

# VITA: Lawrence A. Hornak, Ph.D

## Education

Rutgers University, Ph.D., Electrical Engineering (1991).  
Stevens Institute of Technology, M.E. Electrical Engineering (1986).  
State University of New York at Binghamton, B.S. Physics (1982).

## Employment

1982 to 1991: AT&T Bell Laboratories, Member of Technical Staff, Digital Optics  
Research Dept., Communications Systems Research Laboratory, Holmdel, NJ.  
1991 to Present: Lane Dept. of Computer Science and Electrical Engineering,  
West Virginia University.

### Positions/rank held:

Dec 2001 – present:	Director, NSF Center for Identification Technol. Research (CITeR)
Aug 2005 – present:	Interim Director, WVNano NSEE Initiative
Jan. 1999 – 2002:	Research Director, CSEE
July 1997- Aug 1998:	Co-Interim Chair, Comp. Science and Electrical Eng. Dept.
July 1996 - June 1997:	Interim Chair, Electrical and Computer Engineering Dept.
Since Jan. 1996:	Director, Microelectronic Systems Research Center (MSRC)
1992 to 1996:	Associate Director, MSRC
Since 2001:	Professor
1994 to 2001:	Associate Professor
1991 to 1994:	Assistant Professor

## Awards

- *R. C. Byrd Research Professor*, WVU Research Corporation 2005.
- *National Young Investigator*, National Science Foundation, MIPS 1992.
- 2003 CEMR Outstanding Researcher Award.
- 2001 WVU Foundation Award for Outstanding Teaching.
- CEMR Nomination to WVU for 2001 *US Professor of the Year Program Award for Outstanding Teaching*.
- 1999/2000 *CSEE Researcher of the Year Award*.
- *1997 Golden Apple Outstanding Teaching Award*, University-wide honor awarded by the Golden Key National Honor Society. Award initiated and based solely on student input.
- *1996/97 CEMR Outstanding Teacher Award*, College wide honor for excellence in instruction.
- *1996/97 ECE Outstanding Teaching Award*, ECE Dept. WVU.
- *Outstanding Researcher Nomination* by ECE Dept. to CEMR, 1995/1996 Academic Year.
- *1992/93 College of Engineering Outstanding Young Researcher Award*, COE WVU.
- *Outstanding Graduate and Undergraduate Teacher Nomination* by ECE Dept. to COE, 1992/1993 Academic Year.
- *AT & T Bell Laboratories Exceptional Contribution Awards*, Through-Wafer Optical Interconnections 1987, High-Tc Superconducting Stripline 1989.
- *George E. Moore Award*, outstanding physics senior, SUNY Binghamton, 1982.

## **Instructional Initiatives**

Program Development, Instructional Lab Development, Courses Taught/Developed, Undergrad, Graduate, and Post Graduate Student Mentorship.

### *Program Development:*

#### *Microelectronic and Photonic Technologies & Systems:*

- *WVNano Nanoscience and Engineering Initiative:* Serve as interim director since fall 2005 and member, spring/summer 2005. Interdisciplinary university (and emerging statewide) initiative develops and executes a hiring, research, education, and infrastructure strategy to cultivate and grow nanoscience and engineering at WVU.
- NSF REU site proposal co-PI with D. Lederman (PI) in Physics and WVNano faculty participants. Leverages WVNano initiative research activities for undergraduate research experiences.
- Collaborated in the development of the initial coordinated graduate and undergraduate course set supporting this area at WVU.
- Established the first laboratory infrastructure (modeling, microfab, characterization, test) through donations and funded equipment grants supporting device and integrated systems education and research at WVU.
- Founded, in collaboration with Myers (Physics) the Photonic and Microelectronic Technol. Working Group to address common issues (course, facilities, etc.) spanning engineering and the sciences.
- Co-founded (with Tewksbury) the Microelectronic Systems Research Center within the department to serve as the initial nucleation point for activities in this area.

#### *WVU Forensic Identification Degree (F-ID) – Biometric Systems UG Major and Research Program:*

- Chair the Biometric Systems Curriculum Development Committee Spring 1998 to 2003. This multidisciplinary committee, composed of faculty from arts and sciences, engineering, computer science, and health sciences crafted the first biometric systems BS curriculum. This curriculum was approved by the state BOT in November 1998. Completed first BOT Self Study Document for Biometrics Major in 2001.
- As a member of the WVU F-ID Steering Committee, worked to attain CSEE's central role in the statewide ID technology initiative and the development of Biometrics research and academic programs at WVU. Key participant in 1998 NSF EPSCoR infrastructure grant award (microsensors for biosignal acquisition) to position departmental research for competitive funding and faculty recruitment in support of this area. Success since 1998 resulted in the biometrics - triad focus of the \$9M 2002 statewide NSF-EPSCoR award.
- Led effort which culminated in first NSF Center in biometrics. the Center for Identification Technologies (CITeR), awarded NSF IUCRC status in December 2001.

### *Instructional Lab Development:*

#### *Lightwave Communication Design and Prototyping Laboratory:*

Proposed and established through a 1995 NSF ILI Grant a full lightwave communication and photonics undergraduate lab for use as a curriculum integration tool in Electrical and Computer Engineering, and in support of lightwave and photonics technical electives. Received major donation from Corning Corporation in 2003 valued at \$626K providing the lab with additional test and measurement equipment and fiber.

#### *Hewlett Packard Collaborative Medical Informatics Lab:*

Established through a 1997 HP educational foundation grant (\$404K) and subsequent (\$87K) follow-on grant to CSEE, HSC, and CERC to support research and education in large systems engineering and image processing. Proposal participant, implementation committee member, Proj. Co-Director 1998-00.

### *Courses Taught/Developed:*

- EE 445 (Previously EE 493K) *Communication Electromagnetics*, Elective course follow-on to EE 345, first offered Spring 2003.
- EE 450 (previously EE291) *Electronic Dev. Simulation and Integration*, Required course in new BSEE curriculum electronics emphasis. Newly developed course first offering Spring 01.
- EE/BIOM 426 (previously EE 291) *Biometric Systems*, Required course in new BS F-ID Biometric Systems major. Newly developed course at WVU, team taught, first offering Spring 01.
- EE 345 *Engineering Electromagnetics*, Single semester E&M class. First developed (powerpoint lectures and web access) and offered Fall 2000 as part of new EE curriculum.
- EE 140 *Electric and Magnetic Fields I*, WVU Fall, yearly 1991-1995, 1998.
- EE 141 *Electric and Magnetic Fields II*, WVU Spring, yearly 1992-1996, 1998.
- CpE 181 *Senior Design*, Spring 1999
- EE 254 (previously 291)/ EE 391 *Advanced Topics in Semiconductor Devices: VLSI Microfabrication Technology*, New course, first at WVU. Fall, one or both yearly since 1992.
- EE 255 (previously 291)/ EE 391 *Introduction to Photonics*, New course, first at WVU. Spring, one or both yearly since 1993.
- EE 491 *Microelectronic Systems I, II*, New Courses, first at WVU on Advanced Packaging, Fall 1992.
- EE 496 *Microelectronic and Photonic Systems Graduate Seminar* Developed and made first offering of a new topical seminar section of the graduate seminar. WVU Fall 1995.

### *Undergraduate Student Mentorship*

#### **Undergraduate Summer Research**

- *NSF ITR Multibiometric data collection design and execution* – Support of multiple undergraduate students, M. Monaco and K. Smith initially, now Ryan Bednar, Cliff Luzier, and Mark Wroblekivka. Source: NSF funding.
- *LEAD Research Group* – Josh Nightingale is a member of the LEAD research class led by Korakakis and a major contributor to our ONR funded biosensor project. 2005.
- Sarah Lovell and Christopher Boyce (duals in EE, CpE-Biometrics), have been engaged in biometrics research in liveness detection and the iris biometric since the summer of 2003 under CITeR Support.
- William McCormick and Scott Rittenhouse: (2000/01) MEMS Integrated Optical Monitoring, NSF REU funding two UG positions awarded fall 2000.
- B. Taylor: (1996) Design of linear comb MEMS devices subsequently fabricated by the MEMS Multi-User MEMS Process Service (NSF). (1995) Design and construction of an automated optical waveguide loss measurement system (NSF).
- J. Wolfgang: (1995) Characterization of cantilever MEMS devices (NSF), troff to html conversion.
- J. Barr, W. Cox (1994) Experimental study of the cryogenic operation of Semiconductor Laser Devices (NSF).

#### **Senior Projects**

- *NSA Museum Biometric Kiosk*, K. Smith et al.. Sponsor/Mentor, Hornak, completed Fall 2005.
- *Biometric Scholastic Wrestler Authentication System*, McCarty, Madden, Wade, Naternicola, Ross - faculty technical mentor, Hornak/CITeR - sponsor, to be completed spring 2005.

- *Biometric Turnstile*, Bays, Herbeck, Holstein, Russell. Ross - faculty technical mentor, Hornak/CITeR - sponsor, completed spring 2004.
- *MEMS Tracking Control*, Chaudhry, Khamsi, Richards. Sponsor/Mentor, Famouri-Hornak, completed spring 2004.
- *MEMS Rotary Micromotor Drive Monitoring and Control*, Scott Rittenhouse, William McCormick. LAH, PF Faculty Mentor/sponsor, (Fall 2001) Completed Spring 2002.
- *MEMS Rotary Micromotor Drive Design and Prototyping*, Chris Twigg, Eric Shreve LAH Faculty Mentor/sponsor, (Spring 2000) Completed December 2000. Also includes Augmented Honors Program Proj. for C. Twigg.
- *Free SpaceLink and Fiber Communication Demo Platform Project*, Randolph Copeland, team leader, LAH Faculty Mentor/sponsor, (Spring 2000) Completed December 2000.
- *PCB Fab System Development Group*, B. Baker, K. Shaffer, T. Williams, C. Discepolo. LAH Faculty Mentor (Fall 1999). Completion Date May 2000.
- *SADD Stay Awake Drowsy Driver ID System*, R. Berry, J. Grilli, P. Kritschkgau, Alan Orbeta LAH Mentor(Fall 1999), Monitor (Spring 1999). Completed December 1999.
- *Fingerprint Vitality Identification System*, Erin Hogbin, Carlos Igas, Dr. Schuckers principal advisor, LAH coadvisor for optoelectronic subsystem.
- *Micro-Electro-Mechanical Optical Switch Design and Fabrication*, 94-95, J. Barr, W. Cox, and J. Wolfgang. Oral presentation and proceedings paper at the 9th NCUR Conference, Union College, April 1995. (see citation below)
- *Direct-Write Lithography System*, 1993-1994 G. Williams, A. Swecker, and S. Saltsgaver. Oral presentation and proceedings paper at the 8th NCUR Conference, Union College, April 1994. (see citation below)
- *Inter-MCM Optical Interconnection Design*, 1993-1994 D. Yeager, N. McVaney.
- *Voice/Remote Controlled Lawn Mower*, 1992-1993.
- *Holography Senior Design Project*, 1991-1992.

### **Scholarship Research Advisor/Mentor**

- B. Taylor, EG&G Scholarship '96-97: Waveguide Co-integration with Micro-Electro-Opto-Mechanical Systems (MOEMS).
- J. Barr, EG &G Scholarship '95-96: Merging Integrated Optics with Micro-Electro-Mechanical Systems (MEMS).
- W. Cox, National Goldwater Scholar '94-95: Optical Interconnection Issues in Emerging Wafer Scale Systems.
- G. Williams, EG &G Scholarship '94-95: Direct-Write Microlithographic System Hardware Definition.
- Swecker, EG &G Scholarship '94-95: Direct-Write Microlithographic System Software Development.

### **Other**

G. Holsclaw, Fall 96: Independent research. Electrostatic modeling of linear comb MEMS devices.

## *Graduate and Post Graduate Student Mentorship*

### **Masters**

*Committee chairperson for the following students*

- |                 |   |
|-----------------|---|
| R. Chilakamarri | - (Myosin nanokinematics) Hornak. Defended 2005           |
| R. Garagu       | - ( Blood O2, flow imaging) Lemieux-Hornak. Defended 2005 |
| L. Konduparthi  | - (MEMS Modeling & Detection) Hornak. Defended 2005       |
| D. Pisharoty    | - (E-beam/Laser micromachining) Hornak. Defended 2005     |

- C. Boyce - (Multispectral biometric imaging) Hornak.
- R. Chinnayya - (Photonic Crystal Fab) Hornak
- N. Paturi - (Photonic Crystal Design) Hornak.
- P. Poloju - (Biosensor layer growth) Hornak.
- P. Samudrala - (Optical biosensors) Hornak
- N. Ayyalasamayajula - (YAG Laser Chip) Hornak-Woodruff. Defended 2003.
- W. McCormick - (MEMS Integrated Optical Microprobes.) Hornak. Defended 2004
- S. Pathak - (Resonant Waveguide Biosensor Modeling) Hornak. Defended 2004
- R. Chinnayya - (Photonic Crystal Fab) Hornak.
- R. Medipalli - (MEMS Vertical Actuator Design) Hornak
- M. Bhattacharya - (Thin-film MagneticMat.) Hornak-Seehra
- L. Ramakrishnan - (Mercury Detection) Hornak-Manivannan
- U. Damodaraswamy - (Microfluidic flow meas.) Hornak-Timperman
- S. Katipali - (MEMS Fault Detection) Hornak. Completed Prob. Rep. 2004.
- S. Pavarali - (BPM\_CAD Waveguide Simulation) Hornak. Defended 2002.
- C. Dachna - (Contact Characterization of GaN Dev. ), Defended 2001.
- P. Soora - (CMOS Electrostatic Sensor Modeling), Defended 2000.
- J. Dawson - (MEMS Optical Metrology), Defended 1999.
- E. Christy - (Program Management System-FETC), Completed Prob. Rep. 1999.
- S. Frazier - (Contact Structures for GaN Devices ), Defended 1998.
- K. Devabattini - (Embedded Systems for Image Processing and Sensors), Defended 1998
- V. Gandikota - (Microelectronic Embedded Computational Systems), Defended 1998
- K. Brown - (polymer optical waveguides), Defended 1996
- S. McGinnis - (GaAs/Si Compatibility), Defended 1996
- H. Shimoyoshi - (SOI Submicron CMOS), Defended 1996

