REPORT DOCUMENTATION PAGE

Title: Optoelectronic Materials Devices Systems Research

Author(s): Dr. Nicholas George, Center Director

Performing Organization: The Institute of Optics, University of Rochester, Rochester, NY 14627

Sponsoring/monitoring agency: U.S. Army Research Office, P.O. Box 12211, Research Triangle Park, NC 27709-2211

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ABSTRACT

In the Center for Opto-Electronic Systems Research at the University of Rochester, the primary goal of the faculty is to contribute fundamental scientific knowledge in the critical technology areas of lasers, modulation, optical system design, propagation and coherence, detection theory, signal and image processing, switching, neural networks, and displays. This research impacts on the following topics enumerated in the DoD critical technologies list: Photonics; Signal Processing; Passive Sensors; Software Productivity; and, to a lesser extent, Signature Control; Sensitive Radars; and Machine Intelligence or Robotics. Under the URI program, block funding will also permit us to educate a large number of superior doctoral scholars in a unique environment.
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<th>Section</th>
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<td>4-1</td>
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<tr>
<td>5. Cumulative Listing of Ph.D. Fellows</td>
<td>5-1</td>
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ARO-URI CENTER FOR
OPTO-ELECTRONIC SYSTEMS RESEARCH

OPTOELECTRONIC
MATERIALS
DEVICES
SYSTEMS
RESEARCH

ABSTRACT

In the Center for Opto-Electronic Systems Research at the University of Rochester, the primary goal of the faculty is to contribute fundamental scientific knowledge in the critical technology areas of lasers, modulation, optical system design, propagation and coherence, detection theory, signal and image processing, switching, neural networks, and displays. This research impacts on the following topics enumerated in the DoD critical technologies list: Photonics; Signal Processing; Passive Sensors; Software Producibility; and, to a lesser extent, Signature Control; Sensitive Radars; and Machine Intelligence or Robotics. Research in optics and photonics is inherently broad and encompassing, and significant positive influence can be anticipated across a major sector of our economy, as follows: (a) defense systems, (b) factory and office automation, and (c) communications. In addition to the normal emphasis on refereed publications in the open literature, the nine (9) faculty principals also plan to continue an extensive, successful, innovative program of technology transfer with the appropriate Army laboratories, including seminars, workshops, joint research, and long-term working visits. Furthermore, under the URI program, block funding has enabled us to educate a large number of superior doctoral scholars in a unique environment. This environment includes an eminent, cross-disciplinary faculty, an unexcelled capital facility in electrooptics, and industrial interactions with two major local corporations (Xerox and Eastman Kodak) as well as 25 U.S. corporations who are actively engaged in all aspects of photonics. This program of research is also provided at a reasonable cost to ARO due to substantial cost-sharing and careful management by the University of Rochester.
# Productivity Chart

<table>
<thead>
<tr>
<th>Year</th>
<th>Faculty (Sec. 2.1 to 2.3)</th>
<th>Publications (Cum: Sec. 3.1 to 3.16)</th>
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<td>96-97</td>
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<td>9</td>
<td>21</td>
<td>4 (6)</td>
<td>221</td>
</tr>
</tbody>
</table>

†Page references are indicated in the above table.
SCIENTIFIC PERSONNEL

Nicholas George  Director, ARO-URI Center for Opto-Electronic Systems Research; Wilson Professor of Electronic Imaging; and Professor of Optics and Professor of Electrical Engineering (Ph.D. Electrical Engineering and Physics, California Institute of Technology; M.S. University of Maryland; B.S. University of California, Berkeley)

Novel electronic imaging systems for automatic pattern recognition, imaging through turbulence, fog and smoke, and true-height contour holograms; sub-resolution in color scanning and printing, include dithering and compression

Robert W. Boyd  Associate Director, ARO-URI Center for Opto-Electronic Systems Research and Professor of Optics (Ph.D. Physics, University of California, Berkeley; B.S. Physics, Massachusetts Institute of Technology)

Development of nonlinear optical materials, especially composite materials; applications of nonlinear optics, including optical power limiters, phase conjugate mirrors, optical fiber devices, frequency conversion devices, and optical amplifiers

Govind P. Agrawal  Professor of Optics (Ph.D. and M.S., Indian Institute of Technology, New Delhi, India)

