Magda El-Shenawee
Professor of Electrical Engineering
University of Arkansas, Fayetteville
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University of Nebraska-Lincoln	Ph.D.	August/1991	Electrical Engineering
Assiut University, Egypt	MS	January/1981	Electrical Engineering
Assiut University, Egypt	BS	June/1976	Electrical Engineering

Positions and Employment

April 2010-present	Professor of electrical Engineering at the University of Arkansas
2004-April 2010	Associate Professor of Electrical Engineering at the University of Arkansas.
2001-2004	Tenure-Track Assistant Professor at the University of Arkansas
1999-2000	Scientist at Northeastern University, Center for Electromagnetics Research
1997-1999	Postdoc, University of Illinois Urbana Champaign, Center for Computational Electromagnetics (CEM)
1996-1996	Fellow at Ajou University, Microwave Applications Lab, South Korea
1994-1996	Research Associate at NRC, Cairo, Egypt, Microstrip Laboratory
1991-1994	Postdoc. at the University of Nebraska-Lincoln
1987-1991	Research Assistant at the University of Nebraska-Lincoln
1986-1987	Peace Fellow at the University of Nebraska-Lincoln
1984-1986	Research Assistant at NRC, Cairo, Egypt, Microstrip Laboratory
1979-1984	Teaching Assistant at Cairo University, Egypt
1977-1979	Teaching Assistant at Assiut University, Egypt

Research Interests

Nano-antennas, inverse scattering problems, computational reconstruction algorithms, microwave imaging experimental systems, subsurface sensing of buried objects, mathematical biology modeling of breast tumors, biophysics of tumors, breast cancer biomagnetics and biopotentials, microwave imaging algorithms, UWB/MEMS antennas, rough surface scattering, anti-personnel landmine detection, RF & microwave circuits.

Honors & Recognitions

- Nominated for the John L. Imhoff Award for Teaching in Electrical Engineering Dept., 2009
- Received Electrical Engineering Department Teaching Award in 2009
- Recipient of the 2008 John A White Award for Faculty-Student Collaboration, 2008.
- Received the Faculty Gold Medal for mentoring students at UA in 2008.
- Received Outstanding Faculty Mentor awards at the University of Arkansas 2005, 2007-2010.
- Best Reviewer IEEE Transactions on Geosciences and Remote Sensing, 1998.
- KOSEF Fellow, Korean Science and Engineering Foundation, 1996
- Editorial Board**,** COMPUMAG'95, Berlin, Germany, July 1995.
- Hammond Fellow, University of Nebraska, 1990.
- Peace Fellow, American International Development Agency (USAID), 1986

Students Awards

1) Stephen Crain, junior student, has won (i) the state of Arkansas SURF grant in 2008 ($2,650), (ii) NSF travel grant to the University of Technology of Troyes (UTT), France for three months in summer 2009 to work on fabrication of nano-antennas in collaboration between El-Shenawee and Prof. Renaud at UTT initiated in 2007, (iii) NSF GRF 2010-2013.
2) Jordan Greenlee, senior student, has won: (i) the state of Arkansas SURF grant in 2007 ($2,650) & (ii) the national Goldwater Scholarship award in 2008 (~$7000).

3) Douglas Woten, PhD graduate student has won: (i) the NSF Graduate Research Fellowship for three years (2006-2009). Total of $120,000; (ii) the 2008 Best Paper award in the International Conference of Applied Computational Elecromagnetics (ACES) in Niagara Fall, Canada. Total of $300.
4) Ahmed Hassan, PhD graduate student was awarded the UA DAF for four years based on his GPA in his MS degree. El-Sewanee has nominated him for the fellowship from 2007-2011. Total of $40,000.
5) Mohammad Reza, Ph.D. graduate student was awarded: (i) the 2008 Honorable best paper award in the IEEE International Conference on Antennas and Propagation in San Diego. Total of $1000; & (ii) the 2008 NSF/CIEG grant to spend eleven weeks at the Supercomputer Center in San Diego.
6) Payam Rashidi, MS graduated student, was awarded the NSF Honorable Mention, 2006.

Undergraduate Students, Research Project Title, Year & Funding Source (most recent)

- Stephen Crain, "Nano-Antennas: Investigating the Structural Optimization Using Computer Simulation," 2009-2010 (SURF proposal, pending)
- Stephen Crain, "Fabrication of nano-antennas," summer 2009 in France (NSF)
- Stephen Crain, "Delaunay Discretization of 3D Objects," 2008-2009 (SURF& NSF)
- Lauren Megee, "Application of the DDSCAT in Early Breast Cancer Detection," 08-09 (NSF)
- Jessica Rutledge, "Ground Penetrating Radar for Defect Detection Buried Pipes," 08-09 (NSF)
- Jordan Greenlee, "Modeling of the Breast Ducts and Vasculature," 07-08 (SURF, NSF& Honors)
- Habibah B. Awuah, "MATLAB Programming for Array of Electric Dipoles," 2006 (UA underrepresented CARVER program & NSF)
- Katrina Geren, "Use of HFSS for Antenna Design of Arbitrary Shapes," 2006 (NSF-REU)
- Tushar Bajaj, "Microwave Measurements," 2006 (NSF)

Completed Undergraduate Honors Theses

1. Stephen Crain, "Design and Fabrication of Nano-antennas," May 2010.
2. Lauren Megee, Honors Thesis title "Preliminary study based on the DDSCAT software to explore increasing the contrast of breast tumors for microwave imaging," May 2009.
3. Jordan Greenlee, Honors Thesis title "Computational modeling of the internal structure in the breast," December 2008.
4. Rajit Chatterjea, Honors Thesis title "Algorithms for Smart Antennas in Wireless Communications," May 2005.

Theses & Dissertations (completed)

1. Seth Shumate, *Computational Model of Ductal Carcinoma in-situ of the Breast*, A Thesis submitted in partial fulfillment of the requirement for the degree of Master of Science in the Micro-Electronics and Photonics Program (MicroEP) associated with the Electrical Engineering Department at the University of Arkansas in May 2008.
2. Douglas Woten, *Artificial neural Networks for Breast Cancer Detection using Micro Antennas*, A Thesis submitted in partial fulfillment of the requirement for the degree of Master of Science in the Micro-Electronics and Photonics Program (MicroEP) associated with the Electrical Engineering Department at the University of Arkansas in May 2007.
3. Shruti Pandalraju, *A Hybrid Algorithm based on Mie theory and Evolution Strategy for Breast Cancer Imaging*, A Thesis submitted in partial fulfillment of the requirement for the degree of Master of Science in Electrical Engineering, the University of Arkansas in May 2006.
4. Gokul Nanda Talapanuri, *Improved Microstrip Patch Antenna for Breast cancer Detection*, A Thesis submitted in partial fulfillment of the requirement for the degree of Master of Science in Electrical Engineering, the University of Arkansas in May 2006.
5. Payam Rashidi, *Microwave Imaging for Breast Cancer based on Evolution Strategies*, A Thesis submitted in partial fulfillment of the requirement for the degree of Master of Science in Electrical Engineering, the University of Arkansas in December 2005.
6. Vigneswar Kelambaakam Raja, *Three Dimensional Microwave Imaging of Breast cancer based on Finite Difference Time Domain Metho*d, A Thesis submitted in partial fulfillment of the requirement for the degree of Master of Science in Electrical Engineering, the University of Arkansas in December 2004.