*Committee member for the following:*

- A. Akinbola - (Image Quality of Iris) Schmid. Defended 2005
- N. Bartlow - (Keystroke Analysis) Cukic. Defended 2005
- S. Bhattacharya - (GaN LEDs) Korakakis. Defended 2005
- P. Ivatury - (Correlation and Fusion) Ross. Defended 2005
- N. Kalka - (Image Quality of Iris) Schmid. Defended 2005
- M. Ketkar - (Analysis of Iris Recog) Schmid. Defended 2005
- S. Kuchibhatla - (Nitride Laser Diodes) Korakakis. Defended 2005
- S. Makthal - (Synthesis of Iris Images) Ross. Defended 2005
- R. Vinnakota - (VCSELs) Korakakis. Defended 2005
- T. Rosiek - (Testing Protocols) Cukic. Defended 2005
- J. Shah - (Fingerprint Reconstruction) Ross. Defended 2005
- Y. Shah - (Multimodal Biometric Fusion) Schmid. Defended 2005
- K. Kasarla - (HEMT Design) Korakakis.
- R. Myneni - (Software Environment Development), Cukic.
- S. Ranganathan - (GaN Electrodes) Korakakis.
- S. Shah - (Iris Recog) Ross.
- S. Rittenhouse - (MEMS Parameter Change Detection) Famouri. Defended 2004.
- R. Govindarajan - (Feature Indexing in Multibiometrics) Ross. Defended 2004
- L. Turlapati - (GaN Photodetector Contacts) Korakakis. Defended 2004
- H. Puttashamaiah - (VHDL) Ammar. Completed Prob. Rep. 2004
- T. V. Sujan Parthasaradhi - (CITeR Liveness Study), Schuckers. Defended 2003.
- H. Mohammad - (F-L Fuel cell Controller) Famouri. Defended 2003.
- D. Baker - (Multi-antenna wireless systems), Valenti. Completed
- Reza Derakshani - (Veridicom vitality sensing) , Schuckers chair. Completed

T. Antesseril	- (Deep Submicron CMOS Devices), Completed
S. Hyder	- (Optical Fingerprint Scan System), Completed
M. Uppuluri	- (SWAN Network) Completed
P. A. Cyphert	- (Capacitive sensor) Completed
M. R. Manzo	- (Capacitive sensor) Completed

## Doctoral

*Committee chairperson and research advisor for the following:*

Jeremy Dawson	- (MEMS Optical Monitoring & Feedback), Defended Sp 2002.
K. Brown	- (MEMS In-Situ Guided Wave Optical Monitoring), Defended Aug. 2000.
N. Ayyalasomayajula	- (YAG Laser Chip) Hornak-Woodruff.
K. Feng	- (Integrated Biosensor Optical Interaction), Hornak-Giles
R. Chilakamarri	- (Nanokinematics) Hornak

*Committee member for the following:*

M. Luo	- (Optical Characterization) Giles. Defended 2005
C. Swartz	- (II-VI Material Characterization) Myers. Defended 2005
A. Izadian	- (MEMS control) Famouri.
N. Yang	- (GaN Material Growth) Korakakis.
T. Liu	- (GaN Growth and Devices) Korakakis.
B. Zhao	- (Wireless Comm Diversity) Valenti (2004).
L. Wang	- (MEMS Feedback Control) Famouri (2004).
R. Derakhshani	- (Biometrics Liveness Detection) Schuckers (2004).
T. Charleton	- (Magnetic Tunnel Junctions), Lederman (2002)
S. McGinnis	- (Nanoelectronic devices), Das (2001)
J. D. Chen	- (Induction Motor Modeling and Control), Famouri (2001)
H. E. Nariman	- (GaAs/Si Compatibility Study), Tewksbury (1995)
I. Petrova	- (SWAN Network Design), Tewksbury (1996)
S. Setzler	- (Defects in Nonlinear Optical Materials), Halliburton (Physics, 1998)

## Research Staff or Post Doctoral Personnel

Dr. Kolin Brown - Research Coordinator for CSEE Shared facilities, Primary contact for CEMR shared cleanroom. Since 2004.

Simona Crihalmeanu – Biometrics Research Associate in charge of data collection, database design.

Jeremy Dawson - (Photonic MEMS – supported NASA ½ time), 2002-2003.

Monica Moldovan - (Wide band gap semiconductor initiative), thru June 2000.

## Service Activities

### *Departmental*

- Department Research Director 1999-2002.
  - Responsible for internal research entities/labs, ERB Space and provide input to chair regarding research matters and planning.
  - Act on Chair's or associate chair's behalf in representation of CSEE.
- Interim Co-Chair, newly formed CSEE Department July 1, 1997 - August 15, 1998, interim chair Electrical and Computer Engineering Department July 1, 1996 – June 30, 1997.
 

**CSEE Formation:** Items relate to activities laying the groundwork for the new Department of Computer Science and Electrical Engineering both prior to and after its formation on July 1, 1997.

The items below highlight key achievements during this period as interim chair and interim co-chair.

- ❑ Member CS and ECE Merger Implementation Committee. Spring 1997. Body charged by Provost Lang to draft a Memorandum of Understanding (MOU) governing the formation of a new department in CEMR housing CS, CpE, and EE programs.
- ❑ Spring 1997 Successfully recruited the two faculty candidates to Asst. Professor positions in ECE (Cukic (software engineering), Schuckers (biomedical engineering)).
- ❑ Fall 1997 - Spring 98 planned and negotiated new space allocations and subsequently relocated 2/3 of the total faculty and staff of the new CSEE Dept. in order to collocate CS and ECE faculty within one new expanded departmental space in the Engineering Sciences Building.
- ❑ Fall 1997 – Spring 98 achieved initial merger of CS and ECE budgetary and administrative activities within new CSEE Department.
- ❑ Planner/participant in CSEE Presentation to John Chambers, Jr. of CISCO Systems, November 1997. Resulted in part in pledge of \$250,000 to WVU for CEMR/CSEE and B&E programs.
- ❑ 1997 ABET Accreditation Visit: The new department's two engineering programs, electrical engineering and computer engineering, experienced extremely positive visits and program evaluations (2003 next visit). Among those major areas that were worked on with the faculty to achieve this result were
  - ✓ Drafting volume II for EE and CpE programs,
  - ✓ Developing a coherent and comprehensive lab plan,
  - ✓ Identification and completion of overdue lab enhancements/upgrades,
  - ✓ Development and update of lab safety material,
  - ✓ Continued attention to the revitalization of the IEEE Student Branch, and
  - ✓ Creation of an EE and CpE GTA fall orientation.
- Director 1995-present, Associate Director 1992-95, Microelectronic Systems Research Center.
- Member, CSEE Strategic/Vision Planning Steering Committee, 1999-2000.
- Member EE Curriculum committee, 1992-95, (interim chair 96-98), 98-present.
- Member, CSEE Graduate Committee, 2005.
- Member, CSEE Chair Search Committee, 2003-04.
- Member, CSEE Faculty Search Committee, for NSF EPSCoR funded positions, 2000-01, 2001-02.
- Member, CSEE Workload Committee, 1999-2000. (workload document drafted)
- Member, CSEE Faculty Search Committees, 1998/99 (Meehan, Eschen, Valenti hired), 2001-2002 (Korakakis, Reynolds hired), 2002-3 (Ross, Schmid hired), 2005 (Valizada hired).
- Member, LDCSEE P&T Committee, 2002-04, 2005-06.
- EE Electronics Group Leader, Since Fall 2002.
- Member, Initial CSEE Web Committee, 1999-2001.
- Member, CSEE Systems Committee, EE/Biom rep, Since 1998.
- Member, CSEE Public Relations Committee, 1998-2000.
- Member, CSEE Engineering Scholarship Committee, Since 1996.
- Member, CSEE Recruiting and Retention Committee, 1998-2000.
- Member, DoD IA Scholarship Selection Committee, 2004-05.
- Senior Design Group Assessment Team, Sp 2002, F 2002.
- Chair, Biometric Systems Major Curriculum Committee. Sp 1998 – Sp 2003
- Member, Biometric Systems Major Curriculum Committee, CSEE, Since F 2003.
- Prepared and/or participated in lab demos and tours for numerous parent and student tours/activities, Since 1995.
- Faculty Counselor, WVU IEEE Student Chapter, Since 2002, Co-Advisor, 1996 - 2002.
- Faculty Counselor, SSAB, new biometrics student organization. Since Fall 2003.
- Participant, development activities in support of CSEE donor cultivation with Semiconductor/electronics Company, 2000-2001.
- Hewlett-Packard VLSI Technology Ctr. (Ft Collins, CO) Recruiting contact point, designated Since fall 1998.

- Guide, On-site Individual Student Recruiting Tours, since 1995.
- Developed CSEE Display and manned booth at 1999 WVU Major's Day, Mountainlair Ballroom.
- Committee Member, WVU PRT Computer Upgrade Committee 1996-1998.
- Originator, ECE Display for WVU Environmental Forum, November 1996.
- Committee Member, ECE Chair Search Committee 1994-96.
- Planner , Host, Spring 1997 tour of ChE, ECE ERB labs by Mitsubishi Electric's Delegation from Japan.
- Host, 1996 Tour of ECE research labs by Governor Kajiwaru of Japan.
- Member, ECE Chair Search Committee 1994 - present.
- Member, ECE Faculty Search Committee 1993-94
- ECE Undergraduate Recruiting Coordinator, 1995-96.
- Engineering Seminars (formerly called E1/E2 nights) 1994-97, 2000.
- TEAM+S Competition, February 1996 competition for regional high school students.
- CEMR Visitation Day for high school juniors and seniors 1995-97, 2005.
- Co-organizer, Program for Governor's Science and Math School, Summer 1995.
- Student Resume Review and Counseling 1994-present
- Member EE Academic Standards Committee, 1992 - 1996
- Member Ph.D. Qualifying Exam Committee, 1992, 1993
- Organizer MSRC Undergraduate Research Study Group 1993-94
- Co-organizer MSRC Undergraduate Research Study Group 1992-93
- Initiator Ph.D. Application/Information materials update, 1992-93
- Senior Design Fair Judge, Fall 1991

### *College of Engineering (CEMR):*

- Member, CEMR ad-hoc committee on nanotechnology. Since Fall 2002.
- Member (CEMR Rep with Korakakis), WVU NSF EPSCoR Nanotechnology Committee, Since Fall 2002.
- Faculty Lead, CEMR/WVU Nanosystem Engineering Shared Facility Development, 2002-05.
- Presenter, European Biometrics Policy delegations, 2004, 2005.
- Panelist, McNair Colloquium on Graduate Education, Jan 2003.
- CSEE Representative, CEMR Faculty Council Executive Committee, 1998-00.
- Chair, CEMR Undergraduate Academic Affairs Committee, 2002-03 academic year.
- Member, CEMR Undergraduate Academic Affairs Committee, Biometrics/F-ID curriculum, 1999 - 2003
  - Member, Physics Department Liason Subcommittee of the CEMR UG Academic Affairs Committee, 1999.
- Member, Lane Chair Search Committee, 2002, 2001.
- Faculty Lead, CEMR/WVU Nanosystem Engineering Facility Development, 2002.
- CEMR Member, WVU NSF EPSCoR Nanotechnology Committee, Fall 2002.
- Member, Ad hoc Research Personnel Issues Committee, 2001.
- Member, EE Dept. Chair search committee, WVU Inst. Of Technology.
- Member, Leadership Committee on Materials Engineering 1995-Spring 2000
- Member, CEMR Bioengineering Executive Committee, since 1998.
- Faculty Marshall, May 1999, 2001, WVU Graduation Ceremony.
- Participant , Development Activities of CEMR, 1999.
- ◆ Volunteer, CEMR Sponsored TEAM+S Competition Tours, Spring 2000.
- ◆ Drafted ID-Tech Feature article for CEMR Alumni Newsletter, Spring 2000.
- Developed and hosted CEMR display at the F-ID Showcase, March 3, 1999.

- Participant and Presenter WVU Days in Beckeley WV, Woodrow Wilson High, Shady Spring High School, Oct 1998.
- Member WVU-CEMR/WVUIT-COE Collaboration and Implementation Committee 1997-98.
- Volunteer, CEMR Freshman Applicant Telethon 1996, 1997, 1998, 1999.
- Volunteer caller, CEMR Thank-a-thon, 1998.
- Participant , Braxton Towers Engineering Night. Spring 1997, 1998.
- Coordinator/Facilitator, WVU CEMR / WVUIT COE Statewide Engineering Instructional Technology Proposal Set 1997.
- Participant and Presenter WVU Days in Mountaineer Country. Presentations at Tucker County High School Oct. 29, 1997.
- Reviewer, CEMR Outstanding Researcher Awards.
- Participated in College student Organization Activities, 1999.
- Member, Task Force to Improve Research Management 1994-95
- Member, Library Focus Group 1994

### *University:*

- Co-Chair with Provost Lang, President's Committee on University Strategic Planning and Assessment, 2004-2005.
- Co-Chair with Provost, WVU 2010 Plan Implementation Committee, 2005-2006.
- Past Chair, WVU Faculty Senate, 2005 – 2006.
- Chair, WVU Faculty Senate, 2004-2005 academic year.
- Chair Elect, WVU Faculty Senate, 2003-2004 Academic year.
- Member, WVU Faculty Senate, 2000-03, 2003-2005, 2005-2008.
- Member, WVU Senate Ad-hoc Committee on Research and Graduate Studies, 2005 – 2006.
- Member, Faculty Senate Research and Scholarship Committee. 2005 – 2006.
- Presenter, Chair's Retreat on WVU 2010 Plan, June 2005.
- Presenter, New Faculty Orientation, Summer 2004.
- Participant, Higher Learning Commission Accreditation Visit, April 2004.
- Presenter, Chair Development Session on GEC Implementation, with C. Wilkinson, 2004.
- Member, Information Security Council, 2004.
- WVU University Marshall, 2005 – 2008.
- Member, Task Force on Salary Policy, 2005 – 2006.
- Member, WVU Senate Ad-hoc Committee on General Studies. (Charged with review and redesign of general education (LSP) at WVU.)
- Member, Faculty Senate Liberal Studies Program (LSP) Committee. Fac. Exec. Comm. Liason. 2003 – 2004
- Chair Elect, Faculty Senate Liberal Studies Program Committee, 1999-2000.
- Chair, Faculty Senate Liberal Studies Program (LSP) Committee, 2001-2002. (Generated landmark report which resulted in formation of ad-hoc general studies committee above.)
- Director/team leader, Center for Identification Technology Research (CITeR). NSF Multiuniversity I/UCR Center Since 2002.
- Member, WVU Research Corporation Board, 2001-2004.
- Member, Task Force on Administrative Infrastructure for the Research Enterprise, 2004.
- Member, Foundation Teaching Award Selection Committee, C. B. Wilson Chair, 2002.
- Member, NE Accreditation Faculty Committee, General Education SubCommittee, 2002.
- Reviewer, Research Corp. Investment in Research Stimulation, 2002.
- Member, Biometric Research Advisory Group, Since 2002.
- Member, WVU Biometrics Knowledge Center Principle Scientist and Staff Search Committee, 2002-3.

