NADER ENGHETA

Current Position: H. Nedwill Ramsey Professor of Electrical and Systems Engineering, and Professor of Bioengineering (secondary appoint), University of Pennsylvania

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***Educational Background*:**

June 1982	Ph.D. in Electrical Engineering (with a minor in Physics) California Institute of Technology (Caltech), Pasadena, California
June 1979	M.S. in Electrical Engineering California Institute of Technology (Caltech), Pasadena, California
June 1978	B.S. in Electrical Engineering (with highest honor/rank) University of Tehran, Tehran, Iran.

***Citizenship*:** U.S. Citizen

***Research Interests*:**

Metamaterials, Plasmonics, Nano-optics, Nanophotonics, Optical Nanocircuits, Metamaterial-Inspired Nanophotonics and Nanosystems ("Metatronics"), Nanostructured Materials Modeling, Graphene Metamaterials, Nano-Electromagnetism, Theory of Nanoscale Devices and Components, Miniaturized Antennas, Electromagnetic/Photonic Band Gap Structures, One-way Flow of Photons, Bio-Inspired/Biomimetic Sensing, Processing, and Displaying Polarization Information, Reverse-Engineering of Polarization Vision and Information Sensing in Nature, Physics of Information Contents in Polarization Vision, Bio-Inspired Hyperspectral Imaging, Through-Wall Microwave Imaging, Electromagnetics/Electrophysics of Event-Related Brain Cortical Potentials (e.g., EEG), Mathematics of Fractional Operators and Fractal Domains.

***Professional Experience*:**

July 1987 to present — Department of Electrical Engineering (Dept. of Electrical and Systems Engineering since February 15, 2002)
University of Pennsylvania, Philadelphia, PA

- H. Nedwill Ramsey Professor (January 1, 2005-present)
- Professor of EE (July 1995-present)
- Professor of Bioengineering (Secondary appointment) (5/2005-present)
- UPS Foundation Distinguished Educator chair holder (7/1999-6/2000)
- Associate Professor of EE (tenured) (July 1990-June 95)
- Assistant Professor of EE (July 1987-June 1990)
- EE Graduate Group Chairman (July 1993-June 1997)
- Member of Applied Mathematics and Computational Science Graduate Group (Sept. 2008- present)

Member of Bioengineering Graduate Group (Sept. 96- present)
Member of the Mahoney Institute of Neurological Sciences, U. of PA (February 1995-present)
Affiliated with the Center for Science and Engineering of Nanoscale Systems (SENS), Nano-Bio Interface Center, UPenn (Jan. 2004-present)
Affiliated with the Center for Sensor Technologies, UPenn (June 2000 – present)

March-May 1998 (sabbatical)	Visiting Professor under Fulbright Naples Chair Award Universita' di Napoli Dipartimento di Ingegneria Elettronica Napoli, Italia
June 1983 to June 1987	Senior Research Scientist Kaman Sciences Corporation, Dikewood Division Santa Monica, California.
June 1983 to June 1987	Visiting Research Associate in Electrical Engineering (Part Time) Caltech, Pasadena, California
Spring 1986	Visiting Lecturer in Electrical Engineering (Part Time) UCLA
June 1982 to June 1983	Postdoctoral Research Fellow in Electrical Engineering Caltech, Pasadena, California
January 1979 to June 1982	Graduate Research Assistant in Electrical Engineering Caltech, Pasadena, California

***Honors and Distinctions*:**

- Selected to receive the *2012 IEEE Electromagnetics Award* (one of the Technical Field Awards) for "For contributions to electromagnetic theory and applications of metamaterials and nanoscale optics" (2012)
- *Fellow* of the SPIE- The International Society for Optical Engineering (2011)
- *Fellow* of the American Association for the Advancement of Science (AAAS) (2010)
- *Fellow* of the American Physical Society (APS) (2008)
- Recipient of the *2008 George H. Heilmeier Award for Excellence in Research*, School of Engineering and Applied Science, University of Pennsylvania, December 2007.
- Selected as one of the *Scientific American Magazine 50 Leaders in Science and Technology* in 2006, for his contributions to the field of plasmonics, November 2006.
- Holder of the endowed *H. Nedwill Ramsey Chaired Professorship* in Electrical and Systems Engineering (Jan 1, 2005 - present)
- Recipient of the *IEEE Third Millennium Medal*, April 2000.
- Recipient of a *Guggenheim* Fellowship Award, 1999.
- *Fellow* of the Optical Society of America (OSA) (1999)
- *Fellow* of IEEE (1996)

- Holder of the *UPS Foundation Distinguished Educator term Chair* for one-year term (Academic Year 1999-2000)
- Recipient of the *Fulbright Chair Award for Naples*, Italy through the Fulbright Distinguished Chairs program (1998). (First recipient of Naples Chair in the field of engineering).
- Recipient of a *NSF Presidential Young Investigator* (PYI) Award (1989).
- Recipient of the *W. M. Keck Foundation's 1995 Engineering Teaching Excellence Award*, 1995.
- Recipient of the *Christian F. and Mary R. Lindback Foundation Award for distinguished teaching*, April 1994.
- Recipient (two times) of the *S. Reid Warren, Jr. Award for distinguished teaching*, School of Engineering and Applied Science, University of Pennsylvania, October 1993, and April 2002.
- Recipient of the 2008 *Computer Simulation Technology (CST) University Publication Award* for the paper A. Alu and N. Engheta, "Cloaking and Transparency for Collections of Particles with Metamaterial and Plasmonic Covers," *Optics Express*, Vol. 15, No. 12, pp. 7578-7590, June 11, 2007.
- Recipient of *Magistri Artivm honoris causa* (Honorary MA degree) from University of Pennsylvania, 1990
- Member of *The Electromagnetics Academy*
- Member of *The Committee on Science and the Arts (Electrical Engineering Cluster) of the Frankline Institute*, September 2011-present
- (Courtesy) Adjunct Professor of the *Electromagnetics Academy at Zheijiang University*, Hangzhou, China, November 2004-November 2006
- Elected as the Vice-Chair (for 2010) and Chair (for 2012) for the *Gordon Research Conference on Plasmonics*.
- Member of the External Advisory Board for the Sandia National Laboratory's Metamaterials Grand Challenge Program, October 2008 – April 2011.
- Member of *The International Advisory Committee and Local Organizing Committee of The Hong-Kong University of Science and Technology (HKUST) Institute for Advance Study's Conference and Study Program on "Metamaterials, Plasmonics, and Transformation Optics to be held on October-November 2012*, April 2011-present.
- Member of *The External Advisory Board of the Program "Engineering Metamaterials (EMET)", Spain's Ministry of Science and Innovation's Research Program "Consolider-Ingenio 2010",* September 2010-present
- Chair of the External Advisory Board for the University of Southampton's EPSRC Programme on Nanostructured Photonic Metamaterials, January 2010- Present.
- Member of the DARPA's Defense Sciences Research Council (DSRC), September 1, 2006 – August 31, 2010.
- Our paper "Cloaking a Sensor" published in Phys. Rev. Letters on June 8, 2009 was selected to be highlighted as an Editors'

Suggestion, and also for highlighting in the online APS publication Physics.

- Plenary Speaker on the topic of "Metatronics: Merging Electronics, Photonics, and Magnetics into One Paradigm" in the *2011 European Conference on Antennas and Propagation (EuCAP 2011), Rome, Italy,* January 22-27, 2011**.**
- Plenary Speaker on the topic of "Of Light, Electrons, and Metamaterials" in the *2011 SPIE Photonics West, LASE, San Francisco, California,* January 22-27, 2011**.**
- Invited speaker as the *Distinguished Colloquium Speaker at Department of Electrical and Computer Engineering, University of Michigan, Ann Arbor, Michigan*, November 12, 2010, with a talk entitled "Taming Light and Electrons with Metamaterials".
- Plenary Speaker on the topic of "Metatronics with Light and Electrons: Taming the Optics and Electronics with Metamaterials" in the *4th International Congress on Advanced Electromagnetic Materials in Microwaves and Optics (Metamaterials'2010), Karlsruhe, Germany*, September 13-16, 2010**.**
- Plenary Speaker on the topic of "Metatronics: Manipulating the Light and Electrons with Metamaterials" in the *18th RiNEm (Italian National Conference in Electromagnetics), Benevento, Italy*, September 6-10, 2010**.**
- Plenary Speaker on the topic of "Linear and Nonlinear Elements in Metactronics" in Opening Ceremony of the *NATO Advanced Research Wokrshop META'10, 2nd International Conference on Metamaterials, Photonic Crystals, and Plasmonics, Cairo, Egypt*, February 22-25, 2010**.**
- Plenary Speaker on the topic of "Seeing the Unseen: How Can we Learn from Polarization-Sensitive Eyes and How Can We Design Better Imaging Systems?" in Opening Ceremony of the *2009 European Microwave Conference (EuMC) as Part of the 2009 European Microwave Week (EuMW), Rome, Italy*, September 28-October 2, 2009**..**
- Invited speaker at the *Booz-Allen-Hamilton Distinguished Colloquium Series at Department of Electrical and Computer Engineering, University of Maryland at College Park*, College Park, Maryland, September 11, 2009, with a talk entitled "Taming the Light at the Nanoscale".
- Plenary Speaker on the topic of "Taming the Light with Metamaterials" in the NanoScience and Engineering Part of *the 2009 SPIE-The International Society for Optical Engineering on Optics and Photonics, San Diego, California*, August 2-6, 2009**.**
- Plenary Speaker on the topic of "What to Do with Extreme Metamaterials" at the 2009 *ETOPIM'8 Conference, Crete, Greece* June 11, 2009.
- Plenary Speaker on the topic of "Circuits with Light at the Nanoscale: A New Paradigm for Nanoscale Information Processing" at the *43th Annual Conference on Information Sciences and Systems (CISS 2009), Baltimore, MD*, March 18, 2009.

- Plenary Speaker on the topic of "Circuits with Light at the Nanoscale" at the *13th Interantional Symposium on Antenna Technology and Applied Electromagnetics/Canadian Radio Sciences Meeting/ANTEM/URSI/CNC, Banff, AB, Canada*, February 18, 2009.
- Invited speaker at the *Distinguished Lecturer Series at Department of Electrical and Computer Engineering, Rice University*, Houston, TX, February 12, 2009, with a talk entitled "Circuits with Light at the Nanoscale".
- Plenary Speaker on the topic of "Circuits with Light at the Nanoscale" at *The 6th International System-on-Chip Conference, Exhibit and Workshop, Newport Beach, California,* November 5, 2008.
- Keynote speech on the topic of "Extreme-Parameter Metamaterials," at *the Metamaterials' 2008: 2nd International Congress on Advanced Electromagnetic Materials in Microwave and Optics, Pamplona, Spain*, September 21-26, 2008.
- Delivered the single Public Lecture (a large Plenary speech) on the topic of "Seeing the Unseen: From Polarization-Sensitive Eyes to Biologically-Inspired Sensing and Imaging Science" at the *2008 XXIX General Assembly of the International Union of Radio Science (URSI-GA 2008), Chicago, Illinois*, August 7-16, 2008.
- Keynote speech on the topic of "Metactronics: Optical Circuits and Information Processing in Nanoworlds" at the *NATO Advanced Research Workshop on Metamaterials for Secure Information and Communication Technologies (META'08), Marrakech, Morocco*, May 7-10, 2008.
- Invited speaker at the *Lester Eastman Seminar Series at School of Electrical and Computer Engineering, Cornell University*, Ithaca, NY, November 30, 2007, with a talk entitled "Nanocircuits with Light and Wireless at Nanoworlds".
- Invited talk at the "*Frontiers in Physics" at the 2007 Industrial Physics Forum,* the talk entitled "Circuits with Light at the Nanoscale," in Seattle, WA, October 16, 2007.
- Invited member of a panel on "Metamaterials: Invisible Revolution," at *theEM*Tech*: Emerging Technology Conference @ MIT,* Cambridge, MA, September 25-27, 2007.
- Keynote Speech at the Plasmoic Metamaterials Conference of *the 2007 SPIE-The International Society for Optical Engineering on Optics and Photonics,* the talk entitled "Plasmonic Metamaterials: The Tale of Two Phenomena," in San Diego, California, August 26-30, 2007.
- Plenary Speaker at the *Optical Society of America (OSA) Topical Meeting on Nanophotonics*, talk entitled "What do Optical Nanocircuits, Squeezing Light, and Supermicroscopy Have in Common?" in Hangzhou, China, June 18-22, 2007.
- Plenary Speaker at the *51st International Conference on Electron, Ion, Photon Beam Technology and Nanotechnology (EIPBN)* talk on the topic of "Metamaterial and Plasmonic Nanocircuits: Towards a New Paradigm in Optica Nanoelectronics" in Denver, CO, May 29-June 1, 2007.

- Kilby Keynote Speaker on the topic of "Seeing the Invisible: Polarization Vision in Nature and Non-Invasive Imaging and Sensing Applications" at *the 2006 Government Microcircuit Applications and Critical Technology Conference (GOMACTech 2006)*, San Diego, CA, March 20-23, 2006.
- Delivered one of the three General Lectures (large plenary speech) on the topic of "Metamaterials and Plasmonic Phenomena" at *the XXVIII General Assembly of International Union of Radio Science (URSI)*, in New Delhi, India, October 23-29, 2005.
- Keynote Speaker at the *International Workshop on Antenna Technology: Small Antennas and Novel Metamaterials (iWAT'05*), talk on the topic of "Nanocircuit Elements, Nano-Transmission Lines, and Nano-Antennas Using Plasmonic Materials in the Optical Domains," in Singapore, March 7-9, 2005.
- Panelist on the session "RF/Microwave/Millimeter-Wave Applications Using Left-Handed Metamaterials," at the *2005 IEEE Microwave Theory ad Techniques International Microwave Symposium (IMS'05), Long Beach, CA*, June 12-17, 2005.
- Plenary Speaker at the *International Union of Radio Science (URSI)-U.S. National Committee (USNC), National Radio Science Meeting* talk on the topic of "Seeing the Invisible: Polarization Vision, Its Biophysical Mechanism and Non-Invasive Imaging Applicastions" in Boulder, CO, January 5-8, 2005.
- Invited Keynote Speaker on "Metamaterials and Plasmonic Media: Theory and Potential Applications," at *Bianisotropics'04: 10th International Conference on Complex Media and Metamaterials" in Ghent, Belgium*, September 22-24, 2004.
- Distinguished Lectures Series Speaker at *Temple University, College of Engineering*, November 13, 2006, on "Metamaterials, Shrinking Circuit Elements, and Nanooptics."
- Distinguished Lectures Series Speaker at *Ohio State University, Department of Electrical and Computer Engineering*, Febuary 9, 2006, on "Metamaterials, Shrinking Circuit Elements, and Nanooptics."
- Distinguished Lectures Series Speaker at *University of Toronto, Edward S, Rogers Sr. Department of Electrical and Computer Engineering*, January 18, 2005, on "Metamaterials, Shrinking Components, and Near-Field Nano-Devices and Systems."
- Distinguished Seminar Speaker at *University of Arizona, Department of Electrical and Computer Engineering*, April 20, 2004, on "Metamaterials and Plasmonic Nanostructures: Concepts, Salient Features, and Potential Applications."
- Invited Plenary Speaker on "Electromagnetics of Complex Media and Metamaterials," in a plenary session of *the Mathematical Methods in Electromagnetic Theory (MMET*2002) conference*, in Kiev, Ukraine, Sept. 10-13, 2002.
- Invited Plenary Speaker on "Fractionalization Methods and Their Applications in Radiation and Scattering Problems," in a plenary session of *the Mathematical Methods in Electromagnetic Theory*

*(MMET*2000) conference*, in Kharkov, Ukraine, Sept. 12-15, 2000.

- Invited Keynote Speaker on "Fractional Derivatives, Fractional Integrals and Electromagnetic Theory," in the plenary session of *the International Conference on Computational Electromagnetics and Its Applications (ICCEA'99)*, in Beijing, China, Nov. 1-4, 1999.
- Invited Plenary Speaker on "Fractional Calculus and Fractional Paradigm in Electromagnetic Theory," in a plenary session of *the Mathematical Methods in Electromagnetic Theory (MMET*98) conference*, in Kharkov, Ukraine, June 2-5, 1998.
- Invited Plenary Speaker on "Biologically Inspired Polarization-Difference Imaging," in a plenary session of *the 27th European Microwave Conference (EuMC'97) in Jerusalem, Israel*, September 8-11, 1997.
- Invited Plenary Speaker on Chiral and Complex Material in the 14th Triennial URSI International Symposium on Electromagnetic Theory, Sydney, Australia, on August 17-20, 1992.
- IEEE Antennas and Propagation Society (AP-S) Distinguished Lecturer for June 1997-December 1999.
- Member of the Scientific Advisory Board of the Ph.D. Program in Applied Electromagnetics in Universities of Salerno and Benevento, Italy (January 1999)
- Former Associate Editor of *IEEE Antennas and Propagation Letters (AWPL)* (Jan. 2002– December 2007)
- Former Associate Editor of *IEEE Transactions on Antennas and Propagation* (Oct. 1996– July 2001)
- Former Associate Editor of *Radio Science* (Nov.1991-Dec. 1996)
- Member of the Editorial Board of the *Istituto Superiore Mario Boella Book Series in Radio Science*, SciTech Publishing, October 2009-present.
- Member of the Editorial Board of the Journal *Waves in Random and Complex Media* (WRCM), Taylor and Francis Pub., October 2008-present.
- Member of the Editorial Board of the newly founded journal *Metamaterials*, sponsored by the European Metamorphose Network of Excellence, Elsevier Pub., April 2006- present.
- Co-Guest Editor (with G. Eleftheriades (U. Toronto) the *IEEE Proceedings,* special issue on "Metamaterials: Fundamentals and Applications in the Microwave and Optical Regimes", in progress, to appear in October 2011.
- Co-Guest Editor (with V. Shalaev (Purdue U.), N. Litchinitser (SUNY, Buffalo), R. McPhedran (U. Sydney), E. Shamonina (University of Erlangen-Nuremberg), and T. Klar (Technische Univerität Ilmenau), Special issue of the *IEEE Journal of Selected Topics in Quantum Electronics* on the topic of "Metamaterials", Vol. 16, No. 2, pp. 363-458, March-April 2010.
- Co-Guest Editor (with Gennady Shvets (UT Austin) of the special issue of the *Solid States Communications* on "Negative refraction

and metamaterials for optical science and engineering", September 2007.

- Co-Guest Editor (with R. W. Ziolkowski) of the special issue of the *IEEE Transactions on Antennas and Propagation* on "Metamaterials", Oct. 2003.
- Co-Guest Editor (with L. B. Felsen) of the special issue of the journal *Wave Motion* on "Electrodynamics in Complex Environments," September 2001.)
- Guest Editor of the Part Special issue of the *Journal of the Franklin Institute* on Antennas and Microwaves for "the 13th Annual Benjamin Franklin Symposium" held on May 5, 1995 in Philadelphia, PA. This special issue contains some selected papers from this symposium, vol. 332B, No. 5, 1995.
- Guest Editor of the special issue of the *Journal of Electromagnetic Waves and Applications* (JEWA) on "Wave Interaction with Chiral and Complex Media," Vol. 6, No. 5/6, May-June 1992.
- Member of the International Editorial Board of the *Journal of Electromagnetic Waves and Applications* (1993-2001).
- Recipient of the *1991 Outstanding Chapter Award* in the IEEE Philadelphia Section for Chairing the Antennas and Propagation/Microwave Theory and Technique Joint Chapter of the Philadelphia Section, February 29, 1992.
- Selected as one of the Distinguished Graduates of the University of Tehran's School of Engineering on the occasion of the 70th Anniversary of School of Engineering of University of Tehran, December 2004.
- Listed in *Who's Who in Science and Engineering*.
- Listed in *American Men & Women of Science*
- Listed in *Who's Who in Technology*.
- Listed in *Who's Who in The East*.
- Listed in *Who's Who in The World*.
- Listed in *Who's Who in America*.

***Media News and Press Release about Our Research*:**

- *Nature Materials*, a Research Highlights entitled "Our choice from the recent literature" written by the Editor Joerg Heber, *Nature Materials*, Volume 10, pp. 558 (2011), about our Science papers on "Transformation Optics Using Graphene" *Science*, 332, 1291-1294, (June 2011) by A. Vakil and N. Engheta, http://www.nature.com/nmat/journal/v10/n8/full/nmat3091.html?WT.ec_id=NMAT-201108.

- *Ars Technica* a news article entitled "Sending a beam of light along a sheet of graphene," by Chris Lee, June30, 2011. http://arstechnica.com/science/news/2011/06/sending-a-beam-of-light-along-a-sheet-of-graphene.ars about our Science papers on "Transformation Optics Using Graphene" *Science*, 332, 1291-1294, (June 2011) by A. Vakil and N. Engheta.

- *Inovacao Tecnologica,* a news article entitled "Metametarials plano leva optica a escala atomica," by Editor, June 14, 2011.

http://www.inovacaotecnologica.com.br/noticias/noticia.php?artigo=metamaterial-plano-grafeno-optica-escala-atomica&id=010160110614 about our Science papers on "Transformation Optics Using Graphene" *Science*, 332, 1291-1294, (June 2011) by A. Vakil and N. Engheta.

- *AzoNano,* a news article entitled "Penn Researchers demonstrates transformation optics using graphene," by Cameron Chai, June 13, 2011. http://www.azonano.com/news.aspx?newsID=22669 about our Science papers on "Transformation Optics Using Graphene" *Science*, 332, 1291-1294, (June 2011) by A. Vakil and N. Engheta.

- *Nanowerk News* a news article entitled "Engineers Envisions Two-Dimensional Graphene Metamaterials and One-Atom-Thick Optical Device," by Editor, June 9, 2011. http://www.nanowerk.com/news/newsid=21699.php about our Science papers on "Transformation Optics Using Graphene" *Science*, 332, 1291-1294, (June 2011) by A. Vakil and N. Engheta.

- *Photonics online* a news article entitled "Penn Engineers: Two-Dimensional Graphene Metamaterials and One-Atom-Thick Optical Device," by Editor, June 13, 2011. http://www.photonicsonline.com/article.mvc/Two-Dimensional-Graphene-Metamaterials-And-0001?sectionCode=News&templateCode=SponsorHeader&user=2403429&source=nl:31144 about our Science papers on "Transformation Optics Using Graphene" *Science*, 332, 1291-1294, (June 2011) by A. Vakil and N. Engheta.

- *Kurtzweil News* a news article entitled "Engineers Envision Two-Dimensional Graphene Metamaterials and One-Atom-Thick Optical Device," by Editor, June 10, 2011. http://www.kurzweilai.net/engineers-envision-2-dimensional-graphene-metamaterials-and-1-atom-thick-optical-devices about our Science papers on "Transformation Optics Using Graphene" *Science*, 332, 1291-1294, (June 2011) by A. Vakil and N. Engheta.

- *Physorg.com* a news article entitled "Two-Dimensional Graphene Metamaterials and One-Atom-Thick Optical Devices Envisioned," June 9, 2011. http://www.physorg.com/news/2011-06-two-dimensional-graphene-metamaterials-one-atom-thick-optical.html about our Science papers on "Transformation Optics Using Graphene" *Science*, 332, 1291-1294, (June 2011) by A. Vakil and N. Engheta.

- *Science Daily news* a news article entitled "Engineers Envision Two-Dimensional Graphene Metamaterials and One-Atom-Thick Optical Devices," June 10, 2011. http://www.sciencedaily.com/releases/2011/06/110609141552.htm about our Science papers on "Transformation Optics Using Graphene" *Science*, 332, 1291-1294, (June 2011) by A. Vakil and N. Engheta.

- *Spektrum der Wissenschaft* a German-langiage news article entitled "Wunderfolie noch wundervoller," June 9, 2011. http://www.spektrum.de/artikel/1073924&_z=798888 about our Science papers on "Transformation Optics Using Graphene" *Science*, 332, 1291-1294, (June 2011) by A. Vakil and N. Engheta.

- *Lentar.ru* a Russian-langiage news article entitled "Two-Dimensional Graphene Metamaterials and One-Atom-Thick Optical Devices," June 10, 2011. http://lenta.ru/news/2011/06/10/metagraphen/ about our Science papers on "Transformation Optics Using Graphene" *Science*, 332, 1291-1294, (June 2011) by A. Vakil and N. Engheta.

- *Penn News* press release entitled "Penn Engineers: Two-Dimensional Graphene Metamaterials and One-Atom-Thick Optical Devices," by Evan Lerner, June 9, 2011. http://www.upenn.edu/pennnews/news/penn-engineers-envision-two-dimensional-graphene-metamaterials-and-one-atom-thick-optical-devic about our Science papers on "Transformation Optics Using Graphene" *Science*, 332, 1291-1294, (June 2011) by A. Vakil and N. Engheta.

- *Almanac*, a news brief in the section on Honors and Other Things, about selection to become Fellow of SPIE-The Interantional Society for Optical Engineering, February 8, 2011, Volume 57, No. 21, http://www.upenn.edu/almanac/volumes/v57/n21/hot.html

- *Penn News* press release entitled "Penn Researchers Tap into Cell Power to Create Building "Skins" that Adapt to Heat/Light of Environment" by Jordan Reese, September 21, 2010. http://www.upenn.edu/pennnews/news/penn-researchers-tap-cell-power-create-building-skins-adapt-heatlight-environment about our NSF grant from the Office of Emerging Frontiers in Research and Innovation (EFRI), entitled "Energy Minimization via Multi-Scalar Architectures: From Cell Contractility to Sensing Materials to Adaptive Building Skins," S. Yang (PI), P. Jones (Co-PI), J. Sabin (Co-PI), J. Van der Spiegel (Co-PI), N. Engheta (Co-PI), September 1, 2010 till August 31, 2014.

- *Daily Pennsylvanian* article entitled "Penn Professors Collaborate to Design Futuristic Buildings" by Elena Gooray The Daily Pennsylvanian, September 16, 2010. http://thedp.com/article/profs-collaborate-design-futuristic-building about our NSF grant from the Office of Emerging Frontiers in Research and Innovation (EFRI), entitled "Energy Minimization via Multi-Scalar Architectures: From Cell Contractility to Sensing Materials to Adaptive Building Skins," S. Yang (PI), P. Jones (Co-PI), J. Sabin (Co-PI), J. Van der Spiegel (Co-PI), N. Engheta (Co-PI), September 1, 2010 till August 31, 2014.

- *New Scientist* article entitled "Wireless revolution may reach inside microchips" by Colin Barras, New Scientist Issue 2762, May 26, 2010, http://www.newscientist.com/article/mg20627624.600-wireless-revolution-may-reach-inside-microchips.html about our Physical Review Letters article on "Wireless at the Nsnoscale: Optical Interconnects Using Matched Nanoantennas", Physical Review Letters,. Vol. 104, 213902, May 24, 2010..

- *Photonics Spectra* Profile Interview with Nader Engheta entitled "The Teacher: An Interview with Nader Engheta," by David Shenkenberg, pp. 16-17, October 2009.

- *Daily Pennsylvanian* article entitled "Engineering professor creates 'cloaking device'" by Trishula Patel, The Daily Pennsylvanian, October 25, 2009. http://thedp.com/article/engineering-prof-creates-cloaking-device about our Physical Review Letters article on "Experimental Verification of Plasmonic Cloaking at

Microwave Frequencies with Metamaterials", Physical Review Letters,. 103, 153901, October 6, 2009.

- *PhysOrg.com* article entitled "Running Electronics Using Light" by Miranda Marquit, PhysOrg.com October 19, 2009. http://www.physorg.com/news175161170.html about our Physical Review Letters article on "All-Optical Metamaterial Circuit Board at the Nanoscale", Physical Review Letters,. Vol. 103, 143902, October 2, 2009.

- Quoted in *Optics and Photonics Focus (online*) article by Giorgio Volpe entitled "Refractive Index: To the Limits and Beyond", (about Shanhui Fan's article in Phys. Rev. Lett.) http://www.opfocus.org/content/v6/s2/opfocus_v6_s2.pdf, Vol. 6, Story 2, July 22, 2009.

- *APS Publication Physics* highlight article entitled "Seeing without being seen" by Javier Garcia di Abajo, Physics Vol. 2, 47, 2009. http://physics.aps.org/viewpoint-for/10.1103/PhysRevLett.102.233901 about our Physical Review Letters article on "Cloaking a Sensor", Physical Review Letters,. Vol. 102, 233901, June 8, 2009.

- Quoted in *Nature's News Feature* by Geoff Brumfiel, "Ideal Focus", Vol 479, pp. 504-505, May 28, 2009.

- *Nature Photonics,* a research highlight entitled "In a Squeeze" in page 243, Vol. 3, May 2009 issue of Nature Photonics, www.nature.com/naturephotonics about our Physical Review Letters article on "Transporting an Image through Subwavelength hole", Physical Review Letters, Vol. 102, 103902, March 13, 2009.

- *Science News* article entitled "Cloaked Eye Still Sees" by Laura Sanders, Vol. 175 # 10 (Page 12), May 9, 2009, http://www.sciencenews.org/view/generic/id/42803/description/Cloaked_eye_still_sees about our Physical Review Letters article on "Cloaking a Sensor", Physical Review Letters, 2009.

- *Optics and Photonics Focus (online)* entitled "Twisting the Knob of Light" by Giorgio Volpe, in Volume 4, Story 3 of Optics and Photonics Focus, February 9, 2009, http://www.opfocus.org/index.php?topic=story&v=4&s=3, about our Nature Photonics article on "Tuning the Scattering Response of Optical Nanoantennas Using Nanocircuit Loads" Nature Photonics, Vol. 2, p. 270, May 2008, and our Physical Review Letters article on "Input Impedance, Nanocircuit Loading, and Radiation Tuning of Optical Nanoantennas", Vol. 101, 043901, 2008.

- *Nature Photonics, a News and Views article* entitled "Engineering optical nanoantennas" by Mark Brongersma about our Nature Photonics article on "Tuning the Scattering Response of Optical Nanoantennas Using Nanocircuit Loads" Nature Photonics, Vol. 2, p. 270, May 2008.

- *Nature Photonics, a News and Views article* entitled "Optical Cloaking: A Many-Layered Solution" by Amber Jenkins about our Physical Review Letters article on

"Multifrequency Optical Invisibility Cloaks with Layered Plasmonic Shells (Phys. Rev. Lett., 100, 113901 (2008)", Nature Photonics, Vol. 2, p. 270, May 2008.

- *NANO, the magazine for Small Science*, an article by Elaine Mulcahy entitled "A Trick of Light'" about metamaterials and nanocircuits, Issue 6, April, 2008.

- *Nanomaterials News*, a news story entitled "Shrinking microwave devices with metafilms'" by editors about our IET article on "Sub-wavelength resonators: On the use of metafilm to overcome the lambda/2 size limit"Vol. 4, Issue 4, April 22, 2008.

- *EE Times*, a cover story article entitled "Professor posits metananocircuits as electronics' next frontier'" by Sunny Bains about my Science article on "Circuits with Light at Nanoscales" February 27, 2008 (in March 3, 2008 issue) http://www.eetimes.com/showArticle.jhtml;?articleID=206900564

- *Almanac*, a news brief in the section on Honors and Other Things, about selection to receive the 2008 George H. Heilmeier Faculty Award in Excellence in Research, news brief entitled "Heilmeier Faculty Award: Dr. Engheta", December 11, 2007, http://www.upenn.edu/almanac/volumes/v54/n15/hot.html

- *Laser Focus World,* a news feature entitled "*Photonic Frontier: Integrated Optics: Metananocircuits can operate at optical frequencies*," by Jeff Hecht, about my Science Review Article (Volume 317, Number 5845, Issue of 21 September 2007), Volume 43, Issue 12, December 1, 2007, <http://www.laserfocusworld.com/display_article/314434/12/ARTCL/none/Feat/PHOTONIC-FRONTIERS:-INTEGRATED-OPTICS:-Metananocircuits-can-operate-at-optical-frequencie>)

- *Nanotechweb.org,* from UK Institute of Physics Publishing, a news feature entitled "*Simulation shine a light on optical wire: Nanowaveguide models offer clues to wiring up optical nanocircuits*," by James Tyrrell, about our paper in Optics Express **(**Volume 15, Number 21, October 5, 2007) on "Optical 'Shorting Wire'"". Posted on November 19, 2007, http://nanotechweb.org/cws/article/tech/31824)

- *Sciences et Avenir,* a cover story entitled "L'homme Invisible, c'est possible!", by David Larousserie, about different cloaking methods including our technique. October 2007, pp. 60-71.

- *Photonics Spectra,* a news feature entitled "*Review Provides Blueprint for Optical Nanocircuits*," by David Shenkenberg in the section on Presstime Bulletin, about my Science Review Article (Volume 317, Number 5845, Issue of 21 September 2007), October 2007, p. 18. http://www.photonics.com/content/spectra/2007/October/news/89213.aspx)

- *Nanowerk,* a news feature entitled "*Metamctronics: A Metamaterial-Based Nanotechnology Approach towards Electronics*" by Michael Berger, about my paper in Science **(**Volume 317, Number 5845, Issue of 21 September 2007) on "Circuits with Light at Nanoscales: Optical Nanocircuits Inspired by Metamaterials". Posted on October 16, 2007, http://www.nanowerk.com/spotlight/spotid=2947.php

- *Science,* in the section of *This week in Science*, a news brief about my paper in Science **(**Volume 317, Number 5845, Issue of 21 September 2007) on "Circuits with Light at Nanoscales: Optical Nanocircuits Inspired by Metamaterials". The news briefs edited by Stella Hurtley and Phil Szuromi, Science, Vol. 317, p. 1645, September 21, 2007. www.science.org

- *Nature Materials,* in the section of *Research Highlights*, a news brief about our work on cloaking that appeared in *Optics Express* on Mar 2007. The news article by the editors of Nature Materials, entitled "Shopping for Cloaks," May 2007, Vol. 6, p. 325. www.nature.com/naturematerials

- *Air Force Office of Scientific Research (AFOSR), Air Force Research Laboratory Press Release* about selection to 2006 Scientific American 50 List of Leaders in Science and Technology. Article by Maria Callier, March 2, 2007 " Scientific American Article Names Researcher as One of Top 50 Technological Leaders", http://www.afosr.af.mil/News/nr_2007_06_SAArticle.htm (News outlets NewsBlaze, Commodity Chemicals News, March Air Reserve Base, Kirtland Air Force Base and U.S. Newswire have also announced this press release.)

- *Almanac*, a news brief in the section on Honors and Other Things, about selection to the Scientific American 50 List of leaders in science and technology, news brief entitled "Dr. Engheta: Scientific American 50", January 16, 2007, http://www.upenn.edu/almanac

- *Daily Pennsylvanian*, a news brief about selection to the Scientific American 50 List of leaders in science and technology, news brief by Mara Gordon, "'SEAS Prof. named a top-fifty scientist", December 5, 2006, http://www.dailypennsylvanian.com

- *University of Pennsylvania Office of University Communications Press Release* about selection to 2006 Scientific American 50 List of Leaders in Science and Technology. Article by Greg Lester, December 4, 2006 " University of Pennsylvania's Nader Engheta Named One of the "2006 Scientific American 50", http://www.upenn.edu/pennnews/article.php?id=1059

- *Scientific American,* about selection to 2006 Scientific American 50 List of Leaders in Science and Technology. Description of our work by George Musser, December 2006, http://www.sciam.com/article.cfm?articleID=CA41CF93-E7F2-99DF-332D036FA997032C&pageNumber=4&catID=9

- *Daily Pennsylvanian*, In the section entitled "Perspective" featured under the "Nanotechnology Pie" article by Uri Friedman, page 5 November 14, 2006, http://www.dailypennsylvanian.com

- *Photonics Spectra*, Article by Hank Hogan, entitled "Stepping out of the Shadows Using Polarized Light," October 2006, about out research on bio-inspired polarization imaging for detection of objects in shadows. http://www.photonics.com/content/spectra/2006/October/tech/84505.aspx

- *Daily Pennsylvanian*, a story on the work on one of my graduate students, Brian Edwards, on electric tweezers, Article by Leanne Ta, "'Electric tweezers' make tiny moves easy", September 11, 2006, http://media.www.dailypennsylvanian.com/media/storage/paper882/news/2006/09/11/News/electric.Tweezers.Make.Tiny.Moves.Easy-2265237.shtml

- *University of Pennsylvania Office of University Communications Press Release* about the work of one of my graduate students, Brian Edwards, in my group on electric tweezers. Article by Greg Lester, August 18, 2006 " University of Pennsylvania Student Creates Electric Tweezers; Now Everyone Can Have a Desktop Lab", http://www.upenn.edu/pennnews/article.php?id=992

- *The Pennsylvania GAZETTE*, Article by Jennifer Nath C'08, entitled "Metamaterials to Marvel Over" about our research on metamaterials, July-August 2006, page 29.

- *Quoted in the Science News Article* by Peter Weiss entitled "Out of Sight: Physicists get serious about invisibility shields" week of July 15, 2006, Vol 170, No. 3, p. 42, *http://www.sciencenews.org/articles/20060715/bob9.asp*.

- *Quoted in CNN.com, MSNBC, and NBC10.com*, about the various cloaking proposals, and the Science News Article by Adrian Cho http://www.cnn.com/2006/TECH/05/25/invisibility.cloak.ap/index.html, http://www.msnbc.msn.com/id/12961080/, http://www.nbc10.com/news/9273555/detail.html, May 25, 2006.

- *Optics and Photonics News (OPN), monthly magazine of Optical Society of America.* Article by Patricia Daukantas, Senior Writer/Editor, entitled "Lumped Circuit Elements for Optical Frequencies," Vol. 17, No. 6, p. 9, 2006, about out research on lumped optical elements. http://www.osa-opn.org/abstract.cfm?URI=OPN-17-6-8

- *Physics News Update, Bulletin of Physics News of American Institute of Physics (AIP).* Part of this press conference highlights our work on nanocircuit elements at optical frequencies, Article by Phil Schewe and Ben Stein, Number 770 # 1, March 23, 2006 "Two-Dimensional Light", http://www.aip.org/pnu/2006/split/770-1.html .

- *Fall 2005 Penn Engineering Alumni Magazin*e, Article by Jessica Stein Diamond entitled "Discovering Scientific Gold in Metamaterials" about our research on metamaterials.

- *Science Daily* about our idea of nanocircuit elements at optical frequencies, September 28, 2005 "Penn Theorists to Create Optical Circuit Elements ", http://www.sciencedaily.com/releases/2005/09/050928081542.htm

- *Nanotechnology News* about our work on concept of nanocircuit elements at optical frequencies, September 28, 2005 " A Beam of Light on a Path of Gold to a Miniaturized World: Penn Theorists to Create Optical Circuit Elements ", http://www.nanotech-now.com/news.cgi?story_id=11730

- *CCNmag.com* news about our work on concept of nanocircuit elements at optical frequencies, September 28, 2005 " A Beam of Light on a Path of Gold to a Miniaturized World ", http://www.ccnmag.com/news.php?id=3758

- *Azonano.com* news about our work on theory of nanocircuit elements at optical frequencies, September 28, 2005 "Electronics Run Using Light Instead of Electricity", http://www.azonano.com/news.asp?newsID=1460

- *Physorg.com* news about our work on theory of nanocircuit elements at optical frequencies, September 27, 2005 "Penn Theorists to Create Optical Circuit Elements", http://www.physorg.com/news6798.html

- *University of Pennsylvania Office of University Communications Press Release* about our work on concept of nanocircuit elements at optical frequencies, Article by Greg Lester, September 27, 2005 "A Beam of Light on a Path of Gold to a Miniaturized World: Penn Theorists to Create Optical Circuit Elements", http://www.upenn.edu/pennnews/article.php?id=854

- *OSA News* about our work on non-invasive latent fingerprint imaging, Press Release by Chris Rowe and Ben Stein of American Institute of Phsyics, September 21, 2005 "Optical Method Lifts Detailed Fingerprint without Touching the Surface", http://www.osa.org/news/release/09.2005/FiO_final_release.asp

- *Physics News Update, Bulletin of Physics News of American Institute of Physics (AIP)* about our work on concept of nanocircuit elements at optical frequencies, Article by Phil Schewe and Ben Stein, Number 737 # 1, July 14, 2005 "Circuit elements for optical frequencies", http://www.aip.org/pnu/2005/split/737-1.html

- *Nature News* about our work on achieving transparency using metamaterials, Article by Philip Ball, "Engineers devise invisibility shield", *Nature News*, doi:10.1038/news050228-1, February 28, 2005. http://www.nature.com/news/2005/050228/full/050228-1.html

- *MSNBC*, Science and Technology, a news brief about our work on achieving transparency using metamaterials, Article by Robert Roy Britt, "Now you see it, now you don't", *Febuary* 28, 2005, http://msnbc.msn.com/id/7047872

- *Daily Pennsylvanian*, a story our work on achieving transparency using metamaterials, Article by Cici Zheng, "A disappearing theory", March 29, 2005, http://www.dailypennsylvanian.com/vnews/display.v/ART/424905456174a

- *New Scientist*, about our work on achieving transparency using metamaterials, Article by Jenny Hogan, "Ripples of Light Might Make You Invisible", March 5, 2005, http://www.newscientist.com/article.ns?id=mg18524895.200

- *Guardian Weekly*, a short news brief our work on achieving transparency using metamaterials, Article by Guardian, "Eat your cloak out, Harry Potter", March 3, 2005, http://www.guardian.co.uk/life/dispatch/story/0,,1428740,00.html

- *The Scotsman*, about our work on achieving transparency using metamaterials, Article by James Reynolds, "Scientific wizards find real cloak of invisibility", March 1, 2005, http://thescotsman.scotsman.com/international.cfm?id=226392005

- *The Daily Telegraph*, about our work on achieving transparency using metamaterials, Article by Roger Highfield, "Not seeing is believing for invisibility cloak", February 28, 2005.

- *Science News* about the work on Polarization-Difference Imaging in our lab, Article by Sunny Baines, "Sunfish Shows the Way Through the Fog", *Science*, New Series, Vol. 272, No. 5262, May 3, 1996, p. 653.

- *London Times* article about our work on Bio-inspired Polarization Imaging in our lab. Article by Nigel Hawkes on "As clear as mud to a fish" in *London Times*, June 3, 1996, p. 16.

- *Biophotonics International* article about the work on visibility enhancement using bio-inspired imaging in our lab. Article by Daniel J. Dufresne, on "Polarization-Difference Imaging Stretches the Limits of Visibility", *Biophotonics International*, Jan/Feb 1997, P. 34.

***Scientific and Professional Societies*:**

Fellow: Institute of Electrical and Electronics Engineers (IEEE),
elected as a *Fellow* (1996) for "contributions to the electromagnetic theory of complex media".

Member of the following IEEE societies:
Antennas and Propagation
Microwave Theory and Techniques
Lasers and Electro-Optics
Geoscience and Remote Sensing
Electromagnetic Compatibility

Fellow: Optical Society of America (OSA), elected as a Fellow (March 1999) for "contributions to electromagnetic theory and imaging science."

Fellow: American Physical Society (APS), elected as a Fellow (November 2008) "For development of concepts of metamaterial-inspired optical lumped nanocircuits, and for ground breaking contributions to the fields of metamaterials, plasmonic nano-optics, biologically-inspired imaging, and electrodynamics."

Fellow: American Association for the Advancement of Science (AAAS), elected as a Fellow (December 2009) "For outstanding contributions to thefields of metamaterials, plasmonic nano-optics, biologically-inspired imaging, and electrodynamics, and for developing the concepts of metactronics and metamaterial-inspired lumped nanocircuits."

Fellow: SPIE-The International Society for Optical Engineering, elected as a Fellow (December 2010) "For pioneering contributions to the fields of metamaterials, plasmonic nano-optics, biologically inspired optical imaging, and electrodynamics."

Member: U.S. National Committee (USNC) of International Union of Radio Science (URSI) Commission D on (Electronics and Photonics), Commission B (Fields and Waves). And Commission K (Electromagnetics in Biology and Medicine)

Member-at-Large of USNC-URSI from January 1, 2005 till December 31, 2007

Vice-Chair/Chair-Elect of URSI-USNC Commission B, January 2006-December 2008

Chair of URSI-USNC Commission B, January 2009-December 2011

Material Research Society (MRS)

Sigma Xi

Society of Photo-optical Instrumentation and Engineering (SPIE - -The International Society for Optical Engineering)

Institute of Physics (IOP), United Kingdom

Electromagnetics Academy

***Teaching Experience*:**

EE 100B (at UCLA) Engineering Electromagnetics, Spring 1986.

At the University of Pennsylvania:

EE 111 Introduction to Electrical Engineering (Undergraduate Course), (Developed and Taught) Fall 1993, Fall 1994, Fall 1995, Fall 1996, Fall 1997.

EE 215 Electrical Circuits and Systems I (Undergraduate Course), Fall 98, Fall 99, Fall 2001, Fall 2002.

EE 218 Physics and Models of Semiconductor Devices (Undergraduate Course), Spring 2001.

EE 224 (now ESE 224) Introduction to Digital Signal Processing (Undergraduate Course), Spring 2001, Spring 2002, Spring 2003, Spring 2004.

EE 310 Electric and Magnetic Fields I (Undergraduate Course), Fall 1990, Fall 1991, Fall 1992, Fall 1993, Fall 1994, Fall 1995, Fall 1996, scheduled for Spring 2012.

EE 311 (now ESE 411) Electric and Magnetic Fields II (Undergraduate Course), Spring 1991, Spring 1992, Spring 1993, Spring 2008, Spring 2009, Spring 2010

EE 325 Analog and Digital Communications (Undergraduate Course), Spring 1999.

EE 420 Modern Microwave Techniques (Undergraduate Course), Spring 1988, Spring 1989.

EE 501 Linear Systems Theory and Designs (Graduate Course), Fall 1987

EE 510 (now ESE 510) Applied Electromagnetic Field Theory (now is titled "Electromagnetic and Optical Theory I") (Graduate Course), Fall 1988, Fall 1989, Fall 1997, Fall 98, Fall 99, Fall 2003, Fall 2004, Fall 2005, Fall 2006, Fall 2007, Fall 2008, Fall 2009, Fall 2010, Fall 2011.

EE 511 Introduction to Optics and Photonics (Graduate Course), Fall 1992.

EE 515 Theory of Guided Waves and Integrated Optics (Graduate Course), Spring 1990, Fall 1991. (Developed and Taught)

ESE 610 Electromagnetic and Optical Theory II, Spring 2005, Spring 2006, Spring 2007, Spring 2011.