Femtosecond dynamics of semiconductor lasers; feedback induced enhancement of laser noise; soliton amplification and generation in doped fibers; spatio-temporal coupling in nonlinear media and its role in mode locking Ti:sapphire lasers

Dennis G. Hall  Director of The Institute of Optics and William F. May Professor of Optics (Ph.D. Physics, University of Tennessee; B.S. Physics, University of Illinois, Urbana-Champaign)

Semiconductor opto-electronics; broad area, surface-emitting semiconductor lasers
SCIENTIFIC PERSONNEL (CONTINUED)

Susan Houde-Walter  Professor of Optics
(Ph.D. and M.S. Optics, University of Rochester; B.A., Sarah Lawrence College)
Optoelectronic materials and design: III-V semiconductors, optical glass, design methods for monolithic integration of optoelectronics

Stephen D. Jacobs  Associate Professor of Optics and Senior Scientist at the Laboratory for Laser Energetics
(Ph.D. Optics, University of Rochester)
Polymer liquid crystal flake inks for applications, including reflective paints and pigments, friend/foe discrimination

G. Michael Morris  Professor of Optics
(Ph.D. and M.S. Electrical Engineering, California Institute of Technology; B.S. Engineering Physics, University of Oklahoma)
Diffractive optics technology, including optical system design, manufacture of diffractive structures, and subwavelength structured surfaces

Carlos R. Stroud  Professor of Optics
(Ph.D. Physics, Washington University; A.B. Physics and Mathematics, Centre College)
Quantum electronics with ultrashort laser pulses, remote sensing with modulated laser fields

Emil Wolf  Wilson Professor of Optical Physics, Professor of Physics and Professor of Optics
(Ph.D., Bristol; D.Sc. Edinburgh)
Structure of the focal region; inverse problems, especially diffraction tomography and super-resolution; theory of partial coherence, with applications to radiometry and spectroscopy
<table>
<thead>
<tr>
<th>Faculty Investigator</th>
<th>Phone</th>
<th>Fax</th>
<th>E-Mail Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Govind Agrawal</td>
<td>(716) 275-4846</td>
<td>(716) 244-4936</td>
<td><a href="mailto:gpa@optics.rochester.edu">gpa@optics.rochester.edu</a></td>
</tr>
<tr>
<td>Robert W. Boyd</td>
<td>275-2329</td>
<td>273-1075</td>
<td><a href="mailto:boyd@optics.rochester.edu">boyd@optics.rochester.edu</a></td>
</tr>
<tr>
<td>Associate Director</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nicholas George</td>
<td>275-2417</td>
<td>244-6150</td>
<td><a href="mailto:ngeorge@troi.cc.rochester.edu">ngeorge@troi.cc.rochester.edu</a></td>
</tr>
<tr>
<td>Director</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dennis G. Hall</td>
<td>275-2134</td>
<td>273-1072</td>
<td><a href="mailto:hall@optics.rochester.edu">hall@optics.rochester.edu</a></td>
</tr>
<tr>
<td>Susan N. Houde-Walter</td>
<td>275-7629</td>
<td>271-1027</td>
<td><a href="mailto:shw@optics.rochester.edu">shw@optics.rochester.edu</a></td>
</tr>
<tr>
<td>Stephen D. Jacobs</td>
<td>275-4837</td>
<td>275-5960</td>
<td><a href="mailto:sjac@lle.rochester.edu">sjac@lle.rochester.edu</a></td>
</tr>
<tr>
<td>G. Michael Morris</td>
<td>275-5140</td>
<td>271-1027</td>
<td><a href="mailto:morris@optics.rochester.edu">morris@optics.rochester.edu</a></td>
</tr>
<tr>
<td>Carlos R. Stoud</td>
<td>275-2598</td>
<td>244-4936</td>
<td><a href="mailto:stroud@optics.rochester.edu">stroud@optics.rochester.edu</a></td>
</tr>
<tr>
<td>Emil Wolf</td>
<td>275-4397</td>
<td>473-0687</td>
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</tr>
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</table>


*File number for cumulative listing. 4-1


*File number for cumulative listing.


*File number for cumulative listing.


*File number for cumulative listing.
GOVIND P. AGRAWAL (continued)


*File number for cumulative listing. 4-5


*File number for cumulative listing.