El-Shenawee, Magda

Theses & Dissertations (ongoing)

1. Douglas Woten, Ph.D., MEMS Antennas for Microwave Imaging (May 2010)
2. Mohammad R. Hajihashemi, Ph.D., Inverse Scattering Level Set Algorithm for Retrieving the Shape and Location of Multiple Targets (May 2010)
3. Fadi G. El-Deek, MS, Microwave Detection of Cracks in Buried Pipes Using the Complex Frequency Technique (May 2010).
4. Ahmed Hassan, Ph.D, Biomagnetics for Breast Cancer Detection (expected Dec 2010)
5. May Zein El-Din, MS, DSP Programming for Real Time Detection (co-advisor Dr. Smith), (May 2011)

Courses Taught at UA (2001-present)

- ELEG 1011 Engineering Ethics (Freshman level, was required by ABET)
- ELEG 2103 Circuits I & Lab (sophomore level, core course)
- ELEG 3133 Digital Signal Processing & Lab (junior level, core course)
- ELEG 3703 Fields and Waves (junior level, core course)
- ELEG 4061Electric Senior Design I (senior level, required course)
- ELEG 4071 Electric Senior Design II (senior level, required course)
- ELEG 4723 Introduction to RF & MW Design (Technical elective & Grad level)
- ELEG 4733 Introduction to Antennas (Technical elective & Grad level)
- ELEG 5765 Advanced Electromagnetic Scat. & Trans. (Grad level)
- ELEG 488vH Honors Special Problems
- ELEG 488v/588v Special Problems

Professional Services and Activities

- Associate Editor, IEEE Antenna and Wireless Propagation Letters, Jan 2009-present
- Co-Chair of Women Giving Circle Membership-University of Arkansas, 2009-2010
- Search Committee Vice Provost for Research & Economic Development, 2009-2010
- Served on the John White Convocation selection award committee, June 2009
- By mail NIH proposal Reviewer for the Challenge Stimulus program, June 2009
- Organizing the visit of Dr. Andrawis, chair of electrical engineering NSF GRF Panel, to UA in fall 2009
- Organized & hosted NSF Program Director visit, Dr El-Hakim, to the UA, April 2009
- External Reviewer for ND EPSCoR SEED Proposal Review – May 2009
- External Examiner Ph.D. committee for the University of Manitoba, Canada, Feb 2009
- Book Proposal Reviewer for Wiley & Sons Pub., Feb. 2009
- By mail NSF proposal Reviewer for the PetaApps Program, Jan 2009
- NSF GRFP Fellowship seminars & follow ups to the UA Honors College students, 2008, 2009, 2010.
- Invited to give a seminar to the Society of Women in Engineering (SWE) at UA, March 2009
- Organized/Chaired/Co-chaired technical sessions in professional technical meetings:
    - (i) “Inverse Scattering and Imaging Techniques”, (ii) “Cancer Detection and Treatment”, (iii) “Diverse Measurements Techniques”, and (iv) “IR/Optical Periodic and Nano-Structures” at the IEEE APS & USNC/URSI Symposium, Charleston, SC, June 1-5, 2009.
    - “Microwave Imaging and Inverse Problems”, ACES Conference, Niagara Falls, Canada, 2008.
    - “Advances in Microwave Imaging”, IEEE APS’07 Symposium, Hawaii, 2007.
    - “Radar I”, *SPIE’s International Symposium, Detection & Remediation Technologies for Mines and Minelike Targets, Orlando,* 2003
    - “Sub-Surface Remote Sensing”, *PIERS’02 Symposium, Boston,* 2002
    - “Rough Surface Scattering I & II”, IEEE APS/URSI’01 Symposium, Boston, 2001.
    - “RCS Analysis”, *12th Annual Progress in Applied Computational Electromagnetics* (*ACES*), 1996
- NSF panelist, Graduate Research Fellowship Program (GRFP), 2007, 2008, 2009
- NSF panelist, ECCS program, 2001, 2006, 2008
- NSF site REU Program, accepted invitation to serve as panelist, December 17-18, 2009
- NSF CAREER Program, accepted invitation to serve as panelist, November 2-3, 2009

- Associate Editor, Journal Applied Computational Electromagnetics (ACES), 2002-2006
- Committee Chair for organizing & hosting the Electrical Engineering Seminar Series for one year, 2008.
- IEEE Senior member since 2002.
- Coordinated the monthly Female Graduate Students & Faculty in the College of Engineering and the MicroEP program, 2006-2007
- Reviewer for the *IEEE Trans. Antennas and Propagation*, the *IEEE Trans. Geosciences and Remote Sensing*, the *Journal of Radio Science*, the *IEEE Antennas and Wireless Propagation Letters*, the *Journal of Applied Computational Electromagnetics (ACES)*, the *Journal of Waves in Random Medium*, and the Antennas and Propagation Magazine.

External Research Funding since January 2001
Total Funding: $1,023,300 from spring 2001-present

Awarded

- NSF Workshop, "Advances in Breast Cancer Research," El-Shenawee (PI), with Carol Gattis (Co-PI). Total amount $98,850 for 1 year (including $7000 cost share from UA). Role: PI with C. Gattis (Co-PI).
- NSF MRI-R^2 "Acquisition of an Integrated Instrument for Computational Research and Education," role (Co-PI) with three other Co-PIs, and Amy Apon (PI). Total $900,000 for 3 years. Role: Co-PI with A. Apon (PI).

