

Selected Expertise

- Medical Product Design / Development
 - Optics – Geometric, Diffractive, Waveguide, Optical Technology, Optical Materials
 - Networks, data links, protocols
 - Fiber Optics
 - Lasers & Light Systems
 - Embedded Computer Systems, Microcontrollers
 - Infrared Materials, Technology, Products
 - Imaging & Microscopy (SEM & Optical), Spectroscopy
 - Software & Programming, Embedded & High Level Languages
 - Electronics, Embedded design
 - Sensors, data acquisition
 - Semiconductor Metrology, Photovoltaics, Renewables
 - Project Planning / Management
 - ISO 9000, SPC
 - Tooling / Process Development
 - Market / Patent Research
 - Grant Writing
 - Expert Witness
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Employment History

From: 2005 **California Optical Engineering, Inc.**
To: Present Escondido, CA
Position: *President & Principal*

Consulting in technology & product development (primarily medical and industrial), marketing, business. Specialized in software and hardware (electronics, sensors, optics) development for medical devices and communications, using a variety of platforms (Linux/Windows) and languages (e.g. C/C++, Java, assembly, VHDL, Python). Sample project areas: high-speed hybrid optical-electronic data networks (voice, data, & video, USB, Ethernet, CAN, serial using ARM, AVR, FPGA, others), machine-vision flow control systems (prototyping in Matlab), robotic automated animal marking systems (embedded controls), machine vision for computer aided surgery, embedded systems for dosimetry & flow measurement, polymer materials analysis & evaluation, optical design for in-vivo probes, optical blood glucose monitoring, monitoring of optical ablation of arterial plaque, colorimetric measurement of fluid concentration, ophthalmic instruments, endoscopic/laryngoscopic design.

CV for David Schaafsma

From: 1998 **Ipitek/Tetra Tech Data Systems**
To: 2004 Carlsbad, CA
Position: *Director of Sensor Products*

Responsible for overall management and technical leadership of fiber optic sensor group (scientists, engineers, salespeople, and technicians): R&D, product management, engineering, business development, sales & marketing. Instrument electronic design: photoreceivers (e.g. low noise, high linearity and high speed), embedded processing (uC/PGA, DSP), interfacing (serial, Ethernet, some USB, displays, keypad, etc.), CPLD & FPGA (Xilinx) design. Redesigned temperature sensor product, improving performance & cost. Initiated supplier relationships with medical, automotive, aerospace customers. Software development: embedded processing (ARM, 8051, x86, eZ80), DSP (Analog/TI), scientific computing, numerical modeling. Conceived, initiated, & directed R&D and product development in thermal, acoustic, pressure, biological, chemical, and e-field sensors, as well as communications devices & systems. Other R&D projects: millimeter-wave links, DWDM/UDWDM networks, wavelength cross-connects, fiber optic switches, avionics networks, and secure communications. Over 30 patent disclosures & 2 patents.

From: 1996 **U.S. Naval Research Laboratory**
To: 1998 Washington, DC
Position: *Senior Scientist*

Developed devices & applications for chalcogenide (CG) fibers and integrated optics. Authored three patents, several publications resulting from research. R&D accomplishments: first chalcogenide SM fused coupler, first IR singlemode near-field optical microscope probe, first model of 1.3 μm CG fiber amplifiers, made CG fiber Bragg gratings. Built electro-mechanical system for fiber tapering. Wrote optical amplifier modeling code in C using open source compiler (Windows platform). Other R&D areas: IR scene simulation, Raman amplifiers in CG, chemical sensors, microlensed fibers, photosensitive waveguides & photo-doping.

CV for David Schaafsma

From: 1992 **National Institutes of Standards and Technology**
To: 1996 Boulder, CO
Position: *Research Associate*

R&D in quantum optics of vertical-cavity surface-emitting semiconductor lasers. Set up, instrumented, wrote code for, and maintained optical characterization laboratory. Provided primary optical characterization support for all structures grown in NIST MBE machine. Designed, modeled, characterized laser structures for MBE growth. Wrote code for multilayer dielectric modeling with complex index using Borland C++. Designed instrumentation and wrote instrument control software (in Borland C) for photon counting spectroscopy system (noise floor 4 photons). Other measurements: reflectance, photoluminescence, DCXRD, SEM, and X-ray. Other R&D accomplishments: quantum well interdiffusion, crosstalk in VCSEL arrays, angular and spectral dispersion of and spectral drift of the fundamental lasing mode in VCSELs.

