

Hooman Mohseni

Curriculum Vitae

A. BIOGRAPHICAL INFORMATION	2
B. KEY RESEARCH ACHIEVEMENTS	3
C. UNIVERSITY AND PROFESSIONAL SERVICES.....	5
D. KEY TEACHING, ADVISING, AND OUTREACH ACTIVITIES	9
E. PUBLICATION LIST	12
F. SELECTED INVITED AND KEYNOTE TALKS	25
G. COLLABORATION.....	28

A. BIOGRAPHICAL INFORMATION

HOOMAN MOHSENI

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Education	Northwestern University , Ph.D. in Electrical Engineering	2001
	Sharif University of Technology , M.S. in Electrical Engineering	1995
	Amirkabir University of Technology , B.S. in Electrical Engineering	1993
Appointments	<u>NORTHWESTERN UNIVERSITY</u> , Professor, ECE Department 2014-present Professor, Department of Physics & Astronomy 2016-present <u>KERNEL, A NEUROTECHNOLOGY COMPANY</u> 2018-2019 Chief Technology Officer (CTO) <u>NORTHWESTERN UNIVERSITY</u> , 2004-2009 Assistant Professor, EECS Department <u>SARNOFF CORPORATION</u> , 2001-2004 Member of Technical Staff, Photonic Integration Group <u>NORTHWESTERN UNIVERSITY</u> , 1996-2001 Research Assistant, Center for Quantum Devices <u>SHARIF UNIVERSITY OF TECHNOLOGY</u> , 1994-1995 Research Assistant, Intelligent Systems Laboratory	
Recognitions & Awards at Northwestern	<ul style="list-style-type: none"> • Keck Foundation Science and Engineering Award, W. M. Keck Foundation 2015 • Frontiers of Engineering, National Academy of Engineering 2013 • OSA Fellow, Optical Society of America 2012 • Faculty Honor Roll, Northwestern University Associated Student Government 2012 • SPIE Fellow, International Society for Optical Engineering 2010 • Top Researcher Award, EECS Department, Northwestern University 2009 • DARPA Young Faculty Award, Defense Advanced Research Agency 2007 • USA delegate to the first US-Korea Nano-manufacturing and Direct Self-Assembly Meeting - Selected and funded by NSF 2007 • CAREER Award, National Science Foundation 2006 • USA delegate to the NSF-MEXT US-Japan Young Scientist Exchange Program on Nanotechnology - Selected and funded by NSF 2006 • Searle Junior Fellow, Northwestern University 2005 	

B. KEY RESEARCH ACHIEVEMENTS

[1] Invented and Demonstrated Bio-inspired Nano-injection Infrared Detector and Imager: Inspired by the ultra-low noise gain mechanism in the Rod cells, Hooman Mohseni invented [P4-P6-] a novel semiconductor detector that is based on carrier compression and nano-injection amplification. Mohseni's group has demonstrated generation of more than 10,000 electrons per photon at room temperature, and at a bias of only 1 volt for the first time. Another unique aspect of these devices is that their noise is almost shot-noise limited, even at a very high gain. Such an unusual noise performance is due to electron flow regulation in the nano-injector, similar to the quantum Fano effect. Cameras built based on 320x240 imaging arrays at short-wave infrared (SWIR) show two orders of magnitude higher signal-to-noise ratio compared with best cameras based on the conventional p-i-n detectors. This technology has received the competitive W.M. Keck Foundation Science and Engineering Award to be used for an ultra-sensitive camera for exoplanet imaging at the 8-meter Subaru Telescope in Hawaii. The latest cameras show record high sensitivity compared to existing infrared cameras at similar wavelength, temperature, and frame rate.

[Reference in the publication list: B1-B6-&J1-J17-J19-J20-J21-J27- J30- J42-J45-J48-J49-J54-J56-J58-J59-&C2-C3-C5-C8-C9-C10-C12-C15-C22-C32-C39-C46-C47-C48-C51-C58-C59-C60-C62-&P3-P6-P4-]

[2] Engineering Light-Matter Interaction at the Nano-Scale: A new series of structures have been engineered in Mohseni's group that are capable of producing ultra-broadband and controlled light-matter interaction. They have experimentally demonstrated field enhancement exceeding four orders of magnitude in volumes as small as $10^{-5}\lambda^3$ (λ is the wavelength of light), and with bandwidths approaching 10 THz. When combined with deep sub-wavelength quantum well infrared detectors, his group has demonstrated the highest reported quantum efficiency due to the enhanced interaction of light and matter. They have also demonstrated single-molecule concept detectors by integrating these structures with quantum cascade lasers. Mohseni's group has also demonstrated about two orders of magnitude enhancement in optical force, with excellent agreement with theory, in such structures. They proposed a new computational model called Space-Time Scattering Network, which for the first time enables inverse design of non-linear, broadband, and time-dependent optical structures to perform a desired computation at the nano-scale.