Approved

- NSF: "Modeling and Fabricating Nanotoroid Antenna Pairs to Plasmon-Enhance Solar Photovoltaic" $360,000, Role: (Co-PI), Keith Roper (PI), 2010-2013.
- ARL/Appropriation: "Terahertz Imaging," Role: (Co-PI) with G. McGuire (PI) and other PIs. Amount: $1.6 M, for 1 year 2010-2011

Completed

- Entergy Inc., El-Shenawee (PI) — $55,000 (all direct cost) — 7/08-5/10
  Use of the Ground Penetrating Radar (GPR) and Advanced Imaging Algorithms to Detect Cracks in Buried Pipes.
- National Science Foundation (NSF), El-Shenawee (PI) — $470,000 — 9/05-8/31/09
  ECS, Collaborative Research: Compact Microwave Imaging System Based on Antenna Array of Dielectric Resonators for Breast Cancer Detection ($250,000 for UA, leading, and $220 for the University of Mississippi)
- National Science Foundation (NSF), El-Shenawee (PI) — $27,505 — 9/07-8/31/09
  ECS International Research and Education in Engineering (*Supplement*)
- National Science Foundation (NSF), El-Shenawee (PI) — $28,170 — 7/06-8/31/09
  ECS GRS *Supplement* grant on breast cancer research (*Supplement*)
- National Science Foundation (NSF), El-Shenawee (PI) — $11,500 — 5/08-8'31/08
  CIEG: Cyberinfrastructure Experiences for Graduate Students (*Supplement*)
- National Science Foundation (NSF), El-Shenawee (PI) — $25,000 — 9/06-8/31/08
  ECS International Research and Education in Engineering (*Supplement*)
- Arkansas Bioscience Institute (ABI), El-Shenawee (PI) — $32,000 — 7/06-5/07
  Monitoring Abnormality in Biological Cells Using RF Micromechanical Sensors (MEMS) (including $7,000 match)
- National Science Foundation (NSF), El-Shenawee (PI) — $6,000 — 5/06-8/06
  ECS REU *Supplement* grant on breast cancer research (*Supplement*)
- Women Giving Circle at University of Arkansas, El-Shenawee (PI) — $30,000 — 5/05-5/07
  Microwave Imaging for Early Detection of Breast Cancer
- Arkansas Bioscience Institute (ABI), El-Shenawee (PI) — $134,200 — 1/04-5/05
  Biomedical Research: Innovative Microwave Imaging System for Breast Cancer Detection. F. Barlow (Co-PI).

- Subcontracts ($15k, $15k, $10k) from NEU, ERC NSF, Silevitch (PI), Inverse Scattering Algorithm Using the Fast Multipole Method. Role: PI at UA and key personnel at NEU (Northeastern University). $40,000 9/02-8/05
- National Astronomic Space Agency (NASA), El-Shenawee (PI) Passive Sensors: Modeling the Breast Cancer Tumors in the Frequency Domain Using the Steepest Descent Fast Multipole Method (SDFMM) $57,000 1/02-11/02
- Arkansas Science and Technology Authority (ASTA), El-Shenawee (PI) Subsurface Sensing of Objects Buried in Randomly Rough Multilayered Soil Using Electromagnetic Wave Scattering (including $15,000 match). $57,917 5/01-8/02
- Subcontract from Northeastern University (ARO) Rappaport (PI) Electromagnetic Wave Scattering from a Clutter Object Buried Nearby AP Mine under Two-Dimensional Random Rough Surface, Role: PI at UA and key personnel at NEU. $30,000 3/01-10/01

Pending

- US--Egypt Joint Board on Scientific and Technological Cooperation, "Theoretical and Computational Analysis and Fabrication of Nanotoroid Array of Antennas for Photonic Enhancement Energy Enhancement," Role (PI) with K. Roper (Co-PI), Chemical Engineering. $200,000 for 2 years. Submitted in October 2009.
- NSF: "Virtual Ultra Wideband (VUW) Sensing System," Amount: $351,172. Role (PI) with J. Wu (Co-PI). Duration is 3 years. Submitted in February 2010

Publications

(Co-authors D. A. Woten, A. Hassan, S. D. Shumate, and M. R. Hajihashemi, are Ph.D. students; J. Greenlee was UG student. Others are national and international collaborators)

Refereed Journal Papers

In Review

1. M. R. Hajihashemi and M. El-Shenawee, "Through the Wall Imaging based on the Level-set Shape Reconstruction Algorithm," *IEEE Trans. Magnetics,* (in review).
2. M. El-Shenawee, "Polarization Dependence of Plasmonic Nanotoroid Dimer Antenna" *IEEE Antenna and Propagation Letter*, (in review).
3. M. R. Hajihashemi and M. El-Shenawee, "Three-dimensional Level Set Shape Reconstruction Algorithm for PEC Targets," *J. Computational Physics,* (in review).
4. M. R. Hajihashemi and M. El-Shenawee, "Multiphase Level Set Algorithm for Shape Reconstruction of Multiple 3D Penetrable Targets," *IEEE Trans. Geosci. & Rem. Sens.* (in review).

Accepted

5. A. Hassan and M. El-Shenawee, "Modeling Biopotential Signals and Current Densities of Multiple Breast Cancerous Cells," *IEEE Trans. on Biomed* (*in press*).

Published

6. M. R. Hajihashemi and M. El-Shenawee, "High performance computing for the level-set reconstruction algorithm," *J. Parallel Distributed Computing*, vol. 70, no. 6, pp. 671-679, June 2010.
7. M. R. Hajihashemi and M. El-Shenawee, "*TE* versus *TM* for the Shape Reconstruction of 2-D PEC Targets using the Level-Set Algorithm," *IEEE Trans. Geosci. & Rem. Sens.,* vol. 48, no. 3, pp. 1159-1168, March 2010.
8. D. A. Woten, M. R. Hajihashemi, A. M. Hassan and M. El-Shenawee, "Experimental Microwave Validation of the Level-Set Reconstruction Algorithm," *IEEE Trans. Antennas and Propag.*, vol. 58, no. 1, pp. 230-233, Jan 2010.
9. A. Hassan, M. Hajihashemi, M. El-Shenawee, A. Al-Zoubi, A. Kishk, "Drift De-noising of Experimental *TE* Measurements for Imaging of 2D PEC Cylinder using the Level Set Algorithm," *IEEE Antennas and Wireless Propagation Letters*, vol. 8, pp. 1218-1222, 2009.