From: 1989 **Bandgap Technology Corp.**
To: 1992 Broomfield, CO
Position: *Senior Materials Characterization Engineer*

Primary quality control officer for a start-up compound semiconductor manufacturing company. Designed & supervised construction of characterization laboratory with budget over \$2M. Developed and maintained characterization facilities (hardware, software, training, calibration, etc). Wrote numerous GUI instrument control & data acquisition applications for HP Unix workstations using XWidget & Athena toolkits. Primary technical interface to customers. Responsible for analysis and interpretation of all wafer test data. Set up and administered HP 9000 Unix cluster network for characterization and manufacturing. Trained and supervised technicians and engineers, implemented SPC. One of 4 lead engineers responsible for design and equipping of 2000 sq-ft Class 10 clean room. Techniques used: PL, photorefectance, parametric testing, C-V profiling, Hall effect, resistivity/particulate screening, Nomarski microscopy, DCXRD, and RF device characterization.

From: 1984 **University of Washington, Stanford Linear Accelerator Center**
To: 1987 Seattle, WA and Stanford, CA
Position: *Research Engineer*

CV for David Schaafsma

Designed, built, debugged, and maintained automatic control system for cryogen delivery system for superconducting linac booster. Designed control electronics, directed electronics technicians. Leak tested and verified vacuum and cryogenic systems, maintained and optimized He refrigerator. Retrofit klystron modulators and control electronics for linear accelerator.

Patents

<u>Patent</u> <u>Number</u>	<u>Date</u> <u>Issued</u>	<u>Title</u>
6,285,811	2001	Near-field optical microscope with infrared fiber probe
5,949,935	1999	Infrared optical fiber coupler

Education

<u>College/University</u>	<u>Degree</u>
University of Colorado, Boulder, CO	Ph.D., Physics
Brown University, Providence, RI	M.S., Physics
Whitman College, Walla Walla, WA	B.A., Physics

Publications / Presentations

1. "Comparison of analysis methods for fluorescence lifetime imaging," T. Hall, D.A. Dorroh, S.E. Robertson, and D.T. Schaafsma, SPIE BIOS/Photonics West, Paper #8227 (2012).
2. "Fiber pressure sensors based on periodical mode coupling effects," Haim Lotem, Wen C. Wang, Michael Wang, David Schaafsma, Bob Skolnick, and Haim Grebel, *Proc. SPIE* **5758**, 239 (2005).
3. "All-dielectric miniature wide-band RF receive antenna," Wen Wang, Weiping Lin, Hank Marshall, Bob Skolnick, and David Schaafsma, *Opt. Eng.* **43**, (2004).
4. "Electro-optic RF receive antenna," Wen C. Wang, Weiping Lin, Hank Marshall, David Schaafsma, and Richard Chaung, *SPIE Digital Wireless Communication V* **5100**, 149 - 156 (2003).
5. "Fiberoptic temperature sensors for medical applications," David Schaafsma, Gail Palmer, and James Bechtel, *Proc. SPIE*, (2003).
6. "Efficacy and Performance of Emissivity Cancellation Probes for Pyrometric Systems," M. Fisher and D. Schaafsma, *RTP 2000*, Baltimore, MD, Sept. 2000.