[Reference in the publication list: J5-J24-J25-J28-J34-J36-J37-J38-J40-J43-J44-J48-J51- & C16-C17-C21- C24-C26-C27-C28-C25-C33-C35-C36-C37-C38-C40-C41-C42-C43-]

[3] Demonstrated the first high performance long wavelength, first uncooled, and first very long wavelength type-II superlattice infrared detectors: Mohseni demonstrated the first binary Type-II long wavelength IR detector in 1997, when type-II superlattices were only considered a scientific curiosity. His pioneering paper [J74-] is amongst the highest cited experimental papers in this field. Shortly after, he demonstrated the first uncooled Type-II IR detector, and the first experimental demonstration of Auger suppression in bandgap engineered superlattices. Later, he demonstrated the first high-performance very long wavelength ($\lambda \sim 30 \mu\text{m}$) Type-II IR detector. His theoretical and experimental researches in this field have significantly contributed in propelling type-II IR detectors as the next generation devices worldwide. Currently, tens of millions of dollars in annual research fund are dedicated to research in this field, and many large and small companies across the world are investing in developing this technology for a wide range of applications.

[Reference in the publication list: B7- & J64-J65-J66-J67-J68-J70-J71-J72-J74-J75-J76- & C77-C78-C79-C80-C81-C82-C83-C84-C85-C86-C87-C88-]

[4] Invented and demonstrated low-dimensional Infrared Detectors: Mohseni's early experimental work on quantum dot infrared detectors in 1998 led to the demonstration of a high-performance quantum dot intersubband detector that was reported in a highly cited paper [J73-]. While working at Sarnoff Corporation, he invented [P11-] Gated Nano-pillar Arrays to address the non-uniformity issue of self-assembled quantum dots. This method can also address other limitations of top-down approaches, including the surface effect, which is very significant in such devices. Mohseni has also developed top-down nano-devices in the infrared region.

[Reference in the publication list: J39-J47-J50-J73- & C44- C82- & P11-]

[5] Invented and Demonstrated a novel Deep Sub-wavelength Nano-processing: Utilizing the “Photonic Jet” effect in microspheres –originally predicted by A. Taflove at Northwestern- Mohseni invented a novel nano-processing method [P13-], which has been used by many other groups since publication. Mohseni's group has demonstrated features as small as 50 nm in photoresist with conventional UV lithography at $\lambda \sim 400$ nm. Unlike electron beam lithography, billions of extremely uniform nano-holes or nano-pillars in conventional photoresist could be produced in one shot. The photoresist could then be used to pattern almost any material with a subsequent wet or dry processing. Such a high throughput combined with its simplicity has rendered this method very attractive for many applications that can benefit from nanometer features over large areas including organic displays, organic solar cells, nano-filtration, and fuel cells. Mohseni's group has also used this method to produce extremely uniform arrays of electrically addressable quantum dots.

[Reference in the publication list: J24- J26-J31-J47-J50-J51-J52-J53-J55-J60- & C49-C50-C52-C61- & P5- P13-]

[6] Invented and Demonstrated novel Stepped Quantum Well Modulators: Mohseni invented [P12-] a novel stepped quantum well design that utilizes Kramers-Kronig relation and electron-hole delocalization, and demonstrated semiconductor modulators with one order of magnitude higher modulation efficiency compared with conventional quantum well modulators. He also invented a novel linearization method and produced modulators with more than one order of magnitude higher linearity compared with any reported semiconductor modulator. Extremely large bandgap shifts produced by these modulators was also used to demonstrate surface normal large-area retro modulators with very wide wavelength range and operating temperature.

[Reference in the publication list: J61-J62-J63- & C1-C69-C70-C73-C75- & P12-]

[7] Developed a novel Photonic Integration Methods based on Amorphous Silicon: while at Sarnoff Corporation, Mohseni developed a novel photonic integration method based on plasma enhanced chemical vapor deposition (PECVD) of amorphous silicon. Unlike the existing integration methods, this method is suitable for low-cost production, since it neither requires accurate alignment, nor epitaxial regrowth. This effort led to the first demonstration of a photonic integrated circuit with semiconductor components and amorphous waveguides. He also developed electrically tunable micro-ring resonators for fast and wavelength selective photonic switches. Majority of this work could not be published in journals due to the request of a Korean company that is commercializing this technology. Seven patents covering important aspects of the invention is published so far.

[Reference in the publication list: C71-C74-C76- & P8- P18-P20-P21-P22-]

C. UNIVERSITY AND PROFESSIONAL SERVICES

UNIVERSITY SERVICES AND LEADERSHIP

Promotion and Tenure Committee (2017-2019)

Mohseni has served at the McCormick Promotion and Tenure Committee, which recommends promotion at all levels to the Dean of Engineering. Mohseni has also served as a member of the P&T ad hoc committees in the past.

Northwestern Limited Submissions Advisory Committee (2012-2015)

As a member of the Limited Submission Advisory Committee, Mohseni helps identifying top proposals from Northwestern, when the number of submission per institute is restricted by the funding agencies. The committee is comprised of members from each of Northwestern schools (Engineering, Medicine, and Art and Science) and meets once a month on average.

Northwestern Cleanroom Committee Chair (2014-present)

Mohseni chaired this committee that oversees the overall performance and strategies for Northwestern's cleanroom facilities. He closely works with cleanroom directors to identify the best approaches for expansion of each of the cleanrooms. He also directs the proposal writing effort for major instrumentation for these facilities.