Psych 455	Laboratory in Cognitive Neuroscience (Undergraduate Course), (co-developed and co-taught with Prof. E. N. Pugh), Spring 1997, Fall 1997, Spring 1999.
EXEN 121	Applied Modern Mathematical Methods II, ExMSE Program, December 89-February 1990, December 90-February 1991.

***<u>Academic Administrative Experience</u>*:**

Academic Year	
2011-2012	Member, University Council Committee on Diversity and Equity
2011-2012	Member, SEAS Nanocluster Hiring Committee
2011-2012	Member, ESE Search Committee
2010-2011	Member, Scholarly Chair Review Committee
2001-2010	Chair, Pender Awards Committee
2007-2010	Member, University Council Committee on Honorary Degrees
2008-09	Member, SEAS Faculty Awards Committee
2008	Member, Electrical and Systems Engineering (ESE) Dept. Scholarly Chair Search Committee
2007	Chair, Computer and Information Science (CIS) Dept. Chair Consultative Search Committee
2003-2005, 07-09	Member, SEAS Faculty Personnel Committee (Alternate member,07-08)
2002-2007, 08-09	Chair, SEAS Information (Library and Computing) Resource Committee
2006-2007	Member, Search Committee for Assistant Director for Engineering and Physical Sciences Libraries
2004-2008	Member, ESE Faculty Search Committee (coordinator of the Physical Devices Search)
2006-2007	Member, Bioengineering (BE) Dept. Chair Search Committee
2005	Member, ESE Facility Renovations Committee
2004-2005	Member, Provost Task Force on Retiree Benefits (Health and TDA)
2003	Member, ESE Undergraduate Curriculum Committee
2003-2004	Member, ESE Graduate Affairs Committee
2003-2004	Member, ESE Joint Sophomore Course Sub-Committee
2002-2008	Member, Electrical and Systems Engineering (ESE) Faculty Hiring Committee
2002	Member, Material Science & Engineering (MSE) Dept. Chair Search Committee
2001-2008	Member of the Natural Science and Engineering Review Panel for the University Research Foundation
2001	Member, UPenn Graduate Education Strategic Planning Committee
2000-2001	Chair, EE Graduate Affairs Committee
2000-2001	Member, EE Strategic Planning Committee
2000-2001	Member, SEAS Undergraduate Curriculum Review Committee
1998-99, 01-02	Member, EE Graduate Affairs Committee
1996-97, Fall 1997, 2000-2001	Alternate Member, SEAS Faculty Personnel Committee
1998-99	Chair, SEAS Faculty Personnel Committee
1998-2000	Member, SEAS Faculty Council
1998-Fall 1999	Chair, EE Colloquium Series
1998-99	Member, EE Undergraduate Curriculum Committee
1993-97	Chair, EE Graduate Group

1996-97	Member, SEAS Graduate Student Discipline Standby Committee
Spring-Summer 97	Member, Material Science & Engineering (MSE) Dept. Chair Search Committee
1990-92, 94-97, 01	Chair, EE Ph.D. Qualifying Examination Committee
1990-93	Chair, SEAS Academic Performance Committee
1991-92	Acting Coordinator, RCA Lab. of Elect. Eng. Department
1992-93	Member, EE Graduate Programs and Curriculum Review Committee
1993-96	Chair, EE Graduate Programs and Admission Committee
1993	Chair, EE Ph.D. Examination Review Committee
1992-93	Member, EE Undergraduate Programs & Curriculum Review Committee
1990-92	Member, University Committee on the Future of Science & Technological Information
1990-92	Member, SEAS Faculty Council. Chair of subcommittee on Faculty Teaching Evaluation and Advising in academic year 1991-92.
1991-92	Member, SEAS Committee on Technology in Education
1987-90	Member, EE Ph.D. Qualifying Examination Committee
1987-90	Member, EE Faculty Search Committee
1987-92	Member, EE Undergraduate Curriculum Committee
1987-88	Member, EE Undergraduate Laboratory Committee
1988	Member, EE Written Qualifying Examination Ad Hoc Committee
1988-90	Member, SEAS Academic Performance Committee
1988-89	Secretary, EE Faculty
1989	Member, EE Chairperson Search Committee
1989-90	Member, SEAS Dean Search Committee
1990	Member, SEAS Graduate Student Discipline Standby Committee

***Professional Activities*:**

- Elected as the Vice-Chair (for 2010) and Chair (for 2012) for the *Gordon Research Conference on Plasmonics*.
- Chair of the Commission B (Fields and Waves) of the U.S. National Committee (USNC) of the International Union of Radio Science (URSI) for the term January 1, 2009-December 31, 2011.
- Elected Vice-Chair/Chair-Elect of the Commission B (Fields and Waves) of the U.S. National Committee (USNC) of the International Union of Radio Science (URSI) for the term January 1, 2006-December 31, 2008.
- Elected Member of the Administrative Committee (AdCom) of the IEEE Antennas and Propagation Society (AP-S), from January 2003-December 2005.
- Elected Member-at-Large of the U.S. National Committee (USNC) of URSI USNC-URSI), January 1, 2005-December 31, 2007. Extended January 1, 2008 till December 31, 2008.
- Chair of the "New Technology Directions" for the IEEE Antennas and Propagation Society, November 2004- December 2007. A member from January 2008 till December 2010.
- Chair of the Special Sessions Selection Committee of the joint annual IEEE Antennas and Propagation Society International Symposia/URSI-USNC meetings, July 2005-December 2007.

- Representative of URSI-USNC in the Special Sessions Selection Committee and the Technical Program Committee of the IEEE Antennas and Propagation Society International Symposia, July 2005-June 2007.
- Representative from the IEEE Antennas and Propagation Society on the IEEE NanoTechnology Council Administrative Committee, January 2005-December 2006.
- Programme Mentor for the University of Southampton's Engineering and Physical Sciences Research Council (EPSRC)-sponsored *Center for Nanostructured Photonis Metamaterials*, May 2009 to present.
- Member of the Advisory Board of *Innova Dynamics*, http://www.innovadynamics.com/index.php, San Francisco, California
- Member of the International Advisory Board of the *Focused Session A-12 on "Progress in Metamaterials Research" of Symposium A "Adaptive, Active, Multifunctional Smart Materials Systems, 4th International Conference on "Smart Materials, Structures, and Systems," of the International Conferences Materials and Technologies (CIMTEC), Montecatini Terme, Italy,* June 1015, 2012.
- Chair of the Scientific Advisory Committee of the *META'12, the 3rd International Conference on Metamaterials, Photonic Crystals, and Plasmonics, Paris, France*, April 19-22, 2012.
- Member of the International Advisory Committee of the *4th IEEE International Symposium on Microwave, Antenna, Propagation, and EMC Technologies for Wireless Communications, Beijing, China*, November 1-3, 2011.
- Member of the Advisory Board of *the PLASMETA 2011, Samarkand, Uzbekistan*, September 21-26, 2011.
- Co-Convener and Co-Chair of the Session BD1 on "Metamaterial Theory" at *the 30th Generam Assembly and Scientific Symposium of the International Union of Radio Science (URSI), Istanbul, Turkey*, August 13-20, 2011.
- Co-Convener and Co-Chair of the Session DB2 on "Plasmonics" at *the 30th Generam Assembly and Scientific Symposium of the International Union of Radio Science (URSI), Istanbul, Turkey*, August 13-20, 2011.
- Co-Convener and Co-Chair of the Session DB3 on "Metamaterial Applications" at *the 30th Generam Assembly and Scientific Symposium of the International Union of Radio Science (URSI), Istanbul, Turkey*, August 13-20, 2011.
- Co-Chair of the *Metamaterials: Fundamentals and Applications IV Conference* of *the 2011 SPIE-The International Society for Optical Engineering on Optics and Photonics, San Diego, California*, August 21-25, 2011.
- Member of the Technical Program Committee of *the CLEO Europe-EQEC 2011, Munich, Germany*, May 22-26, 2011.
- Member of the Program Committee of *the 5th International Conference on Surface Plasmon Photonics (SPP-5), Busan, South Korea*, May 15-20, 2011.
- Member of the Program Committee of *the Metamaterials Conference (EOO101) of the SPIE Optics and Optoelectronics, Prague, Czech,* April 18-21, 2011.
- Member of the International Advisory Committee of *the Progress in Electromagnetics Research Symposium (PIERS'2011), Marrakech, Morocco*, March 20-23, 2011.

- Co-Organizer of the Sympsium on "MRS Symposium M: Resonant Optical Antennas – Sensing and Shaping Materials" for the *2010 Material Research Society (MRS) Fall Meeting, Boston, MA*, November 29-December 3, 2010.
- Member of the Technical Program Committee of the *20th International Conference on Applied Electromagnetics and Communications, Dubrovnik, Croatia*, September 20-22, 2010.
- Member of the Scientific Advisory Committee and a Reviewer of *Metamaterials 2010, 4th International Congress on Advance Electromagnetic Materials in Microwave and Optics, Karlsruhe, Germany*, September 13-18, 2010.
- Co-Chair of the *Metamaterials: Fundamentals and Applications III Conference* of *the 2010 SPIE-The International Society for Optical Engineering on Optics and Photonics, San Diego, California*, August 1-5, 2010.
- Member of the Program Committee of *Plasmonics: Nanosensing, Nanoimaging, Nanofabrication, and Their Applications VI Conference* of *the 2010 SPIE-The International Society for Optical Engineering on Optics and Photonics, San Diego, California*, August 1-5, 2010.
- Co-Chair of the Special Sessions of the *2010 IEEE Antennas and Propagation International Symposium/CNC-USNC URSI Radio Science Meeting, Toronto, Ontario, Canada*, July 11-17, 2010.
- Member of the International Advisory Board of the *Focused Session H-7 on "Left-Handed Metamaterials" of the Symposium H "Advances on Electrical, Magnetic, and Optical Ceramics" of the 12th International Ceramics Congress (CIMTEC, 2010), Grosseto, Tuscany, Italy*, June 6-11, 2010.
- Co-Organizer of the *Theo Murphy meeting on Metallic Metamaterials and Plasmonics, sponsored by the Royal Society, London, UK*, June 2-3, 2010.
- Member of the International Advisory Committee (IAC) of the *2010 International Workshop on Antenna Technology (iWAT'2010), Lisbon, Portugal*, March 1-3, 2010.
- Member of the Scientific Advisory Committee of the *2nd International Conference on Metamaterials, Photonic Crystals and Plasmonics META'10, Cairo, Egypt*, February 22-25, 2010.
- Co-Organizer of the Sympsium on "Metamaterials: From Modelling and Fabrication to Applications" for the *2009 Material Research Society (MRS) Fall Meeting, Boston, MA*, November 30-December 4, 2009.
- Member of the International Advisory Committee of the *3rd IEEE International Symposium on Microwave, Antenna, Propagation, and EMC Technologies for Wireless Communications, Beijing, China*, October 27-29, 2009.
- Co-Organizer and Co-Chair of the Special Session on "Cloaking and Coordinate-Transformation Applications" at the *Metamaterials 2009, 3rd International Congress on Advance Electromagnetic Materials in Microwave and Optics, London, UK*, August 30-September 4, 2009.
- Co-Organizer and Co-Chair of the Special Session on "Extreme-Parameter Metamaterials" at the *Metamaterials 2009, 3rd International Congress on Advance Electromagnetic Materials in Microwave and Optics, London, UK*, August 30-September 4, 2009.

- Member of the Scientific Advisory Committee and a Reviewer of ***Metamaterials 2009, 3rd International Congress on Advance Electromagnetic Materials in Microwave and Optics, London, UK***, August 30-September 4, 2009..
- Co-Chair of the *Metamaterials: Fundamentals and Applications II Conference* of *the 2009 SPIE-The International Society for Optical Engineering on Optics and Photonics, San Diego, California*, August 2-6, 2009.
- Member of the Program Committee of *Plasmonics: Nanosensing, Nanoimaging, Nanofabrication, and Their Applications V Conference* of *the 2009 SPIE-The International Society for Optical Engineering on Optics and Photonics, San Diego, California*, August 2-6, 2009.
- Member of the International Technical Program Committee of the ***Optical Society of America-Chinese Optical Society (OSA-COS) Topical Meeting on*** *Application of Optical Metamaterials (AOM'09), Tianjin, China*, June 22-25, 2009.
- Member of the Technical Subcommittee of ***Conference on Laser and Electrooptics/Quantum Electronics and Laser Science (CLEO/IQEC)*** on "Nanooptics and Plasmonics", Baltimore, MD, May 31-June 5, 2009.
- Member of the Technical Program Committee of the ***SPIE-*** *The International Society for Optical Engineering* ***Optics and Optoelectronics Symposium (EOO09), Prague, Czech Republics***, April 20-24, 2009.
- Member of the International Advisory Committee of the ***Progress in Electromagnetics Research Symposium (PIERS 2009) in Beijing, China***, March 23-27, 2009.
- Member of the International Advisory Committee (IAC) for the ***2009 International Workshop on Antenna Technology -- Small Antennas and Novel Metamaterials (iWAT 2009) Santa Monica, CA***, March 2-4, 2009.
- Member of the Technical Program Committee of the *2nd EuroPhysics Conference on Nanophotonics and Metamaterials (NanoMeta 2009), Seefeld, Austria*, January 5-9, 2009.
- Member of the International Advisory Committee of the *2008 International Symposium on Antennas, Propagation, and EM Theory (ISAPE 2008), Kunming, China*.
- Member of the Program Committee of *Optical Society of America (OSA)'s Plasmonics and Metamaterials 2008 Optics and Photonics Congress, Rochester, New York,* October 19-23, 2008.
- Member of the Scientific Advisory Board of the *2nd International Congress on Advanced Electromagnetic Materials in Microwaves and Optics (Metamaterials'2008), Pamplona, Spain*, September 21-26, 2008.
- Co-Chair of the *Metamaterials: Fundamentals and Applications Conference* of *the 2008 SPIE-The International Society for Optical Engineering on Optics and Photonics, San Diego, California*, August 10-14, 2008.
- Member of the Program Committee of *Plasmonics: Nanoimaging, Nanofabrication, and Their Applications IV Conference* of *the 2008 SPIE-The International Society for Optical Engineering on Optics and Photonics, San Diego, California*, August 10-14, 2008.
- Member of the Scientific Advisory Committee of ***NATO Advance Research Workshop (ARW) Metameterials 2008, Marrakech, Morroco***, May 7-10, 2008.
- Member of the Technical Subcommittee of ***Conference on Laser and Electrooptics/Quantum Electronics and Laser Science (CLEO/QELS)*** on "Nanooptics and Plasmonics", San Jose, CA., May 4-9, 2008.

- Member of the International Advisory Committee of the ***2008 Progress in Electromagnetics Research Symposium (PIERS 2008), Hangzhou, China***, March 24-28, 2008.
- Co-Chair of the Technical Program Committee of ***Metamaterials' 2007*** – First International Congress on Advanced Electromagnetic Materials in Microwaves and Optics, Rome, Italy, October 22-26, 2007.
- Member of the Technical Program Committee of the *ICECom 2007 "19**th** **International Conference on Applied Electromagnetics and Communications", Dubrovnik, Croatia***, September 24-26, 2007.
- Co-Chair of the *Photonic Metamaterials Conference* of *the 2007 SPIE-The International Society for Optical Engineering on Optics and Photonics, San Diego, California*, August 26-30, 2007.
- Member of the International Advisory Committee of the ***IEEE 2007 International Symposium on Microwave, Antenna, and EMC Technology for Wireless Communication (MAPE 2007), Hangzhou, China***, August 14-16, 2007.
- Member of the Technical Program Committee of ***International Union of Radio** Science (URSI)'s Electromagnetic Theory Symposium (EMT)'2007, **Ottawa, Ontario, Canada***, July 26-28, 2007.
- Member of the Program Committee of 2007 ***Photonic Metamaterials: From Random to Periodic (META), Jackson Hole, Wyoming***, June 4-7, 2007.
- Member of the Technical Subcommittee of ***Conference on Laser and Electrooptics/Quantum Electronics and Laser Science (CLEO/QELS)*** on "Metamaterials and Periodic and Random Media", Baltimore, MD., May 6-11, 2007.
- Member of the International Program Committee of Progress in Electromagnetic Research Symposium (PIERS'2007), Beijing, China, March 26-30, 2007.
- Member of the Technical Program Committee of the ***NanoMeta 2007, EuroPhysics Conference on Nanophotonics and Metamaterials, Seefeld, Austria***, January 8-11, 2007.
- Member of the Technical Program Committee of the *Bianisotropics'2006 "11**th** Conference on Complex Media and Metamaterials",* ***Samarkand, Uzbekistan,*** Sept. 25-27, 2006.
- Member of the Program Committee of the *2006 SPIE Conferences on Optics and Photonics' Complex Photonic Media VII, San Diego, CA*, August 13-17, 2006.
- Member of the International Advisory Committee of the *2006 IEEE International Workshop on Antenna Technology (iWAT'2006): Small Antennas and Novel Metamaterials, White Plains, NY*, March 6-8, 2006.
- Member of the Technical Program Committee of the *ICECom 2005 "18**th** **International Conference on Applied Electromagnetics and Communications", Dubrovnik, Croatia***, October 12-14, 2005.
- Member of the International Advisory Committee of the ***IEEE 2005 International Symposium on Microwave, Antenna, and EMC Technology for Wireless Communication (MAPE 2005), Beijing, China***, August 8-12, 2005.
- Member of the Technical Program Committee of the ***2005 IEEE AP-S International Symposium/URSI/USNC National Radio Science Meeting, Washington DC,*** July 3-8, 2005.

- Member of the Technical Program Committee of the *Bianisotropics'2004 "10th Conference on Complex Media and Metamaterials", Ghent, Belgium*, Sept. 22-24, 2004.
- Member of the Technical Program Committee of the *2004 URSI International Symposium on Electromagnetic Theory, Pisa, Italy*, May 23-27, 2004.
- Member of the Technical Program Committee of the *2004 10th International Conference on Mathematical Methods in Electromagnetic Theory (MMET'2004)*, in Dnepropetrovsk, Ukraine, September 14-17, 2004.
- Member of Technical Activities Committee of USNC/URSI (United States National Committee of Intenrational Union of Radio Science) Commission B (fields and waves), January 2000-December 2005).
- Member of the International Bianisotropics Conference Committee (IBCC), June 1999-present.
- Member of the International Union of Radio Science's (URSI) Commission B Technical Advisory Board (B-TAB), May 2001-present.
- Member of the steering committee for the IEEE International Microwave Symposium (IMS) 2003, Philadelphia, PA, June 8-13, 2003. Co-chair of the IMS'03 Student Paper Competition, and Co-Chair of Early Career IMS'03 Travel Grant initiative.
- Member of the Technical Program Committee of the *2002 Mathematical Methods in Electromagnetic Theory (MMET'2002) conference*, in Kiev, Ukraine, September 10-13, 2002.
- Co-Organizer and Co-Chair of the special session on "Metamaterial and Plasmonic Antennas in *the 2010 European Conference on Antennas and Propagation (EuCAP'2010), Barcelona, Spain,* April 12-15, 2010.
- Co-Organizer of the special session on "Micro- and Nano-Electromagnetics and Meta-Devices" in the *2009 National Radio Sceience Meeting, International Union of Radio Science-U.S. National Committee (URSI-USNC), Boulder, Colorado,* January 5-8, 2009.
- Speaker of the single Public Lecture (a large Plenary speech) on the topic of "Seeing the Unseen: From Polarization-Sensitive Eyes to Biologically-Inspired Sensing and Imaging Science" at the *2008 XXIX General Assembly of the International Union of Radio Science (URSI-GA 2008), Chicago, Illinois*, August 7-16, 2008.
- Organizer of a Short Course on "Metamaterials" in *the XXIX General Assembly of International Union of Radio Science (URSI)*, in Chicago, Illinois, August 9-16, 2008.
- Co-Convener of the Special Session on joint Commission DB on "Plasmonics" in *the XXIX General Assembly of International Union of Radio Science (URSI)*, in Chicago, Illinois, August 9-16, 2008.
- Organizer of the special session on "Metamaterials: From RF to Optics" in the *2008 National Radio Sceience Meeting, International Union of Radio Science-U.S. National Committee (URSI-USNC), Boulder, Colorado,* January 3-7, 2008.
- Co-Organizer of the special session on "Novel Theoretical Advances and Potential Applications of Metamaterials" in the *2007 Progress in Electromagnetics Research Symposium (PIERS'2006), Beijing, China* March 25-30, 2007.

- Co-Organizer and Chair of the focus session on "Negative-Index Materials: Concept to Applications III", *March Meeting of American Physical Society, Denver, CO*, March 5-9, 2007.
- Co-Organizer and Co-Chair of the special session on "Metamaterials, Nano-Optics and Nano-Electromagnetism" in the *2006 Progress in Electromagnetics Research Symposium (PIERS'2006), Tokyo, Japan* August 2-5, 2006.
- Co-Organizer and Speaker in a Short Course on "Microstructured and Nanostructured Transmission-Line Metamaterials and Their Applications" at *the 2006 IEEE Antennas and Propagation Society International Symposium/URSI National Radio Science Meeting/AMREM, Albuquerque, NM*, July 9-14, 2006.
- Co-Organizer and Co-Chair of the special session on "Nanostructures and Metamaterials for RF and Optical Applications" in the *2006 Progress in Electromagnetics Research Symposium (PIERS'2006), Cambridge, MA,* March 26-29, 2006.
- Co-Organizer and Co-Chair of the special session on "Electromagnetic Applications of Metamaterials" in the *2006 URSI-USNC National Radio Science Meeting, Boulder, CO*, January 4-7, 2006.
- Speaker of General Lecture on the topic of "Metamaterials and Plasmonic Structures" at *the XXVIII General Assembly of International Union of Radio Science (URSI)*, in New Delhi, India, October 23-29, 2005.
- Co-Convener of the Session on "Metamaterials, Plasmonic Structures and Their Applications" in *the XXVIII General Assembly of International Union of Radio Science (URSI)*, in New Delhi, India, October 23-29, 2005.
- Co-Organizer and Co-Chair of the special session on "Metamaterials, EBG, and Plasmonic Structures" in the *ICECom 2005 "18th International Conference on Applied Electromagnetics and Communications", Dubrovnik, Croatia,* October 12-14, 2005.
- Co-Organizer and Co-Chair of the special sessions on "Metamaterials, Nanostructured Electromagnetics and Plasmonic Effects, Parts 1 and 2" in *the International Conference in Electromagnetics and Advance Applications (ICEAA'05) Torino, Italy,* September 12-16, 2005.
- Co-Organizer and Co-Chair of the special session on "Selected Topics in Metamaterials and Plasmonic Media" in the *2005 Progress in Electromagnetics Research Symposium (PIERS'2005), Hangzhou, China,* August 22-26, 2005.
- Co-Organizer and Co-Chair of the special session on "Advances in Plasmonic and Other Electromagnetic Phenomena" in the *2005 IEEE Antennas and Propagation Society International Symposium/USNC/URSI National Radio Science Meeting, Washington DC,* July 3-8, 2005.
- Co-Organizer and Co-Chair of the focused session on "Through-wall microwave sensing and imaging" in the *2005 IEEE Antennas and Propagation Society International Symposium/USNC/URSI National Radio Science Meeting, Washington DC,* July 3-8, 2005.
- Co-Organizer of the workshop on "See-through-Wall Radar" in the *2005 International Microwave Symposium (IMS'2005), Long Beach, CA, June 11-17, 2005*.
- Co-Organizer and Co-Chair of the joint special sessions on "Metamaterials" in the *2004 IEEE Antennas and Propagation Society International*

Symposium/URSI/USNC National Radio Science Meeting, Monterey, CA, June 20-26, 2004.

- Co-Organizer and Co-Chair of the joint special session on "Electromagnetic Bandgap (EBG) Surfaces" in the *2004 IEEE Antennas and Propagation Society International Symposium/URSI/USNC National Radio Science Meeting, Monterey, CA,* June 20-26, 2004.
- Co-Organizer and Co-Chair of the joint special session on "Through-Wall Imaging and Sensing" in the *2004 IEEE Antennas and Propagation Society International Symposium/URSI/USNC National Radio Science Meeting, Monterey, CA,* June 20-26, 2004.
- Co-Organizer and Co-Chair of the special sessions on "Metamaterials" in the *2004 URSI International Symposium on Electromagnetic Theory, Pisa, Italy*, May 23-27, 2004.
- Co-Organizer and Co-Chair of the special session on "Metamaterials: Double-Negative Structures" in *the International Conference in Electromagnetics and Advance Applications (ICEAA'03)* Torino, Italy, September 8-12, 2003.
- Co-Organizer and Co-Chair of the special session on "Metamaterials: Electromagnetic Bandgap (EBG) Media" in *the International Conference in Electromagnetics and Advance Applications (ICEAA'03)* Torino, Italy, September 8-12, 2003.
- Co-Organizer and Co-Chair of the 2-part special sessions on "Metamaterials" in *the 2003 IEEE Antennas and Propagation Society International Symposium/USNC-CNC-URSI North American Radio Science Meeting,* Columbus, Ohio, June 22-27, 2003.
- Co-Organizer and Co-Chair of the 3-part special sessions on "Electromagnetic Bandgap (EBG) Surfaces" in *the 2003 IEEE Antennas and Propagation Society International Symposium/USNC-CNC-URSI North American Radio Science Meeting,* Columbus, Ohio, June 22-27, 2003.
- Co-Organizer and Co-Chair of the special session on "Nanometamaterials" in *the IEEE-Nano'2002 Conference on Nanotechnology*, in Washington, DC, August 26-28, 2002.
- Co-Convener of the poster Session on "Electromagnetic Waves in Complex Environments" in *the XXVII General Assembly of International Union of Radio Science (URSI)*, in Maastricht, The Netherlands, August 17-24, 2002.
- Organizer and Co-Chair of the Special Sessions on "Complex Media and Metamaterials," in *the 2002 IEEE Antennas and Propagation Society Symposium/USNC-URSI National Radio Science Meeting,* San Antonio, Texas, June 16-21, 2002.
- Co-Organizer and Co-Chair of the Special Sessions on "Novel Challenges with Electromagnetic Bandgap Surfaces: Artificial Magnetic Conductors, Hard and Soft Surfaces, and Other Complex Surfaces" in *the 2002 IEEE Antennas and Propagation Society Symposium/USNC-URSI National Radio Science Meeting,* San Antonio, Texas, June 16-21, 2002.
- Organizer and Chair of the Special Session on "Electromagnetic Complex Media and Metamaterials," in *the 2002 National Radio Science Meeting (URSI-USNC),* in Boulder, Colorado, January 9-12, 2002.
- Co-Organizer and Co-Convener of the Special Session on "Waves and Fields in Complex Media," in *the 2001 URSI International Symposium on*

Electromagnetic Theory, in Victoria, British Columbia, Canada, in May 13-17, 2001.

- Organizer and Co-Chairman of the Special joint AP-S/URSI-B Session on "Recent Developments in Theoretical Electromagnetics," in *the 2000 IEEE Antennas & Propagation Society International Symposium/USNC-URSI National Radio Science Meeting,* in Salt Lake City, Utah, in July 16-21, 2000.
- Co-Convener of the poster Sub-Session on "Bianisotropic Media" (as part of BP2 poster sessions on Media Effects in Electromagnetics) in *the XXVI General Assembly of International Union of Radio Science (URSI)*, in Toronto, Ontario, Canada, August 13-21, 1999.
- Organizer and Co-Chairman of the Special AP-S Session on "Selected Topics in Electromagnetic Theory," in *the 1999 IEEE Antennas & Propagation Society International Symposium/USNC-URSI National Radio Science Meeting* in Orlando, Florida, in July 11-16, 1999.
- Organizer and Co-Chairman of the Special Session (joint AP-S/URSI-B) on "Novel Trends in Theoretical Electromagentics," in *the 1998 IEEE Antennas & Propagation Society International Symposium/USNC-URSI National Radio Science Meeting* in Atlanta, Georgia, in June 21-26, 1998.
- Organizer and Co-Chairman of the Special Session (joint AP-S/URSI-B) on "Novel Trends in Electromagentics," in *the 1997 IEEE Antennas & Propagation Society International Symposium/North American Radio Science Meeting*, in Montreal, Canada, in July 13-18, 1997.
- Organizer and Co-Chairman of the Special Session (joint AP-S/URSI-B) on "Novel Mathematical Techniques in Electromagnetic Theory," in *the 1996 IEEE Antennas & Propagation Society International Symposium/URSI-B Radio Science Meeting* in Baltimore, MD, in July 21-26, 1996.
- Member of the AP-S Reviewer Subcommittee of the Technical Program Committee of the 1993 IEEE AP-S International Symposium, Ann Arbor, Michigan, June 27-July 2, 1993.
- Organizer and Chairman of the Special Sessions on "Chiral Materials," for the 14th Triennial URSI International Symposium on Electromagnetic Theory, Sydney, Australia, on August 17-20, 1992.
- Member of the Reviewer Subcommittee of the Technical Program Committee of the 1992 IEEE AP-S/Radio Science/Nuclear EMP Joint Symposia, Chicago, Illinois, July 18-25, 1992.
- Co-Organizer and Co-Chairman of the Special Session on "Chiral, Bianisotropic and Complex Materials," for the 1992 Joint Symposia IEEE AP-S/URSI/NEM, Chicago, Illinois, July 18-25, 1992.
- Organizer and Chairman of the Special Session on "Chiral Materials and Applications," 1991 Progress in Electromagnetic Research Symposium (PIERS), Boston, Massachusetts, July 1-5, 1991.
- Co-Organizer and Co-Chairman of the Special Workshop/Session on "Chiral and Complex Materials," in 1991 Progress in Electromagnetic Research Symposium (PIERS), Boston, Massachusetts, July 1-5, 1991.
- Co-Organizer and Co-Chairman of the Special Session on "Chiral Materials," 1991 International IEEE AP-S/URSI National Radio Science Symposium, London, Ontario, Canada, June 24-28, 1991.
- Topical Editor for the Disk of References to compile titles of papers (in the period 1990-92) in the area of "Propagation in Random Media, Inhomogeneous,

Nonlinear and Complex Media" for the *Review of Radio Science* (RRS for 1990-1992) of Commission B of URSI (International Union of Radio Science). The disk was completed in November 1992, and it appeared in *the XXIVth General Assembly of the International Union of Radio Science (URSI), Kyoto, Japan*, August 25-September 2, 1993.

- Member of the Scientific Advisory Committee of the conference BIANISOTOPICS'97, Scotland, UK, June 5-7 1997.
- Member of the Organizing Committee of the conference BIANISOTOPICS'2000, Lisbon, Portugal, September 27-29, 2000.
- Member of the Technical Program Committee of the fourth International Symposium on Antennas and EM Theory (ISAE'97), in Xi'an, P. R. China, August 19-22, 1997.
- Invited Member of Panels of NSF Workshop On Future Directions in Electromagnetic Research, in Progress In Electromagnetic Research Symposium (PIERS), Boston, Massachusetts, July 27, 1989.
- Member of the Technical Program Committee of the 1988 IEEE AP-S International Symposium/URSI Radio Science Meeting, Syracuse, New York, 6-10 June 1988.
- Member (1994) of the IEEE Scholarship Awards Committee, IEEE, 1994.
- Chairman (1989-1991) of the *IEEE Antennas and Propagation / Microwave Theory and Techniques (AP-S/MTT-S) Chapter*, Philadelphia Section, IEEE.
- Vice-Chairman (1988-1989) of the *IEEE Antennas and Propagation / Microwave Theory and Techniques (AP/MTT-S) Chapter*, Philadelphia Section.
- General Chairman, the Eighth Annual Benjamin Franklin Symposium, Philadelphia, Pennsylvania, March 24, 1990.
- General Chairman, the Ninth Annual Benjamin Franklin Symposium, Philadelphia, Pennsylvania, March 9, 1991.
- Chairman of the Technical Program, the Seventh Annual Benjamin Franklin Symposium, Philadelphia, Pennsylvania, March 11, 1989.
- Reviewer of manuscripts for:

  IEEE Antennas and Wireless Propagation Letters
  IEEE Microwave and Wireless Components Letters
  IEEE Transactions on Antennas and Propagation
  IEEE Antennas and Propagation Magazine
  IEEE Transactions on Geoscience and Remote Sensing
  IEEE Transactions on Electromagnetic Compatibility
  IEEE Transactions on Microwave Theory and Techniques
  IEEE Transactions on Education
  IEE Proceedings- Pt H (Microwave, Antenna)
  Science
  Nature
  Nature Photonics
  Nature Materials
  Nature Physics
  Physical Review A
  Physical Review E
  Physical Review B
  Physical Review Letters
  Journal of Visual Communication and Image Representation
  Vision Research

Applied Physics Letters
Optics Express
Modern Optics
Radio Science
Journal of Optical Society of America (JOSA)
Optics Letters
Journal of Electromagnetic Waves and Applications (JEWA)
Electronics Letters (IEE)
Journal of the Franklin Institute
Canadian Journal of Physics
Z. Naturfosch. A. Chemie (Germany)
Microwave and Optical Technology Letters
Physics Essays (Canadian Journal)
Computer and Electrical Engineering Journal
Book manuscripts on Photonics, Electromagnetics and Microwave
Grant Proposals for ARO, NSF, Member of NSF Review Panel

Ph.D. and MS Theses Supervised:

Philippe Pelet, MS thesis entitled "Guided-Wave Structures Filled with Chiral Materials: Chirowaveguides," EE Dept., completed December 1988.

Philippe Pelet, Ph.D. dissertation entitled "Chirality in Guided-Wave Structures and Printed-Circuit Antennas: Theory and Applications," EE Dept., completed May 1991.

- Philippe Pelet was awarded No. 1 Prize in the 1991 URSI Student Prize Paper contest for the paper entitled "Electromagnetic Properties of Finite-Length Chirostrip Antennas" co-authored by P. Pelet and N. Engheta at the 1991 North American Radio Science Meeting/International IEEE AP-S Symposium, London, Ontario, Canada, June 24-28, 1991.

Kathleen O'Brien, MS thesis entitled "Electrically Induced Variation in Optical Activity of Chiral Liquid Crystals in the Isotropic State," (Joint supervision with L. J. Martinez-Miranda), EE Dept., completed May 1991.

Paul Zablocky, Ph.D. dissertation entitled "Transient Electromagnetic Wave Propagation, Refraction, and Radiation in Chiral Media," EE Dept., completed August 1992.

Mamdouh, M. I. Saadoun, Ph.D. dissertation entitled "The Pseudochiral Ω Medium: Theory and Potential Applications," EE Dept., completed September 1992.

Mark S. Mirotznik, Ph.D. dissertation entitled "Catheter Ablation of the Heart Using Microwave Energy (Joint supervision with K. R. Foster (Bioengineering Dept.)), Department of Bioengineering, completed October 1992.

Manoel 'Mickey' P. Rowe, Ph.D. dissertation in Neuroscience entitled "Double Cones as the Basis for Polarization Sensitivity in Vertebrates," (Joint supervision with E. N. Pugh, Jr. (Psychology Dept.)), Institute of Neurological Sciences, University of Pennsylvania, completed July 1995.

J. Scott Tyo, Ph.D. dissertation entitled "Polarization-Difference Imaging: A means for Seeing through Scattering Media," (Joint supervision with E. N. Pugh, Jr. (Psych Dept.)), EE Dept., completed April 11, 1997.

- Scott Tyo received the NSF CAREER Award in 2003.
- Scott Tyo was awarded the *Union Radio-Scientifique Internationale (URSI) Young Scientist Award* to attend the 2002 URSI General Assembly in Maastricht, The Netherlands in August 2002.
- Scott Tyo was awarded the *URSI Commission B Young Scientist Award* to attend the 1998 URSI Electromagnetic Theory Symposium in Thessaloniki, Greece in May 1998.
- Scott Tyo was elected Fellow of SPIE-International Society for Optical Engineering, 2009.

Charles A. Moses, Ph.D. dissertation entitled "A Theoretical Study of Electromagnetic FeedForward/FeedBackward Media and Wire Media," EE Dept., completed December 1997.

- Charles A. Moses was awarded No. 2 Prize in the 1998 URSI Student Prize Paper competition for the paper for presentation entitled "Theoretical Electromagnetic Study of the Wire Medium" co-authored by C. A. Moses and N. Engheta presented at the 1998 URSI/USNC National Radio Science Meeting , Boulder, Colorado, January 5--8, 1998.

Joshua P. Vatsky, MS thesis, entitled "A Theoretical Investigation of Electromagnetic Sources Described by Complex-Order Fractional Integrals and Their Related Waves," EE Dept., completed June 1999, graduated in August 1999.

John Pennington, MS Graduate Student, worked on his MS thesis on application of fractional operators in waveguide problems, MS thesis entitled "Fractional cross product, derivative, and curl and some of their electromagnetic properties", completed April 2005.

Kenneth J. Hoover, Graduate Student (joint supervision with Stephane Evoy), worked on development/nanotechnology of metamaterials in the optical and IR regimes, completed May 2005.

Siddharth Malik, Graduate Student, worked on fields and waves in metamaterials, and on electrophysical aspects of EEG and the contact-less implementation of EEG signal detection. Started January 2004, MS. Thesis entitled "Resonant transmission of electromagnetic waves in metallic waveguides below cut off", completed April 2005.

Andrea Alu', Visiting Graduate Student at UPenn (and a Ph.D. student in Universita di Roma Tre), under my supervision worked on various aspects of theory of metamaterials, plasmonic nano-optics and nano-circuits, and nano-electromagnetism. Started January 2002. Completed his doctoral degree in March 2007..

- Andrea Alu' was awarded No. 2 Prize in the 2003 IEEE Antennas and Propagation Society International Symposium Student Paper competition for the paper for presentation entitled "Mode Excitation by a Line Source in a Parallel-Plate Waveguide Filled with a Pair of Parallel Double-Negative and Double-Positive Slabs" co-authored by Andrea Alu and N. Engheta presented at the IEEE AP-S Symposium, Columbus, OH, June 22-27, 2003.
- Andrea Alu' was awarded the *Union Radio-Scientifique Internationale (URSI) Young Scientist Award* to attend the 2004 URSI International Symposium on Electromagnetic Theory in Pisa, Italy, May 23-27, 2004.

- Andrea Alu' was awarded The Raj Mittra Travel Grant to attend the 2004 IEEE Antennas and Propagation Society International Symposium/URSI-USNC National Radio Science Meeting, Monterey, California, June 20-25, 2004.
- Andrea Alu' was selected to be among the finalists of the 2004 IEEE Antennas and Propagation Society International Symposium Student Paper competition..
- Andrea Alu' was winner of the SUMMA Foundation Fellowship, September 2004, to pursue his Ph.D. research on "Complex Materials with Double-Negative and Single-Negative Material Parameters and Their Electromagnetic Applications.
- Andrea Alu' was selected to be among the finalists of the 2005 IEEE Antennas and Propagation Society International Symposium Student Paper competition.
- Andrea Alu' was awarded the *Union Radio-Scientifique Internationale (URSI) Young Scientist Award* to attend the XXVIIIth URSI General Assembly in New Delhi, India, October 23-29, 2005.
- For more entries for Andrea Alu, please see the section on "Visiting Scholars, Visiting Research Associates, and Postdoctoral Fellows Supervised"

Alessandro Salandarino, Visiting Graduate Student at UPenn (and a PhD student at Universita di Roma Tre), under my supervision worked on various aspects of theories of plasmonic structures and nano-optics and nano-circuit elements, fields in metamaterials, small antennas, selected electrophysics problems in electroencephalography (EEG),. Started December 1, 2003, completed August 10, 2007.

Brian Edwards, Graduate Student, worked on projects related dielectrophoresis phenomenon in manipulating nanostructures (Electric Tweezers), and projects related to reconfigurable plasmonic structures and sub-wavelength imaging, cloaking experimentas, epsilon-near-zero (ENZ) metamaterials experimentation for supercoupling and anamolous tunneling in narrow channels and bends. Started May 2004, completed December 2008.

- Brian Edwards was awarded No. 1 Prize in the 2006 URSI Student Prize Paper competition for the paper for presentation entitled "Electric Tweezers: Experimental Study of Positive Dielectrophoresis Based Positioning and Orientation of a Gold Nanorod" co-authored by S. Evoy and N. Engheta presented at the 2006 URSI/USNC National Radio Science Meeting , Boulder, Colorado, January 4-7, 2006.
- Brian was also achieved 1st place in the UPenn School of Engineering and Applied Science (SEAS) Graduate Research Symposium, in February 2006, among the graduate students presenting in that meeting.
- Brian was the recipient of the Joseph, D'16, and Rosaline Wolf Award for the best dissertation by a male Electrical and Systems Engineering Ph.D. Candidate, May 2009.

Jingjing 'Dennis' Li, Graduate Student, PhD. Dissertation on Theory of Optical Nanoantennas and Arrays Based on Surface Plasmon Resonance of Plasmonic Nanoparticles. Started Jan. 2005, Completed December 2007.

Che-Yun Lin, MS Graduate Student, his MS thesis on numerical study of conjugate dielectric layers as ENZ metamaterials. Started Spring 2007, Completed May 2008.

Ashkan Vakil, Graduate Student in Electrical and Systems Engineering, working on various aspects of metamaterials, plasmonic optics and graphene photonics. Started September 2008, in progress.

Thomas, Sean, MS Graduate Student, his MS researck on optical polarization. Started January 2011, completed July 2011.

Chen, Liji, MS Graduate Student (joint supervision with Prof. Jan Van der Spiegel), his MS researck on CMOS imagers. Started December 2010, in progress.

Zhu, Wenkan, MS Graduate Student, his MS researck on metamaterials. Started January 2011, in progress.

Nikolina Jankovic, Visiting PhD Graduate Student (from University of Novi Sad, Serbia), working on the epsilon-near-zero (ENZ) metamaterials aspects of filters and circuits, September 27, 2010 till September 2011, work in progress.

Francisco Rodriguez Fortuno, Visiting PhD Graduate Student (from University of Valencia, Spain), working on low-loss plasmonics and ENZ levitation, March 1, 2011 till November 30, 2011, work in progress.

Hongjie ("Matt") Zhu, PhD Student (joint supervision with Professor Jan Van der Spiegel), working on electronic and optical sensors, Started September 2011, work in progress

Fereshteh Abbasi, PhD student, working on metamaterials and plasmonics optics, started September 2011, work in progress.

Ahmed Mahmoud, PhD Student, working on metamaterials and plasmonic optics, started September 2011, work in progress.

Victor Torres Landivar, Visiting PhD Graduate Student (from University of Navarro, Spain), working on ENZ plasmonics, September 19, 2011 till December 18, 2011, work in progress.

Visiting Scholars, Visiting Research Associates, and Postdoctoral Fellows Supervised:

Prof. Qing Jun Deng, University of Electronic Science and Technology of China, Chengdu, Sichuan, China, worked as a Visiting Scholar on theoretical modal analysis of wave propagation in a coaxial fiber filled with isotropic chiral materials," January 1990 - June 1990, part-time June 1990-December 1990.

Dr. Frédéric Mariotte, Commissariat à l'Énergie Atomique (C.E.A.), C.E.S.T.A., Service Physique Expérimentale, Le Barp, France, as a Visiting Research Associate he worked on Properties of Guided Modes in a waveguide Filled with Chiral Materials, September 1991-August 1992.

Dr. Alessandro Toscano, Università degli Studi di Roma "La Sapienza", Dipartimento di Elettronica, Roma, Italy, as a Visiting Research Associate he worked on antenna radiation in cylindrically symmetrical and cartesian pseudochiral Ω medium," August 3, 1992-October 3, 1992.

Dr. Manoel "Mickey" Rowe, postdoctoral researcher, worked on biophysical aspects of polarization vision in green sunfish (joint supervision with E. N. Pugh Jr.) Jan. 1996 through August 1996.

Dr. Eldar I. Veliev, Leading Research Scientist from the Institute of Radiophysics and Electronics of Ukraine Academy of Science, visiting my research group as a Visiting Research Associate. He is collaborating with me on fundamental problems related to applications of fractional calculus in electromagnetic theory. July 2002, November 2002, and June 2003.

Dr. Kostyantyn Yemelyanov, postdoctoral researcher, works on biologically inspired polarization sensing, processing, and mapping strategies, reverse-engineering of polarization vision, and biomimetic imaging, through-wall microwave imaging, and antenna design. November 19, 2001- October 31, 2006.

Dr. Natalia Bliznyuk, postdoctoral researcher, works on millimeter-wave novel lens design and analysis, through-wall microwave imaging, nano-electromagnetism and plasmonic nano-optics. January 28, 2002-August 31, 2004.

Dr. Shih-Schon Lin, postdoctoral researcher, working on the development of bio-inspired polarimetric hyperspectral imaging and sensing, bio-inspired visualization of polarization information and polarization vision, Started January 2003, completed June 2009.

Dr. Mario Goncalo M. V. Silveirinha, Visiting Scholar (on sabbatical from his home institution University of Coimbra, Portugal), working on metamaterials. October 15, 2004 till September 30, 2005.

Mr. Sebastiano Barbagallo, Visiting Graduate Student, working on metamaterials and composite structures. February 1, 2005 till July 31, 2005.

Dr. Viktor Gruev, Postdoctoral Researcher, working on integrated microelectronic bio-inspired polarization sensitive camera chip, November 2004 till June 2008. (joint supervision with Professor Jan Van der Spiegel.)

Dr. Andrea Alu, Postdoctoral Researcher, working on projects involving metametarials and plasmonic phenomena in my group, April 2007 till December 2008.

- Andrea Alu' was awarded the *Union Radio-Scientifique Internationale (URSI) Young Scientist Award* to attend the URSI Electromagnetic Theory Symposium (EMT) in Ottawa, Canada, July 26-28, 2007.

- Andrea Alu' was awarded the *Young Scientist Travel Grant* to attend the 2007 International Symposium on Antennas and Propagation (ISAP'07), in Japan, August 20-25, 2007 to present the paper "Nanovortices around Resonant Optical Nanoantennas with Higher DirectivitieS" co-authored by A. Alu and N. Engheta.

- Andrea Alu' was awarded the 2008 *Leopold B. Felsen Award for Excellence in Electrodynamics*, for outstanding postdocs in Electromagnetics, Award from University of Siena, Siena, Italy, September 17, 2008.

- Andrea Alu' was awarded the *Metamaterials Reviewer Award 2008 for "Outstanding Contribution to the Peer-Reviewed Process" for journal Metamaterials*, September 25, 2008.

- Andrea Alu received the NSF CAREER Award in 2010.

- Andrea Alu received the AFOSR Young Investigator Award in 2010.

- Andrea Alu received the URSI Young Scientist Award to attend the URSI GASS in 2011.