10. A. Hassan and M. El-Shenawee, “Diffusion-Drift Modeling of a Growing Breast Cancerous Cell,” *IEEE Trans. on Biomed. Eng.*, vol. 56, no. 10, pp. 2370-2379, October 2009.
11. D. A. Woten and M. El-Shenawee, “Quantitative Analysis of Breast Skin for Tumor Detection using Electromagnetic Waves,” *J. Applied Computational Electromagnetics*, vol. 24, no. 5, October 2009.
12. J. Greenlee and M. El-Shenawee, “Computer Simulation of Breast Ducts,” *Undergraduate Research Journal Inquiry*, vol. 10, pp. 38-42, October 2009.
13. S. D. Shumate, M. El-Shenawee, “Computational Model of Ductal Carcinoma in Situ: The Effects of Contact Inhibition on Pattern Formation,” *IEEE Trans. on Biomed. Eng.*, vol. 56, no 5, pp. 1341-1347, May 2009.
14. M. El-Shenawee, O. Dorn, and M. Moscoso, “Adjoint-Field Technique for Shape Reconstruction of 3-D Penetrable Object Immersed in Lossy Medium”, *IEEE Trans. Antennas and Propag.,* vol. 57, no. 2, pp. 520-534, Feb. 2009.
15. D. Woten, M. El-Shenawee, "Broadband Dual Linear Polarized Antenna for Statistical Detection of Breast Cancer," *IEEE Trans. Antennas and Propagation*, Vol. 56, no. 11, pp. 3576 - 3580, Nov. 2008.
16. M. R. Hajihashemi, M. El-Shenawee, “Shape Reconstruction Using the Level Set Method for Microwave Applications,” *IEEE Antennas and wireless propagation letters*, vol. 7, no. 4, pp. 92-96, April 2008.
17. D. Woten, J. Lusth, M. El-Shenawee, “Interpreting Artificial Neural Network for Microwave Detection of Breast Cancer,” *IEEE Microwave Letters*, vol. 17, no. 12, pp. 825 - 827, December 2007.
18. M. El-Shenawee, E. Miller, “Spherical Harmonics Microwave Algorithm for Shape and Location Reconstruction of Three-Dimensional Malignant Breast Cancer Tumor,” *IEEE Trans. Medical Imaging*, vol. 25, no. 10, pp. 1258-1271, October 2006
19. M. El-Shenawee, “Polarimetric Scattering from Multi-layered Two-Dimensional Random Rough Surfaces with and without Buried Objects,” *IEEE Trans. on Geosci.& Rem. Sensing*, vol. 42, no. 1, pp. 67-76, January 2004.
20. M. El-Shenawee, “Resonant Spectra of Malignant Breast Cancer Tumors Using the three-Dimensional Electromagnetic Fast Multipole Model,” *IEEE Trans. on Biomedical Engineering*, Vol. 51, No. 1, pp. 35-44, January 2004.
21. M. El-Shenawee, Eric Miller, “Multiple-Incidence Multi-frequency for Profile Reconstruction of Random Rough Surfaces Using the Three-Dimensional Electromagnetic Fast Multipole Model,” *IEEE Trans. on Geosci. & Rem. Sensing,* vol. 42, no. 11, pp. 2499-2510, November 2004.
22. M. El-Shenawee, “Remote Sensing of Objects Buried Beneath 2-D Random Rough Surfaces using the Modified Mueller Matrix Elements,” *Journal of Optical Society of America A (JOSA A*), vol. 20, pp.183-194, January 2003.
23. M. El-Shenawee, “Numerical Assessment of Multi-frequency Microwave Radiometry for Sensing Malignant Breast Cancer Tumor,” *Microwave Optical Technology Letters*, pp. 394-398, vol. 36, no. 5, March 2003.
24. M. El-Shenawee, “Scattering from Multiple Objects Buried under Two-Dimensional Randomly Rough Surface using the Steepest Descent Fast Multipole Method,” *IEEE Trans. Antennas and Propagation*, vol. 51, no. 4, pp. 802-809, April 2003.
25. M. El-Shenawee, C. Rappaport, “Electromagnetic Scattering Interference Between Two Shallow Objects Buried Under 2-D Random Rough Surfaces,” *IEEE Microwave and Wireless Components Letters* (*MWCL*)*,* vol. 13, no. 6 , pp. 223 –225, June 2003.
26. C. Rappaport, M. El-Shenawee, and H. Zhang, “Suppressing GPR Signal Degradation from Randomly Rough Ground Surfaces to Enhance nonmetallic Mine Detection,” *J. Subsurface Sensing Technologies and Applications,* Vol. 4, No. 4, pp. 309-324, October 2003.
27. D. Jiang, W. Meleis, M. El-Shenawee, E. Mizan, M. Ashouei and C. Rappaport, “Parallel Implementation of the Steepest Descent Fast Multipole Method (SDFMM) On a Beowulf Cluster for Subsurface Sensing Applications,” *IEEE Microwave and Wireless Components Letters (MWCL),* vol. 12, no. 1, pp. 24-26, January 2002.
28. M. El-Shenawee, “The Multiple Interaction Model for Non-Shallow Scatterers Buried Beneath Two-Dimensional Random Rough Surfaces,” *IEEE Trans. on Geosci.& Remote Sensing*, vol. 40, no. 4, pp. 982-987, April 2002.
29. M. El-Shenawee and C. Rappaport, “Monte Carlo Simulations for the Statistics of Clutter in Minefields: AP Mine-Like Target Buried Near a Dielectric Object beneath Two-Dimensional Randomly Rough Ground,” *IEEE Trans. Geosci. & Rem. Sensing*, vol. 40, no. 6, pp. 1416-1426, June 2002.