- Member, Vice Pres for Research (Weete) 5-Year Review Committee, 2002-2003.
- Member, Honors Office Goldwater Scholarship Selection and Mentorship Committee, 2004.
- Presenter, to Armed Services Inst. For Pathology Relocation Committee by WVU, Sp. 2002.
- Member, Faculty Development Advisory Committee, 2001.
- Panel member and presenter, Faculty Development Workshop on Teaching, 2001.
- Elected Member, Faculty Hearing Panel, 1994, 2000.
- Member, Honors Program Director Search Committee, Spring 2000.
- Participant, Biometrics/Infor Assurance Media Fellowship. 2003.
- Member, WVU Forensic ID Program Strategic Planning Group, Fall 2000.
- Member, WVU Forensic ID Program University-level Steering/Admissions Committee. Program Research and Education, Since spring 1998.
- Chair, Biometric Systems Curriculum Committee. Since spring 1998.
- Member, WVU NSF EPSCoR Planning Group, Spring 2000-2001.
- Member, WVU Academic Computing Research Director Search Committee, 2001.
- Organizer and Presenter, WVU CITeR ID-Tech Group Display, Leadership WV Workshop, 7/14/00.
- Participant and presenter, Associated Group Venture Capital Group WVU Visit hosted by the WVU Tech Transfer Office, October 2000.
- Member, WVU Academic Computing Research Computing Subcommittee, CEMR Representative. Since Fall 1998.
- Participant, WVU Research Public Relations Presentation produced by WVU video communications, Spring 2000.
- Contributor/Participant, WVU Annual Report by President Hardesty focusing on Research, February 2000, also WVU viewbook.
- Committee Member, WVU Assoc. Provost for Research and Graduate Studies Search Committee 1997-98. Dean Duane Nellis, Chair. 1997-98.
- Participant, Diebold Collaboration Meeting hosted by VP for Student Affairs, May 4, 1999.
- Participant, WVU Relationship with Amherst International, through J. Weete, 1999.
- Meeting participant and Tour Host, Dr. Heinze, General Manager, Kamerawerk Dresden – World Trade Center Dresden, June 1998.
- Attendee and WVU/CSEE representative German American Business Assoc. Meeting. Washington, DC. Oct 14, 1998.
- Meeting participant and Tour Host, Dr. Brian Holloway, Senator Rockefeller's Science and Technol. Staff Member, May 1998.
- Meeting participant and Tour Host, Dr. Antonia Hergoz, Senator Rockefeller's Science and Technol. Staff Member, Dec 9-10, 1998.
- Member, WVU Academic Computing Research Computing Subcommittee, CEMR Representative. Since Fall 1998.
- Member WVU Web-based Instruction Committee, McLaughlin Chair. (1997-98)
- WVU Chair Development Committee. C. B. Wilson, Chair. Spring 1998.
- Advisor, WVU Honors Program (EE, CpE majors). Since Spring 1998.
- Bucklew Scholars Recruitment Activities, 1999.
- Advisor, CHIMES, the university wide junior honorary, Since 1992.
- Editor (and originator), Photonic and Microelectronic Technologies Working Group Home Page, Since 1996.
- Coordinator and Co-Founder, WVU Photonic and Microelectronic Technologies Working Group, Since 1994.
- Originator & Editor, MSRC/ECE/Physics program description entry in SPIE Optics Education and the SPIE Home Page, Since 1993.

- Co-Founder, MSRC Distinguished Speaker Series (1992-1995) (subsequently fully merged with IEEE subsection activities in 1996).

### *State, Region, and Nation:*

- Technical lead and key architect of West Virginia NSF EPSCoR and WVNano's molecular biometrics research umbrella. Theme built on CITeR concept became umbrella for successful 2002-2005 West Virginia NSF EPSCoR Cooperative Agreement. The underlying "triad" theme of nano-biotech is being pursued by WVU as the foundation for WVNano as well as for the 2005 state-wide WV EPSCoR RII proposal for 2006-2009.
- Participant, Benedum Foundation Study by MIT regarding strategy for technology-based economic growth in WV.
- GAO: Visited and interviewed by U.S. Government Accounting Office reps. Regarding use of biometrics in INS. Reviewed final document for national distribution.
- Participant/presenter, Res. Corp. Presentation by WVU to MOEC (Economic Dev.).
- Participant representing CSEE and Engineering, St. Francis Career Day. 2001.
- Invited Panel member, Senate Technology Caucus meeting on Biometrics, US Senate Commerce Committee. June 2000.
- Breakout Session Leader, 1999 WV State Science and Technology Conference, representing WVU ID technology efforts, Nov 30, 1999.
- Member and technical organizer, WV State Science and Technology Council Special Subcommittee on CITeR IUCRC Development, 1999.
- Panel Member, WV State Science and Technology Conference, representing WVU ID technology efforts, Nov 1-2, 1998.
- Panel Session Organizer, WV State Science and Technology Conference, Nov 1-2, 1998.
- North Elementary Exploratories, Morgantown, WV 1992 through 1994, 1997
- E. Greenbrier Junior High, Lewisburg, WV Spring 1993
- MSRC Service to Regional Industry

### *Professional Activities*

- General Co-Chair, 4<sup>th</sup> and 3<sup>rd</sup> Biometrics Symposium at the International Biometrics Consortium Conference, Arlington, VA, Sept 2006, 2005.
- Program Co-Chair, 2<sup>nd</sup> Biometrics Symposium at the International Biometrics Consortium Conference, Arlington, VA, Sept 2004.
- Member, IEEE TAB Committee on Biometrics. Effort establishing biometrics within IEEE, including IEEE sponsorship of the Biometrics Symposium.
- Invited participant, US Treasury/NSF Workshop on Resilient Financial Information Systems. 2005.
- Admin Co-Chair (with B. Cukic), Federal Agency Sponsored National *Advanced Study Face Recognition Workshop*, Nov 11-13, 2005.
- Program Committee, 1<sup>st</sup> Biometrics Symposium at the International Biometrics Consortium Conference, Arlington, VA, Sept 2003.
- Program Committee, 2<sup>nd</sup> International Conference on Biometric Authentication, Jan. 2006.
- Program Committee, SPIE Conference on Biometrics Technology for Human Identification, 2006, 2005, 2004, Orlando, FL.
- Program Committee, 1<sup>st</sup> SPIE Conference on Optical Technologies for Arming, Safing, Fuzing, and Firing. San Diego CA, July 2005.
- NSF: Invited participant in the International Workshop for a Biometric Research Agenda, Lakeview Resort, Morgantown, WV April 29-May 2, 2003.

- Program Committee , IEEE Auto-ID Conference, SUNY Buffalo, Oct 2005, March 2002 Tarrytown, NY.
- Program Committee, SPIE 2002 MOEMS and Miniaturized Systems Conference.
- Government Electronics & information Technology Associaton (GEIA) interviewee for 38<sup>th</sup> annual Ten year forecast for electronics.
- U.S. Civilian Research and Dev. Foundation biometrics special antiterrorism solicitation proposal review.
- Member Board of Governors, IEEE Lasers and Electro-Optic Society, 1995-2000.
- IEEE Laser and Electro-optics Society Electronic and Web Committee Since 1998-2000.
- IEEE Panel of Webmasters, IEEE working group, Since 1998-2000.
- Editor, IEEE Lasers and Electro-Optic Society World-Wide Web Home Page, Since 1994-2000.
- Editor, IEEE Lasers and Electro-Optic Society e-mail Electronic Newsletter leos\_news (original editor until merger with web page in 1996).
- Program and Organizing Committee, Optoelectronic Packaging, Manufacturing and Reliability Conference, 1996 IEEE LEOS Annual Meeting, Boston, MA.
- Program Committee, IEEE AutoID Workshop, Morristown, NJ, Oct 4-5, 1999.
- Program Committee, Optoelectronic Interconnect Conferences 1997,98,99 SPIE Photonics West Symposia.
- IEEE Pittsburgh Section, Treasurer 2001, 2002, 2003 Vice President 2000, Director, 1998-2003,.
- Presenter, IEEE Student Professional Awareness Conference, WVUIT. Spring 2000.
- Judge, IEEE Student Branch Web Site Competition, Region 2. Spring 1999.
- Chair and WVU Main Coordinator, IEEE Upper Monongahela Subsection, 1997-1998. Vice-Chair 1996-97. Treasurer, 1995-96. Delegate at Large, 1994-95.
- Session Chair, Optics session, Thirtieth Southeastern Symposium on System Theory, WVU March 8-10, 1998.
- Invited speaker, IEEE TAB Periodicals Meeting, IEEE Directors World Wide Web Forum, both at IEEE Director's Meeting, June 1995.
- Program committee and session chair, Optoelectronic Interconnections II & III, 1994 - 1995 SPIE OE/LASE.
- Group Leader, NSF 3rd Workshop on Optoelectronic Interconnection and Packaging, Breckenridge, Colorado August 1994.
- Invited attendance of NSF 2nd Workshop on Optoelectronic Interconnection and Packaging, Chartered with formulating NSF roadmap for efforts in this field. Red Lion Inn, Santa Barbara, CA July 27-29, 1993.
- Organizing Committee Member and Session Chair, Optoelectronic Interconnection and Packaging Session, 1993 ASM Electronic Materials and Packaging Conference, San Jose, CA August 30-Sept 2, 1993.
- IEEE/LEOS workshop organizing committee, Packaging, Interconnects and Optoelectronics for the Design of Parallel Computers, Schaumburg, IL, March 1992.
- Session chair, Symp. on NLO Processes, Univ of Penn., Philadelphia, PA. April 1991.
- Session Chair, High-Tc Superconducting Technologies I, II, Electrochemical Society Meeting, Los Angeles, CA May 1989, 1988.
- Reviewer: National Science Foundation (MIPS, ECS, STTR/SBIR, CAREER, POWRE), MIT Press, GAO, IEEE Communications Magazine, IEEE Press, Applied Optics, Marcel Dekker Publisher, IEEE Photonics Technology Letters, IEEE Transactions on Electron Devices, IEEE Electron Device Letters, IEEE Transactions on Very Large Scale Integrated Systems, IEEE Transactions on Signal Processing, IEEE J. Selected Areas in Communications, IEEE Int. Symp. On Signal Proc.and IT, Innovative Systems in Silicon (ISIS) Conference, Optical Communications, Optical Engineering, Electronics

Letters, Optics Letters, Journal of Robotic Systems, ORAU Junior Faculty Awards Proposals, Austrian Science Foundation, Kansas State University, State of Nevada DoD EPSCoR.

- Member: IEEE, IEEE LEOS, ASEE, SPIE, OSA, Sigma Xi, Sigma Pi Sigma.

## Sponsored Research/Education Programs, Grants, and Donations

### *Overview of Research Activities*

**Advanced Systems Technologies :** Interdisciplinary research emphasizes the marriage and understanding of advanced technologies linking the micro and nano scales to enhance system-level performance. Major areas of work include:

*Biometric Identification Technologies:* Lead interdisciplinary CITeR group spanning five universities. Founding director and current co-director of the multi-university NSF Industry/University Cooperative Research Center called the Center for Identification Technology Research (CITeR). NSF Center award received in December 2001. Personal research explores enhancement of existing biometric sensor systems and investigation of new sensor modalities for biometric identification. Primary emphasis is on sensors and data collection. Sponsors: NSF, DHS, Industry, CITeR Membership. Architect of integrating umbrella for ID-Tech and successful 2002 NSF EPSCoR submission, as well as molecular biometrics thrust of the 2005 NSF RII submission and its bridge to and development of nanoscience and engineering at WVU embodied in WVNano.

*Molecular Recognition -Integrated Optical Biosensors:* Major nanoscience and engineering thrust exploring interface between photonic devices and biomolecular functionality. Major component of WVU 2004 NSF EPSCoR thrust in NSE. Lead of interdisciplinary WVU team (CSEE, Chem, Physics, HSC) which developed 2002 NSF/EPSCoR infrastructure grant in support of this and related nanoengineering research thrusts. Research in collaboration with Loats Assoc. Inc. (LAI) of resonant waveguide based evanescent field biosensors with applications ranging from water and food purity detection to DNA analysis. ONR funded. SBIR and DoD proposal funded with LAI.

*MEMS and NEMS:* Major new thrust explores NEMS through nanokinematic study of electric field driven actin-myosin system in collaboration with chemistry, pharmacy, and Gumma University (Japan). Research leveraging optical interconnection and integrated optics work. Research explores intra-package integrated optical architectures for in-situ monitoring of MEMS for lifetime monitoring, failure prediction and detection, and control. Collaborators include Famouri at WVU (electromechanics), NASA JPL, Sandia Nat. Labs.. Funded by an NSF award, NASA, WVU RC.

*Integrated Optics and Optical Interconnections:* Research has focused upon the fabrication and study of both free-space and guided wave optical interconnections for advanced packaged (multi-chip-module (MCM)) and wafer-level environments as well as their insertion within emerging MEMS technology. Efforts span materials characterization through integrated optical element fabrication. Current work focuses on development of hybrid Nd:YAG laser modules for rapid detection (DoE-NETL). Other work focuses on the integration of polymer and free space optics with MEMS for monitoring, control, and switching. Industry/government collaborators and government sponsors: NASA, AT&T, Sandia, Honeywell, NSF and AFOSR.