- Andrea Alu received the 2011 URSI Issac Koga Medal on August 14, 2011.

Dr. Xinyu Liu, Research Associate, working on project involving acoustic wave interaction with objects, September 2007 till August 2008.

Dr. Ramin Pashaie, Postdoctoral Researcher, working on supercoupling effects in epsilon-near-zero metamaterials and its several applications, March 15, 2008 till May 31, 2008.

Mr. Pierluigi Colavini, Research Associate, working on nonlinear metamaterials and plasmonics optics, April 2008 till August 2008.

Dr. David Powell, (from Australian National University, Canberra, Australlia), Visiting Scholar in my group, working on experiments on the role of nonlinearity in Epsilon-near-zero (ENZ) metamaterials and waveguides, September 28, 2008 till November 25, 2008.

Dr. Alessia Polemi, (from University of Modena, Italy), Visiting Scholar in my group, working on planar metamaterials, October 2008-December 2008, October 2009.

Dr. Yong Sun, Postdoctoral Researcher, working on nanofabrication and testing of plasmonic and metamaterial structures, metactronic circuits, etc, started October 2008, completed May 2010.

Dr. Brian Edwards, Postdoctoral Researcher (and now Research Scientist, working on projects related to electric tweezers, cloaking experimentas, epsilon-near-zero (ENZ) metamaterials experimentation for supercoupling and anamolous tunneling in narrow channels and bends, plasmonics and metamaterials. Started December 2008, work in progress.

Dr. Uday Chettiar, Postdoctoral Researcher, working on various aspects of metamaterials and plasmonic projects. Started March 2009, work in progress.

Dr. Olli Luukkonen, Visiting Scholar (from Helsinki University of Technology), working on projects related to metamaterials with broken symmetry. Started August 2009, completed August 2010.

Mr. Alexandre Silva, a Visiting Graduate Student (from University of Campinas (UNICAMPS), Campinas, Brazil, working on 3 projects related to metamaterials and ENZ plasmonic structures. November 28, 2009 till December 20, 2009.

Dr. Mario Goncalo M. V. Silveirinha, Visiting Scholar (from University of Coimbra, Portugal), working on metamaterials and electronic metamaterials. March 22, 2010 till June 2010. April 1, 2011 till June 30, 2011.

Dr. Vesna Crnojevic-Bengin, Visiting Scholar (from University of Novi Sad, Serbia), working on the epsilon-near-zero (ENZ) inspired microstrip filters, May 28, 2010 till June 11, 2010, and also June 13-17, 2011.

Dr. Miguel Navarro, Visiting Scholar (from Public University of Navarra, Pamplona, Spain), working on metamaterials and enhanced transmission May 17, 2010 till August 1, 2010.

Dr. Humeyra Caglayan, Postdoctoral Researcher, working on metamaterials and plasmonic optics. Started September 15, 2010, work in progress.

Professor Gregory Kriegsmann, Visiting Professor (from Mathematics Department, New Jersey Institute of Technology), working on mathematics of metamaterials, January 2011 till June 2011, work in progress.

Dr. Milin Zhang, Postdoctoral Researcher (joint supervision with Professor Van der Spiegel), working on smart sensors with optics and electronics, and circuit designs. Started March 1, 2011, work in progress.

Dr. Alexandre Alves da Silva, Postdoctoral Researcher, working on metamaterials and plasmonic optics, Started June 20, 2011, work in progress.

Dr. Cristian Della Giovampaola, Postdoctoral Researcher, working on metamaterials and plasmonics optics, started October 1, 2011, work in progress.

Dr. Arur Devoyan, Postdoctoral Researcher, working on metamaterials and plasmonics optics, started October 1, 2011, work in progress.

Other Research Efforts Supervised:

Marek W. Kowarz, Summer Undergraduate Research Project, "A Novel Design for Chiral Lens," EE Dept., completed, September 1989.

C. Brendan Traw, Undergraduate Research for Benjamin Franklin Scholarship Program, "Irregular Tetrahedron as Microwave Chiral Object," EE Dept., completed May 1991.

Raul Polakof, Undergraduate Independent Study, "Chiral Structures with Wideband Properties," EE Dept., completed, May 1991.

Syed Z. Ahmed, Graduate Independent Study on "Analytical Study of Radiation Characteristics of Chirsostrip Patch Antennas," EE Dept.,completed August 1991.

Adil A. Khan, Undergraduate Independent Study on "Radiation Patterns of Chirostrip Antennas and Arrays," EE Dept., completed, December 1991.

Theodore Steiner, Undergraduate Independent Study on "Polarization Characteristics of Modes in Chirowaveguides," EE Dept., completed December 1991.

Shamita D. Dhruv, Undergraduate Independent Study on "The Effect of Variation of Chiral Permeability μ_c and Chirality Admittance ξ_c in Surface-Wave Power of Chirostrip Line Antennas," EE Dept., completed December 1991.

Paul G. Zablocky, Graduate Independent Study on "Transient Microwave Antenna Design," EE Dept., completed August 1992.

Guangying Li, Graduate study on "Diffraction of waves in Chiral (Optically Active) Materials" EE Dept., completed August 1992.

Kara L. Ko, General Honor (Undergraduate) Independent Study on "Measuring Electroretingraphic Signals of Green Sunfish, *Lepomis cyanellus*", (joint supervision with E. N. Pugh, Jr. (Psych Dept.)), EE Dept., Fall 1994, continued in Spring 95, completed May 1995.

Andreas Olofsson, Summer Undergraduate Fellowship in Sensor Technologies (SUNFEST) program, summer research on "Microfabrication of Infra-Red (IR) Wire-Grid Polarizers," (joint supervision with E. N. Pugh, Jr. (Psych.), and J. Van der Spiegel (EE)), EE Dept., completed August 1995.

Andreas Olofsson, Graduate Independent Study (EE 899), on Sensor Technologies (in particular Polarization Sensing), (joint supervision with J. Van der Spiegel (EE)), EE Dept., Fall 1996, continued in Spring 97, completed May 1997.

Lauren Berryman, Summer Undergraduate Fellowship in Sensor Technologies (SUNFEST), summer research on "Source Analysis and Cellular Interrogation Using the Electroencephalogram," (joint supervision with E. N. Pugh, Jr., (Ophthalmology)), EE Dept., summer 2000.

Shiva Portonovo, Summer Undergraduate Fellowship in Sensor Technologies (SUNFEST), summer research on "Components of a CMOS Imager for a Polarization-Difference Camera," (joint supervision with J. Van der Spiegel (EE)), EE Dept., summer 2000.

Lawrence C. Weintraub, Graduate Independent Study (EE 899), on Polarization Imaging and Remote Sensing, EE Dept., Fall 2000 and continued in Spring 2001, completed (May 2001).

Gregory J. Barlow, Summer Undergraduate Fellowship in Sensor Technologies (SUNFEST) from North Carolina State University, summer research at UPenn on "CMOS Active Pixel Sensors for Polarization-Differnece Camera" (joint supervision with J. Van der Spiegel, (EE)), EE Dept., summer 2001.

Yale Chang, Summer Undergraduate Fellowship in Sensor Technologies (SUNFEST), summer research on "Diffractive Optical Elements for Polarization-Difference Camera," (joint supervision with D. W. Prather (ECE Dept., University of Delaware)), summer 2001.

Alemayehu Addis, EE Undergraduate student,. He worked part of Fall 2001 on some computer code development for one of our research projects.

Huibin Amelia "Amee" Chew: Undergraduate student from Harvard, who was on leave of absence from Harvard. She worked on the part-time basis in my research group in the Fall 2001 and till February 2002. She worked on computational code development for our EEG project (joint supervision with E. N. Pugh, Jr. (Ophthalmology))

Johnny Wong, CSE Undergraduate student, who did research in my group May 2002. He worked on the data processing (joint supervision with E. N. Pugh (Ophthalomology)).

Aalok Mehta, research on analysis and modeling of EM scattering from complex surfaces with potential applications to antenna design for wireless systems. Completed Spring 2002.

Gregory Nieberg, research on analysis and modeling of antenna design near wire-medium sheets with applications to antennas for wireless systems. Completed Spring 2002.

Matthew Lo, research on mapping polarization information into unison pixel jitters on images from polarization-difference imaging. Completed Spring 2002.

Adrian Lau, worked on research on development of GUI systems for data analysis of the EEG data. Also , as a Summer Undergraduate Fellowship in Sensor Technologies (SUNFEST), wrked on summer research on EEG related study" (joint supervision with E. N. Pugh, Jr. (Ophthalmology), summer 2002.

Amber Sallerson, Summer Undergraduate Fellowship in Sensor Technologies (SUNFEST) from University of Maryland at Baltimore County, summer research at UPenn on "Performance Optimization for Millimeter-Wave Lenses using Metamaterial Concepts", summer 2002.

Shiva Portonovo, EE Undergraduate student, doing research in my research group beginning summer 2002 on code development of wave interaction with metamaterial surfaces.

William Luis: EE Undergraduate student, worked on the computational and experimental aspects of the development of bio-inspired polarization mapping, polarization vision and imaging. May 2002 till May 2003.

Kunal Ghosh, ESE Undergraduate, worked on research on equivalent circuit modeling and simulation of wave interaction with a epsilon-negative (ENG) and mu-negative (MNG) bilayer structures, Spring 2003.

Chanatip Kit: EE Undergraduate student, worked on computational development of fusion of images from simultaneous camera systems for bio-inspired polarization mapping, polarization vision and imaging project, Summer 2003.

Phil Chan: EE Undergraduate student, He is working on development of certain portable imaging and camera systems for bio-inspired polarization mapping and imaging project. Started June 2003, Completed December 2003.

Ryan Aminzadeh, Electrical and Systems Engineering Undergraduate Student and submatriculant, doing Graduate Independent Study on Optimal Electric Tweezers Operation, Completed May 2006.

Saif Malik, Electrical and Systems Engineering Undergraduate Student, working on software development for the Electric Tweezer project, Spring 2006.

Michael Young, Physics and Material Science and Engineering Undergraduate Student, doing independent study on Subwavelength optical filters based on plasmonic media, Independent study Completed May 2006, and continue research in my lab. Completed September 2008.

Divya Krishnan, Electrical and Systems Engineering Undergraduate Student, working on numerical simulation of optics of plasmonic nanoparticles, started Spring 2006, completed June 2007.

Michael Haugh, Physics (and linguistics) Undergraduate Student, working on numerical simulation of acoustic wave interaction with objects with various materials, started May 2007, completed December 2007.

Philip Kwame Danso Asare, Electrical and Systems Engineering Undergraduate Student, working on numerical modeling of acoustic wave interaction with objects with canonical shapes, started May 2007, completed May 2011.

Garrett Bruer, Electrical and Systems Engineering Undergraduate Student, working on numerical simulation of light scattering with nanostructures, started September 2007 completed December 2007.

Matthew Brendzel, Electrical and Systems Engineering Undergraduate Student, working on design and construction of X-Y scanner and some other related topics related to metamaterials, started November 2008, work completed May 2010.

Matthew Byrne, Electrical and Systems Engineering Undergraduate Student, working on design and construction of permittivity meteres and some other related topics related to metamaterials, started January 2009, completed May 2011.

David DiCiurcio, High School intern, working on mapping electromagnetic fields in the simulators and EM simulations, started January 2010, completed May 2011.

Nikhil Karnik, Electrical and Systems Engineering Undergraduate Student, working on assisting on certain electromagnetic and optics projects in the lab, started November 2010, work in progress.

Senior Design Projects Supervised:

Marek W. Kowarz, Senior Design Project on "A Composite Chiral Dielectric for Microwave Frequencies" (joint supervision with D. L. Jaggard), EE Dept., completed, May 1989.

Mark Endicott, Senior Design Project on "Electro-Optical Modulators", (joint supervision with J. J. Santiago-Aviles), EE Dept., completed, May 1989.

Gedeon G. and S. Roseberg, Senior Design Project on "Integrated Optical Slab Waveguides" (joint supervision with J. J. Santiago-Aviles), EE Dept., completed, May 1989.

Ji Lee, Sang Lee, and Dimitrios Faliagas, Senior Design Project on "Integrated Optical Waveguides" (joint supervision with J. J. Santiago-Aviles), EE Dept., completed, May 1990.

Raul Polakof, Senior Design Project, "CAD Program for Microstrip Antennas," EE Dept., completed May 1991.

Oscar Tshabalala and Theodore Steiner, Senior Design Project on "Magnetically Induced Variation of Chirality in Chiral Liquid Crystals in Isotropic Phase" (joint supervision with L. J. Martinez-Miranda), EE Dept., completed, May 1992.

Roland Kawakami, Adil A. Khan, and Peter Kitchin, Senior Design Project on "Optical Analog Modulator Using Chiral Liquid Crystal in Isotropic Phase (chiromodulator)" (joint supervision with L. J. Martinez-Miranda), EE Dept., completed, May 1992.

J. Scott Tyo, Senior Design Project on "Automatic Rotational Polarizer for the Polarization Differencing Camera," (joint supervision with E. N. Pugh, Jr., Psychology Dept.), EE Dept., completed, May 1994.

Harris G. Romanoff, Senior Design Project on "Active Color Spotlight" (joint supervision with James Ostrowski, Mechanical Engineering and Applied Mechanics Dept.), EE Dept., completed in May 1999.

- Harris Romanoff won two departmental awards for his senior design project in EE, and the first award among all SEAS senior projects in 1999.

Lauren J. Berryman and Yael Levi, Senior Design Project on "Magnetic Field Sensor using Ultrasonic Transducers," (joint supervision with E. N. Pugh, Jr., Ophthalmology Dept. and J. J. Santiago-Aviles, EE Dept.), EE Dept., completed in May 2001.

Yale Chang and Shiva Portonovo, Senior Design Project on "Design and Fabrication of Diffractive Optical Elements (DOE) for Polarization Difference Imaging Camera," (joint supervision with Professor Dennis Prather, ECE Dept., University of Delaware), EE Depts., completed April 2002.

Gregory Nieberg and Chi Tu, Senior Design Project on "CMOS Active Pixel Sensor and Arithmetic Circuitry for a Polarization Difference Imaging (PDI) Camera" (joint supervision with J. Van der Spiegel, EE Dept.), EE Dept., completed April 2002.

William Luis and Victor Wan, Senior Design Project on "Component Image Transform Analyzer (CITA)," ESE Department, completed April 24, 2003.

Kunal Ghosh and King Wah Yeung, Senior Design Project on "CMOS Camera-on-Chip with Polarization-Difference Imaging," (joint supervision with J. Van der Spiegel), ESE Department, completed April 24, 2003.

- Kunal Ghosh and King Yeung won the first departmental award for their senior design project in ESE, and the third award among all SEAS senior projects in 2003.

Nii Ayite Ayite, Zereyacob Girma, Aung Naing, Senior Design Project on "Double Vision Television", (joint supervision with K. Daniilidis), ESE Department, completed April 21, 2005.

- Nii Ayite Ayite, Zereyacob Girma, Aung Naing won the 1st prize for the departmental Demo Day prize for their senior design project in ESE, and the second place award among all SEAS senior projects in 2005.

Michael E. Young, Physics Honor Thesis Design Project on "Near-Field Scanning Optical Microscopy," Department of Physics and Astronomy, Started September 2007, Completed May 2008.

Michael E. Young, Senior Design Project on "Fast-Wave Tunneling and Efficient Coupling in Metamaterial Microstrip Devices," Material Science and Engineering Department, Started September 2007, Completed May 2008.

Matthew Brendzel, Alfred Wang and Jason Joo, Senior Design Project on "M.A.P.S. "Microwave Antenna Plotting System," Electrical and Systems Engineering Department, Started September 2009, completed May 2010.

Matthew Byrne, Miguel Gonzales, Nickolaus Woodruff, Andrew Townley, "Phased Speaker Arrays for Directed Sound Control," (jointed supervision with Dr. Brian Edwards), Electrical and Systems Engineering Department, Started September 2010, completed April 2011.
Received honorable mention in the Senior Design Project Competition.

Invited Seminars & Colloquia:
(In Chronological Order)

N. Engheta, "Interface Extinction and Subsurface Peaking of the Radiation Pattern of A Line Source," *University of California at Santa Barbara, Department of Electrical Engineering, Santa Barbara, California*, May 1984.

N. Engheta, "Radiation Characteristics of Interfacial Antennas," *Texas A&M University, Department of Electrical Engineering, College Station, Texas*, June 1985.

N. Engheta, "New Designs for Microwave Integrated-Circuit Antennas and Applications," invited talk, *Syracuse University, Department of Electrical and Computer Engineering, Syracuse, New York*, February 1987.

N. Engheta, "Novel Design to Improve Radiation Characteristics and Efficiencies of Microwave Printed-Circuit Antennas," *Cornell University, School of Electrical Engineering, Ithaca, New York*, February 1987.

N. Engheta, "Radiation Characteristics of Microwave and Millimeter-Wave Integrated-Circuit Antennas," *The Ohio State University, Department of Electrical Engineering, Columbus, Ohio*, March 1987.

N. Engheta, "Some Improvements in Radiation Patterns of Integrated-Circuit Antennas," *Georgia Institute of Technology, School of Electrical Engineering, Atlanta, Georgia*, March 1987.

N. Engheta, "Novel Design to Improve Radiation Characteristics of Microwave Integrated-Circuit Antennas," invited talk, *University of Pennsylvania, The Moore School of Electrical Engineering, Philadelphia, Pennsylvania*, March 1987.

N. Engheta, "New Designs for Microwave and Millimeter-wave Printed-Circuit Antennas," invited talk, *Rockwell International Corporation, Science Center, Thousand Oaks, California*, April 1987.

N. Engheta, "Electromagnetic Properties of Chiral Media," invited talk, *Syracuse University, Department of Electrical and Computer Engineering, Syracuse, New York*, March 4, 1988.

N. Engheta and D. L. Jaggard, "Chiral Materials and Polarization Birefringence" *Lockheed Aeronautical Systems Company, Valencia, California,* August 1, 1988.

N. Engheta, "Chirality in Electromagnetics: Principles and Applications," invited talk, *IEEE joint AP-MTT Chapter Meeting, Philadelphia Section, Philadelphia*, May 16, 1989.

N. Engheta, "Chiral Electrodynamics: Theory and Applications," colloquium, *Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pennsylvania, Pennsylvania*, January 25, 1990.

N. Engheta, "Chiral Materials: Principles and Novel Applications in Microwave and Optics," *Department of Electrical Engineering, University of California at Los Angeles, Los Angeles, California*, May 14, 1990.

N. Engheta, "Electrodynamics of Chiral Materials: Principles and Applications," invited colloquium, *Department of Electronics and Communications Engineering, Faculty of Engineering, Cairo University, Giza, EGYPT, and IEEE Joint AP-S/MTT-S Chapter Meeting, IEEE Egypt Section, Cairo, Egypt*, May 5, 1991.

N. Engheta, "Electromagnetic Chirality and Chiral Materials: Phyiscal Principles and Applications," invited talk, *National Telecommunication Institute, Cairo, EGYPT*, May 7, 1991.

N. Engheta, "What Are Chiral Materials and How Can They Be Used in Design of Novel Devices and Components?", *Department of Electrical and Computer Engineering, Center for Microwave and Lightwave Engineering, Drexel University, Philadelphia, Pennsylvania*, May 13, 1991.

N. Engheta, "Chiral Materials as Electromagnetically Handed Media", *Department of Electrical Engineering and Computer Science, The University of Illinois as Chicago, Chicago, Illinois*, June 21, 1991.

N. Engheta, "Recent Developments in Chiral Materials and Their Applications," invited talk, *IEEE joint AP-MTT Chapter Meeting, Philadelphia Section, Philadelphia*, January 27, 1992.

N. Engheta, "Chiral Materials and Guided-Wave Structures: Principles and Novel Applications in Devices and Components," 1st (of 4) invited seminar, *Dipartimento di Elettronica, Università degli Studi di Roma "La Sapienza", Roma, Italy*, March 10, 1992.

N. Engheta, "Antenna Radiation in Chiral Media: Chirostrip Antennas and Chirodomes," 2nd (of 4) invited seminar, *Dipartimento di Elettronica, Università degli Studi di Roma "La Sapienza", Roma, Italy*, March 10, 1992.

N. Engheta, "Wave Interaction with Chiral Media: Modeling and Applications," 3rd (of 4) invited seminar, *Dipartimento di Elettronica, Università degli Studi di Roma "La Sapienza", Roma, Italy*, March 10, 1992.

N. Engheta, "Chirality and Transient Electromagnetics," 4th (of 4) invited seminar, *Dipartimento di Elettronica, Università degli Studi di Roma "La Sapienza", Roma, Italy*, March 10, 1992.

N. Engheta, "Electromagnetic and Photonic Handedness: Chiral Materials and Their Applications," invited talk, *IEEE Central and South Italy joint AP-MTT, Rome, Italy,* March 12, 1992.

N. Engheta, "How Can Microwave and Light Beams Be Made Right-Handed or Left-Handed?," an invited presentation in *the Parents' Weekend, School of Engineering and Applied Science, University of Pennsylvania*, November 14, 1992.

N. Engheta, "Biologically Inspired Polarization-Difference Imaging: A Technique for Contrast Enhancement in Observation through Scattering Media," *NASA Ames Research Center, Moffett Field, California*, June 9, 1994.

N. Engheta, "Fractional Differintegrals in Electromagnetic Problems," invited talk, presented in *IEEE joint AP-MTT Chapter Meeting, Philadelphia Section, Philadelphia*, June 29, 1994.

N. Engheta, "Fractional Differintegrals and Electrostatic Fields and Potentials near Sharp Conducting Edges," presented in Ecole d'ÉTÉ Internationale sur *Geometrie Fractale et Hyperbolique, Derivation Fractionnaire et Fractal, Applications dans les Sciences de l'Ingenieur et en Economie* (International Summer School on Fractal and Hyperbolic Geometry, Fractional and Fractal Derivatives, Applications in Engineering, Applied Physics and Economics," Bordeaux, France, July 3-8, 1994.

N. Engheta, "Polarization-Difference Imaging: Can Sunfish Eyes Teach Us to See "Better" Under Water? *Department of Electrical Engineering and Computer Sciences, The University of California at Berkeley, Berkeley, California*, October 27, 1995.

N. Engheta, "On Fractional Derivatives in Electromagnetics," *The Radiation Laboratory, Department of Electrical Engineering and Computer Science, The University of Michigan, Ann Arbor, Michigan*, October 29, 1996.

N. Engheta, "Polarization-Difference Imaging (PDI): Principles and Potential Applications," *NASA Ames Research Center, Moffett Field, California*, November 21, 1996.

N. Engheta, "On Fractional Calculus in Electromagnetics," *Department of Electrical Engineering and Computer Sciences, The University of California at Berkeley, Berkeley, California*, November 22, 1996.

N. Engheta, "Unconventional Electromagnetic Media," *Department of Electrical Engineering, The University of California Los Angeles, Los Angeles, California*, June 2, 1997.

N. Engheta, "Fractional Derivatives, Fractional Integrals and Electromagnetic Theory" *Interdisciplinary Studies Department and Department of Electrical Engineering-Physical Electronics, Tel Aviv University, Tel Aviv, Israel*, September 11, 1997.

N. Engheta, "Fractional Derivatives, Fractional Integrals and Electromagnetic Theory" ," invited talk as IEEE AP-S Distinguished Lecture presented in *IEEE joint AP-S/MTT-S/EMC-S Chapter Meeting, Albuquerque, New Mexico*, October 23, 1997.

N. Engheta, "Biologically Inspired Polarization-Difference Imaging" a colloquium in *Department of Electrical and Computer Engineering, Villanova University, Villanova, Pennsylvania*, November 21, 1997.

N. Engheta, "Fractional Derivatives, Fractional Integrals and Electromagnetic Theory" invited talk as IEEE AP-S Distinguished Lecture presented in *IEEE Central Pennsylvania Section, State College, Pennsylvania*, December 11, 1997.

N. Engheta, "Fractional Derivatives and Electromagnetic Theory," presented as part of the Fulbright Naples Chair visit to *the Universita' di Napoli (Federico II), Dipartimento di Ingegneria Elettronica, Napoli, Italia*, March 12, 1998.

N. Engheta, "Unconventional Electromagnetic Media," presented as part of the Fulbright Naples Chair visit to *the Universita' di Napoli (Federico II), Dipartimento di Ingegneria Elettronica, Napoli, Italia*, March 16, 1998.

N. Engheta, "Fractional Paradigm in Electromagnetic Theory," invited talk at the mini-conference celebrating the *80th birthday of Professor Papas, California Institute of Technology, Steele Laboratory, Pasadena, CA*, March 27, 1998.

N. Engheta, "Calcolo Frazionario (Fractional Calculus)," presented at *the Istituto Universatorio Navale, Napoli, Italia*, April 2, 1998.

N. Engheta, "Biologically Inspired Polarization-Difference Imaging," presented as part of the Fulbright Naples Chair visit to *the Universita' di Napoli (Federico II), Dipartimento di Ingegneria Elettronica, Napoli, Italia*, April 8, 1998.

N. Engheta, "Fractional Calculus and Electromagnetic Theory," a series of 4 lectures presented as part of the Fulbright Naples Chair visit to *the Universita' di Napoli (Federico II), Dipartimento di Ingegneria Elettronica, Napoli, Italia*, April 20, April 23, April 28, and April 29, 1998.

N. Engheta, "Fractional Derivatives, Fractional Integrals and Fractional Paradigm in Electromagnetic Problems," an invited talk presented at *the Universita' di Firenze (University of Florance), Dipartimento di Ingegneria Elettronica, Firenze, Italia*, May 6, 1998.

N. Engheta, "Fractional Calculus in Electromagnetism: Electrostatic Problems," first of the two invited talks presented at *the Universita' di Pisa (University of Pisa), Dipartimento di Ingegneria della Informazione: Elettronica, Informatica, Telecomunicazioni, Pisa, Italia*, May 7, 1998.

N. Engheta, "Fractional Derivatives, Fractional Integrals and Electromagnetic Theory of Radiation Problems," second of the two invited talks presented at *the Universita' di Pisa (University of Pisa), Dipartimento di Ingegneria della Informazione: Elettronica, Informatica, Telecomunicazioni, Pisa, Italia*, May 7, 1998.

N. Engheta, "Fractional Derivatives, Fractional Integrals and Fractional Paradigm in Electromagnetic Problems," an invited talk presented at *the Universita' di Siena (University of Siena), Dipartimento di Ingegneria Elettronica, Siena, Italia*, May 8, 1998.

N. Engheta, "Biologically Inspired Polarization-Difference Imaging," presented at *the Istituto Universatorio Navale, Napoli, Italia*, May 11, 1998.

N. Engheta, "Fractional Calculus and Fractional Paradigm in Electromagnetic Theory: Electrostatic Problems," first of the four invited talks presented at *the Universita' degli Studi Roma Tre, Dipartimento di Ingegneria Elettronica, Roma, Italia*, May 14, 1998.

N. Engheta, "Fractional Calculus and Fractional Paradigm in Electromagnetic Theory: Radiation Problems," second of the four invited talks presented at *the Universita' degli Studi Roma Tre, Dipartimento di Ingegneria Elettronica, Roma, Italia*, May 14, 1998.

N. Engheta, "Unconventional Electromagnetic Complex Media: FeedForward/FeedBackward (FFFB) Media," third of the four invited talks presented at *the Universita' degli Studi Roma Tre, Dipartimento di Ingegneria Elettronica, Roma, Italia*, May 15, 1998.

N. Engheta, "Unconventional Electromagnetic Complex Media: Wire Media," fourth of the four invited talks presented at *the Universita' degli Studi Roma Tre, Dipartimento di Ingegneria Elettronica, Roma, Italia*, May 15, 1998.

N. Engheta, "Polarization-Difference Imaging: A Clue from Nature for Visibility Enhancement," *School of Biomedical Engineering, Science and Health Systems*, and *Department of Electrical and Computer Engineering, Drexel University, Philadelphia, PA*, February 19, 1999.

N. Engheta, "Exotic Electromagnetic Media," a seminar in the *Department of Electrical Engineering and Computer Science, University of Michigan, Ann Arbor, Michigan*, May 20, 1999.

N. Engheta, "Unconventional Electromagnetic Media," invited talk as IEEE AP-S Distinguished Lecture presented in *East China Normal University, IEEE AP-S South-East China (Nanjing) Chapter, Shanghai, China*, October 26, 1999.

N. Engheta, "Biologically Inspired Polarization Difference Imaging," invited talk as IEEE AP-S Distinguished Lecture presented in *East China Normal University, IEEE AP-S South-East China (Nanjing) Chapter, Shanghai, China*, October 26, 1999.

N. Engheta, "Fractional Derivative, Fractional Integral and Electromagnetic Theory," invited talk as IEEE AP-S Distinguished Lecture presented in *Nanjing University, IEEE AP-S South-East China (Nanjing) Chapter, Nanjing, China*, October 28, 1999.

N. Engheta, "Biologically Inspired Polarization Difference Imaging," invited talk as IEEE AP-S Distinguished Lecture presented in *Nanjing University, IEEE AP-S South-East China (Nanjing) Chapter, Nanjing, China*, October 29, 1999.

N. Engheta, "Unconventional Electromagnetic Media" invited talk as IEEE AP-S Distinguished Lecture presented in *South East University, IEEE AP-S South-East China (Nanjing) Chapter, Nanjing, China*, October 29, 1999.

N. Engheta, "Biologically Inspired Polarization Difference Imaging," invited talk as IEEE AP-S Distinguished Lecture presented in *Peking University, IEEE AP-S Beijing Chapter, Beijing, China*, November 1, 1999.

N. Engheta, "Fractional Differintegrals, Fractional Operators, and Electromagnetic Theory" Invited seminar at the *Electromagnetics Laboratory, Department of Electrical and Communication Engineering, Helsinki University of Technology, Helsinki, Finland*, November 11, 1999.

N. Engheta, "Fractional Operators and Electromagnetic Theory: How Can They Be Combined?" Invited seminar at the *Department of Electromagnetic Theory, Lund University, Lund, Sweden*, November 15, 1999.

N. Engheta, "Fractional Calculus and Electromagnetic Theory: The Tale of Two Merging Fields," Invited seminar at the *NRL-Edison Chapter of Sigma Xi, Naval Research Laboratory, Washington, D.C.*, March 16, 2000.

N. Engheta, "Biologically Inspired Polarization-Difference Imaging: A Clue from Nature for Target Detection and Visibility Enhancement," presented at *the Army Research Laboratory, Adelphi, Maryland.*, on May 16, 2000.

N. Engheta, "Can We Learn from Nature to See "Better" in Scattering Media?" presented at the *IEEE Night Philadelphia Section Meeting, Philadelphia, Pennsylvania*, October 17, 2000.

N. Engheta, "Biologically Inspired Polarization-Difference Imaging: A Clue from Nature for Target Detection and Visibility Enhancement" presented at the *Department of Electrical and Computer Engineering, Old Dominion University, Norfolk, Virginia*, October 27, 2000.

N. Engheta, "Exotic Electromagnetic Media: Theory and Modeling of EM Metamaterials", presented at *the Department of Electrical and Computer Engineering, University of Delaware, Newark, Delaware*, April 20, 2001.

N. Engheta, "Future of Research and Education in Electrical and Computer Engineering: A Personal Perspective", presented at the *Department of Electrical and Computer Engineering, University of Maryland, College Park, Maryland*, May 7, 2001.

N. Engheta, "From Polarization Vision in Nature to Bio-Inspired Sensing and Imaging in Scattering Environments," presented as an invited keynote speech at the *University of Tehran's School of Engineering's Reunion in San Diego, California*, July 7, 2001.

N. Engheta, "From Polarization Vision in Nature to Bio-Inspired Sensing and Imaging in Scattering Environments," presented at the *Department of Electrical Engineering and Computer Science (EECS), The University of Michigan, Ann Arbor, Michigan*, April 15, 2002.

N. Engheta, "Hybrid PMM/IR Aperture: Metamaterials for PMMW Lens Design," presented at the ONR Surface/Aerospace Surveillance Technology Program Gathering, Washington, DC, April 17, 2002.

N. Engheta, "Exotic Electromagnetic Media and Surfaces: Theory and Modeling of Metamaterials," presented at the *Department of Mechanical Engineering, University of Maryland, College Park, Maryland*, April 19, 2002.

N. Engheta, "From Polarization Vision in Nature to Bio-Inspired Sensing and Imaging in Scattering Environments," presented at the *Department of Electrical and Computer Engineering, University of Maryland, College Park, Maryland*, April 19, 2002.

N. Engheta, "Metamaterials – Lumped Element Models for Double-Positive (DPS), Double-Negative (DNG), Epsilon-Negative (ENG), and Mu-Negative (MNG) Media" presented at the *JASON Program, La Jolla, California*, June 18, 2003.

N. Engheta and R. W. Ziolkowski, "Tailoring the electromagnetic responses of materials: Part 1: double negative metamaterials and Part 2: EM Bandgap Metamaterials" presented at the *2nd International PhD School on Selected Topics in Applied Electromagnetics*

"Metamaterials and RF MicroElectroMechanical Systems", Perugia, Italy, September 15-16, 2003.

N. Engheta, "Metamaterials and Plasmonic Nanostructures: Concepts, Salient Features, and Potential Applications," presented as a Distinguished Seminar Series at *Department of Electrical and Computer Engineering, University of Arizona, Tucson, AZ*, April 20, 2004.

N. Engheta, "Metamaterials" a tutorial given at the *2004 IEEE Radar Conference*, Philadelphia, PA, April 29, 2004.

N. Engheta, "Special Materials and Metamaterials for Electromagnetics and Telecommunications", a series of lectures for a short course given at the *Universita di Salerno (6 lectures) and Universita di Sannio in Benevento (4 lectures), Italy*, July 11-25, 2004.

N. Engheta, "Seeing the Invisible: Bio-Inspired Polarization Imaging and Vision", lectures given at the *Universita di Salerno and Universita di Sannio in Benevento (4 lectures), Italy*, July 19, 21, 2004.

N. Engheta, "Metamaterials, Plasmonic Nanostructures, and Nano-Electromagnetism," a lecture given in the workshop on "Nanotechnology and Advance Materials" at *the 2004 IEEE EMC Conference, Santa Clara, CA*, August 9-13, 2004.

N. Engheta, "Anomalous Wave Manipulation in Metamaterials and Plasmonic Structures" as a Tutorial Short Course on Left-Handed Metamaterials, Circuits and Their Technical Applications at the *2004 European Microwave Conference (EuMC'04), Amsterdam, The Netherlands*, October 11-15, 2004.

N. Engheta, "Left-Handed and Plasmonic Metamaterials: Towards IR and Visible Regimes," at the *Air Force Research Laboratory (AFRL), Hanscom Air Force Base, Massachusetts*, October 18, 2004.

N. Engheta, "NIM: Towards IR and Visible Regimes," at the *Army Research Office (ARO) Workshop on Negative-Index Materials, Duke University, Durham, North Carolina*, November 1-2, 2004.

N. Engheta, "Left-Handed and Plasmonic Metamaterials and Structures: Towards IR and Visible Regimes," at the *Condensed Matter Seminar Series, Department of Physics and Astronomy, University of Delaware, Newark, Delaware*, November 4, 2004.

N. Engheta, "Seeing the Invisible: From Polarization-Sensitive Visual Systems in Nature to Bio-Inspired Sensing and Imaging Science," at *Bioengineering Department, University of Pennsylvania, Philadelphia, PA*, December 9, 2004.

N. Engheta, "Negative Refraction: Ideas from Photonic Paradigm," at *DARPA Phononic Microsystems Workshop, Arlington, VA*, December 17, 2004.

N. Engheta, "Metamaterials, Shrinking Components, and Near-Field Nano-Devices and Systems," as a Distinguished Lecture Series at *Edward S. Roger Sr. Department of Electrical*

and Computer Engineering, University of Toronto, Toronto, Ontario, Canada, January 18, 2005.

N. Engheta, "Seeing the Invisible: From Polarization-Sensitive Visual Systems in Nature to Bio-Inspired Sensing and Imaging Science and Technology," at *Radio Science Seminar Series, STAR Laboratory, Department of Electrical Engineering, Stanford University, Stanford, CA*, January 31, 2005.

N. Engheta, "Metamaterials, Shrinking Circuit Components, and Near-Field Nano-Devices and Systems*, Optics Seminar, Applied Physics Department, California Institute of Technology, Pasadena, CA*, February 1, 2005.

N. Engheta, "Seeing the Invisible: From Polarization Vision in Nature to Bio-Inspired Sensing and Imaging Science and Technology," at *Bioengineering Department, California Institute of Technology, Pasadena, CA*, February 2, 2005.

N. Engheta, "Metamaterials: Concepts, Salient Features and Potential Applications"*, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA*, February 4, 2005.

N. Engheta, "What Can We Learn from Polarization Vision in Nature?"*, Department of Biological Sciences, University of Maryland, Baltimore County, Baltimore, MD*, February 18, 2005.

N. Engheta, "Metamaterials, Nano-Circuit Elements and Near-Field Devices and Systems?"*, Department of Electrical and Computer Engineering, National University of Singapore, Singapore,* March 8, 2005.

N. Engheta, "Negative Refraction: Ideas from Photonic Paradigms for Phononic Problems", *Workshop on Nanoscopic Phonon Engineering, Sponsored by Defense Science Research Council (DSRC), Los Angeles, CA*, March 23, 2005.

N. Engheta, "Metamaterials, Shrinking Circuit Elements, and Near-Field Nano-Devices and Systems, " *Center for Research and Education on Optics and Lasers (CREOL), Florida Photonics Center of Excellence (FPCE), College of Optics and Photonics, University of Central Florida, Orlando, Florida*, April 8, 2005.

N. Engheta, "Electromagnetic Theory of Metamaterials and Their Potential Engineering Concepts," a lecture to be given in the workshop on "Physics, Theory, Fabrications and Applications of Micrwave Metamaterials" at *the 2005 IEEE Microwave Theory and Techniques International Microwave Symposium (IMS'05), Long Beach, CA,* June 12-17, 2005.

N. Engheta, "Metamaterials and Plasmonic Phenomena," an invited lecture given in the *Workshop on Metamaterials, Hangzhu, China*, August 29-30, 2005.

N. Engheta, "Metamaterials, Shrinking Circuit Elements, and Nanophotonics" presented at the *IEEE Section Night, Philadelphia Section Meeting, Philadelphia, Pennsylvania*, September 20, 2005.

N. Engheta, "Metamaterials, Shrinking Circuit Elements, and Nanophotonics" presented at the *Department of Radiocommunications and Microwave Engineering, University of Zagreb, Zagreb, Croatia*, October 10, 2005.

N. Engheta, "Optical Metamaterials and Nanoelements: Concepts and Potential Applications" an invited lecture given at the *Workshop on Design and Applications of Metamaterials, at Indian Institute of Technology, Kanpur, India*, October 27, 2005.

N. Engheta, "Metamaterials and Nanocircuit Paradigms in Nanooptics" presented at the *Nano-Bio Interface Center (NBIC), University of Pennsylvania, Philadelphia, PA*, February 6, 2006.

N. Engheta, "Metamaterials, Shrinking Circuit Elements and Nanooptics" as a Distinguished Lecture Series in *Department of Electrical and Computer Engineering, The Ohio State University, Columbus, Ohio*, February 9, 2006.

N. Engheta, "Metamaterials for Transparency and Miniaturization" an invited talk at *Naval Surface Warfare Center (NSWC), Carderock Division, West Bethesda, MD,* March 17, 2006.

N. Engheta, "Metamaterials, Shrinking Circuit Elements and Nanooptics" an invited seminar at the *Department of Electrical Engineering, University of California Los Angeles (UCLA), Los Angeles, CA*, April 17, 2006.

N. Engheta, "Nanocircuits in Optics and 1-D, 2-D, and 3-D Negative-Index Optical Metamaterials" an invited seminar at the *Annual Review PI-Meeting of Air Force Office of Scientific Research (AFOSR), Ann Arbor, MI,* May 15-16, 2006.

N. Engheta, "Seeing the Invisible: Polarization Vision in Nature and Non-Invasive Imaging and Sensing" an invited seminar as the after-dinner speaker at the *Awards night of the IEEE Central New Jersey Section Princeton, New Jersey*, June 28, 2006.

G. Eleftheriades and N. Engheta, "Microstructured and Nanostructured Transmission-Line Metamaterials and Their Applications" short course at *the 2006 IEEE Antennas and Propagation Society International Symposium/URSI National Radio Science Meeting/AMREM, Albuquerque, NM*, July 9-14, 2006.

N. Engheta, "Plasmonics: Light at Nanometer Scales" an invited seminar as an "Outlook" talk at the *Summer Meeting of DARPA's Defense Sciences Research Council (DSRC), San Diego, CA*, July 20, 2006.

N. Engheta, "Nanophotonic Optical Circuits and Metamaterials" an invited seminar at *University of Southampton, Southampton, United Kingdom*, September 8, 2006.

N. Engheta, "Metamaterial Phenomena and Plasmonic Structures and Elements", an invited lecture in the *Spanish Network on Metmaterials (REME), Spain International Union of Radio Science (URSI), Oviedo, Spain*, September 12, 2006.

N. Engheta, "Metamaterials and Novel Devices" a lecture given at *the 2006 DPG Summer School on Metamaterials, Bad Honnef, Germany,* September 17-22, 2006.

N. Engheta, "Seeing the Invisible: Polarization Vision in Nature and Non-Invasive Imaging and Sensing" an invited seminar as *the IEEE Philadelphia Section, Philadelphia*, PA October 17, 2006.

N. Engheta, "Metamaterials, Shrinking Circuit Elements and Nanooptics" an invited seminar at the *Department of Physics, Queens College of the City University of New York, New York, New York,* October 25, 2006.

N. Engheta, "Metamaterials, Shrinking Circuit Elements and Nanooptics" an invited seminar at the *Department of Electrical Engineering, University of Navarra, Pamplona, Spain,* November 3, 2006.

N. Engheta, "Metamaterials, Shrinking Circuit Elements and Nanooptics" an invited seminar at the *College of Engineering, Temple University, Philadelphia, PA,* November 13. 2006.

N. Engheta, "Metamaterials, Shrinking Circuit Elements and Plasmonic Nanooptics" an invited seminar in the *Center for Nanoscale Science and Technology (CNST) Nanotechnology Seminar Series, National Institute of Standard and Technology (NIST), Gaithersburg, MD*, November 30, 2006.

N. Engheta, "What do Optical Nanocircuits, Cloaking, Squeezing Light, and Supermicroscopy Have in Common?" an invited seminar in the *Radio Laboratory, Helsinki University of Technology, Espoo, Finland*, March 29, 2007.

N. Engheta, "What do Optical Nanocircuits, Cloaking, Squeezing Light, and Supermicroscopy Have in Common?" an invited seminar in the *Applied Physics Department, California Institue of Technology, Pasadena, CA*, April 13, 2007.

N. Engheta, "Metamaterials, Shrinking Circuit Elements and Plasmonic Nanooptics" an invited colloquium in the *Department of Electrical and Systems Engineering, Washington University, St. Louis, Missouri*, April 20, 2007.

N. Engheta, "Metamaterial-based Nanocircuits, Components, and Systems" an invited talk at *the DARPA/MTO-sponsored workshop on "Components from Metamaterials, Arlington, VA*, May 2-3, 2007.

N. Engheta, "Metamaterial, including cloaking" an invited talk at the *AFOSR-sponsored workshop on "EM Wave Propagation through Challenging Media" Hanscom AFB, MA*, May 8, 2007.

N. Engheta, "NIM and Plasmonic Nanoscale Structures" an invited seminar at the *Annual Review PI-Meeting of Air Force Office of Scientific Research (AFOSR), Purdue University, West Lafayette, Indiana,* May 21-22, 2007.

N. Engheta, "Metamaterials and Plasmonics: Bridging Microwaves to Optics", a lecture in the Workshop (WFB) on Reecent Advances in Metamaterials: Theory, Computation, and Applications for the *IEEE Microwave Theory and Technique International Microwave Symposium (IMS'07), Waikiki, Hawaii*, June 8, 2007.

N. Engheta, "Metamaterials, Nanocircuits with Light, and Metaplasmonics", an invited Colloquium at the *Metamaterials Seminar Series, The Pennsylvania State University, University Park, Pennsylvania*, September 12, 2007.

N. Engheta, "Selected Topics in Metamaterials", an invited Colloquium at the *Workshop on Industrial Collaboration and Innovation, for Planning and Developing a Penn State Proposal for a NSF Engineering Research Center on Electromagnetic Metamaterials, The Pennsylvania State University, University Park, Pennsylvania*, September 13, 2007.

N. Engheta, "Wave-Bending Plasmonic Elements, Nanocircuits with Light, and Metaplasmonic Structures", an invited Colloquium at the *Plasmonics Workshop, IEEE Laser and Electro-Optics Society, Central New England Council, Lexington, MA*, November 7, 2007.

N. Engheta, "Metaplasmonics, Nanocircuits with Light, and Wireless at Nanoscales", an invited Colloquium at the *Department of Electrical Engineering, Princeton University, Princeton, NJ*, November 26, 2007.

N. Engheta, "Nanocircuits with Light and Wireless in Nanoworlds", an invited speaker at the Lester Eastman Lecture Series at the *School of Electrical and Computer Engineering, Cornell University, Ithaca*, *NY*, November 30, 2007.

N. Engheta, "Metaplasmonics, Nanocircuits with Light and Wireless in Nanoworlds", an invited colloquium in the *Department of Electrical and Computer Engineering, University of Minnesota,Minneapolis, MN*, December 6, 2007.

N. Engheta, "Metaplasmonics, Nanocircuits with Light and Wireless Elements in Nanoscale", an invited colloquium in the *Department of Electrical and Computer Engineering, Johns Hopkins University, Baltimore, MD*, February 21, 2008.

N. Engheta, "Circuits with Light at Nanoscales", The Heilmeier Award Lecture, *School of Engineering and Applied Science, University of Pennsylvania, Philadelphia, PA*, March 5, 2008.

N. Engheta, "Metactronics: Optical Nanocircuits and Wireless Nanosystems", Drexel IEEE Forum Technical Poster Symposium, *Drexel University, Philadelphia, PA*, March 5, 2008.

N. Engheta, "Circuits with Light at the Nanoscale", Invited Colloquium at the *School of Engineering and Applied Science, Harvard University, Cambridge, MA*, March 14, 2008.

N. Engheta, "Circuits with Light at the Nanoscale", Invited Colloquium at *the Center for Advanced Studies in Photonics Research (CASPR), University of Maryland at Baltimroe County, Baltimore, MD*, March 31, 2008.