30. M. Ashouei, D. Jiang, W. Meleis, D. Kaeli, M. El-Shenawee, E. Mizan, Y. Wang and C. Rappaport, “Profile-based Characterization and Tuning for Subsurface Sensing and Imaging Applications,” The International *Journal of Simulation: Systems, Science and Technology*, an invited paper to the Special Issue on Modeling and Simulation of Parallel and Distributed Systems, vol. 3, No. 1-2, pp. 40-55, June 2002.
31. M. El-Shenawee, C. Rappaport, D. Jiang, W. Meleis and D. Kaeli, “Electromagnetics Computations Using the MPI Parallel Implementation of the Steepest Descent Fast Multipole Method (SDFMM),” *Journal of Applied Computational Electromagnetics* (*ACES*), vol. 17, no. 2, pp. 112-122, July 2002.
32. E. Bahar and M. El-Shenawee, “Double Scatter Cross Sections for Two Dimensional Random Rough Surfaces that Exhibit Backscatter Enhancement,” *J. of Optical Society of America A*, vol. 18, no. 1, pp. 108-116, January 2001.
33. M. El-Shenawee, C. Rappaport, E. Miller and M. Silevitch, "Three-dimensional subsurface analysis of electromagnetic scattering from penetrable/PEC objects buried under rough surfaces: use of the steepest descent fast multipole method (SDFMM)," *IEEE Trans. Geoscience Rem. Sensing*, vol. 39, no. 6, pp. 1174-1182, June 2001
34. M. El-Shenawee and C. Rappaport, “Modeling Clutter from Bosnian and Puerto Rican Rough Ground Surfaces for GPR Subsurface Sensing Applications Using the SDFMM Technique,” *J. Subsurface Sensing Technologies and Applications,* vol. 2, no. 3, pp. 249-264, July 2001.
35. M. El-Shenawee, C. Rappaport and M. Silevitch, “Monte Carlo Simulations of Electromagnetic Wave Scattering from Random Rough Surface with 3-D Penetrable Buried Object: Mine Detection Application Using the SDFMM,” *J. Optical Society of America A*, vol.18, no. 12, pp.3077-3084, December 2001.
36. M. El-Shenawee, "The Method of Lines for the Analysis of Asymmetric Coupled Microstrip Lines on Multilayers with an Inhomogeneous Overlay", *AEU (Archiv fur Elektronik und Ubertragungstechnik),* Vol. 51, No. 6, pp. 309-311, November 1997.
37. M. El-Shenawee and A. Z. Elsherbeni, “Analysis of Signal Distortion on Coupled Microstrip Lines with an Overlay and a Notch,” *Journal of Electromagnetics Waves and Applications* (*JEWA*), Vol. 11, pp. 1627-1631, 1997
38. E. Bahar and M. El-Shenawee, "Enhanced Backscatter from One Dimensional Random Rough Surfaces-Stationary Phase Approximations to Full Wave Solutions," *Journal of Optical Society of America A,* Vol. 12, No. 1, pp. 151-161, January 1995.
39. E. Bahar and M. El-Shenawee, "Full Wave Single and Multiple Scattering from Rough Surfaces," *Journal of Computational Physics,* Vol. 115, No. 2, pp. 390-398, December 1994.
40. M. El-Shenawee and E. Bahar, "Numerical Method to Compute TE and TM Multiple Scatter from Rough Surfaces Exhibiting Backscatter Enhancement," *IEEE Trans. on Magnetics,* Vol. 30, No. 5, pp. 3140-3143, September 1994.
41. E. Bahar and M. El-Shenawee, "Vertically and Horizontally Polarized Diffuse Double Scatter Cross Sections for One Dimensional Random Rough Surfaces That Exhibit Enhanced Backscatter-Full Wave Solutions," *Journal of optical Society of America A,* Vol. 11, No. 8, pp. 2271-2285, August 1994.
42. E. Bahar and M. El-Shenawee, "Use of Supercomputers to Evaluate Singly and Doubly Scattered Electromagnetic Fields from Rough Surfaces," *IEEE Trans. on Magnetics*, Vol. 27, No. 5, pp. 4287-4290, September 1991.

Book Chapters

1. O. Dorn, M. El-Shenawee, M. Moscoso, Iterative Microwave Inversion Algorithm Based on the Adjoit-Fields Method for Breast Cancer Application, *Mathematics in Industry 12*, pp. 587-591, Editors: Luis L. Bonilla and M. Moscoso, Springer-Verlag Berlin Heidelberg 2008.
2. M. El-Shenawee and A. Elsherbeni, Analysis of Signal Distortion on Coupled Microstrip Lines With an Overlay and a Notch, *Electromagnetic Waves, PIER* 17, Progress in Electromagnetic Research, Chief Editor: J. A. Kong, EMW Publishing, Cambridge MA, 1997, Chapter 4-pp. 73-89.

Undergraduate Poster Presentations
(Co-authors: J. Greenlee, L. Megee, S. Crain, J. Rutledge are/were UG students)

1. S. Crain* and M. El-Shenawee, "Investigating the Structural Optimization of Nano-Antennas," *Proc. of the 94th Annual Meeting of the Arkansas Academy of Science Conference* (*AASC*), University of Arkansas at Little Rock, Little Rock, AR, April 9-10, 2010
2. S. Crain*, R. Bachelot, A. Baudrion, and M. El-Shenawee, "Collaborative Research: Compact Microwave Imaging System Based on Antenna Array of Dielectric Resonators for Breast Cancer Detection," the *2010 International Research Engineering and Education* (*IREE*), Poster Session II, Jan 31-Feb 2, Washington D.C., 2010.
3. S. Crain*, R. Bachelot, A. Baudrion, M. El-Shenawee, "Fabrication of Torus Nano-Antenna Arrays Using Electron Beam Lithography," *INBRE Research Conference,* University of Arkansas, Fall 2009, Fayetteville, AR, October 23-24, 2009.
4. S. Crain* and M. El-Shenawee, "Computer Digitization for Target Detection Using Microwave Imaging," *Proc. of the 93rd Annual Arkansas Academy of Science Conference* (*AASC*), University of the Ozarks, Clarksville, AR, April 2-3, 2009
5. J. Greenlee*, M. El-Shenawee, "Computational Modeling of the Internal Structure of the Breast," *Proc. of the 93rd Annual Arkansas Academy of Science Conference* (*AASC*), Poster Session, University of the Ozarks, Clarksville, AR, April 2-3, 2009
6. L. Megee*, D. Macias, M. El-Shenawee, "Collaborative Research: Compact Microwave Imaging System Based on Antenna Array of Dielectric Resonators for Breast Cancer Detection," the *2009 International Research Engineering and Education* (*IREE*), Poster Session, Feb 1-3, Washington D.C., 2009.
7. J. Greenlee, M. El-Shenawee, "A Computational Biology Approach to Full Breast Mathematical Modeling," *Proc. of the 2008 Arkansas Undergraduate Research Conference,* Arkadelphia, Arkansas, April 2008
8. J. Greenlee*, M. El-Shenawee, "Collaborative Research: Compact Microwave Imaging System Based on Antenna Array of Dielectric Resonators for Breast Cancer Detection," the *2007 International Research Engineering and Education* (*IREE*), Poster Session, October 29-30, Purdue University, 2007.