*Gallium Nitride Devices:* Recent proposed work with Korakakis in integrated optical sensor development. Fabrication and characterization of Schottky and ohmic contacts on MBE grown GaN, leveraging established growth work of Myers in Physics. Ultimate target is exploration of device structures for optoelectronic and display applications. Collaborators and government sponsors: WVU

Photonic and Microelectronics Technol. Faculty Working Group: Physics (T. Myers), WVU Chem Eng. (C. Stinespring), CSEE (LAH); DoD/ONR.

## *Awarded Sponsored Research/Education Grants, Contracts, and Donations*

### **Externally Sponsored Research**

- *Acquisition of Instrumentation for Biometric Authentication*, Schuckers, (St. Lawrence PI) Ross (WVU PI), Schuckers, Kumar, Cukic, Hornak, Co-PIs, NSF MRI 8/1/05 – 7/31/05 \$215,805K.
- *ITR Collaborative Research: Biometrics – Performance, Security, and Social Impact*, Hornak PI, Co-PIs: S. Schuckers (Clarkson), M. Schuckers (St. Lawrence), A. Jain (MSU), L. Nelson (Pitt), B. Cukic, H. Singh, NSF ITR Program, DHS funded. 4-year continuing grant, \$3.1M total, \$800k All Schools Yr 1, \$484K WVU-Pitt (430 DHS, 100K NSF) Yr 2.
- *Towards Fieldable Rapid Bioagent Detection: Advanced Resonant Optical Waveguide and Biolayer Structures for Integrated Biosensing*, Hornak PI, Timperman, Holland, Korakakis Co-Pis, ONR DoD EPSCoR, 3-year \$500K, \$250K Match..
- *West Virginia Research Infrastructure Improvement Proposal*, NSF EPSCoR 2002 Competition, Hill, Hornak(ID-Tech Technical Manager), Jenski, VanScoy. \$9M NSF, \$4.5M State Match. Responsible for nanotech component of award (approx ¼ of award). Developed ID-Tech umbrella for proposal, 3/1/02 – 2/28/05.
- *Operating Center Grant for the Center for Identification Technology Research (CITeR): an IUCRC in Biometrics*, Hornak PI, Cukic Co-PI, Virtual Multiuniversity Center: WVU, MSU, Pitt, Clarkson, St. Lawrence, Univ. of Miami current participants. NSF Industry/Univ. Cooperative Research Center Program. 5 yr award with 5 yr optional renewal. Original Award: \$225K NSF, \$173K memberships, \$55,569 match, 12/15/01 – 11/30/04. Continuing Center Funding \$75 12/15/04 – 11/30/05, \$75K 12/15/05 – 11/30/06. Total Center funding to date including memberships: \$1.9M.
- *CITeR NSF Research Experiences for Undergraduates (REU) Supplement*, \$12,000 awarded 2004 for term of Center.
- *Face Recognition Workshop: Operating Center Grant for the Center for Identification Technology Research (CITeR): an IUCRC in Biometrics*, Hornak, Cukic, and Williams co-PIs, Funding from multiple agencies for national Advanced Face Recognition Workshop, November 2005. \$71,505.
- *Multispectral and Multiframe Iris Analysis, (CITeR Research Portfolio Project)*, Ross PI, Hornak, Li co-PIs. \$64K 7/1/05 – 6/30/06
- *Acquisition and Understanding of Nonideal Iris Imagery, (CITeR Research Portfolio Project)*, Hornak PI, Li, S. Schuckers; Schmid, Fahmy Co-PIs. \$122K 1/1/04 – 6/30/05.
- *Phase I Research Support for Multimodal Biometrics*, Funded by DoD/BFC through subcontract with Lockheed-Martin. WVU lead, MSU, Clarkson, St. Lawrence subs. Cukic and Hornak (Co-PIs), Ross, Xin, Schmid. \$650K 12/1/04 – 8/31/05. Two increments: \$100K, \$200K.
- *Phase II Research Support for Multimodal Biometrics*, Funded by DoD/BFC through subcontract with Lockheed-Martin. WVU lead, MSU, Clarkson, St. Lawrence subs. Cukic and Hornak (Co-PIs), Ross, Xin, Schmid. \$650K 9/1/05 – 12/31/05. \$325K.
- *DoD BFC Research and Education Support: CSC Operations Contract*, WVU Sub to CSC. Hornak and Cukic Co-PIs, \$510K Year 1 of multiyear subcontract. 12/2/04 – 9/22/06 \$421,504.

- *NBSP Standards, Research, and Education*, Ross PI, Trapp, Noore, Cukic, Hornak, NBSP \$450K 1/1/2004 – 9/30/2004.
- *NBSP Year 2*, Trapp PI, Althouse, Atkins, Cukic, Hornak, Kleist, Nolan, Noore, Ross NBSP \$461K 10/1/2004 – 9/30/2005.
- *West Virginia Research Infrastructure Improvement Proposal*, NSF EPSCoR 2002 Competition, Hill, Hornak (ID-Tech Technical Manager), Jenski, VanScoy. \$9M NSF, \$4.5M State Match. Developed ID-Tech umbrella for proposal, 3/1/02 – 2/28/05. Ended. *West Virginia Blueprint for Science and Technology: Strengthening Statewide Multidisciplinary Academic Research Infrastructure*, NSF EPSCoR Supplement Peterson, Admin PI; Hornak, Myers, Korakakis, Lederman Tech Co-PIs. \$1,075,000. 3/1/05 – 12/31/05 NSF funds, 3/1/05 – 6/30/06 State funds.
- *Nd:YAG Laser Resonator Chip Design, Validation, and Optical Characterization*, Hornak PI, NETL/Parsons \$49,999, 11/1/02 – 12/31/03. NCE to 6/04. Phase II Partial Award \$20K, 7/1/04 – 11/30/04, Increment of \$16K 12/1/04 – 11/30/05. NCE to 1/20/06.
- *NER:Nanofilament Directional Control within a Hybrid Microelectronic Actin-Myosin Motility Assay via Integrated a Electric Field Addressing*, NSF Nanoscience Experimental Research Award, Famouri PI, Hornak, Timperman(Chem), Gannett(HSC), \$90K, 8/1/04 – 7/31/05. 7/31/06 NCE.
- *STEM – Training Grant in Cancer Nanotechnology*, WV NSF EPSCoR Flynn and Gannett PIs, Hornak and Korakakis (and other faculty ) participants. \$350K 5-years.
- *MEMS-based Integrated Photonic Technologies for in-situ Microstructure Monitoring and Control: Enabling Technology for MEMS Quality Assurance*, Famouri PI, Hornak Co-PI. NASA EPSCoR, \$540,470 WVU/industry: \$540,470. 12/15/01-12/14/04. 3<sup>rd</sup> and 4<sup>th</sup> years \$180,157 NASA, \$103K Match, 8/1/04 – 7/31/06.
- *Proteomics and Cancer, A Partnership between WVU and the Biotech Industry*, Timperman PI, Yu, Flynn, Jiang, Hornak, Barnett Co-PIs. WV High Ed. Policy Com. Facility Support. \$279,739K. 7/1/03 – 6/30/04. NCE to 6/30/05.
- *Proteomics and Cancer, A Partnership between WVU and the Biotech Industry*, Timperman PI,, Yu, Flynn, Jiang, Hornak, Barnett Co-PIs. WV High Ed. Policy Com. Proposal \$1.58M. Facility Support. Year one of five \$293K. 7/1/02 – 6/30/03.
- *Solidifying CITeR's Liveness Research Foundation, (CITeR Research Portfolio Project)*, S. Caswell PI, Hornak Co-PI, \$50K 10/1/01 – 3/31/03
- *Liveness Study of Biometric Devices (CITeR Research Portfolio Project)*, S. Caswell PI, Hornak Co-PI, \$75K 9/1/01 – 3/31/03.
- *Integrated Optical Monitoring: Enabling Technology for MEMS Feedback Control*, L. A. Hornak PI and P. Famouri Co-PI, NSF Phys. Found. Of Enabling Technologies, \$241,997 Undergraduate Education REU Supplement \$10K. 8/1/99 – 7/31/02. NCE 7/31/03.
- *Forensic Identification Training and Research at WVU*, Callery, King, Yura, Hornak Co-PIs, National Institute of Justice, \$1.2 M, \$251K CSEE. End Date with NCE of 6/30/04.
- *Information Assurance/Biometrics Masters Degree Track Development*, Trapp Admin PI, Cukic, Hornak, Goseva, Co-PIs, DoD, US Army, \$367K, 7/3/02 – 8/31/03.
- *Biometrics and IA Curriculum*, M. Schuckers PI, S. Schuckers, Hornak, Cukic CoPIs. STS International/DoD Biometrics Management Office. \$262,443, 7/25/01 – 7/24/02.

- *WV Army National Guard Quick Look Test and Evaluation of Biometrics*, M. Schuckers PI, S. Schuckers, Hornak, Cukic CoPIs. STS International/DoD Biometrics Management Office. \$19250, 1/8/01 – 8/17/01.
- *Resonant Optical Waveguide Biosensor Fabrication, Characterization, and Test Support*, LAI subcontract from successful DoD Proposal to BAA 02-Q-4655 “DoD Field Portable Aqueous Sample Biosensor.” TSWG task #242C2 \$20K, 12/1/02 – 11/30/03.
- *Biosensor Integrated Optical Chip Fabrication and Characterization: Phase I SBIR*, Hornak, Loats Associates, Inc. SBIR: *Handheld, Fieldable Biosensor for the Detection of Contaminants in Foodstuffs*. \$20K, 8/1/01 – 1/31/02. NCE 5/31/02.
- *Development of Advanced Material Growth and Device Processing Capabilities for Wide Band Gap Semiconductors*, Myers PI, Stinespring, Lederman, and Hornak co-investigators, ONR DoD EPSCoR \$350,000 3/1/99 – 3/31/02.
- *Planning Activity for the Center for Identification Technology Research (CITeR)*, Multiuniversity Center: Hornak PI, WVU, Marshall, MSU, SJSU participants. Planning Grant Award by NSF Industry/Univ. Cooperative Research Center Program. \$10K NSF, \$20K state match 8/15/00 – 8/14/01. NCE 8/14/02.
- *Low-Cost High Efficiency Multijunction Solar Cells Based on Semiconductor Nanostructures*, Das PI, Hornak, DoE NREL. 5/10/99 - 5/9/02. \$300,000.
- *Development of The Center for Identification Systems Technology Research*, L. A. Hornak PI. WV Governor's Technology Office Grant for NSF IUCRC development NSF IUCRC \$80,000. 5/15/00-12/31/01. One year NCE to 12/31/02.
- *WV NSF EPSCoR 1998 Cooperative Agreement: ID Tech Component*. Hornak PI, Schuckers, Ammar, Cukic, Zhang investigators. \$3M total grant, \$725K supporting image proc., microsensor, and biosignals research infrastructure (7/98-6/01).
- *MEMS-based Integrated Electronic and Photonic Technologies for in-situ Microstructure Monitoring and Control: Enabling Technology for MEMS IV&V*, NASA EPSCoR Preparation Grant, WV NASA Space Grant Consortium, \$32,996 NASA, \$32,996 WVU. 5/15/00-5/14/01.
- *A Collaborative Medical Informatics Laboratory, HP Large Systems Engineering Grant*. Russell, Cogley, Calzonetti and Cleetus Program Managers, with Tewksbury, Trapp, Mooney, Srin, Ammar, and Hornak Technical PIs. Hornak and Schuckers project managers 1998/00 \$404,227 (7/97 - 6/00), One-time follow-on 7/98 \$87,309.
- *Exploration and Expansion of Identification Technologies Research*, Schuckers PI, Hornak Co-PI. 1999 NASA EPSCoR, Total \$60,000, NASA: \$30,000. 7/99 – 6/00.
- *The Center for Identification Technology Research (CITeR)*, Multiuniversity Center: WVU, Marshall, MSU, SJSU. Hornak PI, Formal Concept Paper, submitted to NSF I/U CRC Program July 1999. Approved for planning grant submission, Sept. 1999.
- *CMOS Fingerprint Sensor Electrostatic Modeling. Phase II*, L. A. Hornak, Veridicom, Inc. \$35,608 Oct 16, 1998 - Oct 15, 2000.
- *The Veridicom CMOS Fingerprint Sensor: Sensing Mechanism Electrostatic Modeling*, L. A. Hornak, S. Schuckers, and T. Norman Veridicom, Inc. \$16,608 Aug 16, 1998 - May 15, 1999.
- *Sensing and Recognition of Finger Vitality using the Veridicom CMOS Fingerprint Sensor*, S. Schuckers, T. Norman, and L. A. Hornak, Veridicom, Inc. \$16,425 8/16/98 – 5/15/99.

- *Co-integrated polymer waveguide optical interconnections for Wafer-Level MCM Systems*, L. A. Hornak principle investigator, NSF NYI, \$100,000/year (1992-1997). NCE 6/30/99.
- *Contracted on-sight technical exchange of MEMS Optical Feedback Technology*, Sandia National Labs, Albuquerque, NM. \$1350. June 1998.
- *Experimental Microelectronic Embedded Systems for Image Processing and Intelligent Sensors*, NSF EPSCoR Systemic Initiative. S. K. Tewksbury and L. A. Hornak co-principle investigators. NSF: \$230,000, WVU/Industry: \$232,370. (8/95 - 7/98)
- *A Regional Communication System Prototyping Laboratory for Electrical and Computer Engineering Curriculum Integration*, NSF ILI Program. L. A. Hornak PI, S. K. Tewksbury and B. Das co-PIs. \$97,466 (NSF and Match). (8/95 - 7/97).
- *Equipment Resources for MCM Technology and System Prototyping*, L. A. Hornak principle investigator, S. K. Tewksbury co-investigator, U.S. Air Force/AFOSR, \$313,604 (1993-1994).
- *HTS Technology Insertion Program: Cryoelectronics in MCM Based Systems*, S. K. Tewksbury principle investigator, L. A. Hornak co-principle investigator, ARPA/E-Systems \$199,982 (1993-1994).
- *Cryoelectronics in MCM Based Systems*, S. K. Tewksbury principle investigator, L. A. Hornak co-principle investigator, ARPA/E-Systems \$94,200 eight months, (1992-1993).
- *Integrated Interconnections for ULSI Using Si Wafer Area Networks*, S. K. Tewksbury principle investigator, L. A. Hornak co-principle investigator, NSF \$138,881.
- *Compatibility of Submicron Silicon CMOS Circuits with GaAs Heteroepitaxy*, S. K. Tewksbury principle investigator, L. A. Hornak co-principle investigator, DARPA URI \$510,000 (1991-1995).