CV for David Schaafsma

7. "Aircraft Fail-Safe Self-Monitoring System," Anthony C. Jackson and David T. Schaafsma, presented at *the 4th Joint DoD/FAA/NASA Conference on Aging Aircraft*, St. Louis, MO, May 2000.
8. "Chalcogenide fibers: an overview of applications," J.A. Moon and D.T. Schaafsma, *Fiber & Integrated Optics* **19**, June 2000.
9. "Comparison of conventional and gain-clamped semiconductor optical amplifiers for wavelength division multiplexed transmission systems," D.T. Schaafsma, E. Miles, and E.M. Bradley, *J. Lightwave Tech.* (July 2000).
10. "Fabrication of Singlemode Chalcogenide Fiber Probes for Scanning Near-Field Infrared Optical Microscopy," D.T. Schaafsma et al, *Opt. Eng.*, (August 1999).
11. "Cross-Gain Modulation and Frequency Conversion Crosstalk Effects in 1550-nm Gain-Clamped Semiconductor Optical Amplifiers," D.T. Schaafsma and E.M. Bradley, *Photon. Tech. Lett.* **11**, 727 (1999).
12. "Singlemode chalcogenide fiber infrared SNOM probes," D.T. Schaafsma, R. Mossadegh, J.S. Sanghera, I.D. Aggarwal, J.M. Gilligan, N.H. Tolk, M. Luce, R. Generosi, P. Perfetti, A. Cricenti, and G. Margaritondo, *Ultramicroscopy* **77**, 77 (1999).
13. "First Experimental Results with the Free Electron Laser Coupled to a Scanning Near-Field Optical Microscope," A. Cricenti, R. Generosi, C. Barchesi, M. Luce, M. Rinaldi, C. Coluzza, P. Perfetti, G. Margaritondo, D.T. Schaafsma, I.D. Aggarwal, J.M. Gilligan, and N.H. Tolk, *Phys. Stat. Sol. A* **170**, 241 (1998).
14. "Cation vacancy formation and migration in the AlGaAs heterostructure system," P. Mitev, S. Seshadri, L. J. Guido, D. T. Schaafsma, and D. H. Christensen, *Appl. Phys. Lett.* **73**, 3718 (1998).
15. "Modeling of Dy³⁺-doped GeAsSe glass 1.3 μ m optical fiber amplifiers," D.T. Schaafsma, L.B. Shaw, B. Cole, J.S. Sanghera, and I.D. Aggarwal, *Photon. Tech. Lett.* **10**, 1548 (1998).
16. "Chalcogenide optical fiber couplers for chemical sensing, telecommunications, and infrared lasers," D.T. Schaafsma, L.B. Shaw, L.E. Busse, J.S. Sanghera, and I.D. Aggarwal, CLEO 98, paper CThP4 (1998).
17. "Dy³⁺-doped GeAsSe 1.3 μ m optical fiber amplifiers," L.B. Shaw, D.T. Schaafsma, B.J. Cole, P. Pureza, R. Mossadegh, V.Q. Nguyen, J.S. Sanghera, and I.D. Aggarwal, presented at CLEO '98.
18. "Rare earth doped selenide glass optical sources," L.B. Shaw, B. Cole, D.T. Schaafsma, B.B. Harbison, J.S. Sanghera, and I.D. Aggarwal, presented at OFC '98.
19. "Rare earth doped glass fibers as sources for IRSS," L.B. Shaw, D.T. Schaafsma, B.J. Cole, B.B. Harbison, J.S. Sanghera, and I.D. Aggarwal, presented at AeroSense '98.
20. "Dy-doped selenide glass for 1.3 μ m optical fiber amplifiers," L.B. Shaw, B.J. Cole, J.S. Sanghera, I.D. Aggarwal, and D.T. Schaafsma, presented at OFC '98.
21. "Fabrication of Singlemode Chalcogenide Optical Fiber," R. Mossadegh, D.T. Schaafsma, J.S. Sanghera, V.Q. Nguyen, R.A. Miklos, and I.D. Aggarwal, *J. Lightwave Technol.* **16**, 214 (1997).