Publications for URI Report

*File number for cumulative listing.  4-7
ROBERT W. BOYD (continued)


*File number for cumulative listing. 4-8


*File number for cumulative listing. 4-11


"Theory for the propagation of short electromagnetic pulses, Nicholas George and Stojan Radic, Opt Comm. 139, 1-6 (1997) (184)

"Diffraction from thick transmission relief gratings," D. Schertler and Nicholas George, in review, Appl. Opt. (190)

*File number for cumulative listing.


*File number for cumulative listing. 4-13
DENNIS G. HALL (continued)


*File number for cumulative listing. 4-14


*File number for cumulative listing. 4-15


*File number for cumulative listing.


*File number for cumulative listing. 4-18
G. MICHAEL MORRIS (continued)


*File number for cumulative listing. 4-20
CARLOS R. STROUD, JR. (continued)


*File number for cumulative listing. 4-21
ARO-URI Center for
OPTO-ELECTRONIC SYSTEMS RESEARCH

EMIL WOLF


*File number for cumulative listing. 4-22


*File number for cumulative listing. 4-23
ARO-URI PH.D. FELLOWS

The ARO-URI Center for Opto-Electronic Systems Research was established to contribute fundamental knowledge in the key technology areas of signal processing and image understanding, sources and sensors, and optical system design. A primary goal of the Center has been the education of outstanding Ph.D. graduate students through its affiliation with The Institute of Optics. To date, sixty Ph.D. Fellows have been supported since the beginning of the ARO-URI Center Program (1988). Of those, fifty have completed their theses and ten are in the process of finishing. This section contains a listing of the Ph.D. Fellows. Their thesis title is given along with their advisor and the year the thesis was completed or is expected. For those Fellows who have graduated, we also include their current location.
# Listing of Ph.D. Fellows