### **Major Infrastructure Funding Secured**

- *CEMR Nano-microsystem Engineering Shared Cleanroom*, Worked with Dean to secure commitment and planning for the State's first full research fabrication cleanroom, upgrading present facility used by faculty campus-wide. Final Cost, \$2.4M. Activated August 2005.

### **Funded University Grants**

- *Nanofilament Directional Control within a Hybrid Microelectronic Actin-Myosin Motility Assay via Integrated a Electric Field Addressing*, WVU PSCoR Award Leveraging NER award, Famouri PI, Hornak, Timperman(Chem), Gannett(HSC), Co-PIs. \$30K, 10/1/04 – 7/31/05.
- *Beyond CITeR: Building biometrics applied research capacity at WVU*, Post Deadline WV Research Incentive Proposal requested by J. Weete, \$144,770K. 1/1/02-6/30/02. NCE to 8/31/02.
- *Research study to support the development of robust, field-deployable fluorescence-based biosensors*, Meehan PI, Hornak, Stinespring Co-PIs. WV Research Challenge Grant, \$70,266 (incl. \$35,133 state). Thru 6/30/02.
- *Development of a Molecular Beam Epitaxy System for Near Infrared Laser Development*, D. Korakakis PI, Myers, Meehan, Hornak, Stinespring co-Pis. WVU Research Corp \$750K pool competition. \$74,100. 2001-2
- *A WVU Interdisciplinary Project to Establish a foundation for Research in Assay Testing via Coupled Advancements in Synthetic Chemistry, Optical Biochip Technology, and Polymerase Chain Reaction Instrumentation*, WVU Research Corp Proposal (750K Pool), K. Meehan PI, Brummond and Finklea (Chemistry), Yelton (HSC), and Hornak Co-PIs. \$60K.

- *Solidifying the MultiUniversity Research Foundation for CITEr*, Hornak PI, Ammar. M. Schuckers Co-Pis, EPSCoR funding of WVU's top research Priority. \$30K, 8/99 – 7/00.
- *Infrastructure Development: Advanced Materials for Microelectronics, Electrooptics, and Display Technologies*, WVU Research Corp Central Funding Grant. Stinespring, Myers, Hornak. \$45,000. Start 7/1/99.
- *MEMS Prototyping Infrastructure for Intelligent Integrated Sensor Systems Research*, WVU Central Funding Grant. Hornak PI. \$36,000. Awarded 10/96
- *Fluid Dynamics in Microelectromechanical (MEM) Components* 1996 Faculty Senate Grant. M. Lylle PI, Hornak co-investigator. \$7,000. Awarded 5/96
- Strategic Research Initiative Proposal: MSRC Microfabrication Laboratory Infrastructure Support, WVU Central Funding Grant. Hornak PI. \$12,000. Awarded 11/95
- NYI Research Initiation, Hornak, WVU Research Office/College of Engineering \$10,000. Awarded 1993.
- Faculty Development Grant: Travel Support for Participation in the meeting "Packaging, Interconnects and Optoelectronics for the Design of Parallel Computers", Hornak, WVU Faculty Dev. Grant \$400 Awarded.
- Faculty Development Grant Request: Travel Support for Participation in the meeting "Packaging, Interconnects and Optoelectronics for the Design of Parallel Computers", Hornak, WVU Faculty Dev. Grant \$300. Awarded.
- Faculty Development Grant Request: Travel Support for Participation in the meeting "Packaging, Interconnects and Optoelectronics for the Design of Parallel Computers", Hornak, WVU Faculty Dev. Grant \$250. Awarded.

### **Secured Donations**

- *Donation for Optical Communications/Photonics UG Laboratory*, Corning Corporation, Test Equipment, Instrumentation, and Fiber, \$626K Value. Jan. 2003.
- *Two SPEX Spectrometers*. Lucent Technologies, Wireless Technology Group, Murray Hill NJ. Contact: P. Polakos. Estimated Value: \$25k.
- FINLE Technologies, Prolith Lithography TCAD Tool , Ten simultaneous NT network license donation negotiated. \$30,000 commercial value.
- Silvaco Inc. Full UNIX TCAD Tool Suite, Two year license negotiated in discussions with Silvaco regional and national sales rep. \$3000 value.
- Optical Fiber, Cabling, and Accesories - Naval Surface Warfare Center, L. A. Hornak, Donation specifically for new NSF Lightwave Communication Lab. Over \$10,000 estimated value. (Fall 1995).
- Technical Modeling Associates TCAD Process and Device Modeling Tools, L. A. Hornak, Deep discounting of this suite of 12 X-window based CAD tools for use in device microfabrication courses and research. \$24,900. (1993).
- IBM Manassas Donation, SEM, Optical Inspection system, Cleanroom Equipment. Arrangements for transport underway 1993. Value: \$528,000.
- Union Carbide Microlithography Lab Donation, Entire lithography lab, general processing equipment and furniture, 1992. Value: \$305,000.

- AT &T Bell Laboratories Engineering Research Center Donation, Visible Lasers, Terminals, PCs, Computers, office furniture, 1992. Estimated value: \$20,000.
- Prolith/Proxlith Lithography Modeling Tools, Finle Technologies. License for multiple PCs, 1992. Value: \$25,175.
- Code V Optical Modeling CAD Tool Academic Status, Received deep discounting of leased CAD tool, 1992. Value: \$20,000/year.
- AT&T Microelectronics Reading Works Donation, Processing, lithography, electronic, laser equipment, 1992. Estimated value: \$450,000.
- AT&T Bell Laboratories Engineering Research Center Donation, Laser systems, 1992. Estimated value \$200,000.
- AT &T Bell Laboratories Donation, Communications Research Lab, Holmdel, NJ. Processing, optical, electronic equipment, 1991. Estimated value: \$300,000.

## Proposals Pending and in Development

### *Pending Proposals*

1. *Next Generation Biometrics: Achieving Strength in Molecular Recognition and Transport*. West Virginia Research Infrastructure Improvement Proposal, NSF EPSCoR 2005 Competition, Hill PI. Aulick, Hornak (Technical Manager), Peterson, Taylor Co-PIs. \$9M NSF, \$4.5M State Match, \$8.2M Research Corp Match. Developed molecular biometrics emphasis with WVNano group and Marshall leveraging CITEr success and core WVU NSE research. 3 years.
2. *NIRT: Exploration of Biomolecular Detection in GaN and Si Photonic Crystals using Enzyme ad Binding-Initiated Lattice Defects*, Hornak PI, Korakakis, Timperman Co-PIs, NSF Nanoscale integrative research team proposal. 48 months \$1.51M.
3. *Multifunctional Materials Research Experience for Undergraduates Site*, Lederman PI, Hornak Co-PI. WVNano faculty participants. NSF Office of Special Programs. \$347,832.
4. *Nanotechnology in DoD Logistics and Transformation*, Hornak. Mantech EIC. \$25K.

### *Proposals in Development*

1. *SIMS System For Molecular Biometrics Research and Education*, Wu, Hornak, Callery(Pharm), Finklea (Chem) NSF MRI 2005. \$1.1M. January 2006 Deadline.
2. *Photonic Crystals for Biosensor Applications*, Hornak, Shi, Timperman. NSF EPDT Directorate. \$240K Spring 2006 unsolicited proposal deadline submission.

## Publications

### *Books and Contributed Chapters*

- Schuckers SAC, Hornak, L.A., Liveness Detection in Biometric Devices, in *Electrical Engineering Handbook*, Chapter 26, 3rd edition, D. Etter, Ed., CRC Press, 2005.
- Editor, *Polymers for Lightwave and Integrated Optics: Technology and Applications*, Optical Engineering Book Series, Marcel Dekker, New York, NY. Published July 1992.

- T. W. Weidman, E. Kwock, P. Bianconi and L. A. Hornak, "Synthesis and Applications of Polysilyne Thin Film Optical Waveguide Media," in *Polymers for Lightwave and Integrated Optics: Technology and Applications*, L. A. Hornak Ed. Marcel Dekker, New York, NY pp. 195-206, Published July 1992.

### *Pressbook Reprint Chapters*

- S. K. Tewksbury, L. A. Hornak, H. E. Nariman, S. M. Langsjoen, N. J. Hall. J. J. Hall, S. P. McGinnis, "Towards Cointegration of Optical Interconnections within Silicon Microelectronic Systems," reprinted in *Selected Papers on Optical Interconnects and Packaging*, S. H. Lee Editor, SPIE Milestone Series, SPIE Press, **MS142**, 532-543, Copyright Dec 1997. ISBN 0-8194-2766-7.
- S. K. Tewksbury and L. A. Hornak, "Silicon ULSI systems: A new communication challenge for optoelectronics," in *Emerging Optoelectronic Technologies*, Selvarajan, Sonde, Shenai and Tripathi (Eds.) Vedams Books International 1992.
- L. A. Hornak, T. W. Weidman, E. Kwock, W. R. Holland, G. Wolk and S. K. Tewksbury, "The Impact of Polymer Integrated Optics on Silicon Wafer Area Networks," in *Current Overviews in Optical Science and Engineering II*, SPIE Advent Technology Book Series AT2 348 (1990) released 1991.
- M. Hatamian, L. A. Hornak, T. E. Little and S. K. Tewksbury, "Fundamental Interconnection Issues," reprinted in *Electronic Materials Handbook*, ASM International (1989), pp. 2-11.
- S. K. Tewksbury, L. A. Hornak and M. Hatamian, "High- $T_c$  superconductivity: Potential for expanding the performance of digital systems," in *Progress in High Temperature Superconductivity*, C. G. Burnham and R. Kane (Eds), (World Scientific Pub., Teaneck, NJ 1988), pp. 51-87.
- S. K. Tewksbury and L. A. Hornak, "Future physical environments and concurrent computation," in *Concurrent Computations: Algorithms, Architecture and Technology*, S. K. Tewksbury, B. W. Dickinson and S. C. Schwartz (Eds), Plenum Press, NY 1988), pp. 65-86.

### *Journal Publications*

- 1) S. Pathak, L. A. Hornak, D. Lloyd, D. Morton, and I. Stevenson, Resonant Optical Waveguide Biosensor Characterization," In preparation for submission to *IEEE Photonics Technology Letters*.
- 2) T. Cornell, S. Pathak, D. Korakakis, L. Hornak, "Thickness and FTIR Peak Instability in Silicon Dioxide Thin-Films Grown by Electron-Gun Deposition," submitted to *J. Vac. Science and Technology*.
- 3) S. D. Woodruff, N. Ayyalasomayajula, and L. A. Hornak, Design and Characterization of a Diode-Pumped Nd:YAG Retro-reflecting Slab Laser," submitted to *Journal of Optical Engineering*.
- 4) J. Park, L. Wang, J. Dawson, L. Hornak, P. Famouri, "Sliding mode based torque and force estimation using MEMS optical monitoring," *IEEE Sensors Journal*, **5**(3) 546-552 (2005).
- 5) S. T. V. Parthasaradhi, R. R. Derakhshani, L. A. Hornak, S. A. C. Schuckers, "Time Series Detection of Perspiration as a Liveness Test in Fingerprint Devices," *IEEE – Systems Man, and Cybernetics Society, Part C: Applications and Reviews - Special Issue on Biometric Systems*, **35**(3) 335-343 (2005).
- 6) L. Wang, J.M. Dawson, L.A. Hornak, and P. Famouri, "Real-time high-frequency closed-loop translational control of a microelectromechanical systems (MEMS) lateral comb resonator," accepted for publication in *IEEE Trans. on Aero. and Elec. Sys.*, **40**(2), pp. 567-575 April 2004.
- 7) J. Dawson, L. Wang, P. Famouri, L. A. Hornak, "Grating Enhanced Through-Wafer Optical Microprobe for MEMS High-Resolution Optical Position Feedback," *Optics Letters*, **28**(14) 1263 (2003).

