ZOLTÁN RÁCZ PHD

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ACADEMIC QUALIFICATIONS

Ph.D.	Electrical Engineering, University of Notre Dame, United States	*2007*
M.Sc.	Electrical Engineering, University of Notre Dame, United States	*2003*
M.Sc.	Electrical Engineering, Technical University of Budapest, Hungary	*2001*

EMPLOYMENT

Assistant Professor in Electronic Engineering, Durham University, United Kingdom *Oct 2013 – Present*

Postdoctoral Research Associate, University of Warwick, United Kingdom *Nov 2007 – Oct 2013*

Research Assistant, University of Notre Dame, United States *Sep 2001 – May 2007*

EDUCATION

University of Notre Dame, Notre Dame, IN, United States
Ph.D. and M.Sc. in Electrical Engineering *May 2007*
Dissertation: *Piezoflexure-enabled Nanofabrication Using Translated Stencil Masks*
Advisor: Professor Alan C. Seabaugh

Technical University of Budapest, Budapest, Hungary *May 2001*
Dipl. Eng. (equivalent to M.Sc.) in Electrical Engineering
Diploma work: *Examination of the Possibilities of Reducing Power Consumption in Adiabatic CMOS Circuits*
Advisor: Professor Ferenc Kovács

WORK EXPERIENCE

University of Durham, *Assistant Professor in Electronic Engineering* *Fall 2013 – present*
As an Assistant Professor, I am a member of the Next Generation Materials and Microsystems Research Challenge. My current research projects include:

- Distributed sensor networks for structural health monitoring
- Polymer and paper based electronics
- Droplet control for automotive and aerospace applications
- MEMS digital isolator for space applications
- Electrosharpening

I supervise 2 PhD students and 3 summer internship students.
Teaching Experience: Digital electronics, Semiconductor Device Physics Finite Element Modelling, CAD for MEMS Finite Element Modelling, Energy Conversion and Delivery, Engineering Design.
Technical Experience: Finite Element Modelling (COMSOL), microcontrollers (Arduino)

University of Warwick, *Postdoctoral Research Associate* *Fall 2007 – 2013*
As a postdoctoral research fellow in the Microsensors and Biosensors Laboratory headed by Julian Gardner, I have led the research efforts in two collaborative multi-disciplinary EU projects for 6 years. The Silicon on Insulator High Temperature Systems (SOI-HITS) project was aimed at developing innovative CMOS-compatible silicon-on-insulator integrated smart microsensor systems capable of multi-measurand detection under harsh environment conditions. I have launched and supervised the design and development of test methodology and electro-thermal characterization of smart sensor arrays and associated circuits. Within the framework of the Biosynthetic Infochemical Communication (iCHEM) project I designed, fabricated and characterized automated mechanical and electrical microsystems based on surface acoustic wave biosensors and developed advanced methods for data acquisition and analysis to implement a novel class of information technology.
In addition, I supervised PhD, masters and undergraduate students; authored quarterly and annual reports on project progress and achievements; liaised with project partners; presented results at conferences and workshops; published research outcomes in journals and contributed to several grant proposals.

Technical experience: Sensor modelling, design, fabrication and characterization; circuit design and manufacturing including printed circuit design and fabrication; computer controlled microfluidic system development; system prototyping and testing; process control; data acquisition and analysis; design and analysis software packages: Matlab, LabView, Altium Designer, Tanner Tools, Spice, MultiSim, MultiSens; graphics programs: Adobe Illustrator, Blender.

University of Notre Dame, *Research Assistant* *Fall 2001 – Spring 2007*
As a research assistant in the Nanoelectronic Devices and Circuits Group, I initiated and completed a project to develop a new technique based on stencil lithography and lift-off to form nanometer-scale electronic and electromechanical devices.
Fabrication: Standard integrated circuit fabrication techniques (surface preparation, layer growth, lithography including mask design and fabrication, wet and dry etching, thin film deposition by e-beam evaporation and LPCVD, lift-off), static and dynamic stencil lithography, stencil mask fabrication.
Process development: Developed and characterized a stencil mask fabrication technique based on the anisotropic KOH-etching of silicon.
Characterization: SEM, 3DSEM, AFM, MFM, EDAX, TEM, optical microscopy, ellipsometry, surface characterization, step profiling, two and three terminal electrical measurements.
System design: Designed and constructed two custom electron-beam evaporator based systems equipped with an integrated piezoflexure stage, thermal shielding and high accuracy temperature controller.

Technical University of Budapest, *Undergraduate Research Assistant* *Fall 1999 – Spring 2001*
As an undergraduate research assistant, I simulated the power consumption and designed the layout of an ultra-low power adiabatic CMOS circuit.
Circuit design: Microcontroller programming and interfacing, and custom VLSI circuit layout design

AWARDS AND HONOURS

- Departmental Award for Teaching given to the top three lecturers of the year based on student feedback (2014)
- *Outstanding Teaching Assistant