<table>
<thead>
<tr>
<th>Title / Fellows / Advisor</th>
<th>Year</th>
<th>Current Address</th>
</tr>
</thead>
</table>
| "Contributions to the theory of the electronic and optical properties of Si$_x$Ge$_{1-x}$ semiconductor superlattices"  
  Carel Martijn de Sterke  
  Dennis G. Hall, Advisor                  | 1987 | University of Sydney  
  Theoretical Physics Department  
  Sydney, Australia  
  NSW 2006                                |
| "Diffraction theory for polygonal apertures"  
  R. Edward English, Jr.  
  Nicholas George, Advisor                 | 1988 | Lawrence Livermore National Laboratory  
  P. O. Box L-462  
  Livermore, CA 94550  
  (510) 422-3602                           |
| "Two-beam coupling and phase conjugation by resonant nonlinear optical interactions"  
  Mark Tyree Gruneisen  
  PL/LITN  
  Kirtland Air Force Base  
  3550 Aberdeen Avenue, SE  
  Albuquerque, NM 87117-6008  
  (505) 846-4730                           |
| "Image recovery from partial Fresnel zone information"  
  Robert J. Rolleston  
  Nicholas George, Advisor                   | 1988 | Xerox Corporation  
  Webster Research Center  
  800 Phillips Road, 0128-27E  
  Webster, NY 14580  
  (716) 422-3138                           |
<table>
<thead>
<tr>
<th>Title / Fellow / Advisor</th>
<th>Year</th>
<th>Current Address</th>
</tr>
</thead>
</table>
| “Laser speckle from thin and cascaded diffusers”  
Lyle Gordon Shirley  
Nicholas George, Advisor | 1988 | MIT  
Lincoln Laboratory  
P. O. Box 73-KB370  
Lexington, MA 02173  
(617) 981-0774 |
| “Optical phase conjugation enhanced by the Brillouin interaction”  
Mark Daniel Skeldon  
Robert W. Boyd, Advisor | 1988 | Laboratory for Laser Energetics  
University of Rochester  
Rochester, NY 14627  
(716) 275-4781 |
| “Sol-gel method for making radial gradient-index glass”  
J. Brian Caldwell  
Duncan T. Moore, Advisor | 1989 | Enichem American, Inc.  
2000 Princeton Park  
Monmouth Junction, NJ 08852  
(908) 422-0400 |
| “Instabilities and chaos of laser beams propagating through nonlinear optical medium”  
Daniel Joseph Gauthier  
Robert W. Boyd, Advisor | 1989 | Duke University  
Department of Physics  
Durham, NC 27706 |
| “Quantum-limited image recognition”  
Thomas Arthur Isberg  
G. Michael Morris, Advisor | 1989 | 3M Company  
3M Center Bldg. 201-3E-03  
St. Paul, MN 55144-1000  
(612) 733-1110 |
<table>
<thead>
<tr>
<th>TITLE / FELLOW / ADVISOR</th>
<th>YEAR</th>
<th>CURRENT ADDRESS</th>
</tr>
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<tbody>
<tr>
<td>Karl William Koch, III, Carlos R. Stroud, Jr., Advisor</td>
<td></td>
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</tr>
<tr>
<td>&quot;Interaction of atomic hydrogen with pico- and femtosecond laser pulses&quot;</td>
<td>1989</td>
<td>University of Maryland, NIST, College Park, MD, (301) 405-1000</td>
</tr>
<tr>
<td>Jonathan S. Parker, Carlos R. Stroud, Jr., Advisor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Classification techniques for quantum-limited and classical-intensity images&quot;</td>
<td>1989</td>
<td>Illinois Institute of Technology, Electrical Engineering Department, 3301 South Dearborn, Chicago, IL 60616</td>
</tr>
<tr>
<td>Miles N. Wernick, G. Michael Morris, Advisor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Madeleine Marie Beal, Nicholas George, Advisor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Optical emission from single-crystal silicon&quot;</td>
<td>1990</td>
<td>Consultant</td>
</tr>
<tr>
<td>Phillip Laurence Bradfield, Dennis G. Hall, Advisor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Title / Fellow / Advisor</td>
<td>Year</td>
<td>Current Address</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------------------</td>
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<td>---------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>&quot;Nonlinear optical systems interacting with amplitude-modulated optical fields&quot;</td>
<td>1990</td>
<td>U.S.A.F. Phillips Laboratory</td>
</tr>
</tbody>
</table>
| Stephen H. Chakmakjian  
Carlos R. Stroud, Jr., Advisor                                                             |      | Nonlinear Optics Branch                                                           |
|                                                                                       |      | Kirtland Air Force Base                                                            |
|                                                                                       |      | Albuquerque, NM 87117-6008                                                         |
|                                                                                       |      | (505) 822-7000                                                                    |
| "Effects and control of the correlation properties of light sources"                   | 1990 | Rochester Photonics Corporation                                                   |