N. Engheta, "Circuits with Light at the Nanoscale", Invited Colloquium at *the Center for Optoelectronics and Optical Communications, Department of Physics and Optical Science, University of North Carlina at Charlotte, Charlotte, NC,* April 25, 2008.

N. Engheta, "Circuits with Light at the Nanoscale", Invited Colloquium at *the Department of Electrical and Computer Engineering, University of Delaware, Newark, Delaware,* April 30, 2008.

N. Engheta, "3D Plasmonic Materials in Microwave and Optics", a lecture in the Workshop (WMJ) on 3D Metamaterials: Theory, Sructures, Techniques, and Devices for the *2008 IEEE Microwave Theory and Technique International Microwave Symposium (IMS'08), Atlanta, Georgia*, June 16, 2008.

N. Engheta, "Metamaterials and Plasmonic Phenomena: Beyond Negative Refraction", a lecture in the short course on Metamaterials and Applications, organized by N. Engheta, for the *2008 XXIX General Assembly of the International Union of Radio Science (URSI-GA 2008), Chicago, Illinois*, August 9, 2008.

N. Engheta, "Metamaterials and Plasmonic Devices and Components: From Microwave to Nanophotonics", an invited talk at the *Air Force Research Laboratory (AFRL) Metamaterial Summit, Dayton, Ohio*, August 25, 2008.

N. Engheta, "Circuits with Light at the Nanoscale", an invited talk at the banquet of the annual meeting of the *Huntsville Electro-Optics Society (HEOS), Huntsville, Alabama*, September 4, 2008.

N. Engheta, "Circuits with Light at the Nanoscale: Metananocircuits and Metactronics", an invited talk at the *MITRE Corporation, Burlington, MA*, September 11, 2008.

N. Engheta, "Seeing the Unseen: From Polarization-Sensitive Eyes to Biologically-Inspired Sensing and Imaging Science", an invited talk at the *IEEE Laser and Electro-Optics Society, Boston Chapter, Lexington, MA*, September 11, 2008.

N. Engheta, "Circuits with Light at the Nanoscale: Metananocircuits and Metactronics", an invited colloquium in *Department of Electrical Engineering and Computer Science, Syracuse University, Syracuse, New York*, September 17, 2008.

N. Engheta, "Circuits with Light at the Nanoscale: Metactronics and Metananocircuits", an invited colloquium in *The Institute for Photonic Sciences (ICFO), Mediterranean Technology Park, Barcelona, Spain*, September 22, 2008.

N. Engheta, "Nanoscale Plasmonic-Metamaterial Elements for Manipulating Nanoantennas" an invited seminar at the *Annual Review PI-Meeting of Air Force Office of Scientific Research (AFOSR), Kent State University, Kent, Ohio,* October 20, 2008.

N. Engheta, "Circuits with Light at the Nanoscale: Metactronics and Metananocircuits", an invited colloquium at the *Laboratory of Physical Sciences (LPS), University of Maryland, College Park, Maryland*, October 29, 2008.

N. Engheta, "Circuits with Light at the Nanoscale", an invited colloquium at the *College of Engineering, Michigan State University, East Lansing, Michigan*, November 4, 2008.

N. Engheta, "Circuits with Light at the Nanoscale: Metactronics and Metananocircuits", an invited colloquium at the *Liquid Crystal Institute, Kent State University, Kent, Ohio*, December 10, 2008.

N. Engheta, "Circuits and Antennas with Light at the Nanoscale", an invited seminar at the *Hewlett-Packard (HP), Palo Alto, California*, February 2, 2009.

N. Engheta, "Circuits with Light at the Nanoscale", an invited colloquium Sponsored by the *Physics and Applied Physics Students in Stanford University, Stanford, California*, February 3, 2009.

N. Engheta, "Circuits with Light at the Nanoscale", an invited colloquium as the *Distinguished Lecturer Series*, Sponsored by the *Department of Electrical and Computer Engineering, Rice University, Houston, Texas,* February 12, 2009.

N. Engheta, "Circuits with Light at the Nanoscale", an invited colloquium as the *Department of Electrical and Computer Engineering, Carnegie Mellon University, Pittsburgh, PA,* March 5, 2009.

N. Engheta, "Circuits with Light at the Nanoscale", an invited colloquium as the *Department of Electrical Engineering, University of Washington, Seattle, WA,* March 12, 2009.

N. Engheta, "Circuits with Light at the Nanoscale", an invited colloquium as the *Institute of Optics, University of Rochester, Rochester, NY,* April 27, 2009.

N. Engheta, "Circuits with Light at the Nanoscale", an invited colloquium as the *Department of Physics, University of Campinas, Campinas, SP, Brazil*, August 14, 2009.

N. Engheta, "Taming the Light at the Nanoscale", an invited Booz-Allen-Hamilton Distinguished colloquium Speaker at the *Department of Electrical and Computer Engineering, University of Maryland at College Park, College Park, Maryland*, September 11, 2009.

N. Engheta, "Metactronics: Circuits with Light at the Nanoscale", an invited colloquium at the *Department of Electrical and Computer Engineering, University of Waterloo, Waterloo, Ontario, Canada*, September 15, 2009.

N. Engheta, "Extreme Metamaterials", an invited colloquium at the *Department of Electrical and Computer Engineering, University of Waterloo, Waterloo, Ontario, Canada*, September 15, 2009.

N. Engheta, "Metamaterials and Plasmonic Phenomena", a teleconference colloquium to *the Lockheed Martin Corporation*, September 17, 2009.

N. Engheta, "Metactronics: Taming the Light with Metamaterials", an invited talk at *the IEEE Night, IEEE Philadelphia Section, Philadelphia, PA*, October 20, 2009.

N. Engheta, "Extreme Metamaterials", an invited colloquium at the *Department of Physics, University of Maryland in College Park, College Park, Maryland*, November 5, 2009.

N. Engheta, "Circuits with Light at the Nanoscale", an invited joint colloquium at the *Departments of Electrical and Computer Engineering and Mechanical Engineering, University of Illinois at Urbana-Champaign, Urbana, Illinois*, November 10, 2009.

N. Engheta, "Metactronics: Taming the Light with Metamaterials", an invited colloquium at *the School of Engineering, Department of Electrical Engineering, Ecole Polytechnique Federale de Lausanne (EPFL), Lausanne, Switzerland*, November 17, 2009.

N. Engheta, "Metactronics: Taming the Light with Metamaterials", an invited colloquium at *the 4th Institute of Phyiscs, University of Stuttgart, Stuttgart, Germany*, March 5, 2010.

N. Engheta, "Manipulating Fields and Waves with Metamaterials", an invited colloquium at *the Northrop-Grumman, Redondo Beach, California*, March 18, 2010.

N. Engheta, "Metactronics: Taming the Light with Metamaterials", an invited colloquium at *the College of Optical Sciences, University of Arizona, Tucson, Arizona,* March 25, 2010.

N. Engheta, "Manipulating the Fields and Waves with Metamaterials", an invited colloquium at *Agilent Technologies, Santa Rosa, CA,* April 5, 2010.

N. Engheta, "Bio-Inspired Polarization Imaging and Sensing", an invited colloquium at *Agilent Technologies, Santa Rosa, CA,* April 5, 2010.

N. Engheta, "Taming the Light with Metamaterials", an invited colloquium at *The Air Force Institute of Technology (AFIT), Wright Paterson Air Force Base, Dayton, Ohio*, April 8, 2010.

N. Engheta, "Circuits with Light at the Nanoscale: Taming the Light with Metamaterials", an invited colloquium at *Industrial Affiliates Day, with the theme of "Optics at the Limit", CROEL, College of Optics and Photonics, University of Central Florida, Orlando, Florida*, April 9, 2010.

N. Engheta, "Taming the Light and Electrons with Metamaterials", an invited colloquium at *The Department of Electrical Engineering, California Institute of Technology, Pasadena, California*, June 2, 2010.

N. Engheta, "Graphene as a 'Flatland' Paradigm for Optical Metamaterials", an invited colloquium at *The Department of Chemistry, Cornell University, Ithaca, New York,* June 23, 2010.

N. Engheta, "Taming the Light and Electrons with Metamataerials", an invited Seminar at *The Navel Research Laboratory, Washington, DC,* July 22, 2010.

A.Alu, N. Engheta, and S. Maci "Plasmonic and Transformation-Optics Cloaking" short course at *the 2010 IEEE Antennas and Propagation Society International Symposium/CNC-USNC URSI Radio Science Meeting, Toronto, Ontario, Canada,* July 11-17, 2010.

N. Engheta, "Extreme Metamaterials," Lectures in *VIII PhD School on Applied Electromagnetics, Benevento, Italy*, September 10-11, 2010.

N. Engheta, "Seeing the Unseen: Biologically-Inspired Polarization Sensing and Imaging," a talk at the kick-off meeting of our NSF/Emerging Frontier in Research and Innovation (EFRI) Penn Project eSkin: Energy minimization via Multi-Scalar Architectures: From Cell Contractility to Sensing Materials to Adaptive Building Skins, Philadelphia, PA, October 8, 2010.

N. Engheta, "Taming Light and Electrons with Metamataerials", an invited Seminar at *the Department of Applied Physics, Yale University, New Haven, Connecticut,* October 13, 2010.

N. Engheta, "Overview of the Program and Thrust 1 on Design of Building Blocks," a talk at the kick-off meeting of our ONR MURI program on Optical Metamaterials entitled "Large-Area, 3D Optical Metamaterials with Low Loss and Tunability," Arlington, VA, October 20, 2010.

N. Engheta, "Taming Light and Electrons with Metamataerials", an invited Seminar at *the Department of Electrical and Computer Engineering and Electronic Imaging Center, New Jersey Institute of Technology, and IEEE Photonics Society, North Jersey Section, Newark, New Jersey,* October 21, 2010.

N. Engheta, "Taming Light and Electrons with Metamataerials", an invited Seminar at *the Department of Electrical Engineering and Computer Science, Massachussetts Institute of Technology, Cambridge, MA,* November 3, 2010.

N. Engheta, "Taming Light and Electrons with Metamataerials", an invited Distinguished Colloquium at *the Department of Electrical Engineering and Computer Science, University of Michigan, Ann Arbor, Michigan,* November 11, 2010.

N. Engheta, "Taming Light and Electrons with Metamataerials", an invited Seminar at *the Department of Electrical and Computer Engineering, University of Colorado Boulder, Boulder, Colorado,* November 12, 2010.

N. Engheta, "Taming Light and Electrons with Metamataerials", an invited Seminar at *the FOM Institute for Atomic and Molecular Physics (AMOLF), Amsterdam, The Netherlands,* January 10, 2011.

N. Engheta, "From Optical Metatronics to Graphene Metamaterials", an invited Seminar at *the Physical, Chemical, and Nanosciences Colloquium Series, Sandia National Laboratory, Albuquerque, New Mexico,* January 27, 2011.

N. Engheta, "Taming Light and Electrons with Metamataerials", an invited Seminar at *the Departments of Electrical and Systems Engineering and Computer Science and Engineering, Washington University in St. Louis, St. Louis, Missouri,* February 25, 2011.

N. Engheta, "Taming Light and Electrons with Metamataerials", an invited colloquium at *the Vanderbilt Institute of Nanoscale Science and Engineering (VINSE),*

Interdisciplinary Graduate Program in Material Science, Vanderbilt University, Nashville, TN, March 2, 2011.

N. Engheta, "Taming Light and Electrons with Metamataerials", an invited colloquium at *the Material Science Center, Norfolk State University, Norfolk, VA,* March 4, 2011.

N. Engheta, "Of Light, Electrons and Metamaterials", an invited talk at *the IEEE Night, IEEE Philadelphia Section, Philadelphia, PA*, March 15, 2011.

N. Engheta, "Taming Light and Electrons with Metamataerials", an invited colloquium at *the Department of Electrical and Computer Engineering, Rutgers University, New Brunswick, New Jersey,* April 5, 2011.

N. Engheta, "Of Light, Electrons and Metamaterials", an invited colloquium at *the Department of Materials Science and Engineering, University of Pennsylvania, Philadelphia, PA*, April 7, 2011.

N. Engheta, "One-atom-thick metamaterials and optical devices", an invited colloquium at *the Solid State and Optics Seminar, Flint Fund Series on Quantum Devices and Nanostructures, Department of Applied Physics, Yale University, New Haven, CT,* September 7, 2011.

Patents & Patent Disclosures:

• Waveguides Using Chiral Materials ,
N. Engheta and D. L. Jaggard,
Disclosed to Office of Research Administ., Univ. of Pennsylvania, March 1989.
First Filing with the U.S. patent and Trademark Office, June 1, 1989.
Status: Issued, November 17, 1992, U.S. Patent # 5,165,059.

• Method of Measuring Chiral Parameters of a Chiral Material ,
D. L. Jaggard and N. Engheta
Disclosed to Office of Research Administ., Univ. of Pennsylvania, UPN 0252, D666, March 1989.
First Filing with the U.S. Patent and Trademark Office, June 6, 1989.
Status: Issued, November 5, 1991, U. S. Patent # 5,063,391.

• Novel Electromagnetic Shielding, Reflection and Scattering Control Using Chiral Material,
D. L. Jaggard and N. Engheta
Disclosed to Office of Research Administ., Univ. of Pennsylvania, March 1989.
First Filing with the U.S. Patent and Trademark Office, January 4, 1990.
Status: Issued, March 24, 1992, U.S. Patent # 5,099,242.

• Printed-Circuit Antennas Using Chiral Materials,
N. Engheta and D. L. Jaggard,
Disclosed to Office of Research Administ., Univ. of Pennsylvania, March 1989.
First Filing with the U.S. patent and Trademark Office, June 6, 1989.

Status: Issued, November 9, 1993, U.S. Patent # 5,260,712.

• Radomes Using Chiral Materials,
N. Engheta and D. L. Jaggard
Disclosed to Office of Research Administ., Univ. of Pennsylvania, Nov. 15, 1990.
First Filing with the U.S. patent and Trademark Office, January 4, 1991.
Status: Issued, March 14, 1995, U.S. Patent # 5,398,037.

• Method of Using Polarization Differencing to Improve Vision,
E. N. Pugh, Jr., N. Engheta, M. P. Rowe, and J. S. Tyo
Disclosed to Office of Technology Transfer, Univ. of Pennsylvania, June 1994.
First Filing with the U.S. Patent and Trademark Office, March 15, 1996.
Status: Issued, November 2, 1999, U.S. Patent # 5,975,702

• Waveguides and Scattering Devices Incorporating Epsilon-Negative And/Or Mu-Negative Slabs,
Nader Engheta and Andrea Alu'
Disclosed to Center for Technology Transfer, Univ. of Pennsylvania, February 2003 (for the "pairing" part) and April 2003 (for the waveguide part).
Filing of the Two Provisional Applications # 60/474,976 and 60/475,028 entitled (Pairing an Epsilon-Negative Slab with a Mu-Negative Slab: Resonance, Tunneling and Transparency, and Guided Modes in a Waveguide Filled with a Pair of Single-Negative (SNG), Double-Negative (DNG), and/or Double-Positive (DPS) Layers) with the U.S. Patent and Trademark Office, June 2, 2003.
Patent application was filed on June 2, 2004.
Status: Issued on February 10, 2005, US Patent # 2005/0031295 A1

• Polarization and Reflection-Based Non-Contact Latent Fingerprint Imaging and Lifting,
Nader Engheta, Edward N. Pugh, Jr., Shih-Schon Lin, and Konstantin Yemelyanov
Disclosed to Center for Technology Transfer, Univ. of Pennsylvania, April 2004, Docket # Q3544, UPN: 4934, under the title (Methods for Fingerprint Imaging and Lifting).
Filing of the Provisional Patent application with the U.S. Patent and Trademark Office, April 27, 2004, application # 11/587,349.
The patent application was filed on April 27, 2005.
Status: Issued on February 10, 2009, US Patent # 7,489,391 (B2).

• Sensor and Polarimetric Filters for Real-Time Extraction of Polarimetric Information at the Focal Plane
Viktor Gruev, Jan Van der Spiegel, and Nader Engheta
Disclosed to Center for Technology Transfer, Univ. of Pennsylvania, February 15, 2006, UPenn Docket # S4194 and S 4193., UPN 4985
Filing of the Provisional Patent application with the U.S. Patent and Trademark Office, April 17, 2006. Patent application was filed. International Patent Application Number PCT/US2007/066885
Status: Issued on September 1, 2009, US Patent # 7,582,857 B2.

• Optical Circuits and Circuit Elements and Methods of Forming Same (Plasmonic and Non-Plasmonic Nanoparticles as Equivalent Nano-Circuit Elements),
Nader Engheta, Andrea Alu, and Alessandro Salandrino
Disclosed to Center for Technology Transfer, Univ. of Pennsylvania, June 2004, Docket # Q3625.
Filing of the Provisional application with the U.S. Patent and Trademark Office, June 18, 2004, application # 60/581-016.

Patent application was filed on June 20, 2005, U.S. Serial Number 11/629,746, UPN-4972.
Status: Pending

• Frequency-Modulated Coding and Data Recording and Storage Using Plasmonic Nanostructures,
Nader Engheta and Alessandro Salandrino
Disclosed to Center for Technology Transfer, Univ. of Pennsylvania, October 20 2004.
Filing of the Provisional application with the U.S. Patent and Trademark Office, May 10, 2005. R3751, UPN: 4422, application # 375582, UPN:4816.
Patent application was filed on May 10, 2006
Status: Pending

• System and Method for Controlling Nanoparticles Using Dielectrophoretic Forces ,
B. E. Edwards, Nader Engheta
Disclosed to Center for Technology Transfer, Univ. of Pennsylvania, December 6, 2005. UPenn Docket Number S4096
Filing of the Provisional application with the U.S. Patent and Trademark Office, December 21, 2005. # 60/753,320
International Patent Application was filed on December 21, 2006 (S&L Docket # P31154-A PCT)
Status: Pending

• Far-Field Sub-Diffraction Optical Lenses (FASDOLS) Using Metamaterial Crystals,
Nader Engheta, Alessandro Salandrino, and Brian E. Edwards
Disclosed to Center for Technology Transfer, Univ. of Pennsylvania, February 7, 2006, UPenn Docket # S4177, UPNA 0119
Filing of the Provisional Patent application with the U.S. Patent and Trademark Office, May 16, 2006. Following the provisional patent, the main application was filed on May 16, 2007. US Patent Application Serial Number: 12/300,948, date of filing July 31, 2009. The application was published on December 10, 2009. Publication Number is US-2009-0303578-A1.
Status: Pending

• Separation and Contrast Enhancement of Overlapping Cast Shadow Components and Target Detection in Shadow Using Polarization,
Shih-Schon Lin, Konstantin M. Yemelyanov, Edward N. Pugh, Jr, and Nader Engheta
Disclosed to Center for Technology Transfer, Univ. of Pennsylvania, June 2, 2006.
Filing of the Provisional application with the U.S. Patent and Trademark Office, July 18, 2006. S4277, UPN: 4865, application # 60/831,798. Following the provisional patent, the main application was filed on July 5, 2007, U.S. Patent Application No. 11/587,349, UPN-4934, Q3544. National Phase application was filed on February 10, 2009, and the application number is 07810557.4 Canadian Patent Application No. 2,658,080 was given the filing date of July 17, 2007. Also, the application was filed on May 19, 2009 and the serial number of 12/373,696. Application is published on January 21, 2010, publication number is US-2010-0013965-A1. Penn Ref: S4277, Woodcock Ref: UPN 5356, Japanese Patent Application No: 2009-520813 was published in Japanese Official Patent Gazette on December 10, 2009 with publication No: P2009-544228A..
Status: Pending

• Lumped Plasmonic "Diode" and Lumped Plasmonic "Rectifier" for Optical Field Rectification and Lumped Optical Second-Harmonic Generation,
Nader Engheta
Disclosed to Center for Technology Transfer, Univ. of Pennsylvania, October 5, 2006.
Filing of the Provisional application with the U.S. Patent and Trademark Office, October 10, 2006. Penn Ref: T4360, Woodcock Ref: UPN: 4935, application # 60/850,857. The full nonprovisional application was filed on October 10, 2007. US Patent Application No: 12/444006. Publication of the Patent Application on February 4, 2010, Publication number: US-2010-0025708-A1.
Status: Pending

• Cloaked Sensor,
Andrea Alu and Nader Engheta
Disclosed to UPenn's Center for Technology Transfer, February 20, 2008.
Under review by UPenn. UPenn code number 4794
Provisional Patent application was submitted on March 30, 2009: UPN-5300, U4794, USSN 61/164,610.
Non-provisional patent application was filed on March 30, 2010. Serial number PCT/US2010/029204. International Patent application was published by World Intellectual Property Organization on October 7, 2010 under No. WO 2010/114834
Status: Pending

• Grating Structure for Splitting Light,
Hideo Iizuka and Nader Engheta
Disclosed to Toyota Motor Engineering and Manufacturing North America (TEMA) and University of Pennsylvania. Case No. 13811-9, 2008-0901
Patent Application Filed in U.S. Patent and Trademark Office, May 1, 2009
Status: Pending

• Grating Structure for Directing Non-Polarized Light,
Hideo Iizuka and Nader Engheta
Disclosed to Toyota Motor Engineering and Manufacturing North America (TEMA) and University of Pennsylvania. Case No. 13811-8, 2008-192
Patent Application Filed in U.S. Patent and Trademark Office, May 1, 2009
Status: Pending

• Grating Structure with High Diffraction Efficiencies for Both Polarizations
Hideo Iizuka, Nader Engheta, and Yasuhiko Takeda
Disclosed to Toyota Motor Engineering and Manufacturing North America (TEMA) and University of Pennsylvania on June 2009.
Patent Application was filed in U.S. Patent and Trademark Office, December 15, 2009
Status: Pending

• Gratings for Transmission Control with Their Shifts
Hideo Iizuka and Nader Engheta
Disclosed to Toyota Motor Engineering and Manufacturing North America (TEMA) and University of Pennsylvania on November 5, 2009.
Patent Application was filed on January 25, 2010. Application number: 12692688
Status: Pending

• Reflection-Minimized Photonic Crystal Interface
Hideo Iizuka and Nader Engheta
Disclosed to Toyota Motor Engineering and Manufacturing North America (TEMA) and University of Pennsylvania on November 17 and December 21, 2009.
Patent Application was filed on February 19, 2010. Application number: 12708860
Status: Pending

• Manipulating and Routing Optical Signal Narrow Paths on Graphene and Graphene as a Platform for Metamaterials
Nader Engheta and Ashkan Vakil
Disclosed to University of Pennsylvania's Center for Technology Transfer on June 4, 2010. UPN-5497, W5607
Provisional Patent Application was filed on June 22, 2010. Application Number: 61/357,262. A PCT non-provisional patent application was filed on June 8, 2011, with application number PCT/US2011/039620.

• Optical Device Using Double_Groove Grating (Previous title: Binary Blazed Grating Coupler)
Hideo Iizuka and Nader Engheta
Disclosed to Toyota Motor Engineering and Manufacturing North America (TEMA) and University of Pennsylvania on June 25, 2010. Penn Reference Number: W5625
Patent Application was filed on August 13, 2010. Application number: 12/855,844.
Status: Pending

• Acousto-Optic Scanner (Previous title: Light Scanning Structure Using Acoustic Wave)
Hideo Iizuka, Nader Engheta, Hisayoshi Fujikawa
Disclosed to Toyota Motor Engineering and Manufacturing North America (TEMA) and University of Pennsylvania on January/February, 2011.
Patent Application was filed on April 4, 2011. Application Serial number: 13079441
Status: Pending

• Optical Light Switch Using Double-Sided Diffraction Structures (Previous title: Grating Switch Using Liquid Layer)
Hideo Iizuka, Nader Engheta, Hisayoshi Fujikawa
Disclosed to Toyota Motor Engineering and Manufacturing North America (TEMA) and University of Pennsylvania on January/February, 2011.
Patent Application was filed on April 4, 2011. Application serial number: 13079339
Status: Pending

- ***Lists of Current and Past Research Grants and Contracts***

Submitted Proposals (currently under review)

- "MRI-R2: Development of Mid-Infrared Near Field Optical Microscope"
  Submitted to National Science Foundation (**NSF**)
  PI: Daniel Wasserman (University of Massachusetts at Lowell)
  Co-PIs: M. Loncar (Harvard U.), R. Zia (Brown U.), V. Podolskiy (UMass at Lowell), H. Altug (Boston U.), J. Therrien (UMass at Lowell), M. Raschke (U. Washington), C. Gmachl (Princeton U.), N. Engheta (UPenn)
  Requested Duration: January 1, 2011-December 31, 2011.
  Engheta's role: One of the users (No funding to be exchanged)
  (Under review)

- "NSF Nanosystems Engineering Research Center for Photonically-Enhanced Nanoelectronics"
  Submitted to National Science Foundation **(NSF)**
  PI: Jonathan Bird (University at Buffalo)
  Several senior and key personnel and Co-PIs. Nader Engheta (UPenn), as a Senior/key personnel
  Requested Amount for Nader Engheta: $ 529,224
  Requested Duration: September 1, 2012-August 31, 2017.
  (Under review)

Current Research Grants

- "Large-Area, 3D Optical Metamaterials with Low Loss and Tunability"
  Office of Naval Resarcg (**ONR MURI**)
  PI: Nader Engheta (UPenn)
  Co-PIs: Andrea Alu (U. Texas Austin), Alexandra Boltasseva (Purdue U.), Cherie Kagan (UPenn), Hossein Mosallaei (Northeastern U.), Chris Murray (UPenn), Vlad Shalaev (Purdue U.), Goerge Whitesides (Harvard U.), and non-funding member Nikolay Zheludev (U. of Southampton, UK).
  Total Funding for 3-year Base Period: $ 4,449,705 (Engheta's share: $ 705,000), for 2-year additional option years: $ 3,050,285 (Engheta's share: $ 470,000), i.e. for total of 5 years: $ 7,499,990 (Engheta's share: $ 1,175,000.).
  Duration: August 1, 2010-July 31, 2015.

- "Metamaterial-based One-Way Cavities, One-Way Terminals, and One-Way Loads"
  Air Force Office of Scientific Research (**AFOSR**)
  PI: Nader Engheta
  Funding for 5-year Period: $ 997,670.
  Duration: August 2, 2010-August 1, 2015.

- "EFRI-SEED: Energy Minimization via Multi-Scalar Architectures: From Cell Contractibility to Sensing Materials to Adaptive Building Skins"

National Science Foundation (**NSF**)
PI: Shu Yang (UPenn, MSE, SEAS)
Co-PIs: N. Engheta (UPenn, ESE, SEAS), J. Van der Spiegel (UPenn, ESE, SEAS), P. Jones (UPenn, PLM, SOM), J. Sabin (UPenn, A, SOD)
Total Funding: ($ 2,000,000), (N. Engheta's portion: $ 378,734)
Duration: September 1, 2010-August 31, 2014.

- "MRI: Acquisition of a Multifunctional Nanoprobe Microscope with a Tunable Ultrafast Laser Source for Interdisciplinary Research and Training"
  National Science Foundation **(NSF)**
  PI: Robert W. Carpick (Upenn)
  Co-PIs: Ritesh Agarwal (UPenn), Marija Drndic (UPenn), and Nader Engheta (UPenn)
  Amount: $ 630,000 (+ matching fund of $ 270,000.)
  Duration: October 1, 2009-September 30, 2011.

- "Metactronics for Ultra-High-Speed, Low-Power Nanocircuits"
  Defense Advanced Research Projects Agency (**DARPA**)
  PIs: Edo Waks (U. Maryland), Benjamin Shapiro (U. Maryland), John Fourkas (U. of Maryland), Sang Bok Lee (U. Maryland), Nader Engheta (UPenn)
  Funding for 1-year Period: $ 340,000. (Engheta's portion: $ 81,800)
  Duration: July 15, 2010-July 14, 2011.

- "SWEEPER: CAPER: Chip-Scaled Arrays of Phased EmitteRs"
  Defense Advanced Research Projects Agency (**DARPA, through Sandia National Lab**)
  PI: Paul Davids (Sandia Lab)
  Co-PI: UPenn (N. Engheta)
  Funding for Phase I for N. Engheta's portion: ($ 75,000)
  Duration: 15 months. From September 2, 2010—December 15, 2011.

- "SISGR: Bi-continuous Multi-Component Nanocrystal Superlattices for Solar Energy Conversion"
  Department of Energy, Office of Science Program (**DOE**)
  PI: Cherie Kagan (ESE, UPenn)
  Co-PIs: Christopher Murray (Chem, UPenn), Jay Kikkawa (Physics, Upenn), Nader Engheta (ESE, UPenn)
  Funding: $ 2,478,462.
  Duration: October 1, 2009-September 30, 2012.

- "Metactronics: Metamaterial-Inspired Optical Nanocircuits and Wireless Nanosystems"
  Air Force Office of Scientific Research **(AFOSR)**
  PI: Nader Engheta (Upenn)
  Funding: $ 603,000.
  Duration: May 1, 2008-April 30, 2013.

- "Fundamental Study on Design and Response of Engineered Metamaterials"
  Northrop-Grumman Space Technology (**NG**)
  PI: Nader Engheta

Amount for : $ 25,000 for January 1, 2010 – December 31, 2010. An additional $ 25,000 to extend till December 31, 2011.

- "Multiband Electronically Configurable Microwave Devices and Antennas for a New Generation of Wireless Systems - MultiWaves"
  International Research Staff Exchange Program, European Union (**EU**)
  PI: Vesna Crnojevic-Bengin (University of Novi Sad, Serbia)
  Co-PIs: George Goussetis (Heriot-Watt University), Irina Vendik (St. Petersburgh Electrotechnical University), Riana Geschke (University of Stellenbosch), Nader Engheta (UPenn)
  Service: Exchange of scientists
  Duration: January 1, 2010-December 31, 2013.

- "Functional Metamaterials Based on Chiral Structures"
  Austrialian Research Council (**ARC**)
  PI: David Powell (Australian National University)
  Co-PIs: Dragomir Neshev (Australian National University), Ilya Shadrivov (Australian National University), Nader Engheta (UPenn)
  Funding: Total: $ 620,595 for all members; (Funding for Nader Engheta: Travel supports)
  Duration: 3 years

Past Research Grants and Contracts

- "Control of Light Propagation Direction in Metamaterials"
  Toyota Motor Engineering and Manufacturing North America (**TEMA**) and Toyota Central Research and Development Laboratories, Inc. (**TCRDL**)
  PI: Nader Engheta
  Amount for : $ 25,000.
  Duration: March 1, 2010 – February 28, 2011.

- "Study of Material Loss Impacts on Epsilon-Near-Zero (ENZ) Metamaterial Devices"
  Submitted to Sandia National Laboratory (**SNL**)
  PI: Nader Engheta (UPenn)
  Funding for 5-month Period: $ 50,000.
  Duration: April 15, 2010-September 30, 2010.

- "Metamaterials and Metastructures for Enhanced RF Transmission on the Sea and Air Interface"
  Office of Naval Research (**ONR**)
  PI: Nader Engheta
  Funding: $ 72,342.
  Duration: October 1, 2009-September 30, 2010.

- "Near-field Scanning Optical Microscope/Atomic Force Microscope with Broad Band Source for Study of Optical Metamaterials and Nanocircuits"
  A Defense University Research Instrumentation Program (**DURIP**) Equipment Proposal
  Air Force Office of Scientific Research (**AFOSR**)
  PI: Nader Engheta

Co-PI: Marija Drndic
Amount for : $ 228,260.
Duration: April 15, 2009-April 14, 2010.

- "Development of Negative Index of Refraction Materials for Spatial and Temporal Manipulation of EM Waves from 70 cm to 10 microns,""
  DARPA
  Co-PI: Nader Engheta (from UPenn), PI: Boeing Company and other Co-PIs from other universities
  Funding portion for Nader Engheta: $405,000.
  Duration: April 1, 2005-June 28, 2009.
  Phase I ($ 165,000) was completed on March 10, 2007. Phase II for UPenn is $ 240,000 from July 1, 2007 till June 28, 2009 for 2 years. A no-cost extension is granted till March 31, 2010).

- "Control of Light Propagation Direction in Metamaterials"
  Toyota Motor Engineering and Manufacturing North America (**TEMA**) and Toyota Central Research and Development Laboratories, Inc. (**TCRDL**)
  PI: Nader Engheta
  Amount for : $ 40,000.
  Duration: March 1, 2009 – February 28, 2010.

- "Epsilon-Near-Zero (ENZ) Optical Metamaterials: A New Way to Manipulate, "Squeeze", and Re-Route Light Energy through Narrow Channels "
  Office of Naval Research **(ONR)**
  PI: Nader Engheta.
  Funding: $ 315,085.
  Duration: February 1, 2007-January 31, 2010.

- "Phase II: Study of Beam-Steerable Optical Antennas for Sensing Systems"
  Toyota Motor Engineering and Manufacturing North America (**TEMA**) and Toyota Central Research and Development Laboratories, Inc. (**TCRDL**)
  PI: Nader Engheta
  Amount for : $ 50,000.
  Duration: October 1, 2008 – February 28, 2009.

- "Through-the-Wall Target Detection and Classification for Achieving Transparent Urban Structures"
  Office of Naval Research (**ONR**), subcontract from Villanova University
  Principal Investigator: Moeness Amin (Villanova University) + Ahmad Hoorfar and Yimin Zhang, Co-Principal Investigators from Villanova University
  Co-Principal Investigators from UPenn: Saleem Kassam (PI from UPenn) and Nader Engheta (Co-PI).
  Amount for UPenn for Phase I: $ 100,000..
  Duration for Phase I: April 1, 2007-November 18, 2007
  Amount for UPenn for Phase II: around $ 207,000.
  Duration of Phase II: extended till March 18, 2008 and again extended to March 2009)

- "Inspired Biological Engineering: Detection and Production of Polarized Light by Animals"

From the Air Force Office of Scientific Research (**AFOSR)**
PI: Thomas Cronin (University of Maryland, Baltimore County)
Co-PI: Nader Engheta
Funding for Nader Engheta: about $ 125,746.
Duration: Feb 1, 2006-February 28, 2009.

- "Phase II for Experimental Investigation of Lumped Nanocircuit Elements at Optical Frequencies" Los Alamos National Laboratory's Center for Integrated Nanotechnology **(CINT)**
  PI: Nader Engheta (Upenn)
  Service: Renewal for Experimentation and Use of Nanofanrication and Evaluation Facilities
  Duration: January 1, 2008-December 31, 2008.

- "Study of Beam-Steerable Optical Antennas for Sensing Systems"
  Toyota Central Research and Development Laboratories, Inc. (**TCRDL**)
  PI: Nader Engheta
  Amount for : $ 70,000.
  Duration: September 1, 2007 – Mach 31, 2008.

- "Experimental Investigation of Lumped Nanocircuit Elements at Optical Frequencies"
  From Los Alamos National Laboratory's Center for Integrated Nanotechnology **(CINT)**
  PI: Nader Engheta (Upenn)
  Service: Experimentation and Use of Nanofanrication and Evaluation Facilities
  Duration: June 1, 2006-December 31, 2007.

- "Selected Ideas for Negative-Index Metamaterials (NIM) and Plasmonic Nano-Scale Structures in IR and Visible Regimes"
  AFOSR
  PI: Nader Engheta
  Funding: $300,000.
  Duration: June 15, 2005-April 30, 2008.

- "Bio-Inspired Sensing of Information Contents in Polarization Signals in Nature"
  The *Bio-Inspired Concept (BIC) Program* of the Air Force Office of Scientific Research **AFOSR**
  PI: Nader Engheta
  Co-PIs: J. Van der Spiegel and E. N. Pugh, Jr.
  Funding: $596,659.
  Duration: Jan 1, 2005-December 31, 2007.

- "Aerial Polarization Imaging"
  From **EmergentViews, Inc**.
  PI: Nader Engheta
  Funding: about $ 16,311.
  Duration: December 2, 2006-June 2, 2007.

- "Scattering Transparency Using Metamaterials"
  From **DARPA, administered by Office of Naval Research (ONR)**
  PI: Nader Engheta

Funding: $ 200,000.
Duration: August 1, 2005-July 31, 2006, with a no-cost extension to January 31, 2007.

- "Through-Wall Microwave Imaging—Phase III"
  from *Concurrent Technologies Corporation* (**CTC**) in Johnstown, Pennsylvania with funding from **DARPA**
  PI from Villanova: Moeness Amin (Villanova University), Co-PI from Villanova: Ahmad Hoorfar
  PI from Upenn: Nader Engheta (UPenn), Co-PI from Upenn: Saleem Kassam (UPenn)
  PI from BAE Systems: Paul Zemeny
  Total amount of funding for the Phase II: about $ 1,000,000. (UPenn's share is $225,000.)
  Duration: December 1, 2005-June 30, 2006.

- "Through-Wall Microwave Imaging—Phase II"
  from *Concurrent Technologies Corporation* (**CTC**) in Johnstown, Pennsylvania with funding coming from **DARPA**
  PI from Villanova: Moeness Amin (Villanova University), Co-PI from Villanova: Ahmad Hoorfar
  PI from Upenn: Nader Engheta (UPenn), Co-PI from Upenn: Saleem Kassam (UPenn)
  PI from BAE Systems: Paul Zemeny
  The total amount of funding for the Phase II: $ 1,505,878. (UPenn's share is $ 289,600.)
  Duration: July 15, 2004-June 30, 2005 (no-cost extension till June 30, 2006).

- "Fabricating 256x256 CMOS Polarize Imager on 10mm^2 die in a TSMC 0.18um Process," **MOSIS**
  Viktor Gruev (Postdoc), Jan Van der Spiegel, Nader Engheta
  Fabrication to be performed by MOSIS: Equivalent value for this fabrication: ~$32,400.

- "Super-Diffraction-Limited Imaging"
  From **DARPA**
  PI: Nader Engheta
  Amount: $100,000.
  Duration: June 1, 2004-February 28, 2005. (with a no-cost extension to June 30, 2005.)

- "Bio-Inspired Sensing and Display of Polarization Imagery"
  From the Bio-Inspired Concept (BIC) program of the Air Force Office of Scientific Research (**AFOSR**).
  PI: Nader Engheta
  Amount: $394,474.
  Duration: March 1, 2002 – December 31, 2004.

- "Selected Electromagnetic Problems in Electroencephalography (EEG), Fields in Complex Media, and Small Radiating Elements in Dissipative Media"
  From the Air Force Office of Scientific Research (**AFOSR**).
  PI: Nader Engheta
  Amount: $ 126,736.
  Duration: September 15, 2003 – September 14, 2004.

- "Through-Wall Microwave Imaging – Phase I"

From *Concurrent Technologies Corporation* (**CTC**) in Johnstown, Pennsylvania with funding coming from **DARPA**
PI from Villanova: Moeness Amin (Villanova University), Co-PI from Villanova: Ahmad Hoorfar
PI from Upenn: Nader Engheta (UPenn), Co-PI from Upenn: Saleem Kassam (UPenn)
PI from NAVSEA (NSWCCD, Philadelphia): Frank Plonski
The total amount of funding for the first year: about $ 869,707.
Duration: August 1, 2002-December 15, 2003.

- "Integrated Wide-Band Millimeter-Wave Imaging System"
  From the Office of Naval Research (**ONR**).
  PI: Dennis Prather (University of Delaware)
  Co-PI: Nader Engheta (PI from UPenn)
  Amount for Upenn: $ 30,000
  Duration: September 1, 2003-April 30, 2004.

- Defense University Research Instrumentation Program (DURIP) Proposal on "Instrumentation for Bio-Inspired, Multi-Sensor, Polarimetric Hyperspectral Imaging System"
  PI: Nader Engheta
  From the Air Force Office of Scientific Research (**AFOSR**) for the **DURIP** Program
  Total amount granted: $ 104,545.
  Duration: May 15, 2002-May 14, 2003, and a no-cost extension to August 14, 2003.

- The Collaboration in Basic Science and Engineering (COBASE) on "Mathematical Aspects of Fractionalization Methods in Analysis of EM Diffraction from Imperfectly Conducting Strips and Plates" (Travel Grant).
  From the National Research Council, Office of International Affairs for the **COBASE** Program
  PI: Nader Engheta (U.S.A.), Co-PI: Eldar I. Veliev (Ukraine)
  Total travel grant requested: $ 9,600. travel grant.
  Duration: July 1-28, 2002 and November 3-30, 2002, with a no-cost extension to September 30, 2003.

- "Metamaterials and Diffractive Optical Elements for Novel Hybrid Millimeter-Wave and IR Lens Design"
  From the Office of Naval Research (**ONR**).
  PI: Nader Engheta
  Amount: $ 150,000.
  Duration: October 1, 2001-September 30, 2002:

- "Biologically Motivated Representational Schemes for Mapping Polarization Information into Visual Information"
  From the Air Force Office of Scientific Research (**AFOSR**)
  PI: Nader Engheta
  Amount: $ 139,148.
  Duration: July 15, 2001-April 14, 2002.

- "Fractional Paradigm of Classical Electrodynamics"

A research fellowship award from the *John Simon Guggenheim Memorial Foundation*. PI: Nader Engheta
Amount: $33,000.
Duration: January 1, 2000-December 31, 2000.

- UPS Foundation Distinguished Educator term Chair
  Holder of the term chair for Academic year July 1, 1999-June 30, 2000: Nader Engheta
  Amount: $10,000.
  Duration: July 1, 1999-June 30, 2000.

- "Theoretical Study of Applications of Fractional Calculus in Electromagnetism"
  from National Science Foundation (**NSF**)
  PI: Nader Engheta
  Amount: $85,000.
  Duration: September 1, 1997-August 31, 1999. (With a no-cost extension from original date of 8/98.)

- "Fulbright Naples Chair Award for Naples, Italy for the academic year 1997-98",
  Amount: total of 19,800,000 Italian Lire (about $ 11,155.) to visit Universita' di Napoli (Federico II) for three months of March-May 1998.

- "Electroretinographic Investigation of Polarization-Differencing Retinal Signals"
  from Office of Naval Research (**ONR**), Augmentation Award for Science and Engineering Training (AASERT)
  PI: Nader Engheta
  Total amount of grant: $ 91,406.
  Duration: July 1, 1994-June 30, 1997.

- "Polarization-Difference Imaging: Biophysical Mechanisms and Engineering Applications to Visibility Enhancement in Scattering Media,"
  from the Office of Naval Research (**ONR**).
  PI: Nader Engheta
  Total amount of grant: $ 473,500
  Duration: July 1, 1993-June 30, 1996.
  A no-cost extension to September 30, 1996 was granted.

- "A Laboratory Course in Cognitive Neuroscience"
  Co-Instructors: Edward N. Pugh, Jr. and Nader Engheta
  Univ. of PA Provost's Funding for New Course
  Total amount: $ 15,000.
  Granted on May 1996
  Course has now been developed and offered in Spring 97, Fall 97, Spring 99.

- "NSF Presidential Young Investigator Award (PYI)"
  from **NSF**
  Support received from NSF: $237,000
  PI: Nader Engheta
  Duration: Aug. 1989-July 1994
  A no-cost extension to July 31, 1995 was requested and granted.

- W. M. Keck Foundation's 1995 Engineering Teaching Excellence Award
  Award's Recipient: Nader Engheta
  Amount: $ 10,000.

- "Upgrade to Image Analysis System in Polarization-Difference Imaging"
  from University of Pennsylvania Research Foundation
  PI: Nader Engheta
  Co-PI: Edward N. Pugh, Jr.
  Total Amount: $8,000
  Duration: January 1, 1994, December 31, 1994

- Matching Fund for Workstation in Polarization-Difference Imaging Project
  form School of Arts and Sciences (SAS), University of Pennsylvania
  Co-PI: Nader Engheta, PI: Edward N. Pugh, Jr.
  Amount: ~ $ 2,900.
  June 1996.

- "Polarization-Contrast Vision: A New Kind of Vision in Vertebrates,"
  from National Institutes of Health (**NIH**)
  PI: E. N. Pugh, Jr.
  Collaborator: Nader Engheta
  Total award $ 201,482 for 3 years, (~ $56,172. for N. Engheta's efforts for 3 years)
  July 1989-June 1992. A no-cost extension was granted until June 1993.

- "Frequency Response of Chiral Materials"
  from Rockwell International Corporation Science Center, Thousand Oaks, CA
  PIs: N. Engheta and D. L. Jaggard
  Total amount: $54,837
  Duration: March 1990-February 1991

- "Microwave Amplifier for Chiral Materials Experiments,"
  from University of Pennsylvania Research Foundation.
  PIs: D. L. Jaggard and N. Engheta
  Total amount: $ 8,000.
  Duration: January 1, 1991-December 31, 1991

- "Radar Cross Section Management for Chiral Targets"
  from Northrop Corporation, CA
  PIs: D. L. Jaggard and N. Engheta
  Total amount: $49,691
  Duration: March, 1990-February 1991

- "Chiroferrites for Coatings"
  from Rockwell International Corporation Science Center, Thousand Oaks, CA
  PIs: N. Engheta and D. L. Jaggard
  Total amount: $39,502
  Duration: March 1989 - March 1990.

- "Equipment for Study of Polarization Contrast: A New Kind of Vision In Vertebrates",
  from the University of Pennsylvania Research Foundation.

Co-PI: N. Engheta , PI: E. N. Pugh, Jr.
Total Amount: $6,895
Duration: January 1, 1989-December 31, 1989.

- "Microwave Laboratory Equipment"
  matching fund from the State of Pennsylvania, 1989.
  PI: Nader Engheta
  Amount: $12,500

- "AT&T Special Purpose Grant"
  from AT&T Foundation
  PI: Nader Engheta
  Total Amount: $ 25,000, September 1988.

PUBLICATIONS

Book (edited)

N. Engheta and R. W. Ziolkowski, (editors), *Metamaterials: Physics and Engineering Explorations*, Wiley-IEEE Press, 414 pages, June 2006.

Special Issues Guest Edited
(in chronological order)

N. Engheta (Guest Editor), Special Issue of "*Journal of Electromagnetic Waves and Applications (JEWA)*" on the topic of "*Wave Interaction with Chiral and Complex Media*", Vol. 6, No. 5/6, May and June 1992.

N. Engheta (Guest Editor), Part Special Issue of the *Journal of the Franklin Institute* on *Antennas and Microwaves* on the topic of Antennas and Microwaves (the *13th Annual Benjamin Franklin Symposium* held on May 5, 1995 in Philadelphia, Pennsylvania). This part special issue contains some selected papers from this symposium. Vol. 332B, No. 5, 1995.