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22. "Fused taper infrared optical fiber couplers in chalcogenide glass," D.T. Schaafsma, J.A. Moon, J.S. Sanghera, and I.D. Aggarwal, *J. Lightwave Technol.* **15**, 214 (1997).
23. "Mode splitting in vertical-cavity microlasers from side-emission measurements," D.T. Schaafsma and D.H. Christensen, CLEO 97, paper CWG4 (1997).
24. "Evaluation of the IR transitions in rare-earth doped chalcogenide glasses," L.B. Shaw, D.T. Schaafsma, J.A. Moon, J.S. Sanghera, B.B. Harbison, and I.D. Aggarwal, CLEO 97, paper CWF48 (1997).
25. "Cavity coupling in vertical-cavity semiconductor lasers," D.T. Schaafsma and D.H. Christensen, NIST Technical Note #5047 (1997).
26. "Mode splitting in side emission from vertical-cavity surface-emitting lasers," D.T. Schaafsma and D.H. Christensen, *Phys. Rev. B* **54**, 14618 (1996).
27. "Cross-sectional microphotoluminescence and buried layer structures," D.H. Christensen and D.T. Schaafsma, 1995 OSA Annual Meeting, p.124, Portland, OR, Sept 10-15 (1995).
28. "Cross-sectional photoluminescence and its application to buried-layer semiconductor structures," D.T. Schaafsma and D.H. Christensen, *J. Appl. Phys.* **78**, 694 (1995).
29. "Vacancy diffusion and Al-Ga interdiffusion in quantum well heterostructures," S. Seshadri, P. Mitev, L.J. Guido, S. Smith, R.D. Burnham, D.T. Schaafsma, and D.H. Christensen, Proc. 21st Intl. Symp. On Compound Semiconductors, San Diego, CA (1994).
30. "Correlation of optical, X-ray, and electron microscopy measurements on semiconductor multilayer structures," D.H. Christensen, R.K. Hickernell, D.T. Schaafsma, J.G. Pellegrino, M.J. McCollum, and R.S. Rai, in *Spectroscopic Characterization Techniques for Semiconductor Technology V*, SPIE Proc. **2141**, 177 (1994).
31. "A self-consistent investigation of coupled vacancy and host-atom diffusion in AlGaAs:GaAs quantum well heterostructures," S. Seshadri, P. Mitev, L.J. Guido, D.T. Schaafsma, D.H. Christensen, M.J. McCollum, S. Smith, and R.D. Burnham, Electronic Materials Conference (1994).
32. "Measurement and simulation of photoluminescence spectra from vertical-cavity surface-emitting laser structures," D.T. Schaafsma, R.K. Hickernell, and D.H. Christensen, in *Quantum Well and Superlattice Physics V*, SPIE Proc. **2139**, 93 (1994).
33. "Comparative photoluminescence measurement and simulation of vertical-cavity semiconductor laser structures," D.T. Schaafsma, R.K. Hickernell, and D.H. Christensen, in *Growth, Processing, and Characterization of Semiconductor Heterostructures*, MRS Symp. Proc. **326**, 483 (1994).
34. "Rapid growth of thick, IC quality GaAs from a flowing solution," E.E. Crisman, C.B. Roberts, D.T. Schaafsma, and H.J. Gerritsen, Fall MRS Meeting, Boston, MA (1989).

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Organizations/ Affiliations

- Executive Editor, *Fiber & Integrated Optics* (peer-reviewed bi-monthly technical journal published by Taylor & Francis)
- Past Member of American Physical Society, Institute of Electrical & Electronics Engineers, Materials Research Society

Litigation/IP Support Experience

Date	Client/ Case
2012	James R. Rogers <i>Bicknell v. West Hills Hospital</i> Personal Injury – product liability, testing of external pacemaker Performed data analysis, product testing.
2012-2013	Molever-Conelly, LLP <i>Kim v. Carl Zeiss, Inc.</i> Product Liability – negligent product service resulting in loss of business. Performed product testing, provided expert opinion (reports). Deposed Jun. 2013, Trial Aug. 2013 (judgment for plaintiff).
2012	Weiss & Moy, LLP <i>Pacific Bioscience Laboratories v. Nutraluxe</i> Intellectual Property – skin brushes Performed data analysis, product testing, provided expert opinion.
2011-2013	Hogan-Lovells, LLP <i>Alere/Inverness v. Church & Dwight</i> Intellectual Property – pregnancy test device. Performed product analysis and interpretation. Settled 2013.
2010	Scheuring, Zimmerman& Doyle, LLP <i>Fonti. v. Wilmarth</i> Personal Injury – product liability, electrosurgical device Performed data analysis, product testing, provided expert opinion.
2009	Peach-Weathers <i>Franklin v. Ladies' Workout and Omron, Inc.</i> Tim Peach, Atty. Personal Injury – body fat analyzer

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Performed product analysis, testing, expert declaration.

2007-8

McKool-Smith

*Medtronic USA, Inc. v. Boston Scientific, Scimed
Life Systems Inc., and Boston Scientific Scimed, Inc.*

Josh Budwin, Atty.

Patent Infringement – angioplasty balloon/stent catheters

Performed patent analysis, product testing, claim construction
analysis, expert declaration and reports.

IP Development/Analysis

Date

Client

2008

Karasic Law Group

Patent Issues – Personal biomonitor device (pulse, respiration)

Performed patent analysis, product viability analysis, product
design.

2006-9

Helixis, Inc. (now Illumina, Inc.)

Patent & IP development

Assisted with IP development for genetic assay system

2007-9

Therafuse, Inc.

IP development

Developed IP & prototypes for optical flow measurement device
for drug delivery

2007-9

Alvarado Orthopedic Research

Patent & IP development

Developed IP for computer-aided arthroplasty system\

2003

L-3 Communications

Due diligence – technology/IP analysis for corporate acquisition

2002

Boston Scientific, Inc.

Patent & IP development

Analyzed (customer) patent for thermal therapy system