Solid-state and Photonics Initiative, SSPI (2010-2016)

Mohseni initiated this collaborative environment in 2010, and leads a group of more than 30 faculties to bridge different disciplines and schools, and develop new ideas based on the Solid-state and Photonics platform. The goal of this initiative is to identify and organize interdisciplinary research with significant impact on health, security, energy, and communication. SSPI has had several successful workshops with about 40 participants from all Northwestern's schools as well as Fermi and Argonne National Labs. One of the outcomes of these workshops was an NSF Science and Technology Center proposal with 39 key personnel from seven universities and two national labs, as well as 25 international partnering schools from Europe, South America, Asia, and the Middle East. It was selected amongst the top 10% of 330 proposals. A new proposal for the current cycle is underway. Another emerging outcome is a collaborative work with Fermi National Lab for establishment of joint NU-Fermi senior electronic center.

Faculty Hiring Search Committees (2010-2011-2013-2014-2017)

Mohseni chaired the hiring committee for a faculty position at the EECS Department in 2017, which was successfully in hiring the top candidate (Pedram Khalili). Mohseni chaired a hiring committee for a joint faculty position between the EECS Department, and Rehabilitation Institute of Chicago (RIC), which was successfully in hiring the top candidate (Brenna Argall - successfully received tenure) in 2011. In addition, he was a committee member in other hiring committees, including a new hire in the area of Solid-state and Photonics at EECS Department in 2013, which was successful in hiring the top candidates (Koray Aydin - successfully received tenure), and a position in Computer Engineering in 2014, which was successful in hiring the top candidate (Jie Gu) in 2014.

Mission and Planning Committee (2009-2012)

As a member of the ECE Mission and Planning Committee, Mohseni helped developing a mission statement for the department, and set departmental 5-year and 10-year goals.

Graduate Committee (2005-2015)

Mohseni is the co-director of the EECS Department's Graduate Committee. He has also been part of the Solid State and Photonic sub-committee since 2005. As a part of this service he helps with the admission process. The committee has been very successful in identifying and admitting the best applicants. For example, EECS achieved the highest selectivity, as well as the highest acceptance rate amongst all engineering departments at McCormick in 2012.

Laboratory Committee (2006-2015)

As a member of the EECS laboratory committee, Mohseni led the effort to modernize the current laboratories, and to a greater extent, develop a state-of-the-art laboratory facility for the Solid States Engineering courses. EECS 223 is a cornerstone course, and is taken by all electrical engineering majors and many students at McCormick as part of their engineering breadth requirement. With the help of many people in the Committee, and in particular Professor Henschen, Mohseni wrote a proposal for the Murphy Society in order to secure a lab revitalization funding in the amount of \$70,421. The lab has been substantially improved, and the student feedback - through CTEC - indicates a high degree of satisfaction from the new lab.

Technological Institute and Ford Engineering Design Center Building Safety Committee (2009-present)

Mohseni serves at the safety committee, which is responsible to maintain the safety standards and procedures for the Ford Engineering Design Building, and the Technological Institute Building. This includes safety against all types of hazards (fire, chemicals, etc.)

Ph.D. Exam and Defense Committees

Mohseni has served at 67 PhD Defense and Prospectus exams at the Departments of Electrical Engineering and Computer Science, Material Science and Engineering, and Physics:

- (2019) Mohseni Rezaei, Farah Fahim, Tony Huang, Edgar Palacios, Ha Uk Chung (Department of Biomedical Engineering)
- (2017) Farah Fahim, Zhongyang Li, Zizhio Liu, Francois Callewaert
- (2016) Anh Hoang, Alireza Bonakdar, Iman Hassani Nia, Vala Fathipour
- (2015) Michael Silver, Abbas Haddadi, Vala Fathipour,
- (2014) Neal Oza, Erdem Cicek, Simeon Boghdanov, Sunanda Prabhu-Gaunkar, Wang Zhou, Iman Hassani Nia, Mohamed Fouda, Zhongyang Li.
- (2013) Tim Rambo, Abijith Kowligy, Alireza Bonakdar, Abbas Haddadi, Guanxi Andy Chen, Erdem Cicek, Neelanjan Bandyopadhyay, Chuanle Zhou, Ryan Gelfand, Kevin Kim, Ed Kwei-wei Huang, Stanley Tsao, Paul Giedraitis.
- (2012) Ryan Gelfand, Neal N. Oza, Kevin Kim, Siamak Abdollahi Pour, Ed Kwei-wei Huang, Jack Kohoutek,
- (2011) Monika Patel, Dibyendu Dey, Jack Kohoutek, Ryan Gelfand
- (2010) Chuanle Zhou, Sunanda Prabhu-Gaunkar, Erik Sczygelski (Department of Materials Science & Engineering), Wei Wu, Dibyendu Dey
- (2009) Wei Wu, Darin Hoffman, Minh Binh Nguyen, Pierre-Yves Delaunay, Monika Patel,
- (2008) Burc Gokden, Darin Hoffman, Allan Evans, Jonathan Allen (Department of Materials Science & Engineering), Kenneth Salit, Katie Minder, Nikhil Rangaraju (Department of Materials Science & Engineering), Ruth Schlitz (Department of Materials Science & Engineering)
- (2007) Jean Nguyen, Ryan McClintock, Andrew Hood, Ho-Chul Lim, Jean Nguyen, Kenneth Salit

(2006) Alireza Yasan, Wei (Dave) Zhang, Andrew Hood, Allan Evans, John David (Department of Materials Science & Engineering)

(2005) Ho-Chul Lim, Aaron Gin, Yajun Wei, Kathryn Minder

EXTERNAL SERVICES AND ACTIVITIES

Editorial Boards

- Associate Editor, Frontiers in Material (Part of Nature Publishing Group) (2015-2019)
- Associate Editor, IEEE Photonics Journal (2016-2019, received Editor's Recognition Distinction Award)
- Associate Editor, Optics Letters (2013-2015)
- Guest Editor, IEEE Selected Topics in Quantum Electronics (2014)

Advisory/Steering Committees

- Elected TC Chair for Integrated Optics and Optoelectronics Division, IEEE Laser and Electro-Optics Society (2007-2010).
- International Advisory Committee Member, International Conference on Control, Communication and Power Engineering - CCPE (2010-2012).
- International Advisory Committee Member, International Joint Journal Conference in Engineering (2009-2010).