L. B. Felsen (Guest Editor) and N. Engheta (Co-Guest Editor), Special Issue of the journal *Wave Motion* on the topic of "*Electrodynamics in Complex Environments*", Vol. 34, No. 3, September 2001.

R. W. Ziolkowski and N. Engheta (Guest Editors), Special Issue of the *IEEE Transactions on Antennas and Propagation* on the topic of "*Metamaterials*", Vol. 51, No. 10, October 2003.

G. Shvets, and N. Engheta (Guest Editors), Special Section of the *Solid State Communications* on the topic of "Negative Refraction and Metamaterials for Optical Science and Engineering", 146, 197, April 2008.

V. Shalaev (Purdue University), N. Litchinitser (SUNY, Buffalo), N. Engheta (UPenn), R. McPhedran (U. Sydney), E. Shamonina (University of Erlangen-Nuremberg), and T. Klar (Technische Univerität Ilmenau), Special issue of the *IEEE Journal of Selected Topics in Quantum Electronics* on the topic of "Metamaterials", Vol. 16, No. 2, pp. 363-458, March-April 2010.

G. Eleftheriades and N. Engheta (Guest Editors), *IEEE Proceedings* on "Metamaterials: Fundamentals and Applications in Microwaves and Optical Regimes," in progress, tentatively scheduled to appear in October 2011.

Book Chapters
(in chronological order)

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U. K. Chettiar and N. Engheta, "'Meta-Atom with Second-Harmonic Scattering and 'Invisible' at First Harmonic: Mixing Plasmonic Cloaking with 2^{nd}-oder Optical Nonlinearity," submitted on April 22, 2010 to *Physical Review Letters*, under review.

P. Fan, U. Chettiar, L. Cao, F. Afshinmanesh, N. Engheta, and M. Brongersma, "Harmonizing Metals and Semiconductor Building Blocks in Optoelectronics,: submitted on June 14, 2011 to *Nature*, under review.

C. Argyropoulos, P-Y. Chen, G. D'Aguanno, N. Engheta, and A. Alu, "Boosting Optical Nonlinearity in epsilon-near-zero Plasmonic Channels," submitted on July 3, 2011 to *Physical Review Letters*. Under review.

Y. Sun, B. Edwards, A. Alu, and N. Engheta, "Experimental Realization of Optical Lumped Nanocircuit Elements at Infrared Wavelengths," submitted on July 19, 2011 to *Nature Materials*, under review.

B. Edwards and N. Engheta, "Experimental Realization of Displacement-Current Wires at Microwave Frequencies," submitted on July 21, 2011 to *Nature Communications*.

E. J. R. Vesseur, T. Coenen, H. Caglayan, N. Engheta, A. Polman, "Structure with Effective Refractive Index n = 0 for Visible Light," submitted on July 26, 2011 to *Science*.

A.Vakil, N. Engheta, "Fourier Optics on Graphene," submitted on August 22, 2011 to *Physical Review Letters*, under review. (The manuscript can be viewed at http://arxiv.org/abs/1108.5218)

F. J. Rodriguez-Fortuno, N. Engheta, "Avoiding Metallic Walls: Use of Modal Superposition in Plasmonic Waveguide to Reduce Propagation Loss," submitted on September 13, 2011 to *Physical Review Letters*, under review.

(Solicited Perspective) N. Engheta, "Antenna-Guided Light", submitted on September 18, 2011, to *Science*, under review.

G. Castaldi, V. Galdi, A. Alu, and N. Engheta, "Nonlocal Transformation Optics," submitted to *Physical Review Letters*, September 26, 2011, under review.

M. G. Silveirinha, and N. Engheta, "Transformation Electronics: Tailoring Electron's Effective Mass," submitted on October 2, 2011 to *Nature Physics*, under review.

B. Edwards, N. Engheta, "Electric Tweezers: Negative dielectrophoretic multiple particle positioning," soon to be submitted.

Conference Proceedings Papers and Abstracts

(In case of multiple authorship, the name of presenter is given in parentheses)

N. Engheta and C. Elachi, "Radar Scattering from a Smooth Surface with a Vegetation Layer Over," *1981 IEEE International Geoscience and Remote Sensing Symposium (IGARSS'81), Washington, D.C.*, June 8-10, 1981. (presented by N. Engheta)

T. G. Farr, and N. Engheta, and A. Sheehan, "Quantitative Comparison of Radar Image, Scatterometer, and Surface Roughness Data from Pisgah Crater, CA," *1983 IEEE International Geoscience and Remote Sensing Symposium (IGARSS'83), San Francisco, California*, August 31-September 2, 1983. (presented by T. G. Farr)

N. Engheta, C. H. Papas and C. Elachi, "On the Polarization Properties of the Far-Zone Radiation Fields of Primary and Secondary Electromagnetic Sources," *URSI/USNC conference, San Francisco, California*, August 31-September 2 1983; Also presented in URSI-B session of *1984 IEEE AP-S/URSI International Symposium, Boston, Massachusetts*, June 25-29, 1984. (presented by N. Engheta)

J. J. van Zyl, N. Engheta, C. H. Papas, C. Elachi and H. Zebker, "Modeling of Backscatter from Vegetation Layers," *International Geoscience and Remote Sensing Symposium Digest (IGARSS'85), Vol. 1*, pp. 389-394, 1985. (presented by. J. J. van Zyl)

N. Engheta, K. S. H. Lee, F. C. Yang and R. Aguero, "HEMP-Induced Transients on Transmission and Distribution (T&D) Lines," *1986 Nuclear Electromagnetic Pulse (NEMP) Conference, Albuquerque, New Mexico*, May 9-13, 1986. (presented by N. Engheta)

N. Engheta and C. Elachi, "Radiation Characteristics of an Antenna Lying on the Surface of a Dielectric Layer" in URSI-B session of *1987 IEEE AP-S/URSI International Symposium, Blacksburg, Virginia*, June 15-19, 1987. (presented by N. Engheta)

S. Bassiri, C. H. Papas and N. Engheta, "Dyadic Green's Function and Dipole Radiation in Chiral Media," in URSI-B session of *URSI National Radio Science Meeting, Boulder, Colorado*, January 5-8, 1988. (presented by N. Engheta)

S. Bassiri, C. H. Papas and N. Engheta, "Fresnel Equations for a Dielectric-Chiral Interface," in URSI-B session of *URSI National Radio Science Meeting, Boulder, Colorado*, January 5-8, 1988. (presented by N. Engheta)

S. S. Venkatesh and N. Engheta, "Neural Network Architectures Based on Wave Propagation with Individual Weight Controllability," poster session, *Neural Networks For Computing Conference, Snowbird, Utah*, April 6-10, 1988. (presented by S. S. Venkatesh and N. Engheta)

A. R. Ochadlick, F. Darreff, C. Haney, J. Schanne, H. N. Kritikos and N. Engheta, "Aircraft Polarimetric and Multifrequency SAR Studies of Current-Wave Interaction for the Planned SIR-C Mission," *American Geophysical Union Spring Meeting, Baltimore, Maryland*, May 16-20, 1988. (presented by A. Ochadlick)

C. Zuffada and N. Engheta, "Common and Differential TEM Modes for Two Wires Above a Ground Plane," *Nuclear ElectroMagnetic Pulse (NEMP) Conference, Menlo Park, California*, May 16-20, 1988. (presented by C. Zuffada)

S. Bassiri, C. H. Papas and N. Engheta, "Propagation, Reflection and Refraction of Electromagnetic Waves in Chiral Media," in URSI-B session of *1988 IEEE AP-S/URSI International Symposium, Syracuse, New York*, June 5-10, 1988. (presented by N. Engheta)

D. L. Jaggard, X. Sun and N. Engheta, "Canonical Arrays and Duality in Chiral Media," in URSI-B session of *1988 IEEE AP-S/URSI International Symposium, Syracuse, New York*, June 6-10, 1988. (presented by D. L. Jaggard)

N. Engheta, "Theory of Chirostrip Antennas," in URSI-B session of *1988 IEEE AP-S/URSI International Symposium, Syracuse, New York*, June 6-10, 1988. (presented by N. Engheta)

N. Engheta, "Radiation Characteristics of Chirostrip Antennas," in URSI-B session of *URSI National Radio Science Meeting, Boulder, Colorado*, January 4-6, 1989. (presented by N. Engheta)

N. Engheta and P. Pelet, "Effects of Chirality on Guided Waves," in URSI-B session of *URSI National Radio Science Meeting, Boulder, Colorado*, January 4-6, 1989. (presented by N. Engheta)

N. Engheta, D. L. Jaggard, X. Sun, P. Pelet, J. Liu and M. W. Kowarz, "Electromagnetic Chirality and Its Applications," *Seventh Annual Benjamin Franklin Symposium, Philadelphia, Pennsylvania*, March 11, 1989. (presented by N. Engheta)

(**invited**) D. L. Jaggard and N. Engheta, "Electromagnetic Chirality: Past, Present and Future," invited poster in *1989 IEEE AP-S/URSI International Symposium, San Jose, California*, June 26-30 1989. (presented by D. L. Jaggard and N. Engheta)

D. L. Jaggard, N. Engheta, M. W. Kowarz, P. Pelet, J. Liu and Y. Kim, "Waves in Periodic Chiral Media," in URSI-B session of *1989 IEEE AP-S/URSI International Symposium, San Jose, California*, June 26-30 1989. (presented by D. L. Jaggard)

N. Engheta, M. W. Kowarz and D. L. Jaggard, "The Doppler Effect and Aberration in Chiral Media," in URSI-B session of *1989 IEEE AP-S/URSI International Symposium, San Jose, California*, June 26-30 1989. (presented by N. Engheta)

S. Bassiri, F. Shahshahani and N. Engheta, "Current Distribution in a Thin Wire Embedded in Chiral Media," in URSI-B session of *1989 IEEE AP-S/URSI International Symposium, San Jose, California*, June 26-30 1989. (presented by S. Bassiri)

D. L. Jaggard and N. Engheta, "Everything You Wanted to Know about Electromagnetic Chirality but Were Afraid to Ask," *Progress in Electromagnetic Research Symposium (PIERS), Cambridge, Massachusetts*, July 26-27, 1989. (presented by D. L. Jaggard)

N. Engheta, "Chiral Substrate in Microstrip Antennas: Chirostrip Antennas," *Progress in Electromagnetic Research Symposium (PIERS), Cambridge, Massachusetts*, July 26-27, 1989. (presented by N. Engheta)

N. Engheta and P. Pelet, "Effects of Chirality in Slab Dielectric Waveguides," *Progress in Electromagnetic Research Symposium (PIERS), Cambridge, Massachusetts*, July 26-27, 1989. (presented by N. Engheta)

S. Bassiri, C. H. Papas and N. Engheta, "Radiation by a Uniformly Moving Charged Particle in a Chiral Medium," *Progress in Electromagnetic Research Symposium (PIERS), Cambridge, Massachusetts*, July 26-27, 1989. (presented by S. Bassiri)

D. L. Jaggard, N. Engheta and M. W. Kowarz, "Chiroferrites as Anisotropic Chiral Materials," *Progress in Electromagnetic Research Symposium (PIERS), Cambridge, Massachusetts*, July 26-27, 1989. (presented by D. L. Jaggard)

(**invited**) N. Engheta and D. L. Jaggard, "Electromagnetic Chirality: Source Radiation in Chiral Media," Invited paper in *NSF Workshop on Future Directions in Electromagnetic*

Research, Progress in Electromagnetic Research Symposium (PIERS), *Boston, Massachusetts*, July 27, 1989. (presented by N. Engheta and D. L. Jaggard)

(**invited**) D. L. Jaggard and N. Engheta, "Electromagnetic Chirality: Source-Free Radiation in Chiral Media," Invited paper in *NSF Workshop on Future Directions in Electromagnetic Research*, Progress in Electromagnetic Research Symposium (PIERS), *Boston, Massachusetts*, July 27, 1989. (presented by D. L. Jaggard and N. Engheta)

N. Engheta and P. Pelet, "Guided-Wave Structures Filled with Chiral Materials," *URSI International Symposium on Electromagnetic Theory, Stockholm, Sweden*, August 14-18, 1989. (presented by N. Engheta)

N. Engheta and M. W. Kowarz, "Dyadic Green's Functions for a Chiral Sphere," in URSI-B session of *URSI National Radio Science Meeting, Boulder, Colorado*, January 3-5, 1990. (presented by N. Engheta)

P. Pelet and N. Engheta, "Analysis of a Novel TE↔TM Converter Using Chiral Materials," in the poster session of *The Eighth Annual Benjamin Franklin Symposium, Philadelphia, Pennsylvania*, March 24, 1990. (presented by P. Pelet)

N. Engheta and D. L. Jaggard, "Chiral Microstructures: Their Frequency Response," in URSI-B session of *1990 IEEE AP-S/URSI International Symposium, Dallas, Texas*, May 7-10, 1990. (presented by N. Engheta)

N. Engheta and M. W. Kowarz, "Chirolens as a Bifocal Lens," in URSI-B session of *1990 IEEE AP-S/URSI International Symposium, Dallas, Texas*, May 7-10, 1990. (presented by N. Engheta)

N. Engheta, "Current on a Long Cylindrical Antenna in Chiral Media," in URSI-B session of *1990 IEEE AP-S/URSI International Symposium, Dallas, Texas*, May 7-10, 1990. (presented by N. Engheta)

D. L. Jaggard, N. Engheta and J. Liu, "Chiroshield: The Chiral Salisbury Shield," in URSI-B session of *1990 IEEE AP-S/URSI International Symposium, Dallas, Texas*, May 7-10, 1990. (presented by D. L. Jaggard)

N. Engheta and P. Pelet, "Surface Wave Propagation in Chiral Layers and Its Application," *the XXIIIrd URSI General Assembly, Session on New Developments in the Electromagnetics of Complex Media: Chirality and Fractals, Prague, Czechoslovakia*, August 28-September 5, 1990. (presented by N. Engheta)

D. L. Jaggard and N. Engheta, "Chirality in Electrodynamics: Modeling and Applications," in the poster session of *The Internationa Conference on Directions in Electromagnetic Wave Modeling, New York, New York*, October 22-24, 1990. (presented by D. L. Jaggard and N. Engheta)

D. A. Cameron, M. Rowe, N. Engheta and E. N. Pugh, Jr., "Do Dual Cones Mediate Vertebrate Polarization Sensitivity?" a poster to *the 1990 Annual Meeting of the Society for Neuroscience, St. Louis, Missouri*, October 28-November 2, 1990. (presented by D. A. Cameron and M. Rowe)

M. M. I. Saadoun, P. Pelet, and N. Engheta, "Analytical Techniques for Guided Modes in Rectangular Chirowaveguides," in the poster session of *The Ninth Annual Benjamin Franklin Symposium, Philadelphia, Pennsylvania*, March 9, 1991. (presented by M. M. I. Saadoun)

P. G. Zablocky and N. Engheta, "Time-Domain Analysis of Chiral Media," in the poster session of *The Ninth Annual Benjamin Franklin Symposium, Philadelphia, Pennsylvania*, March 9, 1991. (presented by P. G. Zablocky)

D. L. Jaggard and N. Engheta, "Novel Use of Layered Chiral Materials for Control of Absorption, Reflection, and Transmission" *the 9th International Symposium on Electromagnetic Compatibility, Zürich, Switzerland*, March 12-14, 1991. (presented by D. L. Jaggard)

N. Engheta and D. L. Jaggard, "Frequency Spectrum and Time Domain Response of Chiral Coated Shields," *the 9th International Symposium on Electromagnetic Compatibility, Zürich, Switzerland*, March 12-14, 1991. (presented by N. Engheta)

K. B. O'Brien, N. Engheta, and L. J. Martínez-Miranda, "A Study of the Effect of an Applied Electric Field on the Optical Activity of a Chiral Liquid Crystal Near the Isotropic-Smectic A Transition," in the poster session of *the 1991 Gordon Conference, New Hampshire*, June 1991. (presented by L. J. Martínez-Miranda)

N. Engheta, P. Pelet, and G. Li, "Edge Diffraction in Chiral Media & RCS Applications: Meixner Edge Condition and The Sommerfeld Half-Plane Problem in Chiral Media," in the Special Session on "Chiral Materials," *1991 North American Radio Science/International IEEE AP-S/URSI Symposium, London, Ontario, Canada*, June 24-28, 1991. (presented by N. Engheta)

P. Pelet and N. Engheta, "Electromagnetic Properties of Finite-Length Chirostrip Antennas," presented by P. Pelet as one of the three student finalists paper in the Special Session for the 1991 URSI Student Prize Paper contest, *1991 North American Radio Science/International IEEE AP-S/URSI Symposium, London, Ontario, Canada*, June 24-28, 1991. ı P. Pelet was awarded No. 1 Prize in this contest. (presented by P. Pelet)

N. Engheta, W. D. Murphy, V. Rokhlin, and M. S. Vassiliou, "The Fast Multipole Method for Scattering from Electrically Large Objects," in URSI-B session of the *1991 North American Radio Science/International IEEE AP-S/URSI Symposium, London, Ontario, Canada*, June 24-28, 1991. (presented by W. D. Murphy)

P. G. Zablocky and N. Engheta, "Transient Response of Chiral Materials," in URSI-B session of the *1991 North American Radio Science/International IEEE AP-S/URSI Symposium, London, Ontario, Canada*, June 24-28, 1991. (presented by N. Engheta)

M. M. I. Saadoun and N. Engheta, "Novel Designs for Reciprocal Phase Shifters Using Pseudochiral or Ω medium," in URSI-B session of the *1991 North American Radio Science/International IEEE AP-S/URSI Symposium, London, Ontario, Canada*, June 24-28, 1991. (presented by N. Engheta)

(**invited**) N. Engheta, "Continuous Dimensionality in Electrodynamics: Non-Integer Vector Calculus in Electromagnetic Problems and Its Applications," *Progress in Electromagnetics Research Symposium (PIERS'91), Cambridge, Massachusetts*, July 1-5, 1991. (presented by N. Engheta)

A. R. Ochadlick, Jr. and N. Engheta, "Magnetic Fields Resulted from Ocean Current Structures Seen in SAR Imagery," *Progress in Electromagnetics Research Symposium (PIERS'91), Cambridge, Massachusetts*, July 1-5, 1991. (presented by A. R. Ochadlick)

N. Engheta, W. D. Murphy, V. Rokhlin, and M. S. Vassiliou, "What Is the Fast Multipole Method (FMM) and How Can It Help You Solve Electromagnetic Problems More Efficiently?," *Progress in Electromagnetics Research Symposium (PIERS'91), Cambridge, Massachusetts*, July 1-5, 1991. (presented by M. S. Vassiliou)

N. Engheta and G. Li, "Diffraction of Electromagnetic Waves in Chiral Media: Aperture Problem," *Progress in Electromagnetics Research Symposium (PIERS'91), Cambridge, Massachusetts*, July 1-5, 1991. (presented by N. Engheta)

N. Engheta and P. Pelet, "Planar and Conformal Chirostrip Arrays," *Progress in Electromagnetics Research Symposium (PIERS'91), Cambridge, Massachusetts*, July 1-5, 1991. (presented by N. Engheta)

N. Engheta and P. G. Zablocky, "Transient Pulse Propagation and Reflection at a Dielectric-Chiral Boundary," *Progress in Electromagnetics Research Symposium (PIERS'91), Cambridge, Massachusetts*, July 1-5, 1991. (presented by N. Engheta)

N. Engheta and M. M. I. Saadoun, "Novel Pseudochiral or Ω mediun and Its Applications," *Progress in Electromagnetics Research Symposium (PIERS'91), Cambridge, Massachusetts*, July 1-5, 1991. (presented by N. Engheta)

(**invited**) N. Engheta, "Chiral Materials and Chiral Electrodynamics: Background & Basic Physical Principles," in Special Workshop on "Chiral and Complex Materials", *Progress in Electromagnetics Research Symposium (PIERS'91), Cambridge, Massachusetts*, July 1-5, 1991. (presented by N. Engheta)

(**invited**) N. Engheta, "Applications of Chiral Materials in Microwave and Optical Devices and Components," in Special Workshop on "Chiral and Complex Materials", *Progress in Electromagnetics Research Symposium (PIERS'91), Cambridge, Massachusetts*, July 1-5, 1991. (presented by N. Engheta)

M. Rowe, N. Engheta, E. N. Pugh, Jr., "Can Birefringence Explain the Polarization Analyzing Capability of Teleost Cones?, presented in the poster session of *the 1991 Annual Meeting of the Society for Neuroscience, New Orleans, Louisiana*, November, 1991. (presented by M. Rowe)

K. B. O'Brien, L. J. Martinez-Miranda, and N. Engheta, "Electrically-Induced Control of Chirality in Isotropic Chiral Liquid Crystals: Experimental Results," in URSI-D session of *URSI/USNC National Radio Science Meeting, Boulder, Colorado*, January 7-11, 1992. (presented by N. Engheta)

M. S. Mirotznik, N. Engheta and K. R. Foster, "Heating Characteristics of Thin Helical Antennas," presented at *the Northeast Bioengineering Conference, Rhode Island*, March 15, 1992. (presented by M. S. Mirotznik)

N. Engheta, "Potential Applications of Chiral Materials in Optical and Microwave Devices and Components," presented at the *Tenth Annual Benjamin Franklin Symposium, Philadelphia, Pennsylvania*, May 2, 1992. (presented by N. Engheta)

N. Engheta, "Wave Interaction with Complex Media: A Review," in the special session (URSI-B session) on Chiral, Bianisotropic and Complex Media and Their Applications in *the 1992 IEEE AP-S International Symposium/URSI Radio Science Meeting/Nuclear EMP Meeting Joint Symposia, Chicago, Illinois*, July 18-25, 1992. (presented by N. Engheta)

F. Mariotte and N. Engheta, "Reflection and Transmission of Guided Electromagnetic Waves at an Air-Chiral Interface in a Parallel-Plate Waveguide," in the special session (URSI-B session) on Chiral, Bianisotropic and Complex Media and Their Applications in *the 1992 IEEE AP-S International Symposium/URSI Radio Science Meeting/Nuclear EMP Meeting Joint Symposia, Chicago, Illinois*, July 18-25, 1992. (presented by F. Mariotte)

N. Engheta, "On the Role of Non-Integral (Fractional) Calculus in Electrodynamics," in the special session (URSI-B) on Symmetry and Scaling in Electromagntics in *the 1992 IEEE AP-S International Symposium/URSI Radio Science Meeting/Nuclear EMP Meeting Joint Symposia, Chicago, Illinois*, July 18-25, 1992. (presented by N. Engheta)

M. M. I. Saadoun and N. Engheta, "Topology of Knots and Links and Cavity Resonators," in the special session (URSI-B session) on Symmetry and Scaling in Electromagntics in *the 1992 IEEE AP-S International Symposium/URSI Radio Science Meeting/Nuclear EMP Meeting Joint Symposia, Chicago, Illinois*, July 18-25, 1992. (presented by N. Engheta)

M. M. I. Saadoun and N. Engheta, "Pseudochiral Ω Medium: What Is It? and What Can It be Used For?," in APS session of *the 1992 IEEE AP-S International Symposium/URSI Radio Science Meeting/Nuclear EMP Meeting Joint Symposia, Chicago, Illinois*, July 18-25, 1992. (presented by N. Engheta)

P. G. Zablocky and N. Engheta, "Chirality and The Transient Electromagnetic Pulse," in APS session of *the 1992 IEEE AP-S International Symposium/URSI Radio Science Meeting/Nuclear EMP Meeting Joint Symposia, Chicago, Illinois*, July 18-25, 1992. (presented by N. Engheta)

(**invited**) N. Engheta,"Chiral Electrodynamics and Complex Materials: A Review of Recent Developments," invited talk in a plenary session, in *the 14th Triennial URSI International Symposium on Electromagnetic Theory, Sydney, Australia*, August 17-20, 1992. (presented by N. Engheta)

M. M. I. Saadoun and N. Engheta, "Pseudochiral Ω Medium anf Guided-Wave Structures: Principles and Applications," in *the 14th Triennial URSI International Symposium on*

Electromagnetic Theory, Sydney, Australia, August 17-20, 1992. (presented by N. Engheta)

F. Mariotte and N. Engheta, "Caractérisation Hyperfrequence en Ondes Guidées de Matériaux Chiraux (avec ou sans Pertes)," *J. C. M. M. 92 Caractérisation Microonde des Matériaux Congrees, Arcachon, France*, October 7-9, 1992. (presented by F. Mariotte)

M. P. Rowe, N. Engheta, and E. N. Pugh, Jr., "Polarization-Difference Vision: Potential Engineering Applications," presented as a poster at the *Eleventh Annual Benjamin Franklin Symposium, Philadelphia, Pennsylvania*, May 1, 1993. (presented by M. P. Rowe and N. Engheta)

M. M. I. Saadoun and N. Engheta, "Electromagnetic Properties and Modeling of the Non-Local Ω Medium," at URSI-B session of *the 1993 IEEE AP-S International Symposium/URSI Radio Science Meeting, Ann Arbor, Michigan*, June 27-July 2, 1993. (presented by N. Engheta)

M. M. I. Saadoun and N. Engheta, "Reflection and Shielding Characteristics of The Layered Lossy Non-Local Ω Medium," at URSI-B session of *the 1993 IEEE AP-S International Symposium/URSI Radio Science Meeting, Ann Arbor*, *Michigan*, June 27-July 2, 1993. (presented by N. Engheta)

M. S. Mirotznik, N. Engheta, and K. R. Foster, "Heating Characteristics of Thin Helical Antennas with Conducting Cores," at *the 1993 IEEE AP-S International Symposium/URSI Radio Science Meeting, URSI-B session, Ann Arbor*, *Michigan*, June 27-July 2, 1993. (presented by M. S. Mirotznik)

(**invited**) F. Mariotte and N. Engheta, "An Overview of Effects of Chiral Material Loss on Propagation, Reflection and Transmission of Guided Modes in Lossy Chirowaveguides," presented at *the XXIVth General Assembly of the International Union of Radio Science (URSI), Kyoto, Japan*, August 25-September 2, 1993. (presented by F. Mariotte)

(**invited**) N. Engheta, "Potential Applications of Fractional Differintegrals in Electromagnetism," presented at the *Twelfth Annual Benjamin Franklin Symposium, Philadelphia, Pennsylvania*, May 6, 1994. (presented by N. Engheta)

J. S. Tyo, M. P. Rowe, N. Engheta, and E. N. Pugh, Jr., "Polarization-Difference Vision and Imging: From Double Cone Photoreceptors to Underwater Observation," presented in the session on "*Biological Approaches to Automatic Target Recognition*," at *the World Congress on Neural Networks, San Diego, California*, June 6-10, 1994. (Abstract not published) (presented by N. Engheta)

N. Engheta, "On the Relationship between Fractional Integration/Differentiation and Green's Functions in Certain Electromagnetic Problems," presented at URSI-B session of *the 1994 IEEE AP-S International Symposium/URSI Radio Science Meeting, Seattle, Washington*, June 20-24, 1994. (presented by N. Engheta)

J. S. Tyo, M. P. Rowe, E. N. Pugh, Jr., and N. Engheta, "Contrast Enhancement for Underwater Imaging Using a Polarization Differencing Technique based on Biological Visual Systems," presented at URSI-K session of *the 1994 IEEE AP-S International Symposium/URSI Radio Science Meeting, Seattle, Washington*, June 20-24, 1994. (presented by N. Engheta)

(**invited**) N. Engheta, "Fractional Differintegrals and Electrostatic Fields and Potentials near Sharp Conducting Edges," *Proceedings of International Summer School on Fractal and Hyperbolic Geometry, Fractional and Fractal Derivatives in Engineering, Applied Physics and Economics*," Bordeaux, France, July 3-8, 1994. (presented by N. Engheta)

J. S. Tyo, M. P. Rowe, E. N. Pugh, Jr., and N. Engheta, "Biologically Inspired Polarization-Difference Imaging for Seeing Through Scattering Media," presented in *the 1994 Annual Meeting of the Optical Society of America, Dallas, Texas*, October 2-7, 1994. (presented by J. S. Tyo)

M. P. Rowe, J. M. Corless, N. Engheta, and E. N. Pugh, Jr., "Scanning Interferometry Demonstrates that Single Cones from a Sunfish Retina Have a Gradient Refractive Index Profile," presented in *the 1994 Annual Meeting of the Optical Society of America, Dallas, Texas*, October 2-7, 1994. (presented by M. P. Rowe)

M. P. Rowe, N. Engheta, S. S. Easter, Jr., J. M. Corless, and E. N. Pugh, Jr., "Inner Segments of Sunfish Single Cone Photoreceptors Are Graded Index Waveguides," presented as a poster in *the 1994 Annual Meeting of the Society for Neuroscience, Florida*, November 14-17, 1994. (presented by M. P. Rowe)

J. S. Tyo, M. P. Rowe, E. N. Pugh, Jr., and N. Engheta, "Biologically Inspired Polarization Difference Imaging: From Double Cone Photoreceptors to Imaging in Scattering Media," presented at the *Thirteenth Annual Benjamin Franklin Symposium, Philadelphia, Pennsylvania*, May 5, 1995. (presented by N. Engheta)

N. Engheta, "Fractional Derivatives, Fractional Integrals, and Image Methods in Electrostatics," presented in URSI-B section of *the 1995 IEEE AP-S International Symposium/URSI Radio Science Meeting, Newport Beach, California,* June 18-23, 1995.

N. Engheta, "Applications of Fractional Calculus to Fields of Finite-Size Sources," presented in URSI-B section of *the 1995 IEEE AP-S International Symposium/URSI Radio Science Meeting, Newport Beach, California,* June 18-23, 1995.

N. Engheta, "Use of Fractional Calculus in Describing Certain "Fractional" Solutions of Helmholtz and Poisson Equations," presented in the *Progress in Electromagnetics Research Symposium, PIERS'95, Seattle, Washington*, July 24-28, 1995.

N. Engheta, "On Fractional Differintegrals and Multipole Expansion in Electromagnetism," presented in the *Progress in Electromagnetics Research Symposium, PIERS'95, Seattle, Washington*, July 24-28, 1995.

M. P. Rowe, N. Engheta, J. M. Corless, and E. N. Pugh, Jr., "Refractive Index Gradient in Sunfish Cones," presented at *Enoch Vision Science Meeting (in honor of Prof. Jay*

Enoch), Berkeley, California, April 28-30, 1996. (Presented by M. P. Rowe). A chapter on this topic will appear in the proceedings of this meeting, to appear in December 1996.

J. S. Tyo, M. P. Rowe, E. N. Pugh, Jr., and N. Engheta, "Colorimetric Representations of Polarization-Difference Imaging of Objects in Scattering Media," presented as a poster in the *Fourteenth Annual Benjamin Franklin Symposium, Philadelphia, Pennsylvania*, May 3, 1996. (Presented by J. S. Tyo)

C. A. Moses and N. Engheta, "Theoretical Electromagnetic Modeling of Non-Local-Coupled-Dipole Artificial Dielectric--Preliminary Results," presented in the *Fourteenth Annual Benjamin Franklin Symposium, Philadelphia, Pennsylvania*, May 3, 1996. (Presented by C. Moses)

N. Engheta, "Fractional Calculus and Electrostatic Fractional Image Methods in Electromagnetism" presented in the *Fourteenth Annual Benjamin Franklin Symposium, Philadelphia, Pennsylvania*, May 3, 1996. (presented by N. Engheta)

N. Engheta "Fractional-Dipole Radiation" presented in URSI-B Session of the *1996 IEEE AP-S International Symposium/URSI Radio Science Meeting, Baltimore, Maryland*, July 21-26, 1996. (Presented by N. Engheta)

C. A. Moses and N. Engheta "Some Mathematical Aspects of Waveguide Modeling Applicable to Sunfish's Retinal Cone Photoreceptors," presented in URSI-B Session of the *1996 IEEE AP-S International Symposium/URSI Radio Science Meeting, Baltimore, Maryland*, July 21-26, 1996. (Presented by C. A. Moses)

N. Engheta, "On Fractional Calculus in Electromagnetic Theory" presented in the *XXV URSI General Assembly, Lille, France*, August 28-September 5, 1996. (Presented by N. Engheta).

J. S. Tyo, M. P. Rowe, E. N. Pugh, Jr., and N. Engheta, "Improved Detection of Targets in Optically Scattering Media Using Polarization-Difference Imaging," presented in *the 1996 Annual Meeting of the Optical Society of America,* Rochester, New York, October 21-24, 1996. (Presented by J. S. Tyo).

J. S. Tyo, E. N. Pugh, Jr., and N. Engheta, "2- and 3-parameter Colorimetric Representations for Use with Polarization-Difference Imaging of Objects in Scattering Media," Presented as a poster in *the 1996 Annual Meeting of the Optical Society of America,* Rochester, New York, October 21-24, 1996.

- The poster was selected as one of the *highlighted posters* in the 1996 OSA Annual meeting.

(**invited**) M. P. Rowe, J. M. Corless, C. A. Moses, N. Engheta, and E. N. Pugh, Jr., "Refractive Index Profiles of Sunfish Cones as Determined by Scanning Microinterferometry," presented in *the 1996 Annual Meeting of the Optical Society of America,* Rochester, New York, October 21-24, 1996. (Presented by M. P. Rowe).

M. P. Rowe, N. Engheta, S. S. Easter, Jr., J. M. Corless, and E. N. Pugh, Jr., "Scanning Microinterferometry Demonstrates that the Refractive Index of Sunfish Double Cone

Inner Segments Exhibit Longitudinal Gradients" presented in *the 1996 Annual Meeting of the Society for Neuroscience, Washington, D.C.*, November, 1996. (Presented by M. P. Rowe).

C. A. Moses and N. Engheta, "Sheet Sources in Electromagnetic FeedForward/FeedBackward Media," presented in the *Fifteenth Annual Benjamin Franklin Symposium, Philadelphia, Pennsylvania*, May 2, 1997. (Presented by C. A. Moses)

E. M. Lynch, N. Engheta, J. M. Rosenthal, and E. N. Pugh, Jr., "Lack of Polarization Discrimination by Green Sunfish," presented as a poster in *the 1997 annual meeting of Association for Research in Vision and Opthalmology (ARVO) in Fort Lauderdale, Florida*, May 11-16, 1997 (Presented by E. M. Lynch).

(**invited**)N. Engheta, "Fractional Derivatives, Fractional Integrals, and Electromagnetic Theory, " presented in conference *Journée Maxwell'97, Bordeaux, France*, May 20-23, 1997. (Presented by N. Engheta)

C. A. Moses and N. Engheta, "An Idea for Electromagnetic Feedforward/Feedbackward Media: I. Plane Wave Propagation in Axial Direction," presented in the URSI-B section of *1997 IEEE AP-S International Symposium/URSI North American Radio Science Meeting, Montreal, Canada*, July 13-18, 1997. (Presented by C. A. Moses). Also presented as a poster in the poster session for all the entrants into the Students Paper Competitions.

(**invited**)N. Engheta, "Extension of the Electrostatic Fractional Image Method to the Case of Electrostatic Dielectric Wedge," presented in the special session entitled "*Frontiers in Mathematical Techniques in Electromagnetics*" in *1997 IEEE AP-S International Symposium/URSI North American Radio Science Meeting, Montreal, Canada*, July 13-18, 1997. (presented by N. Engheta)

(**invited**)N. Engheta, "Fractionalization of the Curl Operator and Its Electromagnetic Application," presented in the special session entitled "*Novel Trends in Electromagnetics*" in *1997 IEEE AP-S International Symposium/URSI North American Radio Science Meeting, Montreal, Canada*, July 13-18, 1997. (presented by N. Engheta)

(**invited plenary talk**)N. Engheta, J. S. Tyo, M. P. Rowe, and E. N. Pugh, Jr., "Biologically Inspired Polarization-Difference Imaging," presented as an invited plenary talk in *the 27th European Microwave Conference (EuMC'97), Jerusalem, Israel*, September 8-11, 1997. (presented by N. Engheta.)

J. S. Tyo, E. N. Pugh, Jr., and N. Engheta, "Colorimetric Representations of Optical Polarization Information," presented in the *1997 Annual Meeting of the Optical Society of America, Long Beach, California*, October 1997. (presented by J. S. Tyo.)

Charles A. Moses and N. Engheta, "Theoretical Electromagnetic Study of the Wire Medium," presented at the *1998 URSI/USNC National Radio Science Meeting, Boulder, Colorado*, January 5--9, 1998. (I presented by C. A. Moses in the plenary session as one of the three student finalists for the URSI Student Prize Paper Competition. C. A. Moses was awarded No. 2 Prize.) (presented by C. A. Moses)

N. Engheta, "Fractional Derivative and Its Role in Fractionalization of the Duality Principles in Electromagnetism," presented at *the 1998 URSI/USNC National Radio Science Meeting, Boulder, Colorado*, January 5--8, 1998. (presented by N. Engheta.)

N. Engheta, "Fractional Duality in Electromagneic Theory," presented in *the International Union of Radio Science (URSI) International Symposium on Electromagnetic Theory, Thessaloniki, Greece*, May 25-28, 1998. (presented by N. Engheta)

C. A. Moses and N. Engheta, "FeedForward/FeedBackward and Wire Media as Electromagnetic Complex Media," presented in *the International Union of Radio Science (URSI) International Symposium on Electromagnetic Theory, Thessaloniki, Greece*, May 25-28, 1998. (presented by N. Engheta)

(**invited plenary talk**)N. Engheta, "Fractional Calculus and Fractional Paradigm in Electromagnetism," presented as an invited plenary talk at *the Methamatical Methods in Electromagnetic Theory (MMET*98), Kharkov, Ukraine*, June 2-5, 1998. (presented by N. Engheta)

N. Engheta, "Fractional Kernels and Intermediate Zones in Electromagnetism: Planar Geometries" presented at the joint AP-S/URSI-B special session in the *1998 IEEE AP-S International Symposium/URSI Radio Science Meeting*, Atlanta, Georgia, June 21-26, 1998. (presented by N. Engheta)

N. Engheta, "Complex-Order Fractional Curl in Electromagnetism," presented at a URSI-B session in the *1998 IEEE AP-S International Symposium/URSI Radio Science Meeting*, Atlanta, Georgia, June 21-26, 1998. (presented by N. Engheta)

C. A. Moses and N. Engheta, "Wire Media as Complex Media with Electrically Large Inclusions" presented at a URSI-B session in the *1998 IEEE AP-S International Symposium/URSI Radio Science Meeting*, Atlanta, Georgia, June 21-26, 1998. (presented by N. Engheta)

C. A. Moses and N. Engheta, " 'Angular Window' of Propagation in Wire Media," presented in the *Progress in Electromagnetic Research Symposium (PIERS'98), Nantes, France*, July 13-17, 1998. (presented by N. Engheta)

N. Engheta, "Fractional Paradigm in Electromagnetism," presented in the *Progress in Electromagnetic Research Symposium (PIERS'98), Nantes, France*, July 13-17, 1998. (presented by N. Engheta)

N. Engheta, "Fractionalization of Kernels for Electromagnetic Intermediate-Zone Fields in Cylindrical and Spherical Geometries" presented in the *Progress in Electromagnetic Research Symposium (PIERS'98), Nantes, France*, July 13-17, 1998. (presented by N. Engheta)

(**invited**)N. Engheta, "Guided Waves in Unconventional Complex Media," presented as an invited talk in the workshop entitled *New Propagation Phenomena in Millimeter Wave Planar Circuits/Lines and Their Applications* at *the 1998 Asia-Pacific Microwave Conference (APMC'98), Yokohama, Japan*, December 8-11, 1998.

N. Engheta, "Gabor Transform of Fractional Kernel in Radiation Problems," presented in the AP-S special session in the *1999 IEEE AP-S International Symposium*, in Orlando, Florida, July 11-16, 1999. (Presented by N. Engheta)

(**invited**) N. Engheta, "Fractional Differintegrals and Electromagnetic Wave Scattering," presented as an invited talk in the Session B3: Scattering and Diffraction in *the XXVI General Assembly of International Union of Radio Science (URSI GA'99), in Toronto, Ontario, Canada*, August 13-21, 1999. (Presented by N. Engheta.)

N. Engheta and J. P. Vatsky, "Radiation from Complex-Order Fractional Multipoles," presented as a poster in the Session B4: Electromagnetic Theory in in *the XXVI General Assembly of International Union of Radio Science (URSI GA'99), in Toronto, Ontario, Canada*, August 13-21, 1999. (Presented by N. Engheta.)

B. Alterman, L. Daniele, C. Daniele, J. B. Demb, N. Engheta, B. Wandell, and E. N. Pugh, Jr., "Attention modulates up to 10-fold the amplitude of scalp potentials evoked by small, flickering stimuli," a poster presented in *the 29th Annual Meeting of the Society for Neuroscience, in Miami Beach, Florida*, October 23-28, 1999. (Presented by E. N. Pugh, L. Daniele, and C. Daniele.)

E. N. Pugh, Jr., J. B. Demb, B. Alterman, C. Daniele, L. Daniele, H. Baseler, N. Engheta, and B. Wandell, "Visual potentials evoked by small oscillating sources located by fMRI: the sagittal fissure is a major shunt," a poster presented in *the 29th Annual Meeting of the Society for Neuroscience, in Miami Beach, Florida*, October 23-28, 1999. (Presented by E. N. Pugh, L. Daniele, and C. Daniele.)

(**invited plenary talk**) N. Engheta, "Fractional Derivatives, Fractional Integrals and Electromagnetic Theory," presented as an invited plenary talk at *the International Conference on Computational Electromagnetics and Its Applications, Beijing, China*, November 1-4, 1999. (presented by N. Engheta)

(**invited**) N. Engheta, "Applications of Fractional Operators in Physical Optics Approximations for Scattering from Impedance Boundaries," presented at the *2000 Day on Diffraction Millennium Symposium, St. Petersburg, Russia*, May 29-June 1, 2000. (presented by N. Engheta)

(**invited**) N. Engheta, "Fractional Operators and Solutions to Maxwell's Equations," presented in the special session on Fundamental Solutions to Maxwell's Equations in *European Electromagnetics* (*Euroem'2000*) conference*, Edinburgh, Scotland*, May 30-June 2, 2000. (presented by N. Engheta)

N. Engheta, "Fractional Stages in Scattering Problems," presented in the joint AP-S/URSI-B special session entitled Recent Developments in Theoretical Electromagnetics in the *2000 IEEE AP-S International Symposium/URSI-USNC Radio Science Meeting, Salt Lake City, Utah*, July 16-21, 2000. (presented by N. Engheta)

(**invited plenary talk**) N. Engheta, "Fractionalization Method and Its Applications in Radiation and Scattering Problems," presented as a plenary talk at *the Mathematical Methods in Electromagnetic Theory (MMET'2000), Kharkov, Ukraine*, September 12-15, 2000. (presented by N. Engheta)

(**Invited**) C. A. Moses and N. Engheta, "An Overview of the Theory of Wire Media," presented in the *Bianisotropics'2000, 8th International conference on Electromagnetics of Complex Media, Lisbon, Portugal*, September 27-29, 2000. (presented by N. Engheta)

C. A. Moses and N. Engheta, "Oblique Wave Propagation in the Feedforward-Feedbackward (FFFB) Media," presented in the special session on "Waves and Fields in Complex Media" in the *2001 URSI International Symposium on Electromagnetic Theory, in Victoria, British Columbia*, Canada, May 13-17, 2001. pp. 380-382 of the proceedings. (Presented by N. Engheta.)

N. Engheta, A. Mehta, G. Nieberg, "Dipole Radiation near a Wire-Medium Sheet above a Ground Plane" an URSI-B abstract for presentation in the URSI-B session, presented at the *2001 IEEE AP-S International Symposium and USNC/URSI National Radio Science Meeting, in Boston, MA*, July 8-13, 2001. page 387 of the URSI volume (presented by N. Engheta.).

N. Engheta, "Compact Cavity Resonators Using Metamaterials with Negative Permittivity and Permeability," presented at the *International Conference on Electromagnetics in Advanced Applications (ICEAA'01), in Torino, Italy*, September 10-14, 2001. pp. 739-742 of the proceedings (Presented by N. Engheta.)

(**Invited**) N. Engheta, "Metamaterials with Negative Permittivity and Permeability: EM Properties, Challenges, and Potential Applications," presented as an invited talk in the *Workshop "Wave Dispersion in Complex Environments" the University of Siena, Siena, Italy*, September 17-18, 2001.

N. Engheta, "Guided Waves in Paired Dielectric-Metamaterial with Negative Permittivity and Permeability Layers" presented at the *USNC-URSI National Radio Science Meeting, in Boulder, Colorado*, January 9-12, 2002. Page 66.

J. Zhu, A. Hoorfar, and N. Engheta, "Feed Locations of Hilbert-Curve Antennas" presented as a poster at the *2002 IEEE Sarnoff Symposium, New Jersey*, March 2002. (Presented by J. Zhu.)

K. M. Yemelyanov, M. A. Lo, E. N. Pugh, Jr., and N. Engheta, "Bio-Inspired Mapping of Polarization Information onto Visual Cues: Coherently Moving Dots and Textures," presented as a poster at *the 19th Annual Neuroscience Retreat of the David Mahoney Institute of Neurological Sciences, University of Pennsylvania, Philadelphia, PA*, April 25, 2002. (presented by K. M. Yemelyanov and N. Engheta.)

N. Engheta and E. N. Pugh, Jr., "Bio-Inspired Mapping and Display of Polarization Imagery," presented at the *AFOSR Bio-Inspired Theme Concept Workshop, Annapolis, Maryland*, April 29-30, 2002, abstract on page 39. (presented by N. Engheta)

(**Invited**) N. Engheta, "Ideas for Potential Applications of Metamaterials with Negative Permittivity and Permeability," presented as an Invited Talk at the *NATO Advanced Research Workshop of Bianisotropics'2002, 9th International Conference on Electromagnetics of Complex Media," Marrakech, Morocco*, May 8-11, 2002., Abstract on page 37. (presented by N. Engheta)

J. McVay, N. Engheta, and A. Hoorfar, "Dipole Radiation Near a Metamaterial Surface made of Hilbert-Curve Inclusions," presented as at the *NATO Advanced Research Workshop of Bianisotropics'2002, 9th International Conference on Electromagnetics of Complex Media," Marrakech, Morocco*, May 8-11, 2002., Abstract on page 38. (presented by N. Engheta)

(**Invited**) N. Engheta, S. Nelatury, and A. Hoorfar, "Omega Medium as a Metamaterial with Negative Permittivity and Permeability," as an URSI abstract for presentation in the joint URSI-B/AP-S special session on "Complex Media and Metamaterials", presented at the *2002 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC/URSI National Radio Science Meeting, in San Antonio, Texas*, June 16-21, 2002. (presented by N. Engheta.)