Refereed Conference Papers

(Co-authors D. A. Woten, A. Hassan, S. D. Shumate, and M. R. Hajihashemi, F. Eldeek, S. Pandalraju, O. Kegege, P. Rashidi, V. K. Raja are/were Grad students. Others are national and international collaborators)

Published

1. A. M. Hassan, M. El-Shenawee, "Modeling Electromagnetic Signals of Multiple Breast Cancerous Cells," *Proc. 2010 USNC-URSI National Radio Science Meeting*, Boulder Colorado, January 6-9, 2010.
2. D. A. Woten, M. El-Shenawee, S. Tung, "Design and Fabrication of a MEMS Steerable Broadband Antenna Capable of Dual Polarization," *Proc. 2010 USNC-URSI National Radio Science Meeting*, Boulder Colorado, January 6-9, 2010.
3. M. R. HajiHashemi, M. El-Shenawee, "Inverse Scattering of Multiple 3D Dielectric Targets using the Level Set Algorithm," *Proc. 2010 USNC-URSI National Radio Science Meeting*, Boulder Colorado, January 6-9, 2010.
4. F. G. Deek, M. El-Shenawee, "Crack Detection In Buried Pipes Using Complex Resonant Frequencies," *Proc. 2010 USNC-URSI National Radio Science Meeting*, Boulder Colorado, January 6-9, 2010.
5. A. M. Hassan, M. R. Hajihashemi, M. El-Shenawee, A. Al-Zoubi, A. Kishk, "Spatial Low Pass Filter for *TE* Experimental Measurements for Microwave Image Enhancement," *Proc. 2010 USNC-URSI National Radio Science Meeting*, Boulder Colorado, January 6-9, 2010.
6. M. R. Hajihashemi, M. El-Shenawee, "MPI Implementation of the level set algorithm for Microwave Imaging Applications," *Early Adopters Ph.D. Workshop: Building the Next Generation of Application Scientists, SC09 International Conference for High Performance Computing, Networking, Storage and Analysis*, Portland, Oregon, Nov. 14-Nov. 20. 2009.
7. A. Hassan, M. El-Shenawee, "Modeling electrical activities of a growing breast cancerous cell based on a semiconductor approach" *the 31st Annual International Conference of the IEEE Engineering in Medicine and Biology Society*, Minneapolis, MN, Sept 2-6, 2009.
8. M. El-Shenawee, D. Macias, A. Baudrion, R. Bachelot, "Torus Nano-Antenna: Enhanced Field and Radiation Pattern," *Proc. of the IEEE International Symposium on Antennas and Propagation and USNC/URSI National Radio Science Meeting*, Charleston, SC, USA, June 1-5, 2009.

9. A. Hassan, D. A. Woten, M. Hajihashemi, A. Al-Zoubi, M. El-Shenawee, A. Kishk, “Experimental Microwave Imaging Using Ultra-Wideband Dielectric Resonator Antennas,” *Proc. of the IEEE International Symposium on Antennas and Propagation and USNC/URSI National Radio Science Meeting*, Charleston, SC, USA, June 1-5, 2009.
10. F. Deek, J. Rutledge, M. R. Hajihashemi, A. Hassan, D. Woten, M. El-Shenawee, “Automated GPR Surface Scanning System for Investigation of Defects in Buried Pipes,” *Proc. of the IEEE International Symposium on Antennas and Propagation and USNC/URSI National Radio Science Meeting*, Charleston, SC, USA, June 1-5, 2009.
11. M. R. Hajihashemi, M. El-Shenawee, “Level Set Shape Reconstruction Algorithm for *TE* Polarization ,” *Proc. of the IEEE International Symposium on Antennas and Propagation/URSI National Radio Science Meeting*, Charleston, SC, USA June 1-5, 2009.
12. M. R. Hajihashemi, M. El-Shenawee, “MPI Parallelization of the Level-Set Reconstruction Algorithm ,” *Proc. of the IEEE International Symposium on Antennas and Propagation/URSI National Radio Science Meeting,* Charleston, SC, USA, June 1-5, 2009.
13. M. R. Hajihashemi, Magda El-Shenawee, “Three-Dimensional Level Set Algorithm for Shape Reconstruction of Conducting Objects,” *Proc. of the IEEE International Symposium on Antennas and Propagation/URSI National Radio Science Meeting,* Charleston, SC, USA, June 1-5, 2009.
14. D. A. Woten, M. El-Shenawee, S. Tung, “Planar Broadband Dual-Linearly Polarized MEMS Steerable Antenna,” *Proc. of the IEEE International Symposium on Antennas and Propagation/URSI National Radio Science Meeting,* Charleston, SC, USA, June 1-5, 2009.
15. D. A. Woten and M. El-Shenawee, "Error Analysis of Breast Tumor Signature versus Skin Thickness at Microwave Frequencies," *Proc. of the IEEE Antenna and Propagation Symposium*, San Diego, CA, July 2008.
16. D. A. Woten, M. El-Shenawee, S. Tung, “MEMS Platform for Planar Broadband Dual-Linearly Polarized Antenna,” *Proc. of the IEEE Antenna and Propagation Symposium*, San Diego, CA, July 2008.
17. A. Hassan, M. El-Shenawee, H. Eswaran, "A Feasibility Study for Passive Detection of Breast Tumors using Naturally Generated Magnetic Fields," *Proc. of the IEEE International Symposium on Antennas and Propagation and USNC/URSI National Radio Science Meeting*, San Diego, CA, July 2008.
18. M. R. Hajihashemi, M. El-Shenawee, “Level Set Algorithm for Shape Reconstruction of Multiple Conducting Cylinders with Arbitrary Cross-Sections,” *Proc. of IEEE International Symposium on Antennas and Propagation*, San Diego, CA, July 2008.
19. M. R. Hajihashemi, M. El-Shenawee, “The Level Set Algorithm for Microwave Imaging of Hidden Objects,” *Proc. of IEEE International Symposium on Antennas and Propagation*, July 2008.
20. A. Hassan, S. Burkett, M. El-Shenawee, "Parametric Investigation of Hilbert Based Artificial Magnetic Conductors" *Proc. of the Annual Review of Progress in Applied Computational Electromagnetics*, pp. 1040-1045, Niagara Falls, Canada, March 2008.
21. D. A. Woten, S. Pandalraju and M. El-Shenawee, "Breast Skin Effect on Scattered Electromagnetic Fields," *Proc. of the Applied Computational Electromagnetics Society Symposium*, Niagara Falls, Canada, pp. 27-32, March 2008
22. A. Hassan, M. El-Shenawee, "Mathematical Modeling of Breast Lesion Growth" *Proc. of the Annual Review of Progress in Applied Computational Electromagnetics*, pp. 86-91, Niagara Falls, Canada, March, 2008.
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26. J. Greenlee**,** S. Shumate, M. El-Shenawee, “A Comprehensive Approach to Modeling Breast Cancer,” *Proc. of 2008 Ohio Collaborative Conference on Bioinformatics,* Toledo, Ohio, June 2008.