| Dean Faklis  
G. Michael Morris, Advisor                                                      |      | 330 Clay Road                                                                     |
|                                                                                       |      | Rochester, NY 14623                                                               |
|                                                                                       |      | (716) 272-3010                                                                    |
| "Stochastic and deterministic fluctuations in stimulated brillouin scattering"        | 1990 | Cornell University                                                                 |
| Alexander L. Gaeta  
Robert W. Boyd, Advisor                                                 |      | Applied & Engineering Physics                                                     |
|                                                                                       |      | Ithaca, NY 14853                                                                  |
|                                                                                       |      | (607) 255-9983                                                                    |
| "Fabrication and testing of index gradients in fluoride materials"                    | 1990 | Burleigh Instruments, Inc.                                                         |
| Michael T. Houk  
Duncan T. Moore, Advisor                                                      |      | Burleigh Park                                                                     |
|                                                                                       |      | Fishers, NY 14453                                                                 |
|                                                                                       |      | (716) 924-9355                                                                    |
| "Radial gradient lenses for single-mode optical systems"                               | 1991 | Rochester Photonics                                                               |
| John P. Bowen  
Duncan T. Moore, Advisor                                                      |      | 330 Clay Road                                                                     |
<p>|                                                                                       |      | Rochester, NY 14623                                                               |
|                                                                                       |      | (716) 272-3010                                                                    |</p>
<table>
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<tr>
<th>TITLE / FELLOW / ADVISOR</th>
<th>YEAR</th>
<th>CURRENT ADDRESS</th>
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<tr>
<td>&quot;Pulse shaping in colliding-pulse, mode-locked dye lasers&quot;</td>
<td>1992</td>
<td>University of Oregon</td>
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<tr>
<td>Mark K. Beck</td>
<td></td>
<td>Department of Physics</td>
</tr>
<tr>
<td>Ian A. Walmsley, Advisor</td>
<td></td>
<td>Eugene, OR 97403</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(503) 346-4751</td>
</tr>
<tr>
<td>&quot;Single point diamond turning of glass&quot;</td>
<td>1992</td>
<td>Rochester Photonics</td>
</tr>
<tr>
<td>Christian Gary Blough</td>
<td></td>
<td>330 Clay Road</td>
</tr>
<tr>
<td>Duncan T. Moore, Advisor</td>
<td></td>
<td>Rochester, NY 14623</td>
</tr>
<tr>
<td>Erwin G. Loewen, Advisor</td>
<td></td>
<td>(716) 272-3010</td>
</tr>
<tr>
<td>&quot;Recovery of particle size distributions from the far field scattering pattern&quot;</td>
<td>1992</td>
<td>Bio-Derm, Inc.</td>
</tr>
<tr>
<td>Scott D. Coston</td>
<td></td>
<td>Clearwater, FL</td>
</tr>
<tr>
<td>Nicholas George, Advisor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Wave guiding and grating coupling phenomena in silicon based integrated optics&quot;</td>
<td>1992</td>
<td>NiOptics Corp</td>
</tr>
<tr>
<td>Robert Milton Emmons</td>
<td></td>
<td>1801 Maple Avenue</td>
</tr>
<tr>
<td>Dennis G. Hall, Advisor</td>
<td></td>
<td>Evanston, IL 60201</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(708) 491-3196</td>
</tr>
<tr>
<td>&quot;Propagation, loss and free-carrier effects in silicon waveguide structures&quot;</td>
<td>1992</td>
<td>Corning Inc.</td>
</tr>
<tr>
<td>Alan Frank Evans</td>
<td></td>
<td>Sullivan Park, SP-FR-01-7</td>
</tr>
<tr>
<td>Dennis G. Hall, Advisor</td>
<td></td>
<td>Corning, NY 14831</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(607) 974-3947</td>
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**LISTING OF PH.D. FELLows (CONTINUED)**