J. McVay, N. Engheta, and A. Hoorfar, "High-Impedance Metamaterial Surface Using Hilbert-Curve Inclusions," as an URSI abstract for presentation in the URSI-B special session on "Novel Challenges with Electromagnetic Bandgap Surfaces", presented at the *2002 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC/URSI National Radio Science Meeting, in San Antonio, Texas*, June 16-21, 2002. (presented by N. Engheta.)

(**Invited**) N. Engheta, "Thin Absorbing Screens Using Metamaterial Surfaces," as an AP-S summary for presentation in the AP-S special session on "Metamaterials for Applications in Antennas and Devices", presented at the *2002 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC/URSI National Radio Science Meeting, in San Antonio, Texas*, June 16-21, 2002, vol. 2, pp. 392-395 of Vol. 1 of the digest of AP-S. (presented by N. Engheta.)

A. Hoorfar, N. Engheta, R. Sun, and J. Zhu, "Non-Uniform Partially Reflective Surfaces for High Gain Planar Antennas," as an URSI abstract for presentation in the URSI-B special session on "Novel Challenges with Electromagnetic Bandgap Surfaces", presented at the *2002 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC/URSI National Radio Science Meeting, in San Antonio, Texas*, June 16-21, 2002. (presented by A. Hoorfar.)

(**Invited**) N. Engheta, "Frequency Selective Metamaterial Surfaces as High-Impedance Ground Planes for Sensor Applications," as an URSI abstract for presentation in the URSI-B special session on "Dielectric Measurement for Sensor Applications", presented at the *2002 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC/URSI National Radio Science Meeting, in San Antonio, Texas*, June 16-21, 2002. (presented by N. Engheta.)

A. Armogida, P. Nepa, G. Manara, and N. Engheta, "On Fractional Operators and Scattering from Impedance Wedges," as an URSI abstract for presentation in the URSI session, presented at the *2002 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC/URSI National Radio Science Meeting, in San Antonio, Texas*, June 16-21, 2002. (presented by N. Engheta.)

J. Zhu, A. Hoorfar, and N. Engheta, "Feed-point Effects in Hilbert-Curve Antennas", as an URSI abstract for presentation in the URSI-B special session on "Fractal Antenna Engineering",

presented at the *2002 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC/URSI National Radio Science Meeting, in San Antonio, Texas*, June 16-21, 2002. (presented by A. Hoorfar.)

N. Engheta, "On Foster's Reactance Theorem for Metamaterials with Negative Permittivity and Permeability," presented as a poster at Session B1: Electromagnetic Theory in *the XXVII General Assembly of International Union of Radio Science (URSI GA'02), in Maastricht, The Netherlands*, August 17-24, 2002, Paper number 1650 in the CD. (Presented by N. Engheta.)

(**Invited**) N. Engheta, S. Nelatury, and A. Hoorfar, "The Role of Geometry of Inclusions in Forming Metamaterials with Negative Permittivity and Permeability" presented as a poster at Session BP: Electromagnetic Theory of Complex Environments in *the XXVII General Assembly of International Union of Radio Science (URSI GA'02), in Maastricht, The Netherlands*, August 17-24, 2002, Paper number 1935 in the CD. (Presented by N. Engheta.)

A. Alu' and N. Engheta, "Anomalous Mode Coupling in Guided-Wave Structures Containing Metamaterials with Negative Permittivity and Permeability," presented at *the 2002 2nd IEEE Conference on Nanotechnology (IEEE-Nano'2002), Washington DC*, August 26-28, 2002, pp. 233-234 of the Proceedings. (Presented by N. Engheta.)

(**invited plenary talk**) N. Engheta, "Electromagnetics of Complex Media and Metamaterials," presented as a plenary talk at *the International Conference on the Mathematical Methods in Electromagnetic Theory (MMET'2002), Kiev, Ukraine*, September 10-13, 2002, pp. 175-180 of the Proceedings. (presented by N. Engheta)

A. Alu', F. Bilotti, N. Engheta, L. Vegni, "Il Ruolo dei Materiali Complessi nel Progetto di Componenti a Microonde di Nuova Generazione" at *RiNEM 2002*, Ancona, Italy, September 2002. (presented by A. Alu')

J. McVay, A. Hoorfar, and N. Engheta, "Applications of Hilbert Artificial Magnetic Conductor Ground planes to Performance Enhancement of Electrically Small Antennas," presented as a poster at *the 2003 IEEE Sarnoff Symposium in Advanced Wired and Wireless Communications, the College of New Jersey*, March 12, 2003, pp. 297-300 of the Proceedings. (presented by J. McVay).

- John McVay was selected to receive the First Prize in the Student Paper/Poster competition.

K. M. Yemelyanov, S.-S. Lin, W. Q. Luis, E. N. Pugh, Jr., and N. Engheta, "Bio-Inspired Temporal Fusion of Polarization Information into Optical Images," presented as a poster at *the 20th Annual Neuroscience Retreat of the David Mahoney Institute of Neurological Sciences, University of Pennsylvania, Bryn Mawr, Pennsylvania* April 10, 2003. (presented by K. M. Yemelyanov)

(**invited**) N. Engheta, "Double-Negative Media vs Single-Negative Media," presented at the "*DARPA Workshop on Negative Index MetaMaterials," Arlington, VA*, May 12-13, 2003.

N. Engheta and E. N. Pugh, Jr., "Bio-Inspired Techniques for Representation of Polarization Information and Enhancement of Target Detection in Polarization-Based Imaging and Vision," the *AFOSR Bio-Inspired Theme Concept Workshop, Annapolis, Maryland*, June 1-2, 2003, abstract on page . (presented by N. Engheta)

(**invited**) N. Engheta, "Metamaterials with Negative Permittivity and Permeability: Background, Salient Features and New Trends," in the focused session entitled "Negative Refractive Index Materials and Applications" at *the 2003 IEEE Microwave Theory and Techniques (MTT) International Microwave Symposium (IMS'03), Philadelphia, PA*, June 8-13, 2003, pp. 187-190 of the digest. (presented by N. Engheta.)

A. Alu and N. Engheta, "Mono-Modal Waveguides Filled with a Pair of Parallel Epsilon-Negative (ENG) and Mu-Negative (MNG) Metamaterial Layers," *the 2003 IEEE Microwave Theory and Techniques (MTT) International Microwave Symposium (IMS'03), Philadelphia, PA*, June 8-13, 2003, pp. 313-316 of the digest. (presented by N. Engheta.)

J. McVay, A. Hoorfar, and N. Engheta, "Radiation Characteristics of Microstrip Dipole Antennas Over a High-Impedance Metamaterial Surface Made of Hilbert Inclusions," *the 2003 IEEE Microwave Theory and Techniques (MTT) International Microwave Symposium (IMS'03), Philadelphia, PA*, June 8-13, 2003, pp. 587-590 of the digest. (presented by J. McVay.)

A. Alu and N. Engheta, "Circuit Equivalence of "Growing Exponential" in Pendry's Lens," as an URSI abstract in the joint URSI-B/AP-S special session on "Metamaterials, Part 1", the *2003 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-CNC-URSI North American Radio Science Meeting, Columbus, Ohio*, June 22-27, 2003, p. 22 of URSI digest. (presented by N. Engheta.)

A. Alu and N. Engheta, "Resonance Phenomenon in Paired Epsilon-Negative and Mu-Negative Bilayers," as an URSI abstract in the joint URSI-B/AP-S special session on "Metamaterials, Part 1", the *2003 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-CNC-URSI North American Radio Science Meeting, Columbus, Ohio*, June 22-27, 2003, p. 19 of URSI digest. (presented by N. Engheta.)

(**Invited**) A. Alu and N. Engheta, "Mode Excitation by a Line Source in a Parallel-Plate Waveguide Filled with a Pair of Parallel Double-Negative and Double-Positive Slabs," as an AP Summary in AP-S special session on "Electromagnetic Meta-Materials: Concept, Analysis, and Applications", the *2003 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-CNC-URSI North American Radio Science Meeting, in Columbus, Ohio*, June 22-27, 2003, pp. 359-362 of Vol. III of Digest. (presented by A. Alu.)

- Andrea Alu' was selected to receive the 2nd Prize in the 2003 IEEE AP-S Student Paper competition for this paper.

E. I. Veliev and N. Engheta, "Generalization of Green's Theorem with Fractional Differintegration," as an URSI abstract in the URSI session, the *2003 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-CNC-URSI*

North American Radio Science Meeting, in Columbus, Ohio, June 22-27, 2003, p. 558 of URSI digest. (presented by N. Engheta)

J. McVay, N. Engheta and A. Hoorfar, "Patch Antenna above Hilbert High-Impedance Surface," as an URSI abstract in the joint URSI-B/AP-S special session on "Metamaterials, Part 2", the *2003 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-CNC-URSI North American Radio Science Meeting, in Columbus, Ohio*, June 22-27, 2003, p. 164 of URSI digest. (presented by N. Engheta.)

J. Zhu, A. Hoorfar, and N. Engheta, "Peano Antennas", as an URSI abstract in the URSI Session, the *2003 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-CNC-URSI North American Radio Science Meeting, in Columbus, Ohio*, June 22-27, 2003, p. 110 of URSI Digest. (presented by A. Hoorfar.)

A. Alu and N. Engheta, "Distributed-Circuit-Element Description of Guided-Wave Structures and Cavities Involving Double-Negative or Single-Negative Media," *the 2003 SPIE-The International Society for Optical Engineering, Volume 5218 (the Complex Mediums IV: Beyond Linear Isotropic Dielectrics), San Diego, California*, August 3-8, 2003, pp. 145-155. (presented by N. Engheta.)

(**invited**) K. M. Yemelyanov, S.-S. Lin, W. Q. Luis, E. N. Pugh, Jr., and N. Engheta, "Bio-Inspired Display of Polarization Information Using Selected Visual Cues," the *2003 SPIE-The International Society for Optical Engineering,Volume 5158 (the Polarization Science and Remote Sensing), San Diego, California*, August 3-8, 2003, pp. 71-84 of Volume 5158. (presented by N. Engheta.)

A. Alu and N. Engheta, "Resonances in Sub-wavelength Cylindrical Structures Made of Pairs of Double-Negative and Double-Negative or Epsilon-Negative and Mu-Negative Coaxial Shells," the special session on "Metamaterials: Double-Negative Structures" in *the International Conference in Electromagnetics and Advance Applications (ICEAA'03) Torino, Italy*, September 8-12, 2003, pp. 435-438. (presented by N. Engheta.)

A. Hoorfar, J. Zhu, and N. Engheta, "Evolutionary Synthesis of Non-Uniform Partially Reflective Surfaces for Beam Shaping of Microstrip Antennas," the special session on "Metamaterials: Electromagnetic Bandgap (EBG) Media" in *the International Conference in Electromagnetics and Advance Applications (ICEAA'03) Torino, Italy*, September 8-12, 2003, pp. 675-678. (presented by A Hoorfar.)

K. M. Yemelyanov, S.-S. Lin, W. Q. Luis, E. N. Pugh, Jr., and N. Engheta, "Bio-inspired visualization of polarization information using temporal fusion, flicker, coherently moving dots and texture," the *Annual Meeting of the Optical Society of America, Tuscon, Arizona*, October 5-9, 2003, p. WM5 of the CD digest. (presented by N. Engheta.)

S.-S. Lin, K. M. Yemelyanov, W. Q. Luis, E. N. Pugh, Jr., and N. Engheta, "Biomimetic, adaptive, optimum polarization-opponent imaging of scenes with preferential polarization distributions," the *Annual Meeting of the Optical Society of America, Tuscon, Arizona*, October 5-9, 2003, p.. MT32 of CD digest. (presented by N. Engheta.)

(Invited) A. Alu and N. Engheta, "'Ideal' Virtual Image Formation and Wave Tunneling in a Lens Made of a Pair of Epsilon-Negative (ENG) and Mu-Negative (MNG) Slabs," the *2003 Progress in Electromagnetic Research Symposium (PIERS'2003), Waikiki, Hawaii*, October 13-16, 2003, p. 19. (presented by N. Engheta.)

(Invited) A. Alu and N. Engheta, "Sub-Wavelength Resonant Structures Containing Double-Negative (DNG) or Single-Negative (SNG) Media: Planar, Cylindrical and Spherical Cavities, Waveguides, and Open Scatterers," the *2003 Progress in Electromagnetic Research Symposium (PIERS'2003), Waikiki, Hawaii*, October 13-16, 2003, p. 12. (presented by N. Engheta.)

(Invited) J. Zhu, A. Hoorfar and N. Engheta, "An Overview of the Role of Space-Filling Curves in Radiation and Scattering Problems, Part 1: Electrically Small Antennas," the *2003 Progress in Electromagnetic Research Symposium (PIERS'2003), Waikiki, Hawaii*, October 13-16, 2003, p. 13. (presented by N. Engheta.)

(Invited) J. McVay, N. Engheta, A. Hoorfar, "An Overview of the Role of Space-Filling Curves in Radiation and Scattering Problems, Part 2: Artificial Magnetic Conductors," the *2003 Progress in Electromagnetic Research Symposium (PIERS'2003), Waikiki, Hawaii*, October 13-16, 2003, p. 11.. (presented by N. Engheta.)

(Invited) N. Engheta and Andrea Alu, "'May Cavities and Waveguides Be Ultra-Thin and Still Support Resonant Modes When They Contain Double-Negative or Single-Negative Media?" The workshop on Left-Handed Metamaterials, the *2003 Progress in Electromagnetic Research Symposium (PIERS'2003), Waikiki, Hawaii*, October 13-16, 2003, p. 381. (presented by N. Engheta.)

(Invited) N. Engheta and Andrea Alu, "Reconstruction of Evanescent Waves Using Double-Negative (DNG) or Single-Negative (SNG) Media" the workshop on Left-Handed Metamaterials, the *2003 Progress in Electromagnetic Research Symposium (PIERS'2003), Waikiki, Hawaii*, October 13-16, 2003, p. 382. (presented by N. Engheta.)

J. Zhu, A. Hoorfar, and N. Engheta, "Mutual Coupling Effects in Space-Filling-Curve Antennas," the *IEEE Topical Conference on Wireless Communication Technology*, Waikiki, Hawaii, October 15-17, 2003. (presented by N. Engheta.)

A. Alu, F. Bilotti, N. Engheta, and L. Vegni, "Employing Metamaterial Layers to Enhance Wave Transmission through a Sub-Wavelength Hole in a Flat Perfectly Conducting Screen," the *Workshop on New Frontiers in Radiation and Guidance Phenomena, Honoring Professor Arthur Oliner at the Occasion of Receiving Honorary Laura Degree from Universita' di Roma "La Sapienza"*, Rome, Italy, September 29, 2003. (presented by A. Alu).

A. Alu, F. Bilotti, N. Engheta, and L. Vegni, "How Metamaterials May Significantly Affect the Wave Transmission through a Sub-Wavelength Hole in a Flat Perfectly Conducting Screen," *Workshop on Metamaterials for Microwave and (Sub) millimetre Wave Applications: Photonic Bandgap and Double Negative Designs, Components and Experiments*, London, UK, November 24, 2003. (presented by A. Alu).

A. Alu and N. Engheta, "Image De-Blurring Using Double-Negative (DNG) or Single-Negative (SNG) Metamaterial Layers," the *URSI-USNC National Radio Science Meeting, Boulder, CO*, January 5-8, 2004, p. 17 of the digest. (presented by N. Engheta).

(Invited) N. Engheta and A. Alu, "Scattering and Wave Guiding in Left-Handed and Plasmonic Media" at the Photonic, Excitonic, Spintronic Processes in Nanostructures International Conference in Honor of the 75th Birthday of Professor Vladimir Agronovich, Richardson, Texas, Jan. 22-24, 2004. (presented by N. Engheta).

N. Bliznyuk, N. Engheta, and A. Hoorfar, "An Efficient Hybrid Computational Technique for Certain Scattering and Radiation Problems in Layered Media," the *2004 IEEE Aerospace Conference, Big Sky, Montana*, March 6-13, 2004, 13-page chapter in the proceedings. (presented by N. Bliznyuk).

(Invited) S.-S. Lin, K. Yemelyanov, E. N. Pugh, Jr., and N. Engheta, "Polarization Enhanced Visual Surveillance Techniques," in the *Special Session on "Visual Surveillance" of the IEEE 2004 International Conference on Networking, Sensing and Control, Taipei, Taiwan,* March 21-23, 2004. (presented by S.-S. Lin).

(Invited) A. Alu and N. Engheta, "Anomalies in Surface Wave Propagation along Double-Negative and Single-Negative Cylindrical Shells," the *2004 Progress in Electromagnetic Research Symposium (PIERS'2004), Pisa, Italy*, March 28-31, 2004 (presented by A. Alu).

(Invited) M. Caiazzo, S. Maci, and N. Engheta, "A Compact Cavity Resonator Using Metamaterial Surfaces," the *2004 Progress in Electromagnetic Research Symposium (PIERS'2004), Pisa, Italy*, March 28-31, 2004 (presented by S. Maci).

(Invited) N. Engheta and A. Alu, "Selected Features of Metamaterials and Plasmonic Media," *the IX Workshop on Microwave Engineering: Metamaterials and Special Materials for Electromagnetic and TLC Applications, Universita di Roma Tre, Roma, Italy*, April 5, 2004, page 4 (presented by N. Engheta).

A. Alu, F. Bilotti, N. Engheta, and L. Vegni, "Metamaterial Covers for Enhanced Transmission through a Sub-Wavelength Hole in a Flat Perfectly Conducting Screen," *the IX Workshop on Microwave Engineering: Metamaterials and Special Materials for Electromagnetic and TLC Applications, Universita di Roma Tre, Roma, Italy*, April 5, 2004, page 7 (presented by A. Alu)

V. R. Kumandori, A. Hoorfar, and N. Engheta, "Wideband Printed Antenna Elements for Through-Wall Microwave Imaging Applications," presented as a poster at the *2004 IEEE Sarnoff Symposium in Advanced Wired and Wireless Communications*, Nassau Inn, Princeton, NJ, April 26-27, 2004. (presented by V. R. Kumandori)

A. Alu and N. Engheta, "Peculiar Scattering Problems in Double-Negative and Single-Negative Metamaterials," presented at the *2004 IEEE Radar Conference, Philadelphia, PA*, April 26-29, pp. 91-93 of the Proceedings, 2004. (presented by N. Engheta).

(Invited) N. Engheta, E. N. Pugh, Jr., S.-S. Lin, and K. Yemelyanov, "'Seeing the Invisible: Bio-Inspired Polarization Sensing and Imaging of Polarization Information in Nature,"

presented at the workshop on *Polarization and Coherence Properties of Electromagnetic Fields, School of Optics, University of Central Florida, Orlando, Florida*, May 4-5, 2004, page 11 of the workshop digest (presented by N. Engheta).

(Invited) A. Alu and N. Engheta, "Tunneling and 'Growing Evanescent Envelopes' in a Pair of Cascaded Sets of Frequency Selective Surfaces in Their Band Gaps," in the Special Session "Metamaterials" at the *2004 URSI International Symposium on Electromagnetic Theory, Pisa, Italy*, May 24-27, 2004, pp. 90-92, Vol. 1 of the Proceedings. (Presented by A. Alu).

- To present this paper, Andrea Alu' was selected to receive the URSI Young Scientist Award.

(Invited) A. Alu and N. Engheta, "Polarizabilities and Effective Material Parameters for Collection of Spherical Nano-Particles Containing Concentric Double-Negative (DNG) and Single-Negative (SNG) Shells," in the Special Session "role of electromagnetism in micro- and nano-technologies" at the *2004 URSI International Symposium on Electromagnetic Theory, Pisa, Italy*, May 24-27, 2004, pp. 24-26, Vol. 1 of the Proceedings. (Presented by N. Engheta)

(Invited) J. McVay, N. Engheta and A. Hoorfar, "Peano High-Impedance Surfaces," in the Special Session "Artificial Magnetic Conductors, Hard and Soft Surfaces, and Other Complex Surfaces" at the *2004 URSI International Symposium on Electromagnetic Theory, Pisa, Italy*, May 24-27, 2004, pp. 284-286, Vol. 1 of the Proceedings. (Presented by A. Hoorfar)

M. Caiazzo, S. Maci, and N. Engheta, "Frequency Selective Surfaces for Compact Cavity Resonators," in the Special Session "Artificial Magnetic Conductors, Hard and Soft Surfaces, and Other Complex Surfaces" at the *2004 URSI International Symposium on Electromagnetic Theory, Pisa, Italy*, May 24-27, 2004, pp. 1176-1178, Vol. 2 of the Proceedings. (Presented by N. Engheta)

A. Alu, F. Bilotti, N. Engheta, and L. Vegni, "Metamaterial Bilayers for Enhancement of Wave Transmission through a Small Hole in a Flat Perfectly Conducting Screen," at the AP-S/URSI Joint Special Session on "Metamaterials" at the *2004 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-URSI National Radio Science Meeting, in Monterey, CA*, June 20-26, 2004, pp. 3163-3166, Vol. 3 of the digest. (Presented by A. Alu).

- For this paper, Andrea Alu' was selected to be among the finalists of this Symposium's Student Paper competition. He also received the The Raj Mittra Travel Grant.

(Invited) A. Alu, N. Engheta, and R. W. Ziolkowski, "FDTD Simulation of Tunneling and "Growing Exponential" in a Pair of epsilon-negative and mu-negative Slabs," at the AP-S/URSI Joint Special Session on "Smart Electromagnetic Materials and Applications" at the *2004 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-URSI National Radio Science Meeting, in Monterey, CA*, June 20-26, 2004, page 18 of the URSI digest.(presented by A. Alu).

J. McVay, A. Hoorfar, and N. Engheta, "Small Dipole Antenna near Peano High-Impedance Surfaces," at the AP-S/URSI Joint Special Session on "Electromagnetic Bandgap Surfaces" at the *2004 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-URSI National Radio Science Meeting, in Monterey, CA*, June 20-26, 2004, pp. 305-308, Vol. 1 of the digest. (Presented by J. McVay).

(Invited) J. McVay, N. Engheta and A. Hoorfar, "Space-Filling-Curve Elements as Possible Inclusions for Double-Negative Metamaterials," at the AP-S/URSI Joint Special Session on "Metamaterials for Electromagnetic Applications" at the *2004 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-URSI National Radio Science Meeting, in Monterey, CA*, June 20-26, 2004, p. 136 of the URSI Digest. (Presented by J. McVay).

N. Bliznyuk, N. Engheta, and A. Hoorfar, "Effects of Wall Thickness and Standing Waves between Walls in Through-Wall-Imaging Applications," at the AP-S/URSI Joint Special Session on "Through-Wall Microwave Sensing and Imaging" at the *2004 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-URSI National Radio Science Meeting, in Monterey, CA*, June 20-26, 2004, p. 272 of the URSI Digest. (Presented by N. Bliznyuk).

A. Alu and N. Engheta, "Reducing Scattering from Cylinders and Spheres Using Metamaterials," at the AP-S/URSI Joint Special Session on "Metamaterials" at the *2004 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-URSI National Radio Science Meeting, in Monterey, CA*, June 20-26, 2004, page 231 of the URSI Digest (presented by N. Engheta).

(Invited) A. Alu and N. Engheta, "Strong Quadrupole Scattering from Ultra Small Metamaterial Nanoshells," at the AP-S/URSI Joint Special Session on "Microscales and Nanoscales Electromagnetics" at the *2004 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-URSI National Radio Science Meeting, in Monterey, CA*, June 20-26, 2004, p. 210 of the URSI Digest (presented by N. Engheta).

N. Engheta, N. Bliznyuk and A. Alu, "Interaction between plasmonic and non-plasmonic nanospheres and their equivalent nano-circuit elements," at the AP-S/URSI Joint Special Session on "Metamaterials" at the *2004 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-URSI National Radio Science Meeting, in Monterey, CA*, June 20-26, 2004, p. 276 of the URSI Digest (presented by N. Engheta).

(Invited) N. Engheta, "Metamaterials, Plasmonic Nanostructures, and Nano-Electromagnetism," in the workshop on "Nanotechnology and Advance Materials" at *the 2004 IEEE EMC Conference, Santa Clara, CA*, August 9-13, 2004. (presented by N. Engheta)

M. Mussetta, N. Bliznyuk, P. Pirinoli, N. Engheta, and R. Zich, "Applications of Genetic Algorithms for Optimization of FSS Reflectarray Antennas," *Proceedings of the Mathematical Methods in Electromagnetic Theory (MMET'2004), Dnepropetrovsk, Ukraine*, September 14-17, 2004, pp. 522-524. (presented by R. Zich)

E. I. Veliev and N. Engheta, "Fractional Curl Operator in Reflection Problems," *Proceedings of the Mathematical Methods in Electromagnetic Theory (MMET'2004),*

Dnepropetrovsk, Ukraine, September 14-17, 2004, pp. 228-230. (presented by E. Veliev)

(Invited) N. Engheta, "Engineering Metamaterials: Concept and Potential Applications," in the special session of Metamaterials at the *28th Annual Antenna Applications Symposium, Monticello, Illinois*, September 15-17, 2004. (presented by N. Engheta).

A. Alu, F. Bilotti, N. Engheta and L. Vegni, "Scattering Anomalo da Cavita' per Antenne Caricate Parzialmente con Metamateriali," in *Proceedings of the XV Riunione Nazionale di Elettromagnetismo Applicato (RiNEM 2004), Cagliari, Italy*, September 13-16, 2004. (presented by A. Alu')

(Invited keynote talk) N. Engheta and A. Alu', "Metamaterials and Plasmonic Media: Theory and Potential Applicastions" *Proceedings of the Bianisotropics'04: 10th International Conference on Complex Media and Metamaterials," Ghent, Belgium*, September 22-24, 2004, pp. 2-6. (presented by N. Engheta.)

(Invited) A. Alu, F. Bilotti, N. Engheta and L. Vegni, "Metamaterials: Technology and Applications," at *Secondo Convegno Nazionale delle Microonde nell'Ingegneria e nelle Scienze Applicate (MISA 2004), Ancona, Italy*, October 6-8, 2004. (presented by A. Alu')

(Invited) N. Engheta, "Anomalous Wave Manipulation in Metamaterials and Plasmonic Structures" at the *2004 European Microwave Conference (EuMC'04), Amsterdam, The Netherlands*, October 11-15, 2004, pp. 29-48 of the Short Course SC EuMC01 Proceedings on "Left-Handed Metamaterials, Circuits and Their Technical Applications. (presented by N. Engheta)

K. Yemelyanov, S.-S. Lin, E. N. Pugh, Jr., and N. Engheta, "Bio-Inspired Adaptive Algorithms for 2- and 3-Channel Polarization Sensing under Various Polarization Statistics with Non-Uniform Distributions," a poster at *the Annual Meeting of the Optical Society of America, Rochester, New York*, October 11-14, 2004, p. FTuG27. (presented by K. Yemelyanov)

N. Engheta, A. Alu', A. Salandrino, N. Bliznyuk "Circuit-Element Interpretation of Optical Energy Transport along a Chain of Plasmonic Nanoparticles," a poster at *the Annual Meeting of the Optical Society of America, Rochester, New York*, October 11-14, 2004, p. FWH47. (presented by N. Engheta)

N. Bliznyuk, M. Mussetta, P. Pirinoli, N. Engheta, and R. Zich, "Design of a Gangbuster Reflectarray Antenna Optimized via Genetic Algorithms," in *Proceedings of the 13th International Symposium on Antennas – JINA 2004, Nice, France*, November 8-10, 2004 (presented by R. Zich and P. Pirinoli)

(Invited) N. Engheta, E. N. Pugh, Jr., S.-S. Lin, and K. M. Yemelyanov, "Biologically Inspired Sensing and Imaging of Polarization Information in Nature" at *the USNC-URSI National Radio Science Meeting, Boulder, Colorado*, Jan. 5-8, 2005, p. 455 of URSI Digest (presented by N. Engheta).

(Invited) A. Alu' and N. Engheta, "More on Transparency of Objects Using Plasmonic Metamaterials" at *the USNC-URSI National Radio Science Meeting, Boulder, Colorado*, Jan. 5-8, 2005, p. 31 of URSI Digest. (presented by N. Engheta).

(Invited plenary talk) N. Engheta, "Seeing the Invisible: Polarization Vision, Its Biophysical Mechanism and Non-invasive Imaging Applications" at *the USNC-URSI National Radio Science Meeting, Boulder, Colorado*, Jan. 5-8, 2005, p. x of URSI Digest (presented by N. Engheta).

(Invited) N. Engheta, "Ideas for Double-Negative Metamaterials, Negative-Index Nano-Layers, Nano-Circuit Elements, and Transmission Lines at Optical Frequencies" at *Latsis Symposium 2005 on Negative Refraction: Revisiting Electromagnetics from Microwave to Optics, Swiss Federal Institute of Technology, Lausanne (EPFL), Switzerland*, February 28-March2, 2005, page 54-56 of book of abstracts (presented by N. Engheta).

A. Alu', F. Bilotti, N. Engheta, and L. Vegni, "Potential Antenna Applications of Metamaterials," in Proceedings of *European Coorporation in the field of Scientific and Technical research (COST) Action 284, 7th Management Committee Business Meeting, Chexbras, Switzerland,* March 2-4, 2005 (presented by A. Alu').

(Invited keynote speech) N. Engheta, A. Salandrino and A. Alu', "Nanocircuit Elements, Nano-Transmission Lines, and Nano-Antennas Using Plasmonic Materials in the Optical Domain," *Proceedings of the International Workshop on Antenna Technology: Small Antennas and Novel Metamaterials (iWAT'05),* Singapore, March 7-9, 2005, page 165-168 (presented by N. Engheta).

N. Engheta, A. Alu', A. Salandrino, "Nanocircuit Elements, Left-Handed Nano-Transmission-Lines and Layered Metamaterials at Optical Frequencies," at *the 2005 American Physical Society (APS) March Meeting, Los Angeles, CA*, March 21-25, 2005, page 1298 of Bulletin, Part 2. (presented by N. Engheta).

N. Engheta, A. Alu', A. Salandrino, "Negative Magnetic Response and Left-Handed Metamaterials in the Optical Domain Using Plasmonic Nanostructures," *the 2005 American Physical Society (APS) March Meeting, Los Angeles, CA*, March 21-25, 2005, page 178 of the Bulletin, Part 1 (presented by N. Engheta).

A. Alu', F. Bilotti, N. Engheta, and L. Vegni, "A sub-wavelength, omnidirectional leaky wave antenna made of a resonant cylindrical metamaterial shell," *the 2005 Loughborough Antennas and Propagation Conference (LAPC'2005), Loughborough, UK*, April, 4-6, 2005 (presented by F. Bilotti).

K. M. Yemelyanov, S.-S. Lin, E. N. Pugh, Jr., and N. Engheta, "Overview of Bio-Inspired Sensing and Imaging of Polarization Information in Nature," presented as a poster at *the 21th Annual Neuroscience Retreat of the Mahoney Institute of Neurological Sciences, University of Pennsylvania, Bryn Mawr, Pennsylvania* April 20, 2005. (presented by K. M. Yemelyanov and S.-S. Lin)

N. Engheta and R. W. Ziolkowski, "Sub-Wavelength Electrically Small Cavity Resonators, Waveguides, and Antennas Using Negative-Index Metamaterials," at *Defense Advanced*

Research Projects Agency (DARPA) Negative Index Materials Kick-Off Meeting, San Antonio, Texas, April 27-29, 2005. (presented by N. Engheta)

B. Perlman, L. Katehi, A. Ballato, N. Engheta, D. Peroulis, W. Chappell, "Nanotechnology and Active Thin Films for Compact RF Components and Agile Systems," at *the 2005 U.S. Army Workshop on Advanced Active Thin Film Materials for the Next Generation of Meso- and Micro-Scale Army Applications, Destin, FL,* May 10-12, 2005. (presented by B. Perlman)

A. Alu, F. Bilotti, N. Engheta, and L. Vegni, "Conformal, Omni-Directional, Leaky-Wave Radiators with Down-Tilted Beams Using Cylindrical Metamaterial Covers," *4th European Workshop on Conformal Antennas, Stockholm, Sweden*, May 23-24, 2005, pp. 117-120. (presented by Andrea Alu).

J. Zhu, A. Hoorfar, N. Engheta, F. Plonski, "Miniaturized Antennas for Low-Frequency Applications," *the Intelligent Ship Symposium IV," Villanova, PA*, June 1-2, 2005 (presented by A. Hoorfar).

(Invited) N. Engheta and R. W. Ziolkowski, "Electromagnetic Theory of Metamaterials and Their Potential Engineering Concepts," at the workshop on "Physics, Theory, Fabrications and Applications of Micrwave Metamaterials" at *the 2005 IEEE Microwave Theory and Techniques International Microwave Symposium (IMS'05), Long Beach, CA,* June 12-17, 2005. (presented by N. Engheta)

(Invited) M. Amin, A. Hoorfar, S. Kassam, N. Engheta, "Through-the-Wall Microwave Imaging at Villanova-UPenn," at the workshop on "See-Through-Wall Radar" at *the 2005 IEEE Microwave Theory and Techniques International Microwave Symposium (IMS'05), Long Beach, CA,* June 12-17, 2005. (presented by N. Engheta)

A. Alu', F. Bilotti, N. Engheta, L. Vegni, "Compact Leaky-Wave Components Using Metamaterialsm," *Digest of the 2005 IEEE Microwave Theory and Techniques International Microwave Symposium (IMS'05), Long Beach, CA*, June 12-17, 2005. (presented by N. Engheta).

(Invited) A. Alu', F. Bilotti, N. Engheta, L. Vegni, "Radiation Properties of Sub-Wavelength Resonant Patch Antennas Filled with a Pair of DPS, DNG, and/or SNG Metamaterial Blocks," the AP-S/URSI Joint Special Session on "Latest Developments on Metamaterials" at the *2005 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-URSI National Radio Science Meeting, in Washington, DC*, July 3-8, 2005, abstract on page 113 of the URSI Digest (presented by A. Alu')

A. Alu' and N. Engheta, "Sub-Wavelength Focusing and Negative Refraction along Positive-Index and Negative-Index Plasmonic Nano-Transmission Lines and Nano-Layers," the AP-S/URSI Joint Special Session on "Advances on Plasmonic and Other Electromagnetic Phenomena" at the *2005 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-URSI National Radio Science Meeting, in Washington, DC*, July 3-8, 2005, pp. 35-38, Vol. 1A of AP Digest (presented by A. Alu).

- For this paper, Andrea Alu' was selected to be among the finalists of this Symposium's Student Paper competition.

(Invited) V. Pierro, V. Galdi, I. Pinto, J. McVay, N. Engheta and A. Hoorfar, "Electromagnetic Properties of Space-Filling Wire Structures Based on Grid-Graph Hamiltonian Paths: Some Preliminary Results," the AP-S/URSI Joint Organized Session on "Smart Electromagnetic Materials" at the *2005 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-URSI National Radio Science Meeting, in Washington, DC*, July 3-8, 2005, abstract on page 214 of the URSI Digest (presented by V. Galdi)

K. M. Yemelyanov, J. McVay, N. Engheta, and A. Hoorfar, "Adaptive Polarization-Difference Algorithms for Through-the-Wall Microwave Imaging Scenarios," at the *2005 IEEE Antennas and Propagation Society (AP-S) International Symposium, in Washington, DC*, July 3-8, 2005, pp. 114-117, Vol. 4B of the AP Digest (presented by K. M. Yemelyanov)

M. G. Silveirinha. A. Alu', and N. Engheta, "Design and Applications of epsilon-negative (ENG) Metamaterials for RCS Reductions at Microwave Frequencies," the AP-S/URSI Joint Organized Session on "Advanced Numerical Methods for Modeling Metamaterials" at the *2005 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-URSI National Radio Science Meeting, in Washington, DC*, July 3-8, 2005, abstract on page 273 of the URSI Digest (presented by M. G. Silveirinha)

A. Alu', A. Salandrino, and N. Engheta, "Ring of Plasmonic Nanoparticles as an Inclusion with Negative Magnetic Response at Optical Frequencies," the AP-S/URSI Joint Special Session on "Advances on Plasmonic and Other Electromagnetic Phenomena" at the *2005 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-URSI National Radio Science Meeting, in Washington, DC*, July 3-8, 2005, abstract on page 13 of the URSI Digest (presented by N. Engheta)

N. Engheta, A. Salandrino, and A. Alu', "Conjoined nanoparticles as parallel and series circuit elements at optical frequencies," the AP-S/URSI Joint Special Session on "Advances on Plasmonic and Other Electromagnetic Phenomena" at the *2005 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-URSI National Radio Science Meeting, in Washington, DC*, July 3-8, 2005, abstract on page 14 of the URSI Digest (presented by N. Engheta)

M. Mussetta, P. Pirinoli, N. Bliznyuk, N. Engheta, and R. Zich, "Optimization of a Gangbuster Reflectarray Antenna," a poster at the *2005 IEEE Antennas and Propagation Society (AP-S) International Symposium, in Washington, DC*, July 3-8, 2005, pp. 626-629, Vol. 3A of AP Digest (presented by M. Mussetta)

V. R. Kumanduri, A. Hoorfar, N. Engheta, "Low-Profile Array Design Considerations for Through-the-Wall Microwave Imaging Considerations," the AP-S/URSI Joint Organized Session on "Through-Wall Microwave Imaging and Sensing" at the *2005 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-URSI National Radio Science Meeting, in Washington, DC*, July 3-8, 2005, pp. 338-341, Vol. 3B of the AP Digest (presented by V. R. Kumanduri)

(Invited) J. McVay, N. Engheta, A. Hoorfar, "Numerical Study and Parameter Estimation for Double-Negative Metamaterials with Hilbert-Curve Inclusions," the AP-S Organized Session on "Advances in Metamaterial Development: Theory and Applications" at the *2005 IEEE Antennas and Propagation Society (AP-S) International Symposium, in Washington, DC*, July 3-8, 2005, pp. 328-331, Vol. 2B of AP Digest (presented by J. McVay)

- For this paper, John McVay was selected to be among the finalists of this Symposium's Student Paper competition.

J. McVay, A. Hoorfar, N. Engheta, "Bandwidth Enhancement and Polarization-Dependence Reduction for Space-Filling Curve Artificial Magnetic Conductors," a poster at the *USNC-URSI National Radio Science Meeting, in Washington, DC*, July 3-8, 2005, abstract on page 454 of the URSI Digest (presented by J. McVay)

J. McVay, N. Engheta and A. Hoorfar, "Radio Frequency Identification (RFID) Tags Utilizing Passive Space Filling Curves," a poster at the *2005 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-URSI National Radio Science Meeting, in Washington, DC*, July 3-8, 2005, URSI Abstract (presented by J. McVay)

(Invited) J. McVay, A. Hoorfar, N. Engheta, "Thin Absorbers Using Space-Filling-Curve High-Impedance Surfaces," the AP-S/URSI Joint Special Session on "Latest Developments on Metamaterials" at the *2005 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-URSI National Radio Science Meeting, in Washington, DC*, July 3-8, 2005, pp. 22-25, Vol. 2A of AP Digest (presented by J. McVay)

(Invited) N. Engheta and A. Alu, "Can Negative-Parameter Metamaterials Provide High Directivity for Small Apertures and Antennas," the AP-S/URSI Joint Organized Session on "Sources and Discontinuities in Metamaterials" at the *2005 IEEE Antennas and Propagation Society (AP-S) International Symposium and USNC-URSI National Radio Science Meeting, in Washington, DC*, July 3-8, 2005, abstract on page 99 of the URSI Digest (presented by N. Engheta)

N. Engheta, "Negative-index metamaterials using plasmonic nano-structures," *AFOSR Program Review in Nanoelectronics, Negative-Index Materials and Superconducting Electronics, San Diego, CA*, July 26-28, 2005. (presented by N. Engheta)

(Invited) A. Alu' and N. Engheta, "Directive Beams from Small Apertures Loaded with Negative-Parameter Metamaterials," in the special session on "Metamaterials in Antenna and Microwave Engineering" at the *2005 Progress in Electromagnetic Research Symposium (PIERS'2005), Hangzhou, China*, p. 21 of Abstracts, August 22-26, 2005 (presented by N. Engheta).

N. Engheta, A. Salandrino, A. Alu', "Series and Parallel Arrangements of Optical Nanocircuit Elements," in the special session on "Selected Topics in Metamaterials and Plasmonic Media" at the *2005 Progress in Electromagnetic Research Symposium (PIERS'2005), Hangzhou, China*, p. 111 of Abstracts, August 22-26, 2005 (presented by N. Engheta).

(Invited) N. Engheta, A. Salandrino, A. Alu', "Optical Negative-Refraction Metamaterials, Nano-Layers and Nano-Transmission Lines," in the special session on "Nanoscopic

Electromagnetics" at the *2005 Progress in Electromagnetic Research Symposium (PIERS'2005), Hangzhou, China*, p. 232 of Abstracts, August 22-26, 2005 (presented by N. Engheta).

(Invited) N. Engheta, A. Hoorfar, and J. McVay, "Electrodynamics of Space-Filling Curves," the special session on "Wave interaction with aperiodic order" in *the International Conference in Electromagnetics and Advance Applications (ICEAA'05) Torino, Italy*, September 12-16, 2005, pp. 637-640. (presented by N. Engheta.)

N. Engheta, M. G. Silveirinha, A. Alu', and A. Salandrino, "Scattering and reflection properties of low-epsilon metamaterial shells and bends" the special session on "Metamaterials, Nanostructured electromagnetics and Plasmonic Effects – Part 2" in *the International Conference in Electromagnetics and Advance Applications (ICEAA'05) Torino, Italy*, September 12-16, 2005, pp. 101-104. (presented by N. Engheta.)

(Invited) J. Mc Vay, N. Engheta, and A. Hoorfar, "Numerical study of phase variation through double-negative and single-negative media formed by space-filling curve inclusions" the special session on "Metamaterials, Nanostructured electromagnetics and Plasmonic Effects – Part 2" in *the International Conference in Electromagnetics and Advance Applications (ICEAA'05) Torino, Italy*, September 12-16, 2005, pp. 99-100. (presented by A. Hoorfar.)

(Invited) A. Alu', F. Bilotti, N. Engheta, and L. Vegni, "A thin absorbing screen employing metamaterial complementary pairs" the special session on "Metamaterials, Nanostructured electromagnetics and Plasmonic Effects – Part 1" in *the International Conference in Electromagnetics and Advance Applications (ICEAA'05) Torino, Italy*, September 12-16, 2005, pp. 75-78. (presented by F. Bilotti.)

(Invited) A. Alu', F. Bilotti, N. Engheta, and L. Vegni, "Anomalous radiation properties of cylindrical metamaterial leaky wave antennas" the special session on "Metamaterials/ metamaorphose network" in *the International Conference in Electromagnetics and Advance Applications (ICEAA'05) Torino, Italy*, September 12-16, 2005, pp. 575-578. (presented by A. Alu')

M. Mussetta, P. Pirinoli, N. Bliznyuk, N. Engheta, R. E. Zich, "Design of a gangbuster surfcae off-set reflector antenna" in *the International Conference in Electromagnetics and Advance Applications (ICEAA'05) Torino, Italy*, September 12-16, 2005, pp. 779-782. (presented by R. Zich.)

(Invited) A. Alu', F. Bilotti, N. Engheta and L. Vegni, "COMetAs: Design of conformal omnidirectional metamaterial antennas," at special session on "Metamaterials, EBG and Plasmonic Structures" at the *18th International Conference on Applied Electromagnetics and Communications (ICECom'05), Dubrovnik, Croatia*, October 12-14, 2005, pp. 337-340 (presented by F. Bilotti).

(Invited) A. Alu', F. Bilotti, N. Engheta and L. Vegni, "Metamaterial Grounded Planar Bilayers Supporting Leaky Waves: Principles and Applications," at special session on "Metamaterials, EBG and Plasmonic Structures" at the *18th International Conference on Applied Electromagnetics and Communications (ICECom'05), Dubrovnik,*

Croatia, October 12-14, 2005, pp. 333-336 (presented by F. Bilotti). Also reprinted in *Automatika*, Vol. 47, 3-4, pp. 127-131 (2006).

N. Engheta, A. Alu' and A. Salandrino, "Negative refraction in the IR and visible frequencies," at special session on "Metamaterials, EBG and Plasmonic Structures" at the *18th International Conference on Applied Electromagnetics and Communications (ICECom'05), Dubrovnik, Croatia*, October 12-14, 2005, pp. 309-311 (presented by N. Engheta).

(Invited) N. Engheta, "Optical Metamaterials and Nano-Scale Circuit Elements and Systems in Optics," at *the Frontiers in Optics 2005 the 89th Annual Meeting of the Optical Society of America, Tucson, Arizona*, October 16-20, 2005 (presented by N. Engheta).

S.-S. Lin, K. M. Yemelyanov, E. N. Pugh, Jr., N. Engheta, "Optical Non-Invasive Latent Fingerprint Lifting," a poster at *the Frontiers in Optics 2005 the 89th Annual Meeting of the Optical Society of America, Tucson, Arizona*, October 16-20, 2005 (presented by S.-S. Lin).

J. Li and N. Engheta, "Optical Leaky-Wave Nano-Antennas Using Plasmonic Nanowires with Periodic Variation of Permittivity," a poster at *the Frontiers in Optics 2005 the 89th Annual Meeting of the Optical Society of America, Tucson, Arizona*, October 16-20, 2005 (presented by J. Li).

B. Edwards, S. Evoy and N. Engheta, "Analysis of Rotational and Translational Movement of a Metallic Nanorod via Electric Fields," a poster at *the Frontiers in Optics 2005 the 89th Annual Meeting of the Optical Society of America, Tucson, Arizona*, October 16-20, 2005 (presented by B. Edwards).

K. M. Yemelyanov, S.-S. Lin, E. N. Pugh, Jr., N. Engheta, "Polarization-Based Segmentation for Enhancement of Target Detection in Adaptive Polarization-Difference Imaging," a poster at *the Frontiers in Optics 2005 the 89th Annual Meeting of the Optical Society of America, Tucson, Arizona*, October 16-20, 2005 (presented by N. Engheta).

N. Engheta, J. Li, and A. Salandrino, "Pattern Synthesis in Optical Nano-Antennas Using Collections of Metallic Nanoparticles," a poster at *the Frontiers in Optics 2005 the 89th Annual Meeting of the Optical Society of America, Tucson, Arizona*, October 16-20, 2005 (presented by N. Engheta).

(General Lecture/Plenary Speech) N. Engheta, "Metamaterials and Plasmonic Phenomena," a General Pleneary Lecture at the *XXVIIIth Genaral Assembly of International Union of Radio Science, New Delhi, India*, October 23-29, 2005 (presented by N. Engheta).