- 8) R. Derakhshani, S. A. C. Schuckers, L. A. Hornak, L. O'Gorman, "Determination of Vitality from a Non-Invasive Biomedical Measurement for use in Fingerprint Scanners," *Journal of Pattern Recognition, Special Issue on Biometrics*, **36**(2), pp. 383-396 (2003).
- 9) J. Dawson, J. Chen, K. Brown, P. Famouri, and L. A. Hornak, "Through-wafer Optical Probe Characterization for MEMS Positional State Monitoring and Feedback Control," *Journal of Optical Engineering*, **39**(12), 3239-3246 (2000).
- 10) F. M. Dickey, S. C. Holswade, L. A. Hornak, and K. S. Brown, "Optical Methods for Micromachine Monitoring and Feedback," *Sensors and Actuators A, Physical*, **78**, 220 (1999).
- 11) K. S. Brown, B. Taylor, and L. A. Hornak, "Characterization of Poly(phenylsilsequioxane) Thin-film Planar Optical Waveguides," *Photonics Technol. Lett.*, **9**(6) 791 1997.
- 12) S. K. Tewksbury and L. A. Hornak, "Optical Clock Distribution in Electronic Systems," *Journal of VLSI Signal Processing*, **16** 225-246 (1997).
- 13) S. K. Tewksbury, L. A. Hornak, L. A. Tewksbury, and L. Chen, "High-Temperature Superconducting Interconnections on MCMs," *Journal of Microelectronic Systems Integration*, **4**(2) 95-133 (1996).
- 14) L. A. Hornak, J. C. Barr, W. D. Cox, K. S. Brown, R. Morgan, and M. Hibbs-Brenner, "Low-Temperature Characterization of MOVPE-Grown Vertical Cavity Surface Emitting Lasers," *Photonics Technol. Lett.*, **7**(10) 1110 (1995).
- 15) S. K. Tewksbury and L. A. Hornak, "Multichip Modules: A platform for optical interconnections within microelectronic systems," invited paper, special issue on OEICs, *Inter. J. Optoelectronics, Devices, and Technologies*, MITA Press **9**(1) 55-80 March (1994).
- 16) S. K. Tewksbury, L. A. Hornak, H. E. Nariman, S. M. Langsjoen, N. J. Hall, J. J. Hall and S. P. McGinnis, "Co-integration of Optoelectronics and Submicron CMOS," *IEEE Trans. CHMT*, Special issue on Wafer-Scale Integration, **16**(7), 674-685 (1993).
- 17) L. A. Hornak and T. W. Weidman, Propagation Loss of Index Imaged Poly(cyclohexylsilyne) Thin Film Optical Waveguides, *Applied Physics Lett.* **62**(9), 913-15 (1993).
- 18) S. K. Tewksbury, L. A. Hornak, H. E. Nariman, S. M. Langssjoen, N. J. Hall, J. J. Hall and S. P. McGinnis, "Towards Co-integration of Optical Interconnections within Silicon Microelectronic Systems," *J. Parallel and Distributed Computing*, **17**, 188-199 (1993).
- 19) L. A. Hornak and T. W. Weidman, "Issues Facing Optical Interconnection Network Scaling within Emerging ULSI Systems," *J. of Nonlinear Optics*, Frontier Issue, **3**(1-2), 25-39 1992.
- 20) T. W. Weidman, E. W. Kwock, L. A. Hornak and W. L. Wilson, Photooxidative patterning of poly(alkylsilyne) network materials: application to thin film optical waveguide fabrication, *Polymer Preprints*, **31**(2), ACS (Washington, DC 1990).
- 21) L. A. Hornak, T. W. Weidman and E. L. Kwock, "Polyalkylsilyne photodefined thin film optical waveguides," *J. Appl. Phys.* **67**(5), 2235 (1990).
- 22) S. K. Tewksbury, L. A. Hornak and M. Hatamian, High-Tc superconductors for digital system interconnections, *Solid-State Electronics*, **32**(11), 947-959 (1989).
- 23) L. A. Hornak, M. Hatamian, S. K. Tewksbury, E. G. Burkhardt, R. E. Howard, P. Mankiewich, B. Straughn and C. D. Brandle, "Electrical behavior of a 31 cm, thin film YBaCuO superconducting microstrip," *J. Appl. Phys.* **66**(10), 5066 (1989).
- 24) S. K. Tewksbury and L. A. Hornak, "Wafer level system integration: A review," *IEEE Circuits and Devices*, **5**(6), pp. 22-30 1989.

- 25) L. A. Hornak, S. K. Tewksbury and M. Hatamian, "The impact of high- $T_c$  superconductivity on system communications," *IEEE Trans. Comp., Hyb., and Manuf. Technol.*, **11**(4), pp. 412-18 (1988).
- 26) L. A. Hornak, "Through-wafer optical interconnection coupling characteristics," *Electronics Lett.*, **24**(11), pp. 714-715, (1988).
- 27) S. K. Tewksbury and L. A. Hornak, "Communication network issues and high density interconnects in large-scale distributed computing systems," *IEEE J. Selected Areas in Communications*, **6**(3), pp. 587-609 (1988).
- 28) M. Hatamian, L. A. Hornak, T. E. Little, S. K. Tewksbury and P. Franzon, "Fundamental interconnection issues," *AT & T Technical Journal*, **66**(4), 13 (1987).
- 29) L. A. Hornak, "Fresnel phase plate lenses for through-wafer optical interconnections," *Applied Optics*, **26**(17), pp. 3649-3654 (1987).
- 30) L. A. Hornak and S. K. Tewksbury, "On the feasibility of through-wafer optical interconnects for hybrid wafer-scale integrated architectures," *IEEE Trans. Electron Dev.*, **ED-34**(7), pp. 1557-63 (1987).
- 31) S. K. Tewksbury, T. L. Lindstrom, L. A. Hornak, M. Biazzo and R. Bosworth, "Chip alignment templates for multi-chip module assembly," *IEEE Trans. Comp. Hybrids, and Manuf. Technol.*, **CHMT-10**(1) pp. 111-21 (1987).
- 32) S. K. Tewksbury, M. Hatamian, P. Franzon, L. A. Hornak, C. A. Siller and V. B. Lawrence, "FIR digital filters for high sample rate applications," *IEEE Communications Mag.*, **25**(7), 62-72 (1987).
- 33) G. Beni, S. Hackwood, L. A. Hornak, J. L. Jackel, "Dynamic Sensing for Robots - An Analysis and implementation," *Int. J. Robotics* **2** 51, (1983).
- 34) S. Hackwood, L. A. Hornak, G. Beni, R. Wolf, T. J. Nelson, "Torque Sensitive Tactile Array for Robotics," *Int. J. Robotics* **2** 46, (1983).
- 35) G. Beni, L. A. Hornak, S. Hackwood, "Proximity Sensor Uses Reentrant Loop Magnetic Effect," *Sensor Review*, April (1983).

### *Conference Proceedings and Invited Papers*

1. A. Izadian, L. A. Hornak, and P. Famouri, "Variable Structure Self-tuning Adaptive Controller for MEMS," 2006 American Control Conference, IEEE Control Systems Society. Submitted.
2. A. Izadian, L. A. Hornak, and P. Famouri, "Adaptive Control of MEMS Devices," 2006 American Control Conference, IEEE Control Systems Society. Submitted.
3. J. M. Dawson, M. A. F. Harrison, C. A. Maxey, W. B. McCormick, and L. A. Hornak, Utilizing Aperiodic Excitation of Microelectromechanical Systems (MEMS) for Microstructure Fault Detection and Improved System Functionality," *SPIE Smart Electronics, MEMS, BioMEMS, and Nanotechnology Symposium*, accepted (San Diego, CA Feb 2006).
4. N. Paturi, C. R. Vemuri, D. Korakakis, L. A. Hornak, "Analysis of Cluster Defects for Photonic Crystal Biosensor Applications" *SPIE Optics East* **6005** 126 (2005).
5. Aditya Abhyankar, L. A. Hornak and S. A. C. Schuckers, "Off-axis Iris Recognition using Bi-orthogonal Wavelet Network System," *Auto ID 2005, Fourth IEEE Workshop on Automatic Identification Advanced Technologies*, V. Bhagavatula and V. Govindaraju, Eds. ISBN 0-7695-2475-3 pp. 239-244 (Buffalo, New York. October 17-18 2005)

6. P. Famouri, H. Takatsuki, L. A. Hornak, K. Brown, R. Chilakamarri, A. Timperman, J. Lemke, P. Gannett, and K. Kohama, "Nanofilament Directional Control within a Hybrid Microelectronic Actin-Myosin Motility Assay via Integrated Electric Field Addressing," *NSTI BioNano Conference*, (Anaheim, CA, May 2005).
7. S.A.C Schuckers, A. S. Abhyankar, L. A. Hornak, "Iris Recognition using Biorthogonal Wavelets," *Proc of SPIE Conference on Biometrics Technology for Human Identification*, **5779** 59-67(Orlando FL, March 2005).
8. S. A. C. Schuckers, S. T. V. Parthasaradhi, R. R. Derakhshani, and L. A. Hornak, "Comparison of Classification Methods for Time Series Detection of Perspiration as a Liveness Test in Fingerprint Devices," invited paper to *Biometric Authentication: First International Conference (ICBA)*, LNCS 3072, Springer, pp. 256-263 (Hong Kong, July 2004)
9. G. Fahmy, L. Hornak, N. Schmid, X. Li, and S. Schuckers, "Non-frontal/Non-ideal Iris Localization and Acquisition," in *Proc. of the SPIE*, **5601**, pp 267-274 (2004).
10. Schuckers SAC, Derakhshani R, Parthasaradhi S, Hornak L, Improvement of an algorithm for recognition of liveness using perspiration in fingerprint devices, *Proceedings of the SPIE Defense and Security Symposium, Biometric Technology for Human Identification*, Orlando, April, 2004.
11. D. Lloyd, L Hornak, S Pathak, D Morton, and I. Stevenson; "Application of Ion Beam Assisted Thin Film Deposition Techniques to the Fabrication of a Biosensor Chip With Fieldability Potential for Important Biohazard Detection Applications" *47th Annual Technical Conference Proceedings, Soc. of Vac. Coaters*, ISSN 0737-5921 (2004).
12. L. A. Hornak, P. Famouri, "Failure Detection of Integrated MEMS Package by Optical Monitoring," 8<sup>th</sup> Microelectronics Reliability and Qualification Workshop, (LA, CA. Feb 2-6, 2004).
13. J.M. Dawson, L. Wang, W.B. McCormick, S.A. Rittenhouse, P. Famouri, and L.A. Hornak, "Integrated optical monitoring of MEMS for closed loop control," in *Proc. of SPIE Micromachining and Microfabrication Symposium*, **4983**, pp 34-43, (Jan. 2003, Santa Clara CA).
14. J. Park, L. Wang, J. Dawson, L. Hornak, P. Famouri, "Microstructure Torque Estimation Using MEMS Optical Monitoring," invited paper in *Proc of 1<sup>st</sup> IEEE International Conference on Sensors*, (June 11-14, 2002 Orlando FL). Nominated for Conference Best Paper Award.
15. L. A. Hornak, P. Famouri, J. Dawson, L. Wang, W. McCormick, S. Rittenhouse, R Ghaffarian "MEMS Integrated Optical Monitoring for Fault Detection and Closed-Loop Control," in *Proc. SMTA International Conference*, (Sept. 22-26, 2002, Chicago, IL).
16. L. A. Hornak, J. Dawson, P. Famouri, L. Wang, and J. Chen, "MOEMS Integrated Optical Monitoring," invited paper in *Proc of SPIE Micromachining and Microfabrication Symposium, MOEMS and Miniaturized Systems II Conference*, Santa Clara CA, **4561**, (Oct. 2001).
17. R. Derakhshani, S. A. C. Schuckers, L. A. Hornak, L. O'Gorman, "Neural Network-Based Approach for detection of Liveness in Fingerprint Scanners," in *2001 Proc International Conference on Artificial Intelligence*, H. R. Arabnia, Ed., CSREA Press pp. 1099-1105 (IC-AI 2001 June 25-28 Las Vegas NV).
18. L. A. Hornak, P. Famouri, J. Dawson, and L. Wang, "MOEMS Integrated Optical Monitoring," invited paper in *Proc of SPIE Micromachining and Microfabrication Conference*, Santa Clara CA, **4561** (2001).
19. A.J. Ptak, T.H. Myers, Lijun Wang, N.C. Giles, M. Moldovan, C.R. Da Cunha, L.A. Hornak, C. Tian, R.A. Hockett, S. Mitha, and P. Van Lierde., "Incorporation of Magnesium and Beryllium During rf-Plasma Growth of GaN by Molecular Beam Epitaxy," presented Fall MRS Meeting, submitted to *Mat. Res. Symp. Proc.* (2001).

20. J. Dawson, L. Wang, P. Famouri and L. A. Hornak, "MEMS Feedback Control Using Through-wafer Optical Device Monitoring," in *Proc of SPIE Micromachining and Microfabrication Conference*, Santa Clara CA, **4178**, 221-231 (2000).
21. L. Wang, J. Dawson, J. Chen, P. Famouri and L. A. Hornak, "Stroke Length Control of a MEMS Device," in *Proc. International Symposium on Industrial Electronics, ISIE 2000*, Dec 4-8 Cholula, Puebla, Mexico, **2**, 535-539 (2000).
22. Jingdong Chen, Parviz Famouri and Lawrence Hornak, "Nonlinear Control of MEMS: Microengine Sliding Control Simulation," in *Proc. International Conference on Intelligent Systems and Control*, ISBN 0-88986-261-3, pp 96-101, Santa Barbara, California, October 28-30, 1999.
23. J. Dawson, K. Brown, and L. A. Hornak, "Through-wafer Interrogation of Microstructure motion for MEMS Feedback Control," in *Proc SPIE*, **3878**, 281-292, 1999.
24. K. S. Brown, B. Taylor, and L. A. Hornak, "Polymer Waveguide Co-integration with Micro Electro-Mechanical Systems (MEMS) for Optical Integrated Metrology," in *Miniaturized Systems with Micro-Optics and Micromechanics III*, *Proc SPIE*, **3276** 112-122 (San Diego, CA January 1998).
25. L. A. Hornak, K. Brown, B. Taylor, and J. C. Barr, "Polymer Guided Wave Integrated Optics: An Enabling Technology for Micro-Opto-Electro-Mechanical Systems," invited paper, in *Miniaturized Systems with Micro-Optics and Micromechanics II*, *Proc SPIE*, **3008** 124-135 (San Diego, CA February 1997).
26. K. S. Brown, B. Taylor, and L. A. Hornak, "Characterization of Poly(phenylsilsequioxane) as a Planar Thin-film Optical Waveguide Material," in *Optical Interconnect and Packaging IV, Photonics West 97*, **3005** 163-169 (San Jose, CA February 1997).
27. B. Das, L. A. Hornak, and S. Saha, "Effect of Channel Profile Engineering on Hot Carrier Reliability in nMOSFETS with 100 nm Channel Lengths," in *Materials and Reliability in Microelectronics VII Symposium*, MRS 1997 Spring Meeting San Francisco, CA (March 31 - April 4).
28. L. A. Hornak, S. K. Tewksbury, B. Das, and M. A. Jerabek, "A Communication System Prototyping Laboratory for Electrical and Computer Engineering Curriculum Integration," *ASEE Conference, Division for Lab-Oriented Studies (DELOS)*, Milwaukee, Wisconsin (June 15-18, 1997).
29. S. K. Tewksbury and L. A. Hornak, "Optical Interconnections for Emerging High-Performance Electronic Modules," in *Proc. 1996 Advanced Technology Workshop*, Hanscom AFB, MA. (August 6-8, 1996).
30. B. Das, L. A. Hornak, and M. Lemmon, "A Model Undergraduate Integrated Optics Laboratory," in *Proc. SPIE Education in Optics*, **2525** 136-147 (1995).
31. L. A. Hornak and S. K. Tewksbury, "Optical and Low-Temperature Environments for High Performance Computing and Communications," invited paper presented at ISHM/IEPS Workshop on Optoelectronics, (Ojai, CA February 1995).
32. L. A. Hornak, S. K. Tewksbury, J. C. Barr, W. D. Cox, and K. S. Brown, "Optical Interconnections and Cryoelectronics: Complimentary Enabling Technologies for Emerging Mainstream Systems," in *Proc. SPIE*, **2400** 224 (1995).
33. S. K. Tewksbury and L. A. Hornak, "Can optoelectronic and silicon chips be monolithically integrated?," invited paper, *Laser Focus World Magazine*, 151-156 May 1994.
34. L. A. Hornak, S. K. Tewksbury, "Generic VLSI Platform for System-Level Optical Interconnections," in *Proc. SPIE-OE/LASE* **2153**, 3-13 (Los Angeles, CA January 22-29 1994).
35. L. A. Hornak, S. K. Tewksbury, "A System-Level VLSI Platform for Optical Interconnection Insertion," IEEE LEOS Annual Meeting (San Jose, CA Nov 16-18 1993).