<table>
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<tr>
<th>TITLE / FELLOW / ADVISOR</th>
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<tr>
<td>&quot;Global optimization in lens design&quot;</td>
<td>1992</td>
<td>Sinclair Optics Inc.</td>
</tr>
<tr>
<td><strong>Andrew E. W. Jones</strong></td>
<td></td>
<td>6780 Pittsford-Palmyra Road</td>
</tr>
<tr>
<td>Gregory W. Forbes, Advisor</td>
<td></td>
<td>Fairport, NY 14450</td>
</tr>
<tr>
<td>(716) 425-4380</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;An investigation of distributed coupling in a nonlinear semiconductor waveguide&quot;</td>
<td>1992</td>
<td>University of Rochester</td>
</tr>
<tr>
<td><strong>David Floyd Prelewitz</strong></td>
<td></td>
<td>Electronic Imaging Systems</td>
</tr>
<tr>
<td>Thomas G. Brown, Advisor</td>
<td></td>
<td>Rochester, NY 14627</td>
</tr>
<tr>
<td>(716) 275-0547</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Feedforward neural networks&quot;</td>
<td>1992</td>
<td>IBM</td>
</tr>
<tr>
<td><strong>Lennart A. Saaf</strong></td>
<td></td>
<td>East Fishkill Facility</td>
</tr>
<tr>
<td>G. Michael Morris, Advisor</td>
<td></td>
<td>Fishkill, NY 12524</td>
</tr>
<tr>
<td>(914) 894-8554</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Hamilton's methods applied to the design of asymmetric optical systems&quot;</td>
<td>1992</td>
<td>University of Rochester</td>
</tr>
<tr>
<td><strong>Bryan D. Stone</strong></td>
<td></td>
<td>The Institute of Optics</td>
</tr>
<tr>
<td>Gregory W. Forbes, Advisor</td>
<td></td>
<td>Rochester, NY 14627</td>
</tr>
<tr>
<td>(716) 275-6205</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;Design methods for gradient-index optical systems&quot;</td>
<td>1992</td>
<td>Co. Breault Research</td>
</tr>
<tr>
<td><strong>David Yih-Hsing Wang</strong></td>
<td></td>
<td>7820 East Broadway, Suite 207</td>
</tr>
<tr>
<td>Duncan T. Moore, Advisor</td>
<td></td>
<td>Tucson, AZ 85710</td>
</tr>
<tr>
<td>(602) 721-0500</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
LISTING OF PH.D. FELLOWS (CONTINUED)

TITLE / FELLOW / ADVISOR

"Nonlinear optical modification to the polarization and noise properties of a laser beam after propagating through atomic-potassium vapor"