A. Alu' and N. Engheta, "Low-Damping Guided Modes along Nano-Transmission Lines with Chains of Quadrupolar Resonant Plasmonic Nano-Particles" in the special session on "Electromagnetic Theory"at the *XXVIIIth Genaral Assembly of International Union of Radio Science, New Delhi, India*, October 23-29, 2005 (presented by A. Alu').

K. M. Yemelyanov, J. McVay, N. Engheta, A, Hoorfar, "Transient Adaptive Polarization Contrast Techniques in Time-Domain Scattering with Applications in Through-Wall Microwave Imaging" in the special session on "Applications of Time-Domain

Electromagnetics" at the *XXVIIIth Genaral Assembly of International Union of Radio Science, New Delhi, India*, October 23-29, 2005 (presented by A. Hoorfar).

N. Engheta, A. Alu and A. Salandrino, "DNG and SNG Metamaterials at Optical Frequencies," in the special session "Metamaterials, Plasmonic Structures and Their Applications" at the *XXVIIIth Genaral Assembly of International Union of Radio Science, New Delhi, India*, October 23-29, 2005 (presented by N. Engheta).

F. Bilotti, A, Alu', N. Engheta, and L. Vegni, "Metamaterial Sub-Wavelength Absorbers," *the 2005 Nanoscience and Nanotechnology Symposium – NN 2005, Frascati, Italy*, November 14-16, 2005 (presented by F. Bilotti)

(Invited) N. Engheta, "Metamaterials for Nanoelements and Nanodevices in Optics" at the *36th Winter Colloquium of the Physics of Quantum Electronics*, Snowbird, Utah, January 2-6, 2006 (presented by N. Engheta).

B. E. Edwards, S. Evoy, and N. Engheta, "Electric Tweezers: Experimental Study of Positive Dielectrophoresis Based Positioning and Orientation of a Gold Nanorod" at the *URSI-USNC National Radio Science Meeting, Boulder, CO*, January 4-7, 2006, p. 102 in abstracts book.

(● presented by B. Edwards in the plenary session as one of the three student finalists for the URSI Student Prize Paper Competition. B. Edwards was awarded No. 1 Prize in this competition) (presented by B. Edwards)

J. Li and N. Engheta, "Ultracompact sub-wavelength plasmonic cavity resonator on a nanowire" at the *URSI-USNC National Radio Science Meeting, Boulder, CO*, January 4-7, 2006, p. 53 in the abstracts book (presented by J. Li).

M. G. Silveirinha and N. Engheta, "Dispersion characteristics of guided-wave structures with ENZ media" at the *URSI-USNC National Radio Science Meeting, Boulder, CO*, January 4-7, 2006, p. 51 in the abstracts book. (presented by N. Engheta).

N. Engheta, "Scattering Transparency Using Metamaterials" at the *2006 DARPA Negative-Index Metamaterials PI Meeting*, Coronado Island, CA, January 11-13, 2006 (presented by N. Engheta).

J. McVay, A. Hoorfar, and N. Engheta, "Space-filling-curve RFID tags," at the *2006 IEEE Radio and Wireless Symposium, San Diego, CA*, Jan. 17-19, 2006 (presented by J. McVay).

(Invited) N. Engheta, "Metamaterials and Circuit Theory in Optics" at the *International Workshop on Electromagnetic Metamaterials: Phenomenology and Applications, Los Alamos National Laboratory, Los Alamos, NM*, January 18-20, 2006 (presented by N. Engheta).

(Invited) N. Engheta, "Metamaterials, Shrinking Circuit Elements, and Nanooptics," at *the Nanotechnology Revolution, The 3rd Annual Conference by the San Fernando Valley Engineers' Council, Studio City, CA*, February 24, 2006 (presented by N. Engheta).

J. Li, A. Salandrino, and N. Engheta, "Radiation Characteristics and Beam Forming of Multi-Particles Nanoantennas at Optical Frequencies," at the *2006 IEEE International Workshop on Antenna Technology (iWAT'06): Small Antennas and Novel Metamaterials, White Plains, New York*, March 6-8, 2006 (presented by N. Engheta).

N. Engheta and A. Alu, "1-D, 2-D, and 3-D Negative-Refraction Metamaterials at Optical Frequencies: Optical Nano-Transmission-Line and Circuit Theory," at the *2006 American Physical Society (APS) March Meeting, Baltimore, Maryland,* March 13-17, 2006 (presented by N. Engheta).

(Invited Kilby Plenary Lecture) N. Engheta, "Seeing the Invisible: Polarization Vision in Nature and Non-Invasive Imaging and Sensing Applications," at the *2006 Government Microcircuit Applications and Critical Technology Conferece (GOMACTech'06),* March 20-23, 2006 (presented by N. Engheta).

M. G. Silveirinha and N. Engheta, "Epsilon-near-zero (ENZ) Metamaterials as Insulators for Nanocircuit Elements," at the *2006 Progress in Electromagnetics Research Symposium (PIERS'06), Cambridge, MA,* March 26-29, 2006 (presented by N. Engheta).

A. Alu and N. Engheta, "Chain of Metamaterial Nanospheres as Leaky-Wave Nanoantennas at Optical Frequencies," at the *2006 Progress in Electromagnetics Research Symposium (PIERS'06), Cambridge, MA,* March 26-29, 2006 (presented by N. Engheta).

F. Bilotti, A, Alu', N. Engheta, and L. Vegni, "Features of a Metamaterial-Based Microwave Absorber," *the X Workshop on Microwave Engineering: Metamaterials and Special Materials for Electromagnetic and TLC Applications, Universita di Roma Tre, Roma, Italy*, March 30-31, 2006 (presented by F. Bilotti)

F. Bilotti, A, Alu', N. Engheta, and L. Vegni, "Metamaterial Complementary Pairs for Antenna Size Reduction," *the 2006 Loughborough Antennas and Propagation Conference (LAPC'2006), Loughborough, UK*, April, 11-17, 2006 (presented by F. Bilotti)

(Invited) N. Engheta, A. Alu, M. G. Silveirinha, A. Salandrino "DNG, SNG, and ENZ Materials for Optical Nanocircuits and Transparency," at the *2006 Material Research Society Spring Meeting, Focused Symposium on "Negative-Index Materials: From Microwave to Optical, San Francisco, CA,* April 17-21, 2006 (presented by N. Engheta).

(Invited) V. Browning, M. Tanielian, R. W. Ziolkowski, N. Engheta, and D. R. Smith "A DoD Perspective on Left-Handed Negative Index Materials and Some Potential Applications," at the *2006 Material Research Society Spring Meeting, Focused Symposium on "Negative-Index Materials: From Microwave to Optical, San Francisco, CA,* April 17-21, 2006 (presented by M. Tanielian).

J. McVay, A. Hoorfar, and N. Engheta, "Theory and Experiments on Peano and Hilbert Curve RFID Tags," at the Wireless Sensing and Processing Conference in *SPIE Symposium on Defense and Security*, Orlando, Florida, April 17-21, 2006 (presented by A. Hoorfar).

V. Gruev, K. Wu, J. Van der Spiegel, and N. Engheta, "Real-Time Extraction of Polarimetric Information at the Focal Plane," at the Polarization: Measurement, Analysis, and Remote Sensing VII Conference in *SPIE Symposium on Defense and Security*, Orlando, Florida, April 17-21, 2006 (presented by V. Gruev).

(Invited) N. Engheta, "Metamaterial Nanocircuits in Optics," at *2nd Optical Society of America (OSA) Integrated Photonics Research and Applications/Nanophotonics (IPRA/Nano) Topical Meeting, Uncasville, Connecticut,* April 26-28, 2006 (presented by N. Engheta).

(Invited) N. Engheta, A. Alu, M. G. Silveirinha, A. Salandrino, J. Li "DNG, SNG, ENZ, and MNZ Metamaterials and Their Potential Applications," at *the 13th IEEE Mediterranean Electrotechnical Conference (MELECON'2006), Torremolinos (Malaga), Spai*n, May 16-19, 2006 (presented by N. Engheta).

V. Gruev, J. Van der Spiegel, and N. Engheta, "Image Sensor with Focal Plane Extraction of Polarimetric Information," at the *2006 IEEE International Symposium on Circuits and Systems (ISCAS 2006), Island of Kos, Greece*, May 21-24, 2006 (presented by V. Gruev).

V. Gruev, K. Wu, J. Van der Spiegel, and N. Engheta, "Fabrication of a Thin Film Micro Polarization Array," at the *2006 IEEE International Symposium on Circuits and Systems (ISCAS 2006), Island of Kos, Greece*, May 21-24, 2006 (presented by V. Gruev).

N. Engheta, "Lumped Nanocircuit Elements and Circuit Theory in Nanooptics – Optical-Field Nanoelectronics," at the *2006 Synergy between Experiment and Computation in Nanoscale Science, Center for Nanoscale System, Harvard University, Cambridge, MA, May 31 – June 3, 2006* (presented by N. Engheta).

(Invited) N. Engheta, "Metamaterials and Nanocircuit Theory in Optics" at *the Optical Society of America Topping Meeting on "Photonic Metamaterials: From Random to Periodic", Grand Bahama Island, The Bahamas, June 5-9, 2006* (presented by N. Engheta).

G. Eleftheriades and N. Engheta, "Microstructured and Nanostructured Transmission-Line Metamaterials and Their Applications" lectures as short course at *the 2006 IEEE Antennas and Propagation Society (AP-S) International Symposium/URSI-USNC National Radio Science Meeting/AMREM, Albuquerque, NM*, July 9-14, 2006. (presented by G. Eleftheriades and N. Engheta)

J. McVay, V. R. Komanduri, K. M. Yemelyanov, A. Hoorfar, N. Engheta, "Experimental Study of Wall Effects on the Performance of a Dual Polarized, Broadband Array of Stacked E-Patch Elements in Through-Wall Imaging Applications," in the URSI-B session at the *2006 IEEE Antennas and Propagation Society (AP-S) International Symposium/URSI-USNC National Radio Science Meeting/AMREM, Albuquerque, NM*, July 9-14, 2006 (presented by J. McVay)

(Invited) A. Alu and N. Engheta, "Dispersion Properties of Volumetric Optical Nanotransmission-Line Metamaterials with Negative Refraction," in the URSI-B special

session on "Dispersion Engineering: Manipulating the Electric and Magnetic Response of the Media" at the *2006 IEEE Antennas and Propagation Society (AP-S) International Symposium/URSI-USNC National Radio Science Meeting/AMREM, Albuquerque, NM* July 9-14, 2006 (presented by N. Engheta)

A. Alu and N. Engheta, "Plasmonic Resonances in an ε-Negative Host Medium: Metamaterials at Optical Frequencies for Nano-Optics and Nanotechnology," in the AP-S session at the *2006 IEEE Antennas and Propagation Society (AP-S) International Symposium/URSI-USNC National Radio Science Meeting/AMREM, Albuquerque, NM* July 9-14, 2006 (presented by A. Alu)

C. Holloway, D. C. Love, E. F. Kuester, A. Salandrino, and N. Engheta, "Reducing Resonator Dimensions with the Use of Metafilms," in the URSI-B session at the *2006 IEEE Antennas and Propagation Society (AP-S) International Symposium/URSI-USNC National Radio Science Meeting/AMREM, Albuquerque, NM* , July 9-14, 2006 (presented by E. Kuester)

J. Li and N. Engheta, "Lasing Effects of a Single Core-Shell Nanoparticle," in the URSI-B session at the *2006 IEEE Antennas and Propagation Society (AP-S) International Symposium/URSI-USNC National Radio Science Meeting/AMREM, Albuquerque, NM* , July 9-14, 2006 (presented by J. Li)

J. Li and N. Engheta, "Feeding Nanoantennas with Nanowaveguides," in the URSI-B session at the *2006 IEEE Antennas and Propagation Society (AP-S) International Symposium/URSI-USNC National Radio Science Meeting/AMREM, Albuquerque, NM* , July 9-14, 2006 (presented by J. Li)

J. McVay, N. Engheta, A. Hoorfar, "Three-Dimensional Hilbert Space-Filling-Curve Plasmonics," in the AP-S session at the *2006 IEEE Antennas and Propagation Society (AP-S) International Symposium/URSI-USNC National Radio Science Meeting/AMREM, Albuquerque, NM*, July 9-14, 2006 (presented by J. McVay)

J. McVay, V. Pierro, V. Galdi, A. Hoorfar, N. Engheta, and I. M. Pinto, "Grid-Graph Hamiltonian-Path Based Inclusions for Artificial Magnetic Conductors with Reduced Polarization Sensitivity," in the URSI-B session at the *2006 IEEE Antennas and Propagation Society (AP-S) International Symposium/URSI-USNC National Radio Science Meeting/AMREM, Albuquerque, NM*, July 9-14, 2006 (presented by V. Galdi)

J. McVay, A. Hoorfar, and N. Engheta, "Space-Filling-Curve Antennas above Space-Filling-Curve High-Impedance Ground Planes," in the URSI-B session at the *2006 IEEE Antennas and Propagation Society (AP-S) International Symposium/URSI-USNC National Radio Science Meeting/AMREM, Albuquerque, NM* , July 9-14, 2006 (presented by J. McVay)

K. M Yemelyanov. J. McVay, A. Hoorfar, and N. Engheta, "Transient Adaptive Polarization-Contrast Imaging for Through-Wall Detection of Objects Inside the Room," in the URSI-B session at the *2006 IEEE Antennas and Propagation Society (AP-S) International Symposium/URSI-USNC National Radio Science Meeting/AMREM, Albuquerque, NM* , July 9-14, 2006 (presented by K. M. Yemelyanov)

(Invited) K. M Yemelyanov. J. McVay, N. Engheta, and A. Hoorfar "An Overview of the Role of Adaptive Polarization-Contrast Techniques in Through-Wall Microwave Imaging Applications," for the AMEREM Special Session at the *2006 IEEE Antennas and Propagation Society (AP-S) International Symposium/URSI-USNC National Radio Science Meeting/AMREM, Albuquerque, NM* , July 9-14, 2006 (presented by A. Hoorfar)

(Invited) M. G. Silveirinha and N. Engheta, "Squeezing and Tunneling of Waves through Sub-Wavelength Waveguide Bends and Discontinuities Using Epsilon-Near-Zero (ENZ) Metamaterials," in the URSI-B special session on "Microscale and Nanoscale Electromagnetics" at the *2006 IEEE Antennas and Propagation Society (AP-S) International Symposium/URSI-USNC National Radio Science Meeting/AMREM, Albuquerque, NM* , July 9-14, 2006 (presented by N. Engheta)

M. G. Silveirinha and N. Engheta, "Design of Mu-Near-Zero (MNZ) and Zero-Index Metamaterials Using Metallic or Plasmonic Non-Magnetic Dielectric Inclusions," in the URSI-B session at the *2006 IEEE Antennas and Propagation Society (AP-S) International Symposium/URSI-USNC National Radio Science Meeting/AMREM, Albuquerque, NM*, July 9-14, 2006 (presented by M. Silveirinha)

(Invited) N. Engheta, "Metamaterials in Microwave and Optics: A Review," in the AP-S special session on "Emerging Technologies Using Metamaterials" at the *2006 IEEE Antennas and Propagation Society (AP-S) International Symposium/URSI-USNC National Radio Science Meeting/AMREM, Albuquerque, NM* , July 9-14, 2006 (presented by N. Engheta)

M. Mussetta, P. Pirinoli, N. Blyznyuk, N. Engheta, R. Zich, "Frequency Response of a Gangbuster-Surface Off-Set Reflectarray Antennas," in the AP-S session at the *2006 IEEE Antennas and Propagation Society (AP-S) International Symposium/URSI-USNC National Radio Science Meeting/AMREM, Albuquerque, NM* , July 9-14, 2006 (presented by P. Pirinoli)

F. Bilotti, A. Alu, N. Engheta, and L. Vegni, "Compact Microwave Absorbers Utilizing Single-Negative Metamaterial Layers," in the URSI-B session at the *2006 IEEE Antennas and Propagation Society (AP-S) International Symposium/URSI-USNC National Radio Science Meeting/AMREM, Albuquerque, NM* , July 9-14, 2006 (presented by F. Bilotti)

A. Alu, F. Bilotti, N. Engheta, and L. Vegni, "Salient Features of Cylindrical Leaky-Wave Antennas with Metamaterial Loadings," in the URSI-B session at the *2006 IEEE Antennas and Propagation Society (AP-S) International Symposium/URSI-USNC National Radio Science Meeting/AMREM, Albuquerque, NM* , July 9-14, 2006 (presented by A. Alu)

S. Barbagallo, A. Monorchio, and N. Engheta, "On the Possibility of Constructing Negative-Refraction Metamaterials with Closely-Spaced Bi-Layered Frequency Selective Surfaces," in the URSI-B session at the *2006 IEEE Antennas and Propagation Society (AP-S) International Symposium/URSI-USNC National Radio Science Meeting/AMREM, Albuquerque, NM* , July 9-14, 2006 (presented by A. Monorchio)

S. Barbagallo, A. Monorchio, and N. Engheta, "Compact Mu-Negative (MNG) and Double-Negative (DNG) Media Using Bi-Layered Frequency Selective Surfaces Using Vias," in the URSI-B session at the *2006 IEEE Antennas and Propagation Society (AP-S) International Symposium/URSI-USNC National Radio Science Meeting/AMREM, Albuquerque, NM*, July 9-14, 2006 (presented by A. Monorchio)

(Invited) A. Alu and N. Engheta, "Metamaterials in the Far Infrared: Ideas for Left-Handed Metamaterials and Micro- and Nanocircuit Elements in the THz regime," in the AP-S special session on "THz Technologies and Applications" at the *2006 IEEE Antennas and Propagation Society (AP-S) International Symposium/URSI-USNC National Radio Science Meeting/AMREM, Albuquerque, NM*, July 9-14, 2006 (presented N. Engheta)

(Invited) N. Engheta, Discussion Leader for session on "Planar Surface Plasmon Polariton Structures" at *the 2006 Gordon Research Conference on "Plasmonics – Optics at the Nanoscale, Keene, New Hampshire*, July 23-28, 2006 (moderated by N. Engheta).

(Invited) N. Engheta, "Nano-Scale Circuit Elements and Circuit Theory in Opitcs: Concepts and Potentials," an invited talk in the session on "Nanophotonics and Plasmonics" in the *Quantum Electronics and Photonics Conference, Photon'06, Manchester, United Kingdom*, September 3-7, 2006 (presented by N. Engheta).

N. Engheta, "Metamaterial Phenomena and Plasmonic Structures and Elements", an invited talk in the *Spanish Network on Metmaterials (REME), Spain International Union of Radio Science (URSI), Oviedo, Spain*, September 12, 2006. (presented by N. Engheta)

N. Engheta, "Metamaterials and Novel Devices" an invited lecture at *the 2006 DPG Summer School on Metamaterials, Bad Honnef, Germany,* September 17-22, 2006. (Presented by N. Engheta)

(Invited) N. Engheta, "Metamaterials, Shrinking Circuit Elements, and Nanooptics" an invited talk in the special session on *Metamaterials* at *2006 Stanford Photonics Research Symposium, Stanford, CA*, September 20, 2006. (Presented by N. Engheta)

F. Bilotti, A. Alu, N. Engheta, A. Toscano, L. Vegni, "Metamaterial Based Microwave Components with Enhanced Features and Miniaturized Dimension," presented at *Mediterranean Microwave Symposium (MMS 2006), Genova, Italy*, September 19-21, 2006 (presented by F. Bilotti).

(Invited) N. Engheta, "Optical-Field Nanocircuits using Nanomaterials," an invited talk at *Bianisotropics'2006- 11th International Conference on Electromagnetic Properties of Complex Materials and Metamaterials, Samarkand, Uzbekistan*, September 25-27, 2006 (presented by N. Engheta).

(Invited) N. Engheta, "Metamaterials, Plasmonics, and Optical Nanocircuits" an invited talk in the *Institute for Mathematics and Its Applications (IMA) Hot Topics Workshop on "Negative Index Materials", University of Minnesota, Minneapolis, MN*, October 2-4, 2006. (Presented by N. Engheta).

A. Alu and N. Engheta, "Coupled Resonances to Increase Bandwidths of Metamaterial Antennas," a talk presented at *the Frontiers in Optics 2006 the 90th Annual Meeting*

of the Optical Society of America, Rochester, NY, October 8-12, 2006 (presented by A. Alu).

A. Alu, M. G. Silveirinha, A. Salandrino, and N. Engheta, "Source Interaction with Epsilon-Near-Zero (ENZ) Materials," a poster presented at *the Frontiers in Optics 2006 the 90th Annual Meeting of the Optical Society of America, Rochester, NY*, October 8-12, 2006 (presented by A. Alu).

N. Engheta, A. Alu, A. Salandrino, J. Li, M. Silveirinha, B. Edwards, "From Plasmonic Nanocircuit Elements to Volumetric Photonic Negative-Refraction Metamaterials," a talk presented at *the Frontiers in Optics 2006 the 90th Annual Meeting of the Optical Society of America, Rochester, NY*, October 8-12, 2006 (presented by A. N. Engheta).

A. Alu and N. Engheta, "Isotropic Negative Permeability at Optical Frequencies," a poster presented at *the Frontiers in Optics 2006 the 90th Annual Meeting of the Optical Society of America, Rochester, NY*, October 8-12, 2006 (presented by A. Alu).

A. Salandrino, B. Edwards, and N. Engheta, "Sub-Diffraction Optical Lenses for Use in Far-Field Sub-Wavelength Optical Microscopy (FSOM)," a talk presented at *the Frontiers in Optics 2006 the 90th Annual Meeting of the Optical Society of America, Rochester, NY*, October 8-12, 2006 (presented by A. Salandrino).

J. Li and N. Engheta, "Plane Waves in 3-D Periodic Distributions of Particles with High-Order Multipole Polarizabilities," a poster presented at *the Frontiers in Optics 2006 the 90th Annual Meeting of the Optical Society of America, Rochester, NY*, October 8-12, 2006 (presented by J. Li).

D. Krishnan, A. Salandrino, and N. Engheta, "Binary Encoding and Nanotagging Using Plasmonic Core-Shell Nanoparticles," a poster presented at *the Frontiers in Optics 2006 the 90th Annual Meeting of the Optical Society of America, Rochester, NY*, October 8-12, 2006 (presented by A. Salandrino).

N. Engheta, "Plasmonic "Diode" for Optical Field Rectification," a talk presented at *the Frontiers in Optics 2006 the 90th Annual Meeting of the Optical Society of America, Rochester, NY*, October 8-12, 2006 (presented by N. Engheta).

S.-S. Lin, K. M. Yemelyaniv, E. N. Pugh, Jr., and N. Engheta, "Shadow Vision Enhancement Using Polarization Imaging," a poster presented at *the Frontiers in Optics 2006 the 90th Annual Meeting of the Optical Society of America, Rochester, NY*, October 8-12, 2006 (presented by S.-S. Lin and K. M. Yemelyanov).

J. Li, A. Salandrino, and N. Engheta, "Optical Yagi-Uda and Reflector Nanoantennas and Their Potential Applications as Nano-Scale Spectrum Analyzers in Molecular Spectroscopy," a talk presented at *the Frontiers in Optics 2006 the 90th Annual Meeting of the Optical Society of America, Rochester, NY*, October 8-12, 2006 (presented by J. Li).

F. Bilotti, A. Alu, N. Engheta, and L. Vegni, "Miniaturized Circular Patch Antenna with Metamaterial Loading," in *the 2006 European Conference on Antennas and Propagation (EuCAP'2006), Nice, France*, November 6-10, 2006 (presented by F. Bilotti).

(**Invited**) N. Engheta, "Plasmonic Metamaterials and Optical Field Nanoelectronics" an invited talk in the *2006 Material Research Society (MRS) Fall Meeting, Boston, MA*, November 27-30, 2006 (presented by N. Engheta).

(**Invited**) N. Engheta, M. Silveirinha, A. Alu, J. Li, and A. Salandrino, "ENZ Nanometamaterials for Optical Nanocircuits, Squeezing Light, and Rerouting Energy," presented at the *First European Topical Meeting on Nanophotonics and Metamaterials, NanoMeta 2007, Seefeld, Tirol, Austria*, January 8-11, 2007 (presented by N. Engheta).

N. Engheta and A. Alu, "Filtering Components in Optical Nanocircuits Using Plasmonic Metamaterials," presented at the *2007 American Physical Society March Meeting, Denver, CO*, March 5-9, 2007 (presented by N. Engheta)

A. Alu, F. Bilotti, N. Engheta, and L. Vegni, "Cylindrical Metamaterial Sub-Wavelength Antennas: Supporting Higher-Order Leaky Modes for Cellular and Satelite Applications," presented at the *2007 ACES Conference on Applied Computational Electromagnetics, Verona, Italy*, March 19-23, 2007 (presented by F. Bilotti).

(**Invited**) N J. Li, A. Alu, and N. Engheta, "Wave Propagation along Periodic Arrays and Lattices of Metamaterial Particles with Dominant Higher-Order Multipolar Polarizabilities," in the special session "Novel Theoretical Advances and Potential Applications of Metamaterials," in *Progress in Electromagnetic Research Symposium (PIERS), Beijing, China*, March 25-30, 2007 (Presented by A. Alu).

(Invited) J. McVay, K. Yemelyanov, A. Hoorfar, and N. Engheta, "Through-the-Wall Imaging and Sensing," presented at the IEEE Workshop on Signal Processing Applications for Public Security and Forensics (SAFE 2007), Washington DC, April 11-13, 2007 (presented by K. Yemelyanov)

(Invited) N. Engheta and A. Alu, "Double-Negative, Single-Negative, and Negative-Index Metamaterials in Far-Infrared and THz regimes," presented at the *Material Research Society Spring Meeting, San Francisco, CA*, April 9-12, 2007 (presented by N. Engheta)

(Invited) N. Engheta, "Metamaterial Nanophotonics," at the plasmonics and metamaterial sessions at the 2007 *Conference on Laser and Electrooptics/Quantum Electronics and Laser Science (CLEO/QELS), Baltimore, MD*, May 6-11, 2007 (presented by N. Engheta).

(Invited) N. Engheta, "Metamaterial Devices and Components," an invited talk at the *Toyota Workshop on Metametarials for Future Automotive Applications, Nagoya, Japan*, May 17, 2007 (presented by N. Engheta).

(Invited Plenary Talk) N. Engheta, "Metamaterial and Plasmonic Nanocircuit Elements: Towards a New Paradigm for Optical Nanoelectronics," an invited plenary talk at the *51st International Conference on Electron, Ion, and Photon Beam Technology and Nanofabrication (EIPBN,07), Denver, CO*, May 29- June 1, 2007 (presented by N. Engheta).

(Invited) N. Engheta and A. Alu, "Filters and Feedbacks in Metamaterial Nanocircuits," the 2007 *Photonic Metamaterials: From Random to Periodic (META), Jackson Hole, Wyoming*, June 4-7, 2007 (presented by N. Engheta).

A. Alu and N. Engheta, "Multifrequency Claoking with Metamaterial Leyered Shells," the 2007 *Photonic Metamaterials: From Random to Periodic (META), Jackson Hole, Wyoming*, June 4-7, 2007 (presented by N. Engheta).

M. G. Silveirinha, A. Alu and N. Engheta, "'Anti-Phase' Plasmonic and/or Metamaterial 'Satelites' for Induced Transparency and Cloaking," a poster at the 2007 *Photonic Metamaterials: From Random to Periodic (META), Jackson Hole, Wyoming*, June 4-7, 2007. (presented by N. Engheta).

(Invited) N. Engheta, "Metamaterials and Plasmonics: Bridging Microwaves to Optics", a lecture in the Workshop (WFB) on Reecent Advances in Metamaterials: Theory, Computation, and Applications for the *IEEE Microwave Theory and Technique International Microwave Symposium (IMS'07), Waikiki, Hawaii*, June 8, 2007. (presented by N. Engheta).

A. Alu and N. Engheta, "On the Role of Random Disorder and Imperfections on Performance of Metamaterials," *the 2007 IEEE Antennas and Propagation Society (AP-S) International Symposium, Waikiki, Hawaii*, June 10-14, 2007, pp. 2897-2900. (presented by N. Engheta)

(Invited) M. Silveirinha and N. Engheta, "Squeezing Electromagnetic Energy through Narrow 3-D Coaxial Channels of Arbitrary Shape filled Epsilon-Near-Zero Materials," a talk in the Special Session honoring Dr. Kendall Casey at *the 2007 IEEE Antennas and Propagation Society (AP-S) International Symposium, Waikiki, Hawaii*, June 10-14, 2007, pp. 3316-3319. (presented by N. Engheta).

J. McVay, A. Hoorfar, and N. Engheta, "Extraction of Effective Permittivity and Permeability of Dispersive Double-Negative Slabs Using Evolutionary Programming," *the 2007 IEEE Antennas and Propagation Society (AP-S) International Symposium, Waikiki, Hawaii*, June 10-14, 2007, pp. 2893-2896. (presented by J. McVay)

(Invited) J. Li and N. Engheta, "'Self-Similar' Optical Antenna Arrays Using Multiple Core-Shell Plasmonic Nanoparticles," a talk in the Special session on "Nano- and Micro-Antenna Technologies," at *the 2007 IEEE Antennas and Propagation Society (AP-S) International Symposium, Waikiki, Hawaii*, June 10-14, 2007, pp. 3388-3391 (presented by J. Li).

N. Engheta, A. Alu and M. Silveirinha, "Metamaterials for Transparency and Total Scattering Reduction," a talk at *the 2007 IEEE Antennas and Propagation Society (AP-S) International Symposium, Waikiki, Hawaii*, June 10-14, 2007, pp. 4985-4986. (presented by N. Engheta)

K. Yemelyanov, J. McVay, N. Engheta, and A. Hoorfar, "Polarization-Contrast Sensing in Complex Environments for Through-the-Wall Microwave Imaging Applications," *the 2007 IEEE Antennas and Propagation Society (AP-S) International Symposium, Waikiki, Hawaii*, June 10-14, 2007, pp. 1473-1476. (presented by K. Yemelyanov).

(Invited Plenary Talk) N. Engheta, "What do Optical Nanocircuits, Squeezing Light, and Supermiicroscopy Have in Common?", an invited plenary talk at the *Optical Society of America (OSA) Topical Conference on Nanophotonics, Hangzhou, China*, June 18-22, 2007 (presented by N. Engheta).

M. Silveirinha and N. Engheta, "Artificial Plasma with Effective Epsilon-Near-Zero (ENZ) for Tunneling and Squeezing of Electromagnetic Waves through 3-D Narrow Channels," a talk in the special session in memory of Professor L. B. Felsen at *the 2007 North American Radio Science Meeting, Ottawa, Ontario, Canada*, July 22-26, 2007, URSI One-Page Abstract 473. (presented by Andrea Alu).

J. Li and N. Engheta, "Transparency of a Spherical Object Using Patterned Metallic Surfaces," talk at *the 2007 North American Radio Science Meeting, Ottawa, Ontario, Canada*, July 22-26, 2007, URSI one-page Abstract 551. (presented by J. Li).

J. Li and N. Engheta, "Nano-Scale Optical Spectrum Analyzer Based on Wavelength and Angular Sensitivity of Optical Nanoantenna Arrays," a talk in the special session on "Microscale and Nanoscale Electromagnetics" in *the 2007 North American Radio Science Meeting, Ottawa, Ontario, Canada*, July 22-26, 2007, URSI One-Page Abstract 513. (presented by J. Li)

J. McVay, V. Pierro, V. Galdi, A. Hoorfar, and N. Engheta, "Dual Polarized High-Impedance Ground Planes based on Grid-Graph Hamiltonian Paths for Antenna Applications," talk at *the 2007 North American Radio Science Meeting, Ottawa, Ontario, Canada*, July 22-26, 2007, URSI One-Page Abstract 605. (presented by J. McVay)

A. Alu and N. Engheta, "Transparency and Cloaking for Collections of Particles with Plasmonic Metamaterial Covers," talk at *the 2007 North American Radio Science Meeting, Ottawa, Ontario, Canada*, July 22-26, 2007, URSI One-Page Abstract 676. (presented by A. Alu)

A. Alu and N. Engheta, "Plasmonic Capacitor for Realization of a Compact Inductor," talk at *the 2007 North American Radio Science Meeting, Ottawa, Ontario, Canada*, July 22-26, 2007, URSI One-Page Abstract 477. (presented by A. Alu)

(Invited) K. Yemelyanov, J. McVay, N. Engheta, and A. Hoorfar, "Characterization of the Walls Using Polarization-Contrast Techniques," talk at *the 2007 North American Radio Science Meeting, Ottawa, Ontario, Canada*, July 22-26, 2007, URSI One-Page Abstract 629. (presented by K. Yemelyanov).

A. Alu and N. Engheta, "Plasmonic Wavegudes with Lateral Confinement: A Comparison among Different Geometries," a talk in the special session on "Microscale and Nanoscale Electromagnetics" in *the 2007 North American Radio Science Meeting, Ottawa, Ontario, Canada*, July 22-26, 2007, URSI One-Page Abstract 475. (presented by Andrea Alu)

A. Alu and N. Engheta, "Q-Factor of Metamaterial and Plasmonic 'Complementary' Resonances," a talk at *the 2007 International Union of Radio Science (URSI)*

Electromagnetic Theory Symposium, Ottawa, Ontario, Canada, July 26-28, 2007, EMTS 4-page Summary 165. (presented by A. Alu).

M. Silveirinha and N. Engheta, "Tunneling of Electromagnetic Waves through Channels Filled with Low-Epsilon Anisotropic Metamaterials," a talk in the Special Session in memory of Professor L. B. Felsen at *the 2007 International Union of Radio Science (URSI) Electromagnetic Theory Symposium, Ottawa, Ontario, Canada*, July 26-28, 2007, EMTS 4-page Summary 162. (presented by Andrea Alu).

J. McVay, A. Hoorfar, and N. Engheta, "An Overview of Space-Filling Curves in Novel Antenna Designs: Theory, Simulations, and Experiments," a talk at *the 2007 International Union of Radio Science (URSI) Electromagnetic Theory Symposium, Ottawa, Ontario, Canada*, July 26-28, 2007, EMTS 4-page Summary 182. (presented by A. Hoorfar).

(Invited) A. Alu and N. Engheta, "Intrinsic Robustness over Variation of Design Parameters in Metamaterial Cloaking," a talk at *the 2007 International Union of Radio Science (URSI) Electromagnetic Theory Symposium, Ottawa, Ontario, Canada*, July 26-28, 2007, EMTS 4-page summary 57. (presented by A. Alu).
(● Andrea Alu' was awarded the *Union Radio-Scientifique Internationale (URSI) Young Scientist Award* to attend the URSI Electromagnetic Theory Symposium (EMT) in Ottawa, Canada, July 26-28, 2007 to present this paper.)

A. Alu and N. Engheta, "Nanovortices around Resonant Optical Nanoantennas with Higher Directivities," a talk at the *2007 International Symposium on Antennas and Propagation (ISAP 2007), Japan*, August 20-25, 2007, Abstract in page 238 of proceedings (presented by A. Alu).
(● Andrea Alu' was awarded the *Young Scientist Travel Grant* to attend the 2007 International Symposium on Antennas and Propagation (ISAP'07), in Japan, August 20-25, 2007 to present this paper.)

(Invited Keynote) N. Engheta, "Plasmonic Metamaterials: The Tale of Two Phenomena," a keynote speech at the *the Photonic Metamaterial Conference of the 2007 SPIE-The International Society for Optical Engineering on Optics and Photonics, San Diego, California*, August 26-30, 2007, Abstract 6638-01, Session 1, page 4 of Part of Proceedings of SPIE Vol. 6638. (presented by N. Engheta).

(Invited) A. Alu and N. Engheta, "Optical Nanocircuit Loading of Nanoantenna Structures," an invited talk at the *Plasmonics: Metallic Nanostructures and Their Optical Properties V Conference of the 2007 SPIE-The International Society for Optical Engineering on Optics and Photonics, San Diego, California*, August 26-30, 2007, Abstract 6641-49, Session11, Page 32 of Part of Proceedings of SPIE Vol. 6641. (presented by N. Engheta).

A. Alu and N. Engheta, "Plasmonic Materials for Cloaking Structures," an invited talk at the *Plasmonics: Nanoimaging, Nanofabrication and Their Applications III Conference of the 2007 SPIE-The International Society for Optical Engineering on Optics and Photonics, San Diego, California*, August 26-30, 2007, Abstract 6642-34, Session 6, Page 45 of Part of Proceedings of SPIE Vol. 6642. (presented by N. Engheta)

(Invited) N. Engheta, "Metaplasmonic Structures, Wave-Bending Components, and Nanocircuits," an invited talk at the *Los Alamos National Laboratory International Workshop on Electromagnetic Metamaterials II: Gradient Lenses to Invisibility Cloaks, Los Alamos, New Mexico*, September 5-6, 2007. (presented by N. Engheta)

M Silveirinha, A. Alu and N. Engheta, "IR and Optical Cloaking with Metamaterials with Plasmonic Implants: Theory and Simulations," a talk at *the Frontiers in Optics 2007 the 91st Annual Meeting of the Optical Society of America, San Jose, CA*, September 16-20, 2007, Abstract FThU4. (presented by N. Engheta)

A. Alu and N. Engheta, "Cloaking an Objects near an Obstacle with Plasmonic Materials," a talk at *the Frontiers in Optics 2007 the 91st Annual Meeting of the Optical Society of America, San Jose, CA*, September 16-20, 2007, Abstract FThU5. (presented by A. Alu)

V. Gruev, A. Ortu, Z. Yang, J. Van der Spiegel, and N. Engheta, "High-Resolution Integrated Image Sensor with Polymer Micropolarized Arrays," a talk at *the Frontiers in Optics 2007 the 91st Annual Meeting of the Optical Society of America, San Jose, CA*, September 16-20, 2007, Abstract FTuS6. (presented by V. Gruev)

J. Li, A. Salandrino, and N. Engheta, "Ideas for Optical Nanoantenna Design: From Microwave to Visible Frequencies," a talk at *the Frontiers in Optics 2007 the 91st Annual Meeting of the Optical Society of America, San Jose, CA*, September 16-20, 2007, Abstract FThF5. (presented by J. Li)

N. Engheta and A. Alu, "Tailoring Filtering Functions at Nano-Scale: Optical Nanofilters," a talk at *the Frontiers in Optics 2007 the 91st Annual Meeting of the Optical Society of America, San Jose, CA*, September 16-20, 2007, Abstract FThC3. (presented by N. Engheta).

A. Alu and N. Engheta, "Nanoconnectors at Optical Frequencies," a talk at *the Frontiers in Optics 2007 the 91st Annual Meeting of the Optical Society of America, San Jose, CA*, September 16-20, 2007, Abstract FThR2. (presented by A. Alu).

S.-S. Lin, E. N. Pugh, Jr., and N. Engheta, "Polarization Imaging in Shadow and Glare," a poster at *the Frontiers in Optics 2007 the 91st Annual Meeting of the Optical Society of America, San Jose, CA*, September 16-20, 2007, Abstract JSuA13. (presented by S.-S. Lin).

(Invited) N. Engheta, "Metamaterial and Plasmonic Structures: Towards Next-Generation Materials, Devices, and Optical Nanocircuits," an invited talk at the *MORIS'2007, Workshop on Thermal and Optical Magnetic Materials and Devices," Pittsburgh, PA,* September 24-26, 2007. (presented by N. Engheta).

(Invited) N. Engheta, "Metamaterials: Exciting Paradigms for Microwave and Optical Engineering," an invited talk at the *EPI RF/Microwave/Antenna Workshop, Newtown, PA,* October 8-11, 2007. (presented by N. Engheta).

(Invited) N. Engheta, "Circuits with Light at the Nanoscale," an invited talk at *the session "Frontiers in Physics" at the Industrial Physics Forum, Seattle, WA*, October 15-16, 2007. (presented by N. Engheta).

(Invited) J. McVay, N. Engheta, and A. Hoorfar, "Three-Dimensional Hilbert Structures as Compact Resonant Plasmonic Elements in Laterally Confined Transmission Lines at Microwave Frequencies," an invited talk at the *Metamaterials'2007, the 1st International Congress on Advance Electromagnetic Materials in Microwave and Optics, Rome, Italy*, October 22-26, 2007, pp. 196-199 of Proceedings. (presented by N. Engheta).

A. Alu and N. Engheta, "Dispersion Characteristics of Metamaterial Cloaking Structures," a talk at the *Metamaterials'2007, the 1st International Congress on Advance Electromagnetic Materials in Microwave and Optics, Rome, Italy*, October 22-26, 2007, pp. 482-485 of Proceedings. (presented by A. Alu).

M. Silveirinha and N. Engheta, "Squeezing Obliquely-Incident Electromagnetic Waves through Subwavelength Regions or Openings Using Epsilon-Near-Zero (ENZ) Materials," a talk at the *Metamaterials'2007, the 1st International Congress on Advance Electromagnetic Materials in Microwave and Optics, Rome, Italy*, October 22-26, 2007, pp. 568-570 of Proceedings. (presented by N. Engheta)

(Invited) N. Engheta, A. Alu, M. Silveirinha, J. Li, A. Salandrino, B. Edwards," Metamaterial Plasmonics for Optical Nanocircuits, Cloaking, Squeezing Light, and Supermicroscopy," an invited talk at the *Metamaterials'2007, the 1st International Congress on Advance Electromagnetic Materials in Microwave and Optics, Rome, Italy*, October 22-26, 2007, pp. 594-598 of Proceedings. (presented by N. Engheta).

(Invited) N. Engheta, "Plasmonic Cloaking", an invited lecture at the *Distributed European School on Metamaterials, on the topic of "The Role of Metamaterials on Cloaking Technology", Rome, Italy*, October 25-26, 2007. (presented by N. Engheta).

(Invited) N. Engheta, "Metaplasmonic Structures, Wave-Bending Elements, and Nanocircuits", an invited talk at the *Workshop on Frontiers in Nanophotonics and Plasmonics, Guaraju, Sao Pauolo, Brazil*, November 10-14, 2007. (presented by N. Engheta).

(Invited) F. Bilotti, A. Alu, N. Engheta, and L. Vegni, "Leaky-Wave Metamaterial Antennas: Conical and Pencil Beam Radiation," at *the 2007 European Conference on Antennas and Propagation (EuCAP'2007), Edinburgh, Scotland, UK,* November 11-16, 2007. (presented by F. Bilotti.)

J. McVay, A. Hoorfar, and N. Engheta, "Bandwidth Enhancement and Polarization Dependence Elimination of Space-Filling Curves Artificial Magnetic Conductors," at the *2007 Asia Pacific Microwave Conference (APMC 2007), Bangkok, Thailand*, December 11-14, 2007 (presented by J. McVay).

B. Edwards, A. Alu, M. Young, M. Silveirinha, and N. Engheta, "Experimental Demonstration of Epsilon-Near-Zero Behavior of a Waveguide at Cutoff and Its Tunneling and Energy Squeezing Properties," at the *URSI-USNC National Radio Science Meeting, Boulder, CO*, January 2-6, 2008. (presented by B. Edwards).

(Invited) N. Engheta, "Metactronics: Metamaterial Nanocricuits and Wireless Elements at Nanoscales," at *the 38th Winter Colloquium on the Physics of Quantum Electronics, Snowbird, Utah*, January 6-10, 2008. (Presented by N. Engheta).

(Invited) N. Engheta, "Metamaterial Nanophotonics: A New Paradigm for Optical Nanocircuits" at *the 2008 SPIE-The International Society for Optical Engineering, Photonics West, San Jose, California,*, January 19-24, 2008. (Presented by N. Engheta).

V. Gruev, J. Van der Spiegel and N. Engheta, "A 60 x 20 15mW 30fps Polarization Image Sensor," *IEEE International Solid State Circuits Conference, San Francisco, CA*, February 3-7, 2008. (presented by V. Gruev)

N. Engheta, A. Alu, M. Silveirinha, M. Young, B. Edwards, J. Li, "Metaplasmonics and Epsilon-Near-Zero Metamaterials for Optical Nanocircuits, Wave-Bending Tunneling Elements, and Nanoantennas", *American Physical Society March Meeting, New Orleans, LA*, March 10-14, 2008. (presented by N. Engheta)

(Invited) N. Engheta, "Metaplasmonic Materials, Nanocircuis with Light, and Wireless Elements at Nanoscales" an invited talk at the *NATO Technical Workshop on "Photonic Metamaterials for Defense and Security Applications", Strasbourg, France*, April 10-11, 2008. (Presented by N. Engheta).

N. Engheta and A. Alu, "Metal-Dielectric Layered Nanostructures as Epsilon-Near-Zero (ENZ) Circuit Boards for Optical Nanocircuits" at the *Conference for Lasers and Electro-Optics/Quantum Electronics and Laser Science Conference (CLEO/QELS), San Jose, CA,* May 4-9, 2008. (Presented by N. Engheta).

B. Edwards, A. Alu, M. Young, M. Silveirinha, and N. Engheta, "Experimental Verification of Supercoupling in Epsilon-Near-Zero Ultranarrow Channels and Bends" at the *NATO Advanced Research Workshop on Metamaterials for Secure Information and Communication Technologies (META'08), Marrakech, Morocco*, May 7-10, 2008. Page 70 of the Proceedings. (Presented by B. Edwards).

(Invited) A. Alu, and N. Engheta, "Scattering Cancellation Using Plasmonic Cloaks" invited talk at the *NATO Advanced Research Workshop on Metamaterials for Secure Information and Communication Technologies (META'08), Marrakech, Morocco*, May 7-10, 2008. Page 31 of the Proceedings. (Presented by A. Alu).

(Invited Keynote) N. Engheta, "Metactronics: Optical Circuits and Information Processing in Nanoworlds" at the *NATO Advanced Research Workshop on Metamaterials for Secure Information and Communication Technologies (META'08), Marrakech, Morocco*, May 7-10, 2008. (Presented by N. Engheta).

