacturing same.

Skills

Programming / Software

- Remix
- React
- Node.js
- Python
- Rust
- Javascript
- JSX
- Typescript
- Matlab
- Labview
- Comsol
- Pro/E
- Creo
- Solidworks
- Cadence Allegro
- Orcad Schematic
- PSPice
- Zemax
- Labview
- C/C++
- Assembly Language