William V. Davis
Robert W. Boyd and Leonard Mandel, Advisors

1993
Eastman Kodak Company
3/81/RL MC02017
Rochester, NY 14650
(716) 588-6318

"Group III-vacancy mediated disordering of intrinsic and n-type AlGaAs/GaAs"

Brian L. Olmsted
Susan N. Houde-Walter, Advisor

1993
University of Georgia
Dept. Physics & Astronomy
Athens, GA 30602
(706) 542-2485

"Subwavelength structured surfaces: theory and experiments"

Daniel Henri Raguin
G. Michael Morris, Advisor

1993
Rochester Photonics Corporation
330 Clay Road
Rochester, NY 14623
(716) 272-3010

"Wavelength and roughness dependence of backscattering"

Donald John Schertler
Nicholas George, Advisor

1993
University of Rochester
The Institute of Optics
Rochester, NY 14627
(716) 275-5805

"Optical absorption, emission, and modulation in III-V semi-conductor quantum well structures"

Steven Marc Shank
Gary W. Wicks, Advisor

1993
Galileo Electro-Optics
Ithaca, NY
<table>
<thead>
<tr>
<th>Title / Fellow / Advisor</th>
<th>Year</th>
<th>Current Address</th>
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</thead>
<tbody>
<tr>
<td>&quot;Experimental determination of the dynamics of a molecular nuclear wave packet via the spectra of a spontaneous emission&quot; Thomas J. Dunn Ian A. Walmsley, Advisor</td>
<td>1994</td>
<td>Anvik Corporation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>250 Clearbrooke Road</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Elmsford, NY 10523</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(914) 345-2442</td>
</tr>
<tr>
<td>Spatial optical transforms with applications&quot;</td>
<td>1994</td>
<td>Advanced Optical Systems, Inc.</td>
</tr>
<tr>
<td>Keith Bryan Farr</td>
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<td>(205) 650-5960</td>
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<tr>
<td>&quot;Semiclassical dynamics of Rydberg electron wave packets&quot;</td>
<td>1994</td>
<td>University of Kansas</td>
</tr>
<tr>
<td>Mark R. Mallalieu</td>
<td></td>
<td>Department of Chemistry</td>
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<td>Carlos R Stroud, Jr., Advisor</td>
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<tr>
<td>&quot;Resonant interactions of atoms with modulated optical fields&quot;</td>
<td>1994</td>
<td>Indigo Medical Incorporated</td>
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<tr>
<td>Stephanos Papademetriou</td>
<td></td>
<td>2309 Renard Place, S.E. Suite 104</td>
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<td>(505) 765-0488</td>
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<td>&quot;Modal expansions in transparent and nontransparent planar waveguides&quot;</td>
<td>1994</td>
<td>Sandia National Laboratory</td>
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<td>Robert Edward Smith</td>
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<td>Albuquerque, NM</td>
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<td>&quot;Image processing, coding, and compression with multiple-point impulse response functions&quot; Bryan Joseph Stossel Nicholas George, Advisor</td>
<td>1994</td>
<td>Eastman Kodak Company Research Laboratories</td>
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<td>&quot;Ultrafast stimulated Raman scattering in optical fibers&quot;</td>
<td>1995</td>
<td>AT&amp;T Bell Laboratories</td>
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<tr>
<td>Clifford Headley</td>
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<td>Murray Hill, NJ 07974</td>
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<td>Govind P. Agrawal, Advisor</td>
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<td>&quot;Diffraction effects in the near field&quot;</td>
<td>1995</td>
<td>Eastman Kodak Company</td>
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<td>Marek Kowarz</td>
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<td>Optical Storage Technology R&amp;D</td>
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<td>Emil Wolf, Advisor</td>
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<tr>
<td>&quot;Periodic structures in multiwavelength optical systems&quot;</td>
<td>1995</td>
<td>University of Rochester</td>
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<td>Stojan Radic</td>
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<td>The Institute of Optics</td>
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<td>&quot;Aspects of the generation and propagation of solitons in optical fibers&quot;</td>
<td>1995</td>
<td>AT&amp;T Bell Laboratories</td>
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<td>Andrew Stentz</td>
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<td>Robert W. Boyd, Advisor</td>
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<tr>
<td>&quot;Novel asymptotic methods for wave-propagation&quot;</td>
<td>1996</td>
<td>Macquarie University</td>
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<tr>
<td>Miguel Angel Alonso</td>
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<td>School of MPCE</td>
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<td>&quot;Methods of inverse scattering for random media&quot;</td>
<td>1996</td>
<td>Johns Hopkins University</td>
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<td>David Gerard Fischer</td>
<td></td>
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<td>Laurel, MD 20723</td>
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<td>&quot;Ion exchange and chemical structure in glass&quot;</td>
<td>1996</td>
<td>Pacific-Sierra Research Corp.</td>
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<td>Jill Marie Inman</td>
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<td>Reston, VA 22091</td>
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<td>(703) 453-3515</td>
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<td>&quot;Temporal, spectral, and noise characteristics of erbium-doped fiber amplifiers and lasers&quot;</td>
<td>1996</td>
<td>Corning, Inc.</td>
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<td>Lisa Liou</td>
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<tr>
<td>&quot;Atomic electron wave packet interference and control&quot;</td>
<td>1996</td>
<td>University of Virginia</td>
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<tr>
<td>Michael Noel</td>
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<td>Carlos R. Stroud, Jr., Advisor</td>
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<td>Charlottesville, VA 22901</td>
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<td>&quot;Polarization-control components and narrow-band filters based on subwavelength grating structures&quot;</td>
<td>1996</td>
<td>IBM</td>
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<td>Song Peng</td>
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<td>Essex, VT</td>
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<td>G. Michael Morris, Advisor</td>
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<td>&quot;Investigation of the third-order nonlinear optical response of composite materials&quot;</td>
<td>1997</td>
<td>Sandia National Laboratory</td>
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<tr>
<td>Russell Jeffrey Gehr</td>
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<td>Lasers, Optics &amp; Remote Sensing Department</td>
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<td>&quot;Ultrafast spatiotemporal coupling in nonlinear dispersive media&quot;</td>
<td>1997</td>
<td>Decan Research</td>
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<td>Andrew T. Ryan</td>
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<td>Govind P. Agrawal, Advisor</td>
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<td>&quot;Resonant grating structures: theory, design, and applications&quot;</td>
<td>1997</td>
<td>Seagate, Inc.</td>
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<td>Scott Norton</td>
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<td>California</td>
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<td>G. Michael Morris, Advisor</td>
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<td>&quot;Angularly localized wave packets in one- and two-electron atoms&quot;</td>
<td>1997</td>
<td>Corning, Inc.</td>
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<td>James West</td>
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<td>&quot;On the resolution enhancement of optical beams with extreme focal depth&quot;</td>
<td>1997</td>
<td>Finle Technologies</td>
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<td>Ronald L. Gordon</td>
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<td>Austin, TX 78746</td>
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<td>&quot;Phase-only superresolution elements&quot;</td>
<td>1997</td>
<td>Rochester Photonics Corporation</td>
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<td>Tasso R. Sales</td>
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<td>G. Michael Morris, Advisor</td>
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<td>&quot;Static, dynamic, and noise characteristics of vertical-cavity surface-emitting lasers&quot;</td>
<td>1997</td>
<td>Therma-Wave, Inc.</td>
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<td>Joanne Y. Law</td>
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<td>1250 Reliance Way</td>
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<tr>
<td>&quot;Classical limit state of an atom&quot;</td>
<td>1998</td>
<td>University of Maryland</td>
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<tr>
<td>Michael Van Leeuwen</td>
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<td>Bethesda, MD</td>
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<td>&quot;Concentric-circle-grating lasers&quot;</td>
<td>(1999)</td>
<td>University of Rochester</td>
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<td><strong>Pamela Greene</strong></td>
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<td>&quot;Automatic pattern recognition using an all digital</td>
<td>(1999)</td>
<td>University of Rochester</td>
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<td>ring-wedge detector&quot;</td>
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<td>The Institute of Optics</td>
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<td>Diffractive optics for imaging spectrometers&quot;</td>
<td>(1999)</td>
<td>University of Rochester</td>
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<td>&quot;Terahertz pulses&quot;</td>
<td>(1999)</td>
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<td>&quot;Optical gain in rare-earth doped glasses&quot;</td>
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<td>University of Rochester</td>
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<td><strong>Gina Jones</strong></td>
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<td>&quot;Quantum computing&quot;</td>
<td>(2001)</td>
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<td><strong>Ashok Muthukrishnan</strong></td>
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