Conference Chair & Co-Chair

- Bio-sensing and Nano-medicine, SPIE Optics & Photonics (2011-2019)
- Mid-Infrared Optoelectronics: Materials and Devices (2012)
- Bio-sensing, SPIE Optics & Photonics (2008-2010)
- Optics and Photonics, IEEE-MWSCAS (2009)
- Integrated Optics & Optoelectronics, IEEE Photonics Annual Meeting (2007-2009)
- Nano-Science and Engineering symposium, SPIE Optics and Photonics Conference (2008)
- Enabling Photonic Technologies for Defense, Security, and Aerospace Applications, SPIE Defense and Security Symposium, Orlando FL (2007)

Technical Program Committees

- Euro-American Workshop on Information Optics, Kyoto, Japan (2015)
- SPIE Optical Sensing, San Diego, CA (2015)
- Euro-American Workshop on Information Optics, Tenerife, Spain (2013)
- IEEE/ICNSC International Conference on Networking Sensing and Control, Beijing, China (2012)
- Euro-American Workshop on Information Optics, Quebec, Canada (2012)
- Euro-American Workshop on Information Optics, Benicassim, Spain (2011)
- IEEE/ICNSC International Conference on Networking Sensing and Control, Delft, The Netherlands (2011)
- Euro-American Workshop on Information Optics, Helsinki, Finland (2010)

- IEEE International Conference on Networking, Sensing and Control, Chicago, IL (2010)
- SPIE International Symposium, Quantum Sensing, Photonics West, San Jose CA (2007)
- IEEE Laser Electro-Optics Society (LEOS) 20th Annual Meeting, Montreal, Canada (2006)
- SPIE International Symposium, Photonics West, San Jose CA (2006)
- IEEE Laser Electro-Optics Society (LEOS) 19th Annual Meeting, Sydney Australia (2005)

Recent Review Panels (of the total of 31 panels involved)

- Poland Science Foundation, Scientific Review Panel (2018)
- French Government New Research University (Ecoles Universitaires de Recherche) panel (2017)
- Army Research Office (ARO) (2017)
- National Science Centre Poland (OSF) (2017)
- Science Foundation Ireland (SFI) (2017)
- Singapore National Research Foundation (NRF) - Competitive Research Programme (CRP) (2017)
- National Science Foundation (NSF) - IIP (2016)
- National Science Foundation (NSF) - EPMD (2016)
- Army Research Laboratory (ARL) (2016)
- National Science Foundation (NSF) - CAREER (2015)
- Army Research Laboratory (ARL) (2015)
- European Research Council (ERC), Advanced Grant (2015)
- National Science Foundation (NSF) - EMPD (2015)
- Israeli Ministry of Science, Technology and Space (2014)
- European Research Council (ERC) Starting Grant review panel (2014)
- National Science Foundation (NSF), SBIR-STTR (2013)
- Army Research Office, Young Investigator Program (2013)
- European Research Council (ERC) (2012)
- Israel Science Foundation (ISF) (2012)
- Department of Energy (DOE), Basic Energy Sciences (2011)
- National Science Foundation (NSF), International Research Fellowship Program (2011)
- European Research Council (ERC) Advanced Grant review panel (2010)
- National Science Foundation (NSF) - EPDT (2010)
- The Canada Foundation for Innovation (CFI) -Leaders Opportunity Fund (2010)
- National Science Foundation (NSF) - EPDT (2009)
- National Institute of Health (NIH) - Challenge Grant (2009)
- National Science Foundation (NSF) -Physics Division (2009)
- US-Israel Bi-national review panel (2009)
- National Science Foundation (NSF) - Major Equipment Grants (2009)

D. KEY TEACHING, ADVISING, AND OUTREACH ACTIVITIES

TEACHING

- **Course Development and Improvements:** Developed and/or substantially improved undergraduate, and graduate level courses with excellent student evaluation feedback (maximum student evaluation CTEC score=6.0):
 - o EECS-409 “Semiconductor Lasers”; (CTEC= 6.0)
 - o EECS-402 “Advanced Electronic Devices”; (CTEC=5.2)
 - o EECS-405 “Advanced Photonics”; (CTEC=4.8)
 - o MITP-491 “Emerging Technologies: Nanotechnology”; (CTEC= 5.2)
 - o EECS-381 “Electronic Properties of Material”; (CTEC= 6.0)
 - o EECS-223 “Fundamentals of Solid-state Engineering”; (CTEC =4.9)
 - o EECS-202 “Introduction to Electrical Engineering”; (CTEC =5.14)
- **Undergraduate Lab Development:** developed a new undergraduate lab with three subjects in the Solid-State field: Low-dimensional Quantum Confinement, Optical properties of Semiconductors, and Defects in Semiconductor Crystals.
 This included designing the experiments, developing the lab manuals, and purchasing and assembling the lab equipment.
- **Undergraduate Lab Revitalization:** applied for and received a Murphy Society Research Grant in the amount of \$70K to renew Solid-State undergraduate laboratory (2006 to present). The funding has been used to revitalize the lab and to substantially improve 11 lab experiments covering the basics of this field from symmetry and the structure of atoms in crystals, to thermal properties of solid. This has led to a high student satisfaction in several Solid State courses supported by this lab (according to CTEC comments).