27. D. Woten, M. El-Shenawee, “Improvement of Artificial Neural Network Detection of Breast Cancer Using Broadband Dual Polarized Antenna,” *Proc. of the IEEE 2007 AP-S International Symposium*, pp. 261-264, Honolulu, Hawaii, June 2007.
28. M. El-Shenawee, M. Castro, O. Dorn, “On the Stability of Surface Shape Reconstruction Using Microwave Algorithm for 3-D Breast Tumor Based on the Adjoint-Fields Scheme,” *Proc. of the IEEE 2007 AP-S International Symposium*, pp. 2188-2191, Honolulu, Hawaii, June 2007.
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32. S. Shumate and M. El-Shenawee, “Computational model of breast cancer tumor growth,” *Proc. of IEEE Region 5 Technical Conference,* pp. 13-15*,* Fayetteville, Arkansas, April 2007
33. D. A. Woten and M. El-Shenawee, “Effect of wave polarization on breast cancer detection,” *Proc. of IEEE Region 5 Technical Conference,* pp. 5-8*,* Fayetteville, Arkansas*,* April 2007
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45. M. El-Shenawee, E. Miller, "Microwave Imaging of Malignant Breast Cancer Tumor Based on Optimization Technique," *Proc. of the 16th International Zurich Symposium on Electromagnetic Compatibility-Biomedical EMC*, pp. 85-88, Zurich, February 2005
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49. M. El-Shenawee, E. Miller, "Joint Retrieval of Target and Background Electrical Parameters of Buried Objects," *Proc of Progress in Electromagnetics Research Symposium* (*PIERS 2004*), Pisa, Italy, March 2004
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51. M. El-Shenawee, Eric Miller, "Reconstruction of Two-Dimensional Rough Surface Profile using Optimization Techniques," *Proc. of Progress in Electromagnetics Research Symposium* (*PIERS 2004*), Pisa, Italy, March 2004.
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75. M. El-Shenawee, "Propagation Characteristics of Microstrip Transmission Lines on Rough Dielectric Substrate Surface," *Proc. of the 1997 IEEE AP-S International Symposium and URSI Radio Science Meeting,* Montreal, Canada, July 1997.
76. M. El-Shenawee and A. Z. Elsherbeni, "Method of Lines Analysis of Coupled Microstrip Transmission Line with a Notch," *Proc. of the 1997 IEEE AP-S International Symposium and URSI Radio Science Meeting,* Montreal, Canada, July 1997.
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80. M. El-Shenawee and E. Bahar, "Single and Double Like and Cross Polarized Scatter from Two Dimensional Random Rough Surfaces-High Frequency Approximations," *Proc. of the IEEE AP-S*

International Symposium and URSI Radio Science Meeting, Hyatt Regency Baltimore, Maryland, July 1996.

81. M. El-Shenawee and E. Bahar, "Double Scatter Radar Cross Sections for Two Dimensional Random Rough Surfaces That Exhibit Backscatter Enhancement," *Proc. of the Applied Computational Electromagnetic Society (ACES'96*), Monterey, CA, March 1996.
82. M. El-Shenawee and E. Bahar, "Enhanced Backscatter from Two Dimensional Random Rough Surfaces," *Proc. of the National Radio Science Meeting,* Boulder Colorado, January 1996.
83. M. El-Shenawee and E. Bahar, "Double Scatter Radar Cross Sections for Two Dimensional Random Rough Surfaces-High Frequency Approximation," *Proc. 1995 IEEE AP-S International Symposium and USNC/URSI Radio Meeting,* Newport Beach, CA, June 1995.
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85. M. Khattab and M. El-Shenawee, "Construction Operation Cost/Time Tracking Systems," Proc. of the *First International Conference on Electronics, Circuits and Systems (ICECS'94),* Cairo, Egypt, December 1994.
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87. M. El-Shenawee and E. Bahar, "Multiple Scattering from Random Rough Surfaces Based on a Deterministic Full Wave Model," *Proc. of the 1994 International Geoscience and Remote Sensing Symposium (IGARSS'94),* Pasadena, CA, August 1994.
88. E. Bahar and M. El-Shenawee, "Examination of Large Radius of Curvature Approximation for Rough Surface Scatter Cross Sections," *Proc. of the 1994 IEEE AP-S International Symposium and URSI Radio Science Meeting, Seattle,* Washington, June 1994.
89. E. Bahar and M. El-Shenawee, "Full Wave Multiple Scattering from One Dimensional Random Rough Surfaces and High Frequency Stationary Phase Approximations," *Proc. of 1993 IEEE AP-S International Symposium and Radio Science Meeting at Ann Arbor*, MI, June 1993.
90. E. Bahar and M. El-Shenawee, "Multiple Scattering from One Dimensional Random Rough Surfaces-Full Wave Solutions," *Proc. of PIERS 1993 at Pasadena,* CA, on July 1993.
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93. E. Bahar and M. El-Shenawee, "Multiple Scattering from Random Distributions of Individual Rough Surface Scatterers," *Proc. of the IEEE-APS International Symposium and URSI Radio Science Meetin,* Chicago on July 1992.
94. E. Bahar and M. El-Shenawee, "Single and Multiple Scattering and Depolarization from Two Dimensional Rough Surfaces," *Proc. of IEEE AP-S International Symposium & North American Radio Science Meeting, University of Western Ontario,* Ontario, Canada, June 1991.
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96. E. Bahar and M. El-Shenawee, "Full Wave Multiple Scattering from Rough Surfaces," *Proc. of the IEEE AP-S International Symposium & URSI Radio Science Meeting*, Dallas, Texas, May 1990.
97. E. Bahar and M. El-Shenawee, "Use of Supercomputers to Evaluate Singly and Doubly Scattered Electromagnetic Fields from Rough Surfaces," *Proc. of the Fourth Biennial IEEE Conference on Electromagnetic Field Computations,* Toronto, Canada, October 1990.

Non-refereed Conference Presentations

1. G. Talapanuri, S. Pandalraju, D. Woten*, M. El-Shenawee, "Breast Cancer Detection Using Microwave Imaging," *Arkansas Biosciences Institute Conference* (Poster Session), Little Rock, October 2006.

2. P. Rashidi, V. Raja, F. Magableh, M. El-Shenawee*, F. Barlow*, "Innovative Microwave Imaging System for Breast Cancer Detection," *Arkansas Biosciences Institute Conference*, Poster Session, Little Rock, October 2004.
3. V. Raja, F. Magableh, P. Rashidi, M. El-Shenawee*, F. Barlow, "Microwave Imaging System for Breast Cancer Detection," *Biomedical Forum III*, University of Arkansas-Fayetteville, November 2004.