36. L. A. Hornak, S. K. Tewksbury and H. E. Nariman, "GaAs Heteroepitaxy with submicron silicon CMOS: An experimental compatibility study," in *Proc. SPIE OE/LASE* (Los Angeles, CA January 18-20 1993).
37. S. K. Tewksbury and L. A. Hornak, invited paper, Technical Digest, Optical Society of America Topical Meeting on Photonics in Switching, **7**, 290 (Palm Springs, CA March 1993).
38. S. K. Tewksbury, L. A. Hornak and H. E. Nariman, "Co-integration of optoelectronics and submicron CMOS," in *IEEE Conference on Wafer Scale Integration* (San Francisco, CA January 20-22, 1993).
39. K. W. Goossen, J. A. Walker, J. E. Cunningham, W. Y. Jan, D. A. B. Miller, S. K. Tewksbury and L. A. Hornak, "Monolithic integration of GaAs/AlGaAs multiple quantum well modulators and micron linewidth silicon MOS transistors," in *Conference on Lasers and ElectroOptics* (CLEO) 1993.
40. K. W. Goossen, J. A. Walker, J. E. Cunningham, W. Y. Jan, D. A. B. Miller, S. K. Tewksbury and L. A. Hornak, "Monolithic integration of GaAs/AlGaAs multiple quantum well modulators and silicon MOS transistors," in *Topical Meeting on Optical Switching*, (Palm Springs, CA March 1993).
41. L. A. Hornak, S. K. Tewksbury and H. E. Nariman, "Merging optics and microelectronic systems: Compatibility of GaAs heteroepitaxy with submicron Si CMOS," *IEEE Laser and Electro-Optic Society (LEOS) Annual Meeting* 438 (Boston, MA Nov 16-19 1992).
42. L. A. Hornak, S. K. Tewksbury, N. J. Hall, S. Langsjoen, H. E. Nariman and T. W. Weidman, Optical Interconnection Adaptation for emerging MCM environments, invited paper, in *Proc. 7th Electronic Materials and Processing Congress*, 185-196 (Cambridge, MA August 1992).
43. L. A. Hornak and T. W. Weidman, "Optical interconnection network co-integration: the potential role of optical polymers," invited paper, in *Materials for Optical Information Processing*, C. Warde, J. Stamatoff and W. I. Wang, Eds. MRS Symposium Proceedings, vol. 228 pp.51-62 (1992).
44. L. A. Hornak, S. K. Tewksbury and T. W. Weidman, "Towards co-integration of optical interconnection networks within silicon multi-chip systems," in *Proc. SPIE, OE/Aerospace-sense*, **1704** paper 44 (Orlando, FL April, 1992).
45. S. K. Tewksbury, M. Uppuluri and L. A. Hornak, "Interconnections/Micro-Networks for integrated microelectronics," *IEEE GLOBECOM Conference*, 180-186 (Orlando, FL December 6-9, 1992).
46. T. W. Weidman and L. A. Hornak, "Polyalkylsilyne photodefinable thin film optical waveguide media," *Materials Research Society*, paper M3.6/N1.6, 265 (Anahiem, CA, May 1991).
47. S. K. Tewksbury and L. A. Hornak, "Silicon ULSI systems: A new communication challenge for optoelectronics," invited paper in *SPIE Emerging Optoelectronic Technologies Conference*, (Bangalore, India, Dec 16-21, 1991).
48. S. K. Tewksbury and L. A. Hornak, Integration of electronics and optics for advanced MCM packaging," invited paper, in *Proc. IEEE Symp. on High Density Integration in Communications and Computer Systems*. (Oct. 17-19, 1991).
49. L. A. Hornak, T. W. Weidman, E. W. Kwock, W. R. Holland, G. L. Wolk and S. K. Tewksbury, "The impact of polymer integrated optics on silicon wafer area networks" invited paper in *Proc. SPIE*, **1337**, pp. 12-22 (1990).
50. S. K. Tewksbury and L. A. Hornak, "Silicon wafer area networks: Co-integration of novel communication network technologies within Si ULSI," *1990 Government Microcircuit Applications Conference* (Las Vegas, Nevada, Nov. 6-8, 1990).
51. S. K. Tewksbury and L. A. Hornak, "Systolic Networks for massively Parallel Scaled Computers: A Vehicle for Demonstration of Advanced Technologies," invited paper, in *Proc. ISHM*, (Chicago, Ill, October 15-17, 1990).

52. S. K. Tewksbury and L. A. Hornak, "Evolution of interconnections to wafer-level networks for future VLSI Systems," invited paper, *IEEE Workshop: Interconnections within High Speed Systems* (May 14-16, 1990: Santa Fe, NM).
53. L. A. Hornak, S. K. Tewksbury, T. W. Weidman and E. W. Kwock, "Wafer level optical interconnection network layout," in *Int. Conf. on Optical Science and Engineering*, (March 12-15, 1990: The Hague).
54. S. K. Tewksbury and L. A. Hornak, "Co-integration of Optoelectronics and Silicon ULSI for Scaled, High Performance Distributed Computing Systems," in *Proc SPIE O-E Lase`90*, Conference on Digital Optical Computing, (Los Angeles, CA Jan. 17-19, 1990).
55. S. K. Tewksbury and L. A. Hornak, "System level performance limits and optical interconnection performance," invited paper, in *IEEE LEOS Conference Digest*, 60 (Orlando, FL, Oct.17-20 1989).
56. L. A. Hornak, "Optical interconnection routing studies using alkylsilicon polymers," in *Proc. SPIE Optoelectronics and Fiber Optic Devices and Applications Conf.*, Optical Interconnects in the Computer Environment, 1178, 146-54 (Boston, MA, Sept. 5-8, 1989).
57. S. K. Tewksbury and L. A. Hornak, "Optical vs. electrical tradeoffs for communications in highly parallel, distributed memory multiprocessors," in *Proc. SPIE Optoelectronics and Fiber Optic Devices and Applications Conf*, Optical Interconnects in the Computer Environment, **1178**, 131-45 (Boston, MA, Sept. 5-8, 1989).
58. S. K. Tewksbury, L. A. Hornak and M. Hatamian, "Low temperature semiconductor devices and high temperature superconducting interconnections," in *Proc. IEEE Workshop on Low Temperature Electronics*, (Burlington, VT, Aug. 7-8, 1989).
59. S. K. Tewksbury, L. A. Hornak and M. Hatamian, "Superconducting vs. Optical Interconnections," *Device Research Conference*, (Boston, MA June 19-23,1989).
60. L. A. Hornak and S. K. Tewksbury, "Advanced interconnection technologies and system-level communication functions," invited paper, in *Proc. 1989 IEEE V-MIC*, 211-25 (Santa Clara, CA, June 12-13, 1989).
61. M. Hatamian, S. K. Tewksbury, L. A. Hornak, B. Straughn and C. D. Brandle, "Experiments with a 31 cm High-Tc superconducting thin film transmission line," in *Proc. IEEE MTT-S*, 2, 623-6 (Long Beach, CA, June 12-16, 1989).
62. S. K. Tewksbury, L. A. Hornak and M. Hatamian, "Superconducting interconnections: performance and applications," invited paper, *Electro/89*, New York, NY (April 11, 1989).
63. M. Hatamian, L. A. Hornak and S. K. Tewksbury, "Potential applications of high-Tc superconducting transmission lines in integrated systems," in *Proc. IEEE ICCD '88*, 172-177 (Oct. 1988).
64. M. Hatamian, S. K. Tewksbury and L. A. Hornak, "Applications of superconducting transmission lines in integrated systems," in *IEEE Vail Computer Elements Workshop*, Vail, Colorado (July 26-29, 1988).
65. L. A. Hornak, S. K. Tewksbury and M. Hatamian, "Practical barrier issues facing high temperature superconducting interconnections in electronic systems," invited paper, HiTCST 2 Symp., Electrochemical Society (Los Angeles, CA May 7-12, 1989).
66. L. A. Hornak, S. K. Tewksbury and M. Hatamian, "The impact of high-Tc superconductivity on system communications," invited paper, in *Proc. 38th Electronic Components Conf.*, 152-158, (Los Angeles, CA. May 9-11, 1988).
67. L. A. Hornak and S. K. Tewksbury, "Optical interconnections for wafer-scale architectures," invited paper in *Proc. 7th Int'l Elec. Pack. Soc. Conf.*, 815-819, (Boston MA Nov 9-11, 1987).

68. S. K. Tewksbury, M. Hatamian and L. A. Hornak, "Applications and performance questions for high-Tc superconducting films in digital electronics," *Superconductors in Electronics Commercialization Workshop*, (San Francisco Sept. 14-15, 1987).
69. L. A. Hornak, "Optical interconnections for wafer-scale integrated and hybrid wafer-scale integrated architectures," in *Proc. SPIE Integrated Optical Circuit Engineering V*, **835**, 322-7Aug. 1987.
70. S. K. Tewksbury, L. A. Hornak, A. Ligtenberg and B. Sugla, "Distributed Routing Algorithm for Mesh Networks: The Impact of Execution Times and Time Uncertainties," *Parallel Computer Conference*, 15-17 July 1987 Amsterdam.
71. L. A. Hornak, S. K. Tewksbury, M. Hatamian, A. Ligtenberg, B. Sugla, and P. Franzon, Through-wafer optical interconnects for multi-wafer wafer-scale-integrated architectures, in *Proc. SPIE Current Dev. in Optical Engineering and Diffraction Phenomena*, **679**, 57-62 Aug. 1986.
72. S. K. Tewksbury and L. A. Hornak, "Future large scale systems: technology boundaries and the role of interconnects," *4th IEEE Int. Workshop on VLSI in Communications*, (Ottawa, Canada June 19-21, 1986).
73. L. A. Hornak, "A Task Oriented Software Design for Multi-Robot/Sensor Systems," invited paper, in *Proc. 166th Electrochem. Soc. Meeting*, **894** 84-2 (New Orleans, October 1984).
74. L. A. Hornak, S. Hackwood, G. Beni, "Reentrant-Loop Magnetic Effect Proximity Sensing for Robotics," in *Proc. Robots*, **449**, 323-7 (Boston, November, 7-9, 1983).

### *Other Conferences, Papers, Articles*

- D. Lloyd, L. A. Hornak, S. Pathak, Dale Morton, and I. Stevenson, "SPARROW a New Thin Film Based Biosensor Chip Technology, in *Vacuum Technology and Coating*, pp. 48-57, (2004).
- E. Rood and L. A. Hornak, "Are you who you say you are?" in *The World and I, The Magazine for Lifelong Learners*, Washington Times Corp, Washington, DC, Summer 2003.
- S.A.C Schuckers, L. A. Hornak, S. Parthasaradhi, and R. Derakhshani, "Time series Detection of Perspiration as a Liveness Test in Fingerprint Devices," 1<sup>st</sup> Biometrics Symposium at the 2003 Biometrics Consortium Conference, (Sept 23-25, Arlington, VA, 2003).
- S. A. C. Schuckers, L. Hornak, R. Derakhshani, S. Parthasaradhi, "Making Biometrics Spoof-Proof," *Proc of Biometrics 2002*, (Nov 6-8, 2002, London England).
- L. A. Hornak, "WVU ID-Tech Group Research Nano-Microtech," presentation at WV State EPSCoR Meeting, (Charleston, WV January 28-29, 2002).
- L. A. Hornak, "Nano-Microtech – Underpinning of EPSCoR ID-Tech Efforts," presentation to WV Secretary of Education Goodwin, WVURC. April 2002.
- P. Famouri, L. A. Hornak, R. Ghaffarian, and A. Lee, "MEMS-based Integrated Photonic Technology for *in-situ* Microstructure Monitoring and Control: An enabling Approach to MEMS Quality Assurance," NanoSpace Conference, (Houston, TX, March 2001).
- L. A. Hornak, "WVU ID-Tech Group Research," presentation at WV State EPSCoR Meeting, (Charleston, WV February 26-27, 2001). (Presented by G. Trapp due to illness).
- R. Derakhshani, S. Schuckers, and L. A. Hornak, "Determination of Vitality from a Non-Invasive Biomedical Measurement for use in Fingerprint Scanners," poster session, *World Congress on Medical Physics and Biomedical Engineering*. (July 23-28 2000 Chicago, Illinois).

- R. Derakhshani, S. Schuckers, and L. A. Hornak, “Determination of Vitality from a Non-Invasive Biomedical Measurement for use in Fingerprint Scanners,” *85<sup>th</sup> International Association for Identification Int. Educ. Conference*. (July 23-29 2000 Charleston, WV).
- L. A. Hornak, “ID-Technologies: Strategies and Challenges,” prepared at the request of and submitted to the *WV S&T Advisory Council Briefing Paper*, 2/28/00.
- J. C. Barr, (L. A. Hornak and K. Brown Advisors), “ Photonic Microelectromechanical Switches,” in *10th National Conference on Undergrad. Research*, Charlotte, NC (April, 1996).
- J. C. Barr, W. D. Cox, and J. J. Wolfgang, (L. A. Hornak, K. Brown Advisors), “Development and Fabrication of Microelectromechanical Optical Switches,” in *Proceedings Ninth National Conference on Undergraduate Research*, 2 599-603 (Union College, April 20-22, 1995).
- G. Williams and A. Swecker, (L. A. Hornak Advisor), “Direct-Write Microlithography System,” poster presentation at The Ninth National Conference on Undergraduate Research,” (Union College, April 20-22, 1995).