SUPERVISING

Mohseni is currently supervising seven PhD students, and three postdocs.

- **PhD Students:**
 - Travis Hamilton: is a third-year PhD student. He has received a Murphy Fellowship.
 - Skylar Wheaton: is a third-year PhD student. He has received a Murphy Fellowship.
 - Simone Bianconi: is a first-year PhD student. He has received an SPIE Scholarship Award, a Murphy Fellowship, and a International Institute of Nanotechnology Ryan Fellowship.
 - Cobi Rabinowitz: is a second-year PhD student.
- **Former Graduate Students:**
 - Farah Fahim – PhD 2019: Deputy Head, Quantum Science , Fermi National Lab
 - Mohsen Rezaei – PhD 2019: Consultant, Boston Consulting Group (BCG)

Robert Brown – PhD 2018: Scientist, Intel Corporation

Vala Fathipour- PhD 2017: Postdoctoral Fellow, UC Berkeley

Iman Hassani Nia- PhD 2016: Scientist, Cisco.

Alireza Bonakdar- PhD 2015: Technology Leader, ASML.

Ryan Gelfand- PhD 2013: Assistant professor, The College of Optics & Photonics (CREOL) University of Central Florida.

Jack Kohoutek- PhD 2012: Senior System Engineer, Northrop Grumman.

Dibyendu Dey- PhD 2011: Scientist, Intel Corporation.

Wei Wu- PhD 2010: Research Investigator at DuPont Central Research and Development.

Omer Gokalp Memis- PhD 2009: Senior Scientist, Intel Corporation.

- **Former Post-doctoral Fellows and Visiting Scholars:**

Chee Leong Tan was a postdoctoral fellow from GIST, Korea. He is currently an assistant professor at Photonics Research Center, University Malaya.

Min-Su Park was a post-doctoral fellow from GIST, Korea. He is currently at Korea Electronics Technology Institute.

Sung Jun Jang was a post-doctoral fellow from GIST, Korea. He is currently at Lumentum Inc.

Omer Gokalp Memis was Research Assistant Professor. He is currently a group leader at Intel.

Alex Katsnelson was a post-doctoral fellow from Ioffe Institute, Russia. Alex is currently at Princeton Lightwave.

Soon Cheol Kong was a post-doctoral fellow from MIT, USA.

Pascal Behr was a visiting graduate student from ETH-Zurich, Switzerland.

Hongqiao Wen was a visiting professor from Wuhan University of Technology, China.

Lucas Bruderer was a visiting graduate student from ETH-Zurich, Switzerland.

Marco Tomamichel was a visiting graduate student from ETH-Zurich, Switzerland .

- **Undergraduate Research Students:**

Four undergraduate research students in Mohseni's group have received the competitive EECS Research Award. Undergraduate researchers have been co-author in five journal papers. Here is the list of the undergraduate research students (40% female):

Michael MacLean is a visiting student from Purdue University, working on optical communication with neurons.

Maria Mutz is a junior working on nanofabrication and light-matter coupling enhancement and our new photonic simulation model, STSN.

Alvin Tan is a sophomore working on infrared focal plane arrays

Jaehyun (Patrick) Kim is a sophomore working on the multi-spectral imaging for early skin cancer identification

Sara Malik was a freshman working on optical communication with neurons

Alfie Astor was a sophomore working on optical communication with neurons

Katie Barnhart was a sophomore working on superlens fabrication

Frank Wang was a sophomore working on superlens fabrication

Eric Dexheimer was a sophomore working on high-throughput nano-fabrication

Abigail Turay was a junior working on probe implants for neural sensing

Joseph Younge was a junior working on integration of an inverted optical microscope

Zoe Listernick was a sophomore working on graphene optoelectronic devices

Kari Drymier was a senior working on wearable photonic sensors

Alejandro Sklar was a senior working on near-field imaging of plasmonic structures

Meredith Chow was a senior working on theoretical aspect of Casimir force

Gregory Huffman was a senior working on numerical simulation of Casimir force

Alexander Antaris was a senior working on laser cooling of solids

Ivy Wan was a senior working on Casimir force effects in nano-scale gaps

Sanjay S Kumar was working on semiconductor device characterization

Bradley Crowe was working on nano-characterization and nano-fabrication of semiconductors

Sevil Shafee Fazel was working on Monte Carlo simulation of semiconductors

Andrew Dei was a junior working on photonic jet nano-processing

- **Undergraduate Academic Advisor:** advised 29 students (2005 to present) in selecting their courses, applying to co-op, summer internships, study abroad, locating and applying to jobs.
- **Co-adviser of five undergraduate teams in McCormick School of Engineering Robot “Design Competition”.** As one of the most exciting events in McCormick School of Engineering, DC provided me with the opportunity to advise groups of students to build their unique robots from design to implementation of hardware and software.

OUTREACH

- **Career Day for Girls:** participated in the annual event and presented fun science and engineering activities for over 260 high school girls during six lab sessions. These included observation of atomic layers with an atomic force microscope, comparing different “colors” in visible and infrared using our visible and infrared cameras, and observation of laser light propagation in different media.
- **Elementary and middle School Career Talk:** informal and fun demonstration of how a laser pointer beam can be bent by fiber optics and relating it to the Internet at Romona Public School.
- **Science Olympiad Coach:** teaching the concepts of renewable energy, and helping 5th and 6th graders in building wind turbines with optimum blade design at Highcrest Middle School.

E. PUBLICATION LIST

Selected Publications since Tenured in 2009:

Journal Name	Dates	Impact Factor	Journal Ranking (ISI)
Nature	2012	38.1	1 st in Multidisciplinary Sciences
Nano Letters	2012, 2011	13.7	3 th in Nanotechnology
Nature Communication	2017	11.3	3 rd in Multidisciplinary Sciences
ACS Nano	2011	13.3	4 th in Nanotechnology
Small	2012	8.3	6 th in Nanotechnology
Nanoscale	2014	7.7	10 th in Nanotechnology
Nature Scientific Reports	2017, 2017, 2019	5.2	7 th in Multidisciplinary Sciences
Optics Express	2010, 2009, 2017	3.7	3 rd in Applied Optics
Applied Physics Letters	2009, 2009, 2014, 2014, 2015, 2016, 2019	3.7	1 st in Applied Physics (number of citations)
IEEE STQE	2014, 2018	3.4	1 st in Quantum Devices
Optics Letter	2009, 2010, 2013, 2015	3.4	4 th in Applied Optics

Invited Book Chapters:

- B1- I. H. Nia and H. Mohseni “Coulomb-assisted Laser Cooling of Piezoelectric Semiconductors,” Laser Cooling edited by Galina Nemova, Pan Stanford 2016.
- B2- H. Mohseni, “Optical Antenna for Optoelectronic Devices,” Future Trend in Microelectronics, Frontiers and Innovation edited by S. Luryi, J. Xu, and A. Zaslavsky, Wiley 2013.
- B3- John Kohoutek, Ryan Gelfand, and Hooman Mohseni, “Integrated Plasmonic Antennas with Active Optical Devices,” The Wonders of Nanotechnology edited by M. Razeghi, SPIE press 2013.
- B4- O.G. Memis and H. Mohseni, “Design of the Nano-injection Detectors Using Finite Element Modeling,” Computational Finite Element Methods in Nanotechnology, edited by Sarhan M . Musa, CRC Press 2012.
- B5- O.G. Memis and H. Mohseni, “Nano-injection Detectors and Imagers for Sensitive and Efficient Infrared Detection”, Information Optics and Photonics: Algorithms, Systems, and Applications, edited by T. Fournel and B. Javidi, Springer 2010.
- B6- H. Mohseni and O.G. Memis, “Nano-Injection Photon Detectors for Sensitive, Efficient Infrared Photon Detection and Counting”, VLSI Micro- and Nanophotonics: Science, Technology, and Applications, edited by E.-H. Lee, L. Eldada, M. Razeghi, C. Jagadish, CRC Press 2010.
- B7- H. Mohseni, M. Razeghi “GaSb/InAs Superlattices for Infrared FPAs,” chapter 6 of Handbook of Infrared Detection Technologies edited by M. Henini and M. Razeghi, Elsevier 2002.

Peer-reviewed Journals:

- J1- S. Bianconi, M. Rezaei, M.S. Park, W. Huang, C.L. Tan, H. Mohseni, “Engineering the gain-bandwidth product of phototransistor diodes,” *Applied Physics Letters* 115 (5), 051104, (2019)
- J2- Iman Hassani nia, Skyler Wheaton, and Hooman Mohseni, “Evaluation of the Returned Electromagnetic Signal from Retroreflectors in Turbid Media,” *Scientific Reports* 9, 6550 (2019).
- J3- Mohsen Rezaei, Min-Su Park, Cobi Rabinowitz, Chee Leong Tan, Skylar Wheaton, Melville Ulmer, and Hooman Mohseni, “InGaAs based heterojunction phototransistors: Viable solution for high-speed and low-noise short wave infrared imaging,” *Appl. Phys. Lett.* 114, 161101 (2019) {Cover of APL, and selected as Editors’ Pick}
- J4- Simone Bianconi, Min-Su Park, and Hooman Mohseni, “Giant Conductivity Modulation of Aluminum Oxide using Focused Ion Beam,” *ACS Applied Electronic Materials* (2019).
- J5- Travis Hamilton and Hooman Mohseni, “Space-Time Scattering Network for Electromagnetic Inverse Design and Tomography,” *arXiv:1811.07207* (2018).
- J6- Chee Leong Tan, Hooman Mohseni, “Emerging technologies for high performance infrared detectors,” *Nanophotonics* 7(1): 169–197 (2018).
- J7- Min-Su Park, Mohsen Rezaei, Iman Nia, Robert Brown, Simone Bianconi, Chee Leong Tan, and Hooman Mohseni, “InGaAs/InP quantum well infrared photodetector integrated on Si substrate by Mo/Au metal-assisted wafer bonding,” *Optical Materials Express* Vol. 8, Issue 2, pp. 413-419 (2018).
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Patents:

- P1- U.S. Patent # 10,254,407; **H. Mohseni** "Electroabsorption modulator for depth imaging and other applications," 2019.
- P2- U.S. Patent # 9,488,810; **H. Mohseni** "Apparatuses and methods to image surfaces with small spot-size and large field of view," 2016.
- P3- U.S. Patent # 9,472,597; **H. Mohseni** "Systems, Apparatuses and Methods for Converting Light Wavelengths," 2016.
- P4- U.S. Patent # 9,054,247; **H. Mohseni** and Omer G. Memis, "Single-photon nano-injection detectors" 2015.
- P5- U.S. Patent # 8,445,188; **H. Mohseni**, "Process for formation of highly uniform arrays of nano-holes and nano-pillars" 2013.
- P6- U.S. Patent # 7,745,816; **H. Mohseni**, "Single-photon detector with a quantum dot and a nano-injector" 2010.
- P7- U.S. Patent # 7,773,840; M. Kwakernaak, W. Chan, C. Capewell, and **H. Mohseni**, "Interface for a-Si waveguides and III/V waveguides" 2010.
- P8- U.S. Patent # 7,546,011; M. Kwakernaak, **H. Mohseni**, and G. Pajer "Monolithically integrated optical devices with amorphous silicon arrayed waveguide gratings and InGaAsP gain" 2009.
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- P10- U.S. Patent # 7,376,319; **H. Mohseni**, J. Abeles, M. Kwakernaak, and V. Khalfin, "Vertically Coupled Large Area Amplifier" 2008.
- P11- US Patent # 7,026,641; **H. Mohseni** and W. Chan, "Electrically tunable quantum dots and methods for making and using for same" 2006.
- P12- US Patent # 7,064,881; **H. Mohseni**, "InP-based phase modulators and methods for making and using for same" 2006.
- P13- US Patent App. 10/254,407 2019
- P14- US Patent application # 20160259059, 2016
- P15- US Patent application # 20140264025; 2014
- P16- US Patent application #20140268371; 2014
- P17- US Patent application # 20100080954; 2010.
- P18- US Patent application #20050117844, 2005.
- P19- International Patent # WO2007044543, 2007.
- P20- International Patent Application # WO2007044545, 2007.
- P21- US patent application # 20050724535; International Patent application # WO2007044542, 2007.
- P22- International Patent application # WO2007044554, 2007.

F. SELECTED INVITED AND KEYNOTE TALKS

- 1- NASA's Distinguished Speaker Seminar, Pasadena, CA (2019)
- 2- SPIE Photonic West, San Jose, CA (2019)
- 3- California Institute of Technology, Pasadena, CA (2018)
- 4- University of California Berkeley, Berkeley, CA (2018)
- 5- Future Trends in Microelectronics, Sardinia, Italy (2018)
- 6- SPIE Photonic West, San Jose, CA (2018)
- 7- Quantum Structure Infrared Photodetectors Conference, Stockholm, Sweden (2018)
- 8- SPIE Defense and Commercial Sensing, Orlando, FL (2018)
- 9- Euro-American Workshop on Information Optics, Interlaken, Switzerland (2017)
- 10- University of Notre Dame, College of Engineering, IN (2017)
- 11- OSA Imaging and Applied Optics Congress, Heidelberg, Germany (2016)
- 12- North Carolina State University, Raleigh, NC (2016)
- 13- Army Research Laboratory, Adelphi, MD (2016)
- 14- OSA Advanced Photonics, Vancouver, Canada (2016)
- 15- International Conference on Computational Photography (ICCP), Evanston, IL (2016)
- 16- IEEE Photonics Conference (IPC), Reston, VA (2015)
- 17- Euro-American Workshop on Information Optics, Kyoto, Japan (2015) {Plenary}
- 18- The 10th Asia-Pacific Conference on Near-field Optics, Hokkaido, Japan (2015)
- 19- International Conference on Materials for Advanced Technologies, Suntec, Singapore (2015)
- 20- Biomedical Engineering Department, Brown University, Providence, RI (2015)
- 21- Frontiers in Optics (FIO), San Jose, CA (2015)
- 22- Rowland Institute, Harvard University, Cambridge, MA (2015)
- 23- Future Trends in Microelectronics, Mallorca, Spain, (2015)
- 24- University of Arizona College of Optical Sciences Colloquium, Tuscan, AZ (2015)
- 25- Euro-American Workshop on Information Optics, Neuchatel, Switzerland (2014)
- 26- Quantum Structured Infrared Photodetector International Conference, Santa Fe, NM (2014)
- 27- UCLA Department of Electrical Engineering Seminar, CA (2014)
- 28- Nano & Giga Challenges in Electronics, Photonics & Renewable Energy, Phoenix, Arizona (2014)
- 29- International Conference and Exhibition on Lasers, Optics & Photonics, Philadelphia (2014)
- 30- SPIE Defense, Security, and Sensing, Baltimore, MD (2014)

- 31- PITTCON, Chicago, IL (2014)
- 32- SPIE Photonic West, San Jose, CA (2014)
- 33- School of Engineering, Washington University in St. Louis, MO (2013)
- 34- National Academy of Engineering U.S-China Frontiers of Engineering Symposium, China (2013)
- 35- Euro-American Workshop on Information Optics, Quebec City, Tenerife, Spain (2013)
- 36- Resonant Optics of Metallic and Dielectric Nanostructures, MRS Spring conference (2013)
- 37- Center for Detectors, Rochester Institute of Technology, Rochester NY(2012)
- 38- Argonne National Laboratory, Center for Nanoscale Materials (2012)
- 39- Quantum Structured Infrared Photodetector International Conference, Corsica, France (2012)
- 40- Future Trends in Microelectronics Workshops, France (2012)
- 41- Euro-American Workshop on Information Optics, Quebec City, Canada (2012)
- 42- IBM Watson Research Center, MA (2012)
- 43- Department of Electrical Engineering, University of Illinois, IL (2012)
- 44- Department of Electrical Engineering, UCLA, CA (2012)
- 45- SPIE Photonic West, San Jose, CA (2012)
- 46- IEEE Photonics Society Annual Meeting, Arlington VA (2011)
- 47- Euro-American Workshop on Information Optics, Benicassim, Spain (2011)
- 48- SPIE Security and Defense, Orlando, FL (2011) {3 invited talks}
- 49- SPIE Optics & Photonics, San Diego, CA (2010)
- 50- National Academy of Engineering -Developments in Detector Technologies, (2010)
- 51- SPIE Optics and Photonics, San Diego, CA (2010)
- 52- Euro-American Workshop on Information Optics, Paris, France (2009)
- 53- Department of Electrical Engineering, UCLA, CA (2009)
- 54- The Next Generation Vision Sensors and Algorithms, DARPA, DC (2009)
- 55- 8th Annual NanoTechnology for Defense Conference, Burlingame, CA (2009)
- 56- SPIE Photonic West, San Jose, CA (2009)
- 57- SPIE Symposium on Security and Defense, Orlando, FL (2009)
- 58- NAVTEQ (Nokia) TeqTalk, Chicago, IL (2009)
- 59- Department of Electrical Engineering, UCLA, CA (2008)
- 60- SPIE, Human Vision and Electronic Imaging, San Jose, CA (2008) {Keynote}
- 61- SPIE Optics and Photonics, San Diego, CA (2008)
- 62- Department of Aerospace of Engineering, University of Maryland, MD (2007)

- 63- US-Korea Workshop on Nano-manufacturing, Seoul, Korea (2007)
- 64- SPIE International Defense and Security Symposium, Orlando FL (2007)
- 65- SPIE Photonic West, San Jose, CA (2007)
- 66- US-Japan Young Scientist Exchange Program, Tokyo, Japan (2006)
- 67- IEEE Indium Phosphide and Related Material Conference, Princeton NJ (2006)
- 68- Institute for Defense Analysis (IDA), Washington, DC (2006)
- 69- SPIE International Defense and Security Symposium, Orlando FL (2006)
- 70- SPIE Photonic West, San Jose, CA (2006)
- 71- Symposium on Infrared Material and Technologies, Penn State PN (2005)
- 72- SPIE Photonic West, San Jose, CA (2005)
- 73- Government Microcircuit Applications & Critical Technology Conference, Las Vegas NV (2005)
- 74- SPIE Security and Defense, Orlando FL (2005)
- 75- Albany NanoTech Colloquia, University at Albany, Albany NY (2004)
- 76- AFOSR Workshop on Quantum Devices, Atlanta (2004)

G. COLLABORATION

Mohseni has had research collaboration, publications, and/or collaborative proposals with many distinguished researchers. The following is a representative list of his major collaborators:

Northwestern - Departmental:

Ollie Cossairt, Koray Aydin, Manijeh Razeghi, Prem Kumar, Selim Shahriar, Thrastos Papas, Aggelos Katsaggelos, Alan Sahakian, Jack Tumblin, Chang Liu,

Northwestern - Interdepartmental:

Emily Weiss (Chemistry & Material Science and Engineering); Melville Ulmer (Physics & Astronomy); Venkat Chandrasekhar (Physics & Astronomy); Giles Novak (Physics & Astronomy); Kristian Hahn (Physics & Astronomy); John Ketterson (Physics & Astronomy); Sam Stupp (Materials Science, Chemistry, and Medicine); Fraser Stoddart (Chemistry); Tobin Marks (Chemistry, Materials Science); Mark Ratner (Chemistry); Mark Hersam (Material Science and Engineering); Lincoln Lauhon (Material Science and Engineering); Wing Kam Liu (Mechanical Engineering); Bruce Wessels (Material Science and Engineering); Mitra Hartmann (Biomedical Engineering); Carla Pugh (Feinberg School of Medicine); Malcolm MacIver (Mechanical Engineering); Horacio Espinosa (Mechanical Engineering); Kevin Lynch (Mechanical Engineering);

National and International – Partial List:

Reiner Leitgeb (University of Vienna), Tilman Schmoll (ZEISS), Viktor Gruev (Washington University), Ilesanmi Adesida (University of Illinois); Mark Lundstrom (Purdue); Paul Raptis (Argonne National Lab); Steve Forrest (U. of Michigan); Muhammad Alam (Purdue); Bahram Javidi (U of Connecticut); Majeed Hayat (UNM); Dino DiCarlo (UCLA); Aydogan Ozcan (UCLA); Jaegab Lee (Kookmin University, South Korea); Markus-Christian Amann (Technical University of Munich, Germany); Bijan Najafi (University of Arizona); Dr. Thomas Nelson (Air Force Research Lab); Nicholas Fang (MIT); George Lauder (Harvard University); James Kerman (MIT-Lincoln Lab); Zane Shallenbarger (SRI-International Sarnoff); Jason Hemphill (St. Jude Medical);