Invited Speaker

1. M. El-Shenawee*, "Recent Computational Electromagnetics for Inverse Scattering and Imaging Applications," invited to present to the *faculty and students in the Electrical and Computer Engineering Department at the University of Manitoba*, Winnipeg, Manitoba, Canada, April 2009.
2. M. El-Shenawee*, "Computational Electromagnetics for Inverse Scattering and Imaging Applications," invited to present to the faculty at *Dijon University*, Dijon, France, July 2008.
3. M. El-Shenawee*, "Microwave Imaging for Breast Cancer at the University of Arkansas" invited to present to the faculty and scientists at the *University of Technology of Troyes*, Troyes, France, July 2007.
4. M. El-Shenawee*, "Breast Cancer Research at the University of Arkansas," invited to present to the faculty in the *Department of Mathematics at the University of Dundee*, Dundee, Scotland, April 2007.
5. M. El-Shenawee*, "Microwave Imaging of Breast Cancer," invited to present to the faculty in the *Department of Electrical and Computer Engineering at the University of North Carolina-Charlotte*, March 2007.
6. M. El-Shenawee*, A. Hassan*, O. Kegege, M. Reza Hajhashemi, S. Shumate, D. Woten, "Microwave Imaging and Detection of Breast Tumor Shape & Development of Tumorigenesis Model," invited to present to the faculty and graduate students at the *Biomedical Engineering Forum*, UAMS, LR, AR, June 2007.
7. M. El-Shenawee*, "Breast Cancer Research at the University of Arkansas-Fayetteville-Microwave Technique for the Early Detection of Breast Cancer," invited to present research progress to the *Arkansas Biosciences Institute* (*ABI*) *Advisory Committee*, Little Rock, October 2006.
8. M. El-Shenawee*, "Surface Integral Equations for Subsurface Sensing Applications Using Electromagnetic Waves," the *Department of Applied Mathematics*, University of Arkansas, October 2003.
9. M. El-Shenawee*, "Clutter Sources in Minefields: Challenges and Suggestions," invited and presented to the *National Center Physical Acoustics* (*NCPA*) at the University of Mississippi, August 2003.
10. M. El-Shenawee*, "Computational Electromagnetics for Mine Detection and Breast Cancer Applications," invited and presented in a seminar to the *Department of Electrical Engineering* at the University of Mississippi, August 2003.
11. M. El-Shenawee*, "Computational Electromagnetics for Biomedical Engineering," invited and presented to the faculty of *Biological and Agricultural Engineering Department*, University of Arkansas, March 2003.
12. M. El-Shenawee*, "Resonant Spectra of Malignant Breast Cancer Tumors Using the three-Dimensional Electromagnetic Fast Multipole Model," invited and presented to *NASA Langley Research Center*, Electromagnetic Sensor Group, Hampton, VA, July 2002.
13. M. El-Shenawee*, "Modeling the Breast Cancer Tumors in the Frequency Domain Using the Steepest Descent Fast Multipole Method (SDFMM)," invited and presented to *NASA Langley Research Center*, Electromagnetic Sensor Group, Hampton, VA, July 2001.
14. M. El-Shenawee*, "Fast Multipole Method for Scattering from Two Objects Buried under Random Rough Ground," invited and presented *to the Fifth Annual Landmine Basic Research Technical Review* Sponsored by the UXO Center of Excellence, Countermine Division NVESD and Army Research Office, Springfield, VA, 9–11, October 2001.
15. M. El-Shenawee*, "Fast Multipole Frequency Domain Green's Function Electromagnetic Method," invited and presented to the *NSF Center for Subsurface Sensing and Imaging Systems* (*CenSSIS*) meeting at Northeastern University, November 2000.
16. M. El-Shenawee*, "Monte Carlo Simulation-Based Scheme to Predict Mines Buried under Rough Surfaces", invited and presented to the *ARO MURI Review Meeting, Ft. Belvoir,* August 1999.

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Articles Published by Others

1. Article published in *Nature jobs* titled “Making a switch” by Bryn Nelson, April 25, 2010.
2. Article published in the *Arkansas Wires* titled “Understanding the Electricity of Breast Cancer Cells,” spring 2010. http://newswire.uark.edu/article.aspx?id=13818
3. Article published in the Magazine of the *Arkansas Alumni Association*, Inc. titled “What lies beneath: Researcher applies landmine detection expertise to discover new ways of detecting cancer,” fall 2008.
4. Article published in the Arkansas *INGENUITY* titled: Student Awarded Goldwater Scholarship for Breast Cancer Research, summer 2008.
5. Article published in the health section of the January Issue of *Northwest Arkansas CitiScapes* titled” UA researchers developing new technology for breast cancer detection,” January 2006.
6. Article published in the Women’s Giving Circle News titled “Improving Early Detection: Grant makes revolutionary breast cancer detection a reality”, fall 2005.
7. Article published in the University of Arkansas-Daily Headlines titled “System will provide sharp, 3-D Images of Breast Tumors,” November 2005.
8. Article published in Spring 2005 the University *Research Frontier Magazine issue* (hardcopy) and online Spring 2005: http://www.uark.edu/rd_vcad/urel/publications/research_frontiers/
9. Story about the breast cancer research project *broadcasted in Channel 9 News* on Thursday 4/28/2005 at 10:00pm.
10. Article posted in 2005 on the *UA daily headlines* http://dailyheadlines.uark.edu/4667.htm
11. Aired on the WTOP radio in DC and posted on their website in 2005 http://www.nae.edu/nae/pubundcom.nsf/weblinks/CGOZ-5SZQNG?OpenDocument
12. Article posted in the news letter in the Northeastern University- Boston, for the NSF-ERC Research Center for *Subsurface Sensing and Imaging Systems* (CenSSIS) *Wavelets News Flash,* May issue 2005.
13. Story published about the breast cancer research project at UA is broadcasted in Channel 5 News on Monday 9/27/2004 at 5:00 and at 6:00pm and other times.
14. Story posted online as an article about the breast cancer project with a video clip 2004: http://5newsonline.com/Global/story.asp?S=2355762&nav=2uEHRMxh
15. Addressed by Chancellor John While the research on breast cancer in the *State of the University* on September 24, 2004.
16. Published by Rice University, Center for Excellence and Equity in Education, the candidate’s research graphics on mine detection in the book titled “Computational Science: Tools for a Changing World (*A High SchoolCurriculum*) by Richard Tapia, Cynthia Lanius, Casandra Mc Zeal, and Teresa Parks, http://ceee.rice.edu/Books/CS/. 2002.
17. Article by Aries Keck in 2001, published in *Access Magazine*, the *National Center for Supercomputing Applications* (NCSA), the University of Illinois concerning the applicant’s research on humanitarian mine detection. The title is: A Survey of the Field, vol. 14, no. 1, pp. 6-9, Spring 2001. http://access.ncsa.uiuc.edu/CoverStories/landmine/