

# Nathan P. Bickel

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## RESEARCH ENGINEER

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Innovative, resourceful, and detail-driven individual, with interdisciplinary training in the research and development of semiconductor based photonic devices. Strong team member but proven capable as an independent researcher. Good communications and interpersonal skills, with years of experience in cross-cultural interaction. Push until project is done attitude.

## QUALIFICATION SUMMARY

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- ◆ Originated processes for the integration of multiple functions into more complex photonic devices.
- ◆ Generated alternative fabrication methods, as needed, to realize design goals.
- ◆ Detailed, hands-on knowledge of micro- and nanofabrication processes for semiconductors, dielectrics, metals, and polymers.

## CAREER HIGHLIGHTS

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### [CREOL, The College of Optics & Photonics](#), University of Central Florida, Orlando, FL

**Postdoctoral Research Scientist**

**8/2010-12/2010 (Short-term Contract)**

- ◆ Construction of nonlinear optical isolators as key part of a multi-institution project.
- ◆ Electron beam processing of photolithographic masks and nano-imprinting masters.
- ◆ Oversaw all day-to-day lab and cleanroom operations; mentored graduate students.

**Graduate Research Assistant**

**8/2002-8/2010**

- ◆ **Photonic Device Development (III-V Wafer Materials):**
  - ◇ Originated method for suppression of vacancy disordering in quantum dots. Required fewer process steps vs. existing methods which reduced cycle time and cost.
  - ◇ Leveraged challenges posed by equipment losses to establish waveguide fabrication method for semiconductor devices now employed group-wide.
  - ◇ Addressed design issues and realized compact, multimode, all-optical switches.
  - ◇ Modeled photonic integrated circuits using beam propagation analysis software.
  - ◇ Development of MQW-based beam steering devices, with steering controlled through the creation of virtual waveguides. Provided an alternative to component cascading.
  - ◇ Tailored dry etching and PECVD processes to meet device fabrication requirements.
- ◆ **Nanostructure/Nano-Device Fabrication:**
  - ◇ Solved challenges in creating sub-100 nm, high aspect ratio, nanopillar arrays.
  - ◇ Conducted studies on nanopore formation in semiconductors for device application.

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**Graduate Research Assistant**

**8/2002-8/2010**

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◆ **Cleanroom Operations:**

- ◇ All day-to-day supervision – Established standardized training process, wrote user and equipment manuals, initiated push to bring facility in line with EHS regulations, and dealt with suppliers.

**ASML, Fine Alignment Group, Wilton, CT**

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**Optical Manufacturing Engineer/Lead Engineer**

**1/2000-8/2002**

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◆ **Manufacturing:**

- ◇ Identified manufacturing issues on step and scan lithography systems and generated solutions.
- ◇ Promoted to lead engineer on QML projection optics line after 1 year.
- ◇ Minimized production delays by actively monitoring photolithographic test stands.
- ◇ Field service liaison and primary diagnostician for “in the field” alignment corrections of optical systems (On call all hours).

◆ **Process and System Development:**

- ◇ Introduced procedures to shift responsibility of certain process steps to technicians, freeing engineering staff for more essential work.
- ◇ Diagnosed production issues for 193 nm (Micrascan V) projection optics line, working extended hours to push completion (10 to 15 per week).
- ◇ Physical buildup and alignment of lithography test stand for 157 nm system.

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**OTHER SKILLS**

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◆ **Software Tools:**

- ◇ BeamPROP (BPM), LabVIEW, MATLAB, Origin, AutoCAD, L-Edit, Adobe Photoshop, and Microsoft Office Suite.

◆ **Equipment:**

- ◇ Plasma enhanced chemical vapor deposition (PECVD), reactive ion etching (RIE), ICP-RIE, rapid thermal annealing systems, and diffusion furnaces.
- ◇ Scanning electron microscope, atomic force microscope, and micro-profilometers.
- ◇ Thermal evaporation and electron beam evaporation systems.
- ◇ Photolithography, electron beam lithography, and mask aligner technology.
- ◇ Optical spectrum analyzers, photodetectors, optical circulators, and power meters.
- ◇ Lasers systems operation: Fiber lasers, Ti-Saph, Argon-Ion, etc.

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**ACADEMIC HISTORY**

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[CREOL, The College of Optics & Photonics](#), University of Central Florida, Orlando, FL

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- ◆ **Ph.D. in Optics ■ 2010** **GPA: 3.87/4.0**  
    **Advisor:** Dr. Patrick LiKamWa  
    **Dissertation Title:** “*Electro-Optical and All-Optical Switching in Multimode Interference Waveguides Incorporating Semiconductor Nanostructures*”

[Institute of Optics](#), University of Rochester, Rochester, NY

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- ◆ **M.S. in Optics ■ 1999** **GPA: 3.45/4.0**
- ◆ **B.S. in Optics (w/distinction) ■ 1998** **GPA: 3.25/4.0**

**REFERENCES**

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Available Upon Request