### *Talks and Presentations*

- L. A. Hornak, “CITeR – Foundation for a Biometrics Industry Growth in WV,” *Appalachian Regional Council Conference*, (Charleston, WV July 2005).
- L. A. Hornak, “Nanotechnology and Biometrics,” *Homeland Security Presentation to WV Secretary Spears, Department of Military Affairs and Public Safety* (Morgantown, WV August 2005).  
*Management Team Briefing Department of Military Affairs and Public Safety* (Morgantown, WV November 2005).
- L. A. Hornak, “Biometric Identification Technologies and Homeland Security,” breakout presentation at *NSF I/UCRC Directors Meeting*, Emerging Research Area Feature Panel, (Washington, DC, January 2004).
- L. A. Hornak, “ID-Technologies – Building Core Research Competencies Toward the Bio-Nano-Info Interface,” *NSF Site Visit of WV NSF EPSCoR Program* (Charleston, WV October 2004).
- L. A. Hornak, “CITeR and NSE at WVU” *Homeland Security Colloquium*, (NRCCE Morgantown, WV August 2004).
- L. A. Hornak, “The Center for Identification Technology Research - CITeR,” Feature Panel Session, *NSF IUCRC Director’s Conference*, Arlington, VA, January 9-10, 2003.
- L. A. Hornak and T. Myers, “Current Research and Proposed Growth: Bionanotechnology,” invited breakout presentation at *WV State EPSCoR Meeting*, (Charleston, WV May 13-14, 2003).
- L. A. Hornak, “CITeR Overview and Directions,” invited talk, *Fall 2002 International Conference of the Biometrics Consortium*, Arlington, VA, Sept 23 – 25, 2002.
- L. A. Hornak, “The Center for Identification Technology Research - CITeR,” invited talk, *2001 International Conference of the Biometrics Consortium*, Crystal City, VA, Feb 13-15, 2002. (rescheduled to Feb 2002 due to 9-11).
- L. A. Hornak, “What is Biometrics,” invited talk, WVU Research Office. First in Biometrics Series. May 12, 2002.
- L. A. Hornak, “Biometrics,” invited talk, Marshall University, Sept. 18, 2002.

- L. A. Hornak, "What is Biometrics," invited talk, Federal Executive Association Talk Series, September 12, 2002.
- L. A. Hornak, *Biometrics at WVU - The Center for Identification Technology Research - CITEr*, invited talk, WVHTF Breakfast Talk Series, November 14, 2001.
- L. A. Hornak, "Biometric Identification Research Directions," invited participation, *US Senate Commerce Committee, Technology Caucus Panel on Biometrics*, (June 28, 2000 Washington DC).
- L. A. Hornak, "Biometrics Research Initiatives at West Virginia University," invited talk, *2000 International Conference of the Biometrics Consortium*, NIST, Gaithersburg MD Sept. 14-15, 2000.
- L. A. Hornak, *Biometrics Systems: Research at the Bio-Nano-Info Interface*, invited talk, Fall Physics Colloquium Series, Indiana University of Pennsylvania, Oct 20, 2000.
- L. A. Hornak, *Biometrics*, invited talk, WV Society of Profession Engineers Annual Meeting, Lakeview Resort, Morgantown, WV Oct 12-13, 2000.
- L. A. Hornak, "Research of the WVU ID Tech Group," presentation to *the AAAS EPSCoR Review Committee*, (WVU Mountainlair, March 15-17, 2000).
- L. A. Hornak, "WVU ID-Tech Group Research Initiatives," presentation at WV State EPSCoR Meeting, (Charleston, WV February 13-15, 2000).
- L. A. Hornak, "Center for Identification Technology Research (CITEr) I/UCRC Development: Progress and Challenges," presentation at ID Technologies-CITEr Development Breakout Session, *Mountain State On the Move Conference, WV State Science and Technology Committee Annual Meeting*, (FETC, Morgantown, WV Nov 30, 1999).
- L. A. Hornak, "Identification Technologies at WVU," *CEMR Visiting Committee Meeting*, (Holiday Inn, Morgantown October 14, 1999).
- L. A. Hornak, "Biometric Systems Research and Education at WVU," presentation to RIT Administration, (Mollohan Innovation Center, March 31, 1999).
- L. A. Hornak, "CSEE Biometric Systems Research Initiatives," poster presentation at *AAAS Research in Domestic Preparedness Conference*, (OSU, Stillwater, Oklahoma. March 14-16, 1999).
- L. A. Hornak, "Biometric Identification Technology Research at WVU," presentation at WVState EPSCoR Meeting, (Charleston, WV February 25, 1999).
- *The Enabling Role of WVU ID-Technology Research in Economic Development*, Panel Member Presentation, *Mountain State On the Move Conference*, WV State Science and Technology Committee, Nov 1-2, 1998. L. A. Hornak, "Biometric Systems Research at WVU," invited talk, CEMR Visiting Committee Fall Meeting Banquet, Morgantown, WV October 14, 1999.
- L. A. Hornak, "Photonics MEMS: Technology for IOM" invited talk, Sandia National Labs, Albuquerque, NM. June 15, 1998.
- L. A. Hornak, "LEOS Home Page and e-mail Newsletter," invited talk, at IEEE Technical Advisory Board (TAB) Periodicals Meeting, IEEE Directors' Meeting, June 1995.
- L. A. Hornak, "Development of the LEOS Home Page," invited talk, IEEE Directors World Wide Web Forum, both at IEEE Director's Meeting, June 1995.
- L. A. Hornak, *Transitioning Materials to System Technologies: The MSRC*, WVU Research Workshop (April 21, 1994).

- L. A. Hornak and S. K. Tewksbury, Optical Interconnection Insertion within Si Microelectronic Systems, invited talk, ASM Electronic Materials and Processes Conference (San Jose, CA August 30 - Sept 1, 1993).
- L. A. Hornak and S. K. Tewksbury, Design for Manufacturability Strategies for Multi-Chip Modules, Presentation to DARPA funding officers, NJIT Consortium Proposal Meeting, November 24, 1992.
- L. A. Hornak, Optical interconnection network co-integration for silicon wafer-area systems, invited talk, Naval Research Nanoelectronics Laboratory, (NRL, Washington, DC Nov. 15, 1991).
- L. A. Hornak and T. W. Weidman, Co-integration of optical interconnection networks within emerging Si systems, invited talk, Conf on Mat. for Elect. Packaging, 14, (SUNY Buffalo, NY Aug 20-22 1991).
- L. A. Hornak and T. W. Weidman, Issues facing optical interconnection network scaling within emerging ULSI systems, on the role of optical polymers in achieving full co-integration invited talk, Symp. on NLO Processes in Organic and Polymer Systems and Photonic Devices, Univ of Penn. (Philadelphia, PA, April 29-30, 1991).
- L. A. Hornak, Polysilene thin film optical waveguides, invited talk, Amer. Vac. Soc. 17th Symposium, Upstate NY Chapter (Rochester, NY June 13-15, 1990).
- L. A. Hornak, Optical interconnection network layout for wafer-level systems, invited talk, Electrical Engineering Seminar, Syracuse University, Syracuse, NY (April 20, 1990).
- S. K. Tewksbury and L. A. Hornak, invited talk, System Performance Limits of Optical Interconnects, GE-CR &D Electro-Optics Workshop, Jan. 10, 1990.
- S. K. Tewksbury and L. A. Hornak System level performance limits and optical interconnection performance, Invited lecture, IEEE LEOS (Orlando, FL, Oct. 1989).
- L. A. Hornak, S. K. Tewksbury and M. Hatamian, Interconnection issues and high-Tc superconductivity, Invited talk, HiTCST 1 Symp., Electrochemical Society (Chicago, IL Oct. 11, 1988).
- L. A. Hornak, High performance interconnections: optical and superconducting technologies, Invited Talk: Lehigh University, (Allentown, PA April 22, 1988).
- S. K. Tewksbury, L. A. Hornak and M. Hatamian, High-Tc superconducting interconnections for digital electronics, Invited talk, 5th Annual Texas Regional Symposium, (Dallas, TX April 11-12, 1988)
- L. A. Hornak, Optical interconnection issues for multi-wafer systems, Invited talk: Advanced Materials and Processes for High Density Packaging: Engineering Foundation Conf. (Santa Barbara, CA., March 20-25, 1988)
- L. A. Hornak, Interconnection technologies and high-Tc superconductivity, invited talk, IEEE Electron Device Chapter, (Syracuse, NY Sept. 3, 1987).
- S. K. Tewksbury and L. A. Hornak, Future large scale systems: technology boundaries and the role of interconnects, invited talk, 4th IEEE Int. Workshop on VLSI in Communications, (Ottawa, Canada June 19-21, 1986).
- L. A. Hornak, High Precision Device Robotics, invited talk, Eastern Analytical Symposium, NYC, November 1984.

*Conferences Attended* (e.g. not a formal participant in program)

- *NSF IUCRC Director's Conference*, Arlington, VA, January 2001-2006.

- *International Computer Security Association*, Tucson Arizona, Nov 7-11, 1998. Represented F-ID program, CEMR/CSEE.
- *Biometrics Consortium Meeting*, Washington, DC Sept 21-23, 1998. Attended representing WVU F-ID program, CEMR/CSEE.
- *Biometrics Consortium Meeting*, San Jose, CA, Dec 6-8 1997. Attended with M. Yura representing WVU F-ID efforts.

### *AT&T Bell Laboratories Technical Reports (1982-1991)*

- T. W. Weidman, W. L. Wilson, E. Kwock and L. A. Hornak, Photodefined birefringence in polysilynes, May 1991.
- S. K. Tewksbury and L. A. Hornak, Co-integration of optoelectronic and silicon ULSI for scaled networks, Sept. 1989.
- L. A. Hornak Externally sourced intramodule optical interconnections for multi-wafer systems, Computer and Robotic Systems Technical Report 88-8, 1988.
- S. K. Tewksbury, L. A. Hornak and M. Hatamian, Reconfigurable networks using superconducting interconnections, 1988.
- S. K. Tewksbury, L. A. Hornak and M. Hatamian, Extrinsic attenuation and phase velocity in superconducting interconnections, 1987.
- L. A. Hornak, An Experimental Setup for the Measurement, Processing, and Plotting of Intensity Distributions for Integrated Optics, Sept. 1986.
- L. A. Hornak, Low Power Hybrid Optical Driver and Receiver Circuits for Optical Interconnect Experimentation, Sept. 1986.
- S. K. Tewksbury and L. A. Hornak, Communication network limits and high density interconnects for large-scale distributed computing systems, Sept. 1986.
- Tewksbury, Franzon, Hatamian, Hornak, Kumar, Jones, Reconfiguration “chip frame” for wafer-scale and hybrid wafer-scale fault tolerant arrays, Sept. 1986.
- L. A. Hornak, S. K. Tewksbury and J. Segen, On the Integration of Automated Assembly and Silicon Circuit Boards for Hybrid-Wafer-Scale-Integrated Modules, Sept. 1985.
- L. A. Hornak, Motor Shaft Angle Detection Using Light Amplitude Modulation, Nov. 1984.
- P. A. Beck, G. Beni, S. Hackwood and L. A. Hornak, Intelligent Robot System for Microelectronics, Sept. 1984.
- L. A. Hornak, A Task Oriented Software Design for High Precision Multi-Robot Systems, April 1984.
- P. A. Beck and L. A. Hornak, Multi-Magnification Photolithographic Calibration Method for Robotic Applications, March 1984.
- L. A. Hornak, P. A. Beck, S. Hackwood and G. Beni, A Modular Robotic Microscope: System Communication, Feb. 1984.
- P. A. Beck, L. A. Hornak, S. Hackwood and G. Beni, A Robot Microscope for High Precision Device Robotics, Feb. 1984.
- L. A. Hornak, S. Hackwood and G. Beni, Sensory Communication in Intelligent Robotic Systems, Sept. 1983.
- S. Hackwood, L. A. Hornak and G. Beni, Non-Polluting, Protective Robot covering for Clean-Rooms and Hostile Environments, Feb. 1983.

### **Patents, Applications, and Disclosures**

S. C. Schuckers, R. Derakhshani, and L. A. Hornak, “Liveness Detection Technique for Multitechnology Fingerprint Sensors,” Disclosure filed 4-1-03, patent application in process.

L. O'Gorman, S. C. Schuckers, R. Derakhshani, and L. A. Hornak, "Method and Apparatus for Determining a Living Finger on a Fingerprint Sensor," *US Provisional Patent Application*, Docket Number P-7653 US. Filed October 7, 1999.

"Optical Interconnects for Wafer-Scale-Integrated Assembly," U.S. Patent Application Hornak-Tewksbury 6-9, Dec. 12, 1985.

"Concentric Ring Fiducial Marks for use with Robotic Microscope and Computer Vision System - Intelligent Robot System for Microelectronics," U.S. Patent Application Beck-Beni-Hackwood-Hornak 2-15-9-5, July 10, 1985.

"Protective Robot Covering," European Patent Beni-Hackwood-Hornak 13-7-4, September 26, 1984, U.S. Patent Application Beni-Hackwood-Hornak 13-7-4, October 3, 1983.

"Dynamic Optical Sensor - Robotic System and Manufacturing Method Utilizing Same," U.S. Patent Application Beni-Hackwood-Hornak-Jackel 12-6-3-5, May 27, 1983.

"Robotic System Utilizing a Tactile Sensor Array," Beni-Hackwood-Hornak 11-5-2, U.S. Patent No. 4,588,348 May 13, 1986.

"Robot Having Magnetic Proximity Sensor and Manufacturing Method Utilizing Same," Beni-Hackwood-Hornak 10-4-1, U.S. Patent No. 4,541,771 Sept 17, 1985.