V. Gruev, J. Van der Spiegel and N. Engheta, "Low Power Image Sensor with Polymer Polarization Filters," *2008 IEEE International Symposium on Circuits and Systems (ISCAS 2008), Seattle, WA*, May 18-21, 2008. (presented by V. Gruev)

V. Gruev, J. Van der Spiegel and N. Engheta, "Image Sensor with Focal Plane Polarization Sensitivity," *2008 IEEE International Symposium on Circuits and Systems (ISCAS 2008), Seattle, WA*, May 18-21, 2008. (presented by V. Gruev)

M. Silveirinha, A. Alu, B. Edwards, N. Engheta, "Overview of Tunneling through Narrow Tight Channels Using ENZ Materials," *Days of Diffractions'2008, St. Petersbutgh, Russia*, June 3-6, 2008, abstract appeared on page 61-62 of the proceedings. (presented by M. G. Silveirinha)

(Invited) N. Engheta, "3D Plasmonic Materials in Microwave and Optics", a lecture in the Workshop (WMJ) on 3D Metamaterials: Theory, Sructures, Techniques, and Devices for the *2008 IEEE Microwave Theory and Technique International Microwave Symposium (IMS'08), Atlanta, Georgia*, June 16, 2008. (presented by N. Engheta).

(Invited) N. Engheta, "Circuits with Light at the Nanoscale and Information Processing in Nanoworlds: Metactronics and Metananocircuits", a lecture in the *Workshop in Dispersion Engineering, Emerging Communications Technology Institute, University of Toronto, Toronto, Canada*, June 26-27, 2008. (presented by N. Engheta).

A. Alu and N. Engheta, "Isotropic Low-Loss Negative-Index Metamaterial at Optical Frequencies: Theory and Simulations," a talk at *the 2008 IEEE Antennas and Propagation Society (AP-S) International Symposium/USNC/URSI National Radio Science Meeting, San Diego, CA,* July 5-12, 2008. (presented by A. Alu)

A. Alu and N. Engheta, "Metamaterial and Plasmonic Cloaking: Potentials and Physical Insights", a talk in the Special Session on "Electromagnetic Cloaking" at *the 2008 IEEE Antennas and Propagation Society (AP-S) International Symposium/USNC/URSI National Radio Science Meeting, San Diego, CA,* July 5-12, 2008. (presented by N. Engheta)

A. Alu and N. Engheta, "Dependence and Sensitivity of Plasmonic Cloaking on Size and Geometry," a talk in the Special Session on "Electromagnetic Cloaking" at *the 2008 IEEE Antennas and Propagation Society (AP-S) International Symposium/USNC/URSI National Radio Science Meeting, San Diego, CA,* July 5-12, 2008. (presented by A. Alu)

A. Alu, B. Edwards, M. G. Silveirinha, and N. Engheta, "Antennas in Epsilon-Near-Zero (ENZ) Metamaterials Filling Narrow Waveguide Channels and Bends," a talk at *the 2008 IEEE Antennas and Propagation Society (AP-S) International Symposium/USNC/URSI National Radio Science Meeting, San Diego, CA,* July 5-12, 2008. (presented by A. Alu)

M. G. Silveirinha and N. Engheta, "Effects of Loss in Squeezing and Tunneling Waves through Narrow Channels Filled with Epsilon-Near-Zero (ENZ) Materials," a talk at *the 2008 IEEE Antennas and Propagation Society (AP-S) International Symposium/USNC/URSI National Radio Science Meeting, San Diego, CA,* July 5-12, 2008. (presented by M. G. Silveirinha)

B. Edwards, A. Alu, M. Young, M. G. Silveirinha, and N. Engheta, "Microwave Experiments and Applications of Epsilon-Near-Zero (ENZ) Metamaterial-Inspired Waveguide Channels," a talk at *the 2008 IEEE Antennas and Propagation Society (AP-S) International*

Symposium/USNC/URSI National Radio Science Meeting, San Diego, CA, July 5-12, 2008. (presented by B. Edwards)

A. Alu and N. Engheta, "Three-Dimensional Plasmonic Nanoswitch: Extreme Variation of Scattering Properties upon Rotation," a talk at *the 2008 IEEE Antennas and Propagation Society (AP-S) International Symposium/USNC/URSI National Radio Science Meeting, San Diego, CA,* July 5-12, 2008. (presented by A. Alu)

M. G. Silveirinha and N. Engheta, "Sampling and Squeezing Using Epsilon-Near-Zero (ENZ) Metamaterials," a talk in the Special Session in the Memory of Professor Charles H. Papas at *the 2008 IEEE Antennas and Propagation Society (AP-S) International Symposium/USNC/URSI National Radio Science Meeting, San Diego, CA,* July 5-12, 2008. (presented by N. Engheta)

A. Alu and N. Engheta, "Matching Optical Nanoantennas Using Optical Lumped Nanocircuit Elements," a talk in the special session on "Nanoelectromagnetism" at *the 2008 IEEE Antennas and Propagation Society (AP-S) International Symposium/USNC/URSI National Radio Science Meeting, San Diego, CA,* July 5-12, 2008. (presented by N. Engheta)

(Invited) N. Engheta, "Metamaterial-Inspired Nanocircuits: Metananocircuits and Metactronics," an invited talk at *the 2nd Gordon Research Conference on Plasmonics, Tilton, New Hampshire*, July 27-August 1, 2008. (Presented by N. Engheta)

(Invited) A. Alu and N. Engheta, "Comparison between Loading and Tuning Nanodipoles and Nanodimers as Optical Nanoantennas," an invited talk at the *Plasmonics: Metallic Nanostructures and Their Optical Properties VI Conference of the 2008 SPIE-The International Society for Optical Engineering on Optics and Photonics, San Diego, California*, August 10-14, 2008. Abstract 7032-04. (presented by N. Engheta).

(Invited) A. Alu and N. Engheta, "Nanoscale Grooves and Channels in Epsilon-Near-Zero (ENZ) Nanocircuit Boards," an invited talk at the *Metamaterials: Fundamentals and Applications Conference of the 2008 SPIE-The International Society for Optical Engineering on Optics and Photonics, San Diego, California*, August 10-14, 2008. Abstract 7029-07 (presented by N. Engheta).

(Invited) A. Alu, M. Silveirinha, and N. Engheta, "Squeezing Optrical Signals through Epsilon-Near-Zero Plasmonic Channles," an invited talk at the *Plasmonics: Nanoimaging, Nanofabrication and Their Applications IV Conference of the 2008 SPIE-The International Society for Optical Engineering on Optics and Photonics, San Diego, California*, August 10-14, 2008. Abstract 7033-51. (presented by N. Engheta).

N. Engheta, A. Alu, M. Silveirinha, J. Li, and B. Edwards, "Metaplasmonic Structures, Optical Nanocircuits, and Wireless Nanosystems," in the DB session on plasmonics at the *2008 XXIX General Assembly of the International Union of Radio Science (URSI-GA 2008), Chicago, Illinois*, August 7-16, 2008. (presented by N. Engheta.)

M. Silveirinha, A. Alu, B. Edwards, and N. Engheta, "Overview of Theory and Applications of Epsilon-Near-Zero (ENZ) Materials," in the Commission B session on Electromagnetic Theory at the *2008 XXIX General Assembly of the International Union of Radio*

Science (URSI-GA 2008), Chicago, Illinois, August 7-16, 2008. (Presented by N. Engheta).

A. Alu, and N. Engheta, "Limitations of Plasmonic Cloaking at Microwave and Optical Frequencies," in the Commission B session on Electromagnetic Theory at the *2008 XXIX General Assembly of the International Union of Radio Science (URSI-GA 2008), Chicago, Illinois*, August 7-16, 2008. (Presented by A. Alu).

B. Edwards, A. Alu, M. Silveirinha, and N. Engheta, "Comparison beween Epsilon-Near-Zero and Fabry-Perot Resonant Transmission through Waveguide Bends and Chanels," in the Commission B Poster session at the *2008 XXIX General Assembly of the International Union of Radio Science (URSI-GA 2008), Chicago, Illinois*, August 7-16, 2008. (Presented by B. Edwards).

V. Galdi, V. Pierro, G. Castaldi, and N. Engheta, "Metamaterial Surface Pairs Genetically-Optimized for Wide-Band Out-of-Phase Mutual Response," in the Commission B Poster session at the *2008 XXIX General Assembly of the International Union of Radio Science (URSI-GA 2008), Chicago, Illinois*, August 7-16, 2008. (Presented by V. Galdi).

(Public Lecture/Plenary Speech) N. Engheta, "Seeing the Unseen: From Polarization-Sensitive Eyes to Biologically-Inspired Sensing and Imaging Science," an invited lecture as a plenary Public Lecture at the *2008 XXIX General Assembly of the International Union of Radio Science (URSI-GA 2008), Chicago, Illinois*, August 7-16, 2008. (presented by N. Engheta).

(Keynote) N. Engheta, "Extreme-Parameter Metamaterials," an invited keynote talk at *the Metamaterials' 2008: 2nd International Congress on Advanced Electromagnetic Materials in Microwave and Optics, Pamplona, Spain*, September 21-26, 2008 (presented by N. Engheta).

N. Engheta and A. Alu, "Manipulating Optical Nanoantennas with Optical Nanocircuits," at *the Metamaterials' 2008: 2nd International Congress on Advanced Electromagnetic Materials in Microwave and Optics, Pamplona, Spain*, September 21-26, 2008 (presented by N. Engheta).

A. Alu, M. Silveirinha, and N. Engheta, "Transmission-Line Modeling of ENZ-based Supercoupling in Waveguide Transition Channels and Bends," at *the Metamaterials' 2008: 2nd International Congress on Advanced Electromagnetic Materials in Microwave and Optics, Pamplona, Spain*, September 21-26, 2008 (presented by A. Alu).

M. Silveirinha, and N. Engheta, "Analytical Modeling of Transmission of Complex Electromagnetic Images through an Array of ENZ Narrow Channels," at *the Metamaterials' 2008: 2nd International Congress on Advanced Electromagnetic Materials in Microwave and Optics, Pamplona, Spain*, September 21-26, 2008 (presented by A. Alu).

(Invited) A. Alu, and N. Engheta, "Plasmonic Cloaking: Fundamentals and Novel Potential Applications," at *the Metamaterials' 2008: 2nd International Congress on Advanced*

Electromagnetic Materials in Microwave and Optics, Pamplona, Spain, September 21-26, 2008 (presented by A. Alu).

(Invited) N. Engheta, "Metamaterial Nanocircuits with Light: Information Processing at the Nanoscale," at *the 2008 Marconi Prize Symposium at the Royal Society, with the theme of "The Power of Light: The Future of Photonics"*, *London, UK*, September 26, 2008 (presented by N. Engheta).

S.-S. Lin, V. Gruev, J. Van der Spiegel, E. N. Pugh, Jr., and N. Engheta, "Artifact Reduction Method for Single Chip Polarization Sensor with On-Chip Polarization Filter Mosaic," a poster at *the Frontiers in Optics 2008 the 92nd t Annual Meeting of the Optical Society of America, Rochester, New York*, October 19-24, 2008, Abstract JWA7. (presented by S.-S. Lin).

A. Alu and N. Engheta, "Matching Optical Nanoantennas with Nanocircuit Elements," a poster at *the Frontiers in Optics 2008 the 92nd Annual Meeting of the Optical Society of America, Rochester, New York*, October 19-24, 2008, Abstract JWA73. (presented by N. Engheta).

M. G. Silveirinha and N. Engheta, "Squeezing and Bending an Image through a Subwavelength Hole," a talk at *Plasmonics and Metamaterials (META) Topical Meeting* in *the Frontiers in Optics 2008 the 92nd Annual Meeting of the Optical Society of America, Rochester, New York*, October 19-24, 2008, Abstract MWB1. (presented by N. Engheta).

A. Alu and N. Engheta, "ENZ-Inspired Optical Tunneling through Arbitrarily-Shaped Plasmonic Narrow Channels and Sharp Bends," a talk at *Plasmonics and Metamaterials (META) Topical Meeting* in *the Frontiers in Optics 2008 the 92nd Annual Meeting of the Optical Society of America, Rochester, New York*, October 19-24, 2008, Abstract MWB7. (presented by N. Engheta).

N. Engheta and A. Alu, "Re-Routing Optical Fields in Channels Carved in Epsilon-Near-Zero (ENZ) Nanocircuit Boards," a talk at *Plasmonics and Metamaterials (META) Topical Meeting* in *the Frontiers in Optics 2008 the 92nd Annual Meeting of the Optical Society of America, Rochester, New York*, October 19-24, 2008, Abstract MWD1. (presented by N. Engheta).

A. Alu and N. Engheta, "Loading Babinet Optical Nanoantennas with Nanocircuit Elements," a talk at *Plasmonics and Metamaterials (META) Topical Meeting* in *the Frontiers in Optics 2008 the 92ndt Annual Meeting of the Optical Society of America, Rochester, New York*, October 19-24, 2008, Abstract MWD7. (presented by N. Engheta).

(Invited Plenary Talk) N. Engheta, "Circuits with Light at the Nanoscale," a plenery talk at *The 6th International System-on-Chip Conference, Exhibit and Workshop, Newport Beach, California,* November 5-6, 2008. (presented by N. Engheta).

(Invited) N. Engheta, "Circuits with Light at the Nanoscale: Metananocircuits and Metactronics," an invited talk at *The First International Workshop on Theoretical and Computational Nano-Photonics, Bad Honnef, Germany,* December 3-5, 2008. (presented by N. Engheta).

G. Castaldi, I. Gallina, V. Galdi, A. Alu, and N. Engheta, "Pairing Invisibility Cloaks and Anti-Cloaks," a poster at *National Workshop on Metamaterials and Special Materials for Electromagnetic Applications and TLC (MMSM'08), Naples, Italy,* December 18-19, 2008. (presented by I. Gallina, V. Galdi).

(Invited) N. Engheta, "Metactronics and Metananocircuits," an invited talk at the *2nd European Topical Meeting on Nanophotonics and Metamaterials (NanoMeta 2009), Seefeld, Austria*, January 5-8, 2009. (presented by N. Engheta).

(Invited) N. Engheta, "Manipulating Optical Nanoantennas with Nanocircuit Loads," an invited talk at the *Workshop on Nanoantenna, Institut d'Optique, Palaiseau, Paris, France*, January 16, 2009. (presented by N. Engheta).

(Invited Plenary Talk) N. Engheta, "Circuits with Light at the Nanoscale," an invited plenary talk at the *13th International Symposium on Antenna Technology and Applied Electromagnetics/Canadian Radio Sciences Meeting (ANTEM/URSI/CNC), Banff, AB, Canada*, February 15-18, 2009. (presented by N. Engheta).

(Invited) A. Alu and N. Engheta, "Antenna Matching in Epsilon-Near-Zero Metamaterial Channels," an invited talk at the *9th International Workshop on Antenna Technology (iWAT'09), Santa Maonica, California*, March 2-4, 2009. (presented by A. Alu).

N. Engheta and A. Alu, "Manipulating, Extending, and Re-Routing Optical Near Fields Using Epsilon-Near-Zero Metamaterial in Nano-Optics," at the *American Physical Society (APS) March Meeting, Pittsburgh, PA*, March 16-20, 2009. (presented by N. Engheta).

(Invited Plenary Talk) N. Engheta, "Circuits with Light at the Nanoscale: A New Paradigm for Nanoscale Information Processing," an invited plenary talk at the *43th Annual Conference on Information Sciences and Systems (CISS 2009), Baltimore, MD*, March 18-20, 2009. (presented by N. Engheta).

D. Powell, A. Alu, B. Edwards, A. Vakil, Y. Kivshar, and N. Engheta, "Energy coupling through nonlinear ENZ channels," a talk at the *PECS VIII: The 8th International Photonics and Electromagnetic Crystal Structures Meeting, Sydeny, Australia*, April 5-9, 2009. (presented by D. Powell.)

(Invited) N. Engheta, "Special Features of Metactronics and Metananocircuits," an invited talk at the Symposium EE: Materials for Nanophotonics - -Plasmonics, Metamaterials, and Light Localization at *the Materials Research Society (MRS) Spring Meeting, San Francisco, CA*, April 14-17, 2009. (presented by N. Engheta).

(Invited) N. Engheta, "Extreme Metamaterials for Imaging, Supercoupling, and Metactronics, and Bio-Inspired Optical Polarization Imaging," an invited talk at *the Workshop on Non-Conventional Imaging and Focusing Techniques: From Acoustics to Optics, Cargese, Corsica Island, France*, May 3-8, 2009. (presented by N. Engheta).

(Invited Tutorial) N. Engheta, "Circuits with Light at the Nanoscale: Meta-nanocircuits and Metactronics," an invited tutorial at *the 19th Great Lakes Symposium on VLSI, Boston, MA*, May 10-12, 2009. (presented by N. Engheta).

(Invited) N. Engheta, "Molding the Light with ENZ Metamaterials," an invited talk at *The 3rd International Workshop on Electromagnetic Metamaterials III: Toward Real World Applications," Los Alamos National Laboratory, New Mexico*, May 18-19, 2009. (presented by N. Engheta).

N. Engheta, "Progress in Metactronics and Negative-Index Metamaterials," a poster at the *AFOSR Joint Electronics Workshop, Arlington, VA*, May 27-29, 2009. (presented by N. Engheta)

(Invited) N. Engheta, "Progress in ENZ Metamaterials," an invited talk at the *Adelphi Antenna Workshop on Metamaterials, Clarksville, MD*, May 28-29, 2009. (presented by N. Engheta)

A. Alu and N. Engheta, "Resonances and Bandwidth Issues in Finite Arrays of Coupled Plasmonic Nanoantennas," a talk at the *Days of Diffractions, St. Petersburg, Russia*, May 26-29, 2009. (presented by A. Alu)

A. Alu and N. Engheta, "Guided Modes and Power Relationships for Linear Arrays of Plasmonic Nanoparticles," a talk at the *Days of Diffractions, St. Petersburg, Russia*, May 26-29, 2009. (presented by A. Alu)

N. Engheta and A. Alu, "Transient Response in Optical ENZ Nanocircuit Boards," a talk at the *Conference on Laser and Electrooptics/Quantum Electronics and Laser Science (CLEO/IQEC), Baltimore, MD*, May 31-June 5, 2009. (presented by N. Engheta)

(Invited) A. Alu and N. Engheta, "Plasmonic Optical Nanolaunchers for Enhanced Molecular Emission," an invited talk in the special session on "Nanomaterials and Nanostructures for RF, MMW, and THz applications" at the *2009 IEEE Antennas and Propaation Society (AP-S) International Symposum/USNC/URSI National Radio Science Meeting, Charleston, SC*, June 1-5, 2009. (presented by A. Alu)

(Invited) A. Alu and N. Engheta, "Linear Arrays of Quadrupolar Plasmonic Nanoparticles as Optical Nanotransmission Lines," an invited talk in the special session on "Multiphysics Electromagnetics" at the *2009 IEEE Antennas and Propaation Society (AP-S) International Symposum/USNC/URSI National Radio Science Meeting, Charleston, SC*, June 1-5, 2009. (presented by A. Alu)

(Invited) G. Castaldi, I. Gallina, V. Galdi, A. Alu and N. Engheta, "A Study of Cloak/Anti-Cloak Interactions," an invited talk in the special session on "Transformation Electromagnetics" at the *2009 IEEE Antennas and Propaation Society (AP-S) International Symposum/USNC/URSI National Radio Science Meeting, Charleston, SC*, June 1-5, 2009. (presented by A. Alu)

(Plenary Talk) N. Engheta, "What to Do with Extreme Metamaterials," an invited plenary talk at the *2009 ETOPIM'8 Conference, Crete, Greece*, June 7-12, 2009. (presented by N. Engheta)

(Invited) N. Engheta, "ENZ-based Plasmonics," an invited talk at the *4th International Conference on Surface Plasmon Photonics (SPP'4) Amsterdam, The Netherlands*, June 21-26, 2009. (presented by N. Engheta)

D. Powell, A. Alu, B. Edwards, A. Vakil, Y. Kivshar, and N. Engheta, "Tunable Tunnelling in Epsilon-Near-Zero Channels," at the *Progress in Electromagnetics Research Symposium, Moscow, Russia*, August 2009.

(Plenary Talk) N. Engheta, "Taming the Light with Metamaterials," an invited plenary talk in the *NanoScience and Engineering* part of the *the 2009 SPIE-The International Society for Optical Engineering on Optics and Photonics, San Diego, California*, August 2-6, 2009. (presented by N. Engheta)

(Invited) N. Engheta, "Seeing the Unseen: From Polarization-Sensitive Eyes to Biologically Inspired Imaging and Sensing Science," an invited talk at the *Biosensing II of the 2009 SPIE-The International Society for Optical Engineering on Optics and Photonics, San Diego, California*, August 2-6, 2009. Abstract 7397-19. (presented by N. Engheta).

(Invited) M. G. Silveirinha and N. Engheta, "Transporting an Image through a Subwavelength Hole," an invited talk at the *Metamaterials: Fundamentals and Applications II Conference of the 2009 SPIE-The International Society for Optical Engineering on Optics and Photonics, San Diego, California*, August 2-6, 2009. Abstract 7392-47 (presented by N. Engheta).

(Invited) N. Engheta and A. Alu, "Magnetically-Coupled Nanoscale Channels in Optical Epsilon-Near-Zero (ENZ) Substrates," an invited talk at the *Plasmonics: Nanoimaging, Nanofabrication and Their Applications V Conference of the 2009 SPIE-The International Society for Optical Engineering on Optics and Photonics, San Diego, California*, August 2-6, 2009. Abstract 7395-64. (presented by N. Engheta).

(Invited) N. Engheta, "Wave-Matter Interactions: Plasmonics, Metamaterials, and Optical Nanocircuitry," 4 invited lectures at *The Workshop and Advanced School of Nanoplasmonics, Sao Carlos, Brazil*, August 9-14, 2009. (presented by N. Engheta).

(Invited) N. Engheta, "Extreme Metamaterials and Metactronics," 2 invited lectures at *The Metamorphose Doctoral school at the Metamaterials 2009, the 3rd International Congress on Advance Electromagnetic Materials in Microwave and Optics, London, UK*, August 30-31, 2009. (presented by N. Engheta).

(Invited) N. Engheta, "Metacomponents for Metactronics," an invited talk in the special session on "Optical Meta-Devices" at *The Metamaterials 2009, the 3rd International Congress on Advance Electromagnetic Materials in Microwave and Optics, London, UK*, August 30-September 4, 2009. (presented by N. Engheta).

(Invited) N. Engheta, A. Alu, M. Silveirinha, B. Edwards "Supercoupling and Enhanced Transmission in ENZ Structures," an invited talk in the special session on "Extreme-Parameters Metamaterials" at *The Metamaterials 2009, the 3rd International Congress on Advance Electromagnetic Materials in Microwave and Optics, London, UK*, August 30-September 4, 2009. (presented by N. Engheta).

(Invited) A. Alu and N. Engheta, "Cloaking a Sensor with Plasmonic Materials," an invited talk in the special session on "Cloaking and Coordinate-Transformation Applications" at *The Metamaterials 2009, the 3rd International Congress on Advance Electromagnetic Materials in Microwave and Optics, London, UK*, August 30-September 4, 2009. (presented by A. Alu).

(Invited) G. Castaldi, I. Gallina, V. Galdi, A. Alu and N. Engheta, "Interaction between Invisibility Cloaks and Anti-Cloaks," an invited talk in the special session on "Cloaking" at the *International Conference on Electromagnetics and Advance Applications (ICEAA'09), Torino, Italy*, September 14-17, 2009. (presented by I. Gallina).

(Invited) A. Alu and N. Engheta, "Peculiar and Anamolous Cloaking Features of Plasmonic Materials," an invited talk in the special session on "Cloaking" at the *International Conference on Electromagnetics and Advance Applications (ICEAA'09), Torino, Italy*, September 14-17, 2009. (presented by A. Alu).

(Plenary Invited Talk) N. Engheta, V. Gruev, S.-S. Lin, and J. Van der Spiegel "Seeing the Unseen: How Can we Learn from Polarization-Sensitive Eyes in Nature and How Can We Design Better Imaging Systems?" A plenary talk at the Opening Ceremony of *the 2009 European Microwave \Conference (EuMC) as Part of the 2009 European Microwave Week (EuMW), Rome, Italy*, September 28-October 2, 2009. (presented by N. Engheta).

(Invited) N. Engheta, "Extreme Metamaterials" an invited talk at *the Air Force Research Laboratory (AFRL) 6.2 Metamaterials Workshop, Wright-Patterson Air Force Base, Dayton, Ohio*, October 6-8, 2009. (presented by N. Engheta).

N. Engheta and M. Young, "Can We Have an Optical Memristor Using Metamaterials?" a talk at *the Frontiers in Optics 2009 the 93rd Annual Meeting of the Optical Society of America, San Jose, CA*, October 11-15, 2009, Abstract FMA7. (presented by N. Engheta).

N. Engheta and A. Alu, "Can Optical Nanoantenna Links Compete with Plasmonic Waveguide Connections?" a talk at *the Frontiers in Optics 2009 the 93rd Annual Meeting of the Optical Society of America, San Jose, CA*, October 11-15, 2009, Abstract FMH6. (presented by N. Engheta).

U. Chettiar and N. Engheta, "Mixing Plasmonic Cloaking with 2nd Order Optical Nonlinearity" a talk at *the Frontiers in Optics 2009 the 93rd Annual Meeting of the Optical Society of America, San Jose, CA*, October 11-15, 2009, Abstract FTuN7. (presented by N. Engheta).

(Invited) N. Engheta, "Metamaterials and Plasmonic Phenomena," 3 invited lectures at *The Metamorphose Doctoral school In Levi, Kittila, Lapland, Finland,* November 18-20, 2009. (presented by N. Engheta).

N. Engheta, "Metactronics: Taming and Processing the Light with Metamaterials," a poster at *the Tri-Service Metamaterials Applications Conference, Atlanta, GA*, December 8-10, 2009. (presented by N. Engheta).

(Invited) N. Engheta, "Nonlinear Nanostructures in Metactronics," *at the 40th Winter Colloquium on the Physics of Quantum Electronics (PQE-2010), Snowbird, Utah*, January 3-7, 2010. (presented by N. Engheta).

(Invited) N. Engheta, "Metamaterialas as a Paradigm for Taming the Light," at *the 20th Anniversary of the Opticl Society of Korea Workshop, Seoul, Republic of Korea*, January 20-22, 2010. (presented by N. Engheta).

(Invited) N. Engheta, "Metactronics: A New Paradigm for Optical Nanocircuitry," at the *2010 SPIE-The International Society for Optical Engineering Photonics West, Ultrafast Phenomena in Semiconductors and Nanostructure Materials XIV Symposium, San Francisco, California*, January 24-28, 2010. (presented by N. Engheta).

(Invited) N. Engheta, "Metamaterials for Taming the Light: Metactronics at the Nanoscale," at *the Institute of Pure and Applied Mathematics (IPAM)'s Workshop on Metamaterials: Applications, Analysis and Modeling, University of California, Los Angeles, California,* January 26, 2010. (presented by N. Engheta).

(Invited) N. Engheta, "Extreme-Parameter Plasmonics," at the *2010 SPIE-The International Society for Optical Engineering Photonics West, Optoelectronics Integrated Circuits XII Symposium, San Francisco, California*, January 24-28, 2010. (presented by N. Engheta).

(Plenary Invited Talk) N. Engheta, "Linear and Nonlinear Elements in Metactronics," a plenary talk at the *NATO Advanced Research Workshop, META'10, 2nd International Conference on Metamaterials, Photonic Crystals, and Plasmonics, Cairo, Egypt*, February 22-25, 2010. (presented by N. Engheta).

(Invited) N. Engheta, "Plasmonic Nanowaveguides, Nanoantennas, and Imaging," an invited talk in the special session on "Plasmonic Applications" in the *2010 American Physical Society (APS) March meeting, Portland, Oregon*, March 15-19, 2010. (presented by N. Engheta).

N. Engheta, "Waveguide Splitters and Filters," DARPA Negative-Index Materials (NIM) Final Review Meeting, Arlington, VA, March 23-24, 2010. (Presented by N. Engheta).

N. Engheta, "Taming the Fields and Waves with Metamaterials," DARPA Negative-Index Materials (NIM) Final Review Meeting, Arlington, VA, March 23-24, 2010. (Presented by N. Engheta).

(Invited) N. Engheta, "Nonlinearity in ENZ Plasmonics and Metactronics," an invited talk in *the Conference D on Plasmonic Materials and Metamaterials in the Material Research Society (MRS) Spring Meeting, San Francisco, CA*, April 5-9, 2010. (presented by N. Engheta).

(Invited) N. Engheta, "Metactronics vs Electronics," an invited talk in *the SPIE Photonics Europe Conference, Brussels, Belgium*, April 12-16, 2010. (presented by N. Engheta).

(Invited) A. Alu and N. Engheta, "Non-Scattering Nanoantenna Receiver," an invited talk in *the SPIE Photonics Europe Conference, Brussels, Belgium*, April 12-16, 2010. (presented by A. Alu).

A. Alu and N. Engheta, "Tailoring the Nanoantenna Geometry to Improve Efficieny and Bandwidth," a talk at *the European Conference on Antennas and Propagation (EuCAP'2010) Barcelona, Spain*, April 12-15, 2010. (presented by A. Alu).

A. Alu, P.-Y. Chen, N. Engheta, and S. Maci "Multi-Band Cylindrical Antenna Using Epsilon-Near-Zero Gap," a talk at *the European Conference on Antennas and Propagation (EuCAP'2010) Barcelona, Spain*, April 12-15, 2010. (presented by A. Alu).

(Invited) N. Engheta, "Similarities and Differences between Metactronics and Electronics," an invited talk in *the Workshop on Nano-Optics Plasmonics and Advance Materials, National Institute of Standard and Technology (NIST), Gaithersburg, Maryland,* April 19-22, 2010. (presented by N. Engheta).

N. Engheta, "Metamaterials and Metastructures for Enhanced RF Transmission through the Sea-Air Interface," a talk in *the Ofiice of Naval Research (ONR) Communications Technology Program Review, Planning, and Assessment Meeting, Naval Research Laboratory, Washington DC*, May 4, 2010. (presented by N. Engheta).

N. Engheta and A. Alu, "Selected Features of Plasmonic Cloaking," an invited talk in the minisymposium on "Metamaterials and Cloaking" as part of the *the 2010 Society of Industrial and Applied Mathematics (SIAM) Confenrce on Mathematical Aspects of Material Science, Philadelphia, Pennsylvania*, May 23-26, 2010. (presented by N. Engheta).

N. Engheta, "Epsilon-Near-Zero Optical Metamaterials," a talk at *the 2010 Tri-Service Metamaterials Review, Virginia Beach, VA*, 24-26, 2010. (presented by N. Engheta).

N. Engheta, "Progress on Optical Nanocircuits Inspired by Metamaterials," a talk at *the 2010 Tri-Service Metamaterials Review, Virginia Beach, VA*, 24-26, 2010. (presented by N. Engheta).

A. Alu and N. Engheta, "The Paradox of Zero-Forward Scattering in Relation with Optical Theorem," a talk at the *Annual Internation Conference on Days of Diffractions, St. Petersburg, Russia*, June 8-11, 2010. (presented by A. Alu)

(Invited) I. Gallina, G. Castaldi, V. Galdi, A. Alu, and N. Engheta, "Selected Applications of Transformation Electromagnetics," *CIMTEC 2010: 12th International Conference on Modern Materials and Technologies, Montecatini Terme, Italy*, June 6-18, 2010. Proceedings paper was published in Advances in Science and Technology, Vol. 75, pp. 246-255, 2010. (presented by V. Galdi)

A. Alu, and N. Engheta, "Anti-Resonance Transparency with Plasmonic Shells," a talk at *the 28th Progress in Electromagnetics Research Symposium (PIERS), Cambridge, Masssachussetts*, July 5-8, 2010. (presented by A. Alu)

A. Polemi, A. Alu, and N. Engheta, "Nanocircuit Loading of Optical Plasmonic Waveguides," a talk in the Special Session entitled "Nanoparticles and Nanostructures for RF Applications" at *the 2010 IEEE Antennas and Propagation Society International Symposium/CNC-USNC URSI National Radio Science Meeting, Toronto, Ontario, Canada*, July 11-17, 2010. (presented by A. Polemi)

B.Edwards, A. Alu, M. Silveirinha, and N. Engheta, "Experimental Verification of Metamaterial Cloaking at Microwave Frequencies Using the Scattering Cancellation Technique," a talk in the Special Session entitled "Experimental Validation of Metamaterial Phenomena" at *the 2010 IEEE Antennas and Propagation Society International Symposium/CNC-USNC URSI National Radio Science Meeting, Toronto, Ontario, Canada*, July 11-17, 2010. (presented by B. Edwards)

I. Gallina, G. Castaldi, V. Galdi, A. Alu, and N. Engheta, "A General Class of Transformation-Optics-Inspired Metamaterial Slabs," a talk at *the 2010 IEEE Antennas and Propagation Society International Symposium/CNC-USNC URSI National Radio Science Meeting, Toronto, Ontario, Canada*, July 11-17, 2010. (presented by V. Galdi)

A. Alu, and N. Engheta, "Homogenization of 2D and 3D Sub-Diffractive Arrays of Plasmonic Nanoparticles," a talk in the Special Session entitled "Homogenization of Metasurfaces and Bulk Metamaterials at Microwaves, THz, and Optical Frequencies" at *the 2010 IEEE Antennas and Propagation Society International Symposium/CNC-USNC URSI National Radio Science Meeting, Toronto, Ontario, Canada*, July 11-17, 2010. (presented by A. Alu)

(Invited) N. Engheta, "Flatland Metamaterials and Transformation Optics with Graphene," an invited talk at *the 4th International Workshop on Electromagnetic Metamaterials (IWEM IV), New Directions in Active and Passive Metamaterials, Albuqueque, New Mexico*, August 11-12, 2010. (presented by N. Engheta).

(Invited) A. Alu and N. Engheta, "Extremely Anisotropic Boundary Conditions and Their Optical Applications," an invited talk at *the 2010 International Union of Radio Science (URSI), International Symposium on Electromagnetic Theory (URSI-EMTS), Berlin, Germany*, August 16-19, 2010. (presented by N. Engheta).

(Invited) I. Gallina, G. Castaldi, V. Galdi, A. Alu and N. Engheta, "A Transformation-Optics-Inspired Route to Sensor Invisibility Based on Cloak/Anti-Cloak Interaction," an invited talk at *the 2010 International Union of Radio Science (URSI), International Symposium on Electromagnetic Theory (URSI-EMTS), Berlin, Germany*, August 16-19, 2010. (presented by I. Gallina).

(Plenary Invited Talk) N. Engheta, "Metatronics: Manipulating the Light and Electrons with Metamaterials," an invited plenary talk at *the XVIII RiNEM (18th Italian National Conference in Electromagnetics), 1st National Conference of URSI Commission B, Benevento, Italy*, September 6-10, 2010. (presented by N. Engheta).

I.Gallina, G. Castaldi, V. Galdi, A. Alu, and N. Engheta, "Approaches to Sensor Cloaking," at *the XVIII RiNEM (18th Italian National Conference in Electromagnetics), 1st National Conference of URSI Commission B, Benevento, Italy*, September 6-10, 2010. (presented by V. Galdi)

(Plenary Invited Talk) N. Engheta, "Metatronics with Light and Electrons: Taming the Optics and Electronics with Metamaterials," an invited plenary talk at *the 4Th International Congress on Advanced Electromagnetic Materials in Microwaves and Optics (Metamaterials 2010), Karlsruhe, Germany*, September 13-16, 2010. (presented by N. Engheta).

(Invited) A. Alu and N. Engheta, "Electromagnetic Modeling and Limitations in the Homogenization of Metamaterials and Metasurfaces," an invited talk at the *the 4Th International Congress on Advanced Electromagnetic Materials in Microwaves and Optics (Metamaterials 2010), Karlsruhe, Germany*, September 13-16, 2010. (presented by A, Alu).

(Invited) V. Galdi, G. Castaldi, I. Gallina, A.Alu and N. Engheta, "General Classes of Anisotropic Metamaterial Transformation Slabs," an invited talk at the *the 4Th International Congress on Advanced Electromagnetic Materials in Microwaves and Optics (Metamaterials 2010), Karlsruhe, Germany*, September 13-16, 2010. (presented by A, Alu).

A.Vakil, and N. Engheta, "Manipulating of IR Surface-Plasmon Polariton on Graphene," a poster at *the 94th Annual Meeting of the Optical Society of America (OSA), 2010 Frontiers in Optics (FiO) Conference, Rochester, New York*, October 24, 28, 2010 (presented by A. Vakil).

H. Iizuka, N. Engheta, H. Fujikawa, K. Sato, and. Y. Takeda, "Capabilities of Trapping in Single Gratings and Switching in Double-Sided Gratings for Normal Incident Light," a poster at *the 94th Annual Meeting of the Optical Society of America (OSA), 2010 Frontiers in Optics (FiO) Conference, Rochester, New York*, October 24, 28, 2010 (presented by H. Iizuka).

Y. Sun, B. Edwards, A. Alu, and N. Engheta, "Experimental Verification of the Concept of Optical Lumped Circuit Elements at IR Wavelengths," a talk at *the 94th Annual Meeting of the Optical Society of America (OSA), 2010 Frontiers in Optics (FiO) Conference, Rochester, New York*, October 24, 28, 2010 (presented by N. Engheta).

O. Luukkonen, and N. Engheta, "One-Way Waveguides and Impedance Matching of Loads," a talk at *the 94th Annual Meeting of the Optical Society of America (OSA), 2010 Frontiers in Optics (FiO) Conference, Rochester, New York*, October 24, 28, 2010 (presented by N. Engheta).

(Invited) N. Engheta, "Taming the Fields and Waves with Extreme Metamaterials," a talk at *the 94th Annual Meeting of the Optical Society of America (OSA), 2010 Frontiers in Optics (FiO) Conference, Rochester, New York*, October 24, 28, 2010 (presented by N. Engheta).

U. Chettiar and N. Engheta, "Pair of Optical Nanoantennas for Enhancing Second-Harmonic Generation," a talk at *the 94th Annual Meeting of the Optical Society of America (OSA), 2010 Frontiers in Optics (FiO) Conference, Rochester, New York*, October 24, 28, 2010 (presented by N. Engheta).

(Invited) N. Engheta, "Extreme Metamaterials," a talk at *the Schultz/Metamaterials Symposium to honor Professor Sheldon Schultz, La Jolla, California*, November 4, 2010 (presented by N. Engheta).

(Invited) N. Engheta, "From Metatronics to Graphene Nanocircuits," a talk at *the NanoMeta 2011, Third International Topical Meeting on Nanophotonics and Metamaterials, Seefeld, Tirol, Austria*, January 2-6, 2011 (presented by N. Engheta).

A.Vakil, N. Engheta, "Two-Dimensional Lensing on Graphene," a talk at *URSI-USNC National Radio Science Meeting, Boulder, Colorado*, January 5-8, 2011 (presented by A. Vakil).

(Invited) A. Vakil and N. Engheta, "Flatland Metamaterials with Graphene," an invited talk at *the 2011 SPIE Photonics West, Photonic and Phononic Properties of Engineered Nanostructures Conference (7946), San Francisco, California*, January 22-27, 2011 (presented by N. Engheta).

(Invited Plenary Talk) N. Engheta, "Of Light, Electrons, and Metamaterials," an invited plenary talk at *the 2011 SPIE Photonics West, LASE, San Francisco, California*, January 22-27, 2011 (presented by N. Engheta).

M. Saboktakin, B. Edwards, N. Engheta, and C. Kagan "Radiation Tuning of Optical Nanoantennas for Design of Nanofilter Elements," a talk at *2011 American Physical Society (APS) March Meeting, Dallas, Texas*, March 21-25, 2011 (presented by M. Saboktakin).

(Invited) N. Engheta, "Taming Light and Electrons with Metamaterials," *2011 Joint Spring Meeting of the New England Sections of the American Physical Society and the American Association of Physics Teacher, Lowell, MA*, April 8-9, 2011 (presented by N. Engheta).

(Invited Plenary Talk) N. Engheta, "Metatronis: Merging Electronics, Photonics, and Magnetics into One Paradigm," an invited plenary talk at *the 2011 European Conference on Antennas and Propagation (EuCAP'2011), Rome, Italy*, April 11-15, 2011 (presented by N. Engheta).

(Invited) N. Engheta, "Merging Electronics and Photonics Using Metamaterials," an invited talk at the *2011 Plasmonics, Photonics, and Magneto-Optics (PPM 2011) Conference of the 2011 ImagineNano Conference, Bilbao, Spain*, April 11-15, 2011 (presented by N. Engheta).

P. Fan, U. Chettiar, L. Cao, F. Afshinmanesh, N. Engheta, and M. Brongersma, "Gold Coated Silicon Nanowire: A Case Study of Engineering Novel Light-Matter Interaction," a talk at the *2011 Materials Resrearch Society (MRS) Spring Meeting, San Francisco, CA*, April 25-29, 2011 (presented by P. Fan).

P. Fan, U. Chettiar, L. Cao, F. Afshinmanesh, N. Engheta, and M. Brongersma, "Gold Coated Silicon Nanowire: An Invisible Photodetector," a talk at the *2011 Materials Resrearch Society (MRS) Spring Meeting, San Francisco, CA*, April 25-29, 2011 (presented by M. Brongersma).

(Invited) N. Engheta, "Recent Progress in IR Metatronics," an invited talk at the *2011 Materials Resrearch Society (MRS) Spring Meeting, San Francisco, CA*, April 25-29, 2011 (presented by N. Engheta).

(Invited Tutorial) N. Engheta, "Optical Metatronics," an invited talk at the *2011 Conference on Laser and Electrooptics/Quantum Electronics and Laser Science (CLEO/QELS), Baltimore, MD*,, May 2-6, 2011 (presented by N. Engheta).

(Invited) N. Engheta, "IR Metatronics and Graphene Metamaterials," an invited talk at the *2011 Institut d'Etudes Scientifiques de Cargese on Recent Developments of Wave Physics in Complex Media, Cargese, Corsica Island, France*, May 2-6, 2011 (presented by N. Engheta).

N. Engheta (on behalf of the ONR MURI Team), "Large-Area, 3D, Optical Metamaterials with Low Loss and Tunability", at the *2011 ONR Metamaterials Program Review Meeting, Santa Rosa, CA*, May 10-11, 2011 (presented by N. Engheta on behalf of the MURI Team).

A.Vakil, N. Engheta, "One-Atom-Thick Plasmonic Metamaterials and Optical Devices", at *the 2011 5th International Conference on Surface Plasmon Photonics (SPP'5), Busan, South Korea*, May 15-20, 2011 (presented by N. Engheta)

N. Engheta, "Metatronics and One-Way Terminals", at the *AFOSR 2011 Joint Electronics Program Review Meeting, Arlington, VA*, May 23-26, 2011 (presented by N. Engheta).

(Invited) N. Engheta, "Metatronics", a plenary talk at *the 2011 Days on Diffraction, St. Petersburg, Russia*, May 30-June 3, 2011 (presented by N. Engheta)

(Invited) N. Engheta, "On Transformation Optics on Graphene Metamaterials", an invited talk at *the WavePro Conference celebrating Costas Soukoulis' 60th Birthday, Crete, Greece*, June 8-11, 2011 (presented by N. Engheta)

M. Silveirinha and N. Engheta, "Reducing the Effects of Material Loss with Near-Zero-Permeability Metamaterials," presented at the *2011 IEEE AP-S International Symposium/USNC/URSI Meeting, Spokane, Washington*, July 3-8, 2011, URSI-B abstract (presented by N. Engheta)

M. Navarro-Cia, M. Beruete, M. Sorolla, and N. Engheta, "Lens Concept Using Epsilon-Near-Zero (ENZ) Metamaterials," presented at the *2011 IEEE AP-S International Symposium/USNC/URSI Meeting, Spokane, Washington*, July 3-8, 2011, URSI-B abstract (presented by M. Navarro-Cia)

G. Castaldi, I. Gallina, V. Galdi, A. Alu, and N. Engheta, "Tunneling Properties through Asymmetrical Single-Negative, Double-Positive Tri-Layers", presented at the *2011 IEEE AP-S International Symposium/USNC/URSI Meeting, Spokane, Washington*, July 3-8, 2011, URSI-B abstract (presented by A. Alu)

O. Luukkonen, U. Chettiar, and N. Engheta, "Connecting One-Way Waveguides to Terminal Loads", presented at the *2011 IEEE AP-S International Symposium/USNC/URSI*

Meeting, Spokane, Washington, July 3-8, 2011, URSI-B abstract (presented by N. Engheta)

B. Edwards and N. Engheta, "Experimental Verification of Plasmonic/Dielectric Waveguide Exhibiting Wire-Like Properties", presented at the Special Session on "Experimental and Numerical Validations of Metamaterials Phenomena" in the *2011 IEEE AP-S International Symposium/USNC/URSI Meeting, Spokane, Washington*, July 3-8, 2011, URSI-B abstract (presented by B. Edwards)

A.Vakil, and N. Engheta, "Ultrathin Waveguides and Cavities Using Graphene", presented at the *2011 IEEE AP-S International Symposium/USNC/URSI Meeting, Spokane, Washington*, July 3-8, 2011, URSI-B abstract (presented by A. Vakil)

A.Vakil and N. Engheta, "Synthesis of Optical Nanocircuits based on Generalized Optical Impedance for Composite Nanoparticles", presented at the *2011 IEEE AP-S International Symposium/USNC/URSI Meeting, Spokane, Washington*, July 3-8, 2011, URSI-B abstract (presented by A. Vakil)

U. Chettiar and N. Engheta, "Difference-Frequency Signal Generation Enhanced by Optical Nanoantennas", presented at the *2011 IEEE AP-S International Symposium/USNC/URSI Meeting, Spokane, Washington*, July 3-8, 2011, URSI-B abstract (presented by N. Engheta)

(Invited) N. Engheta, "From Electronics to Metatronics to Graphene Metamaterials", presented at the *30th General Assembly and Scientific Symposium of the International Union of Radio Science (URSI), Istanbul, Turkey*, August 13-20, 2011, BD1.10 summary (presented by N. Engheta)

(Invited) N. Engheta, "Nonlinearity in Metatronics," presented at the special session on "Nonlinear Metamaterials" at the *Metamaterials: Fundamentals and Applications IV Conference of the 2011 SPIE-The International Society for Optical Engineering on Optics and Photonics, San Diego, California*, August 21-26, 2011, Abstract 8093-4 (presented by N. Engheta)

(Invited) N. Engheta, "From Microwave Antennas to Optical Nanoantennas," an invited talk at the *2011 Advanced DPG Physics School on "Nanoantennas and Hybrid Quantum Systems," Physikzentrum Bad Honnef, Germany*, September 25-30, 2011. (presented by N. Engheta)

(Invited Plenary Talk) N. Engheta, "Of Light and Metatronics," an invited plenary talk at the *2011 MESA+ Meeting of the Institute of Nanotechnology, University of Twente, The Netherlands*, September 27, 2011. (presented by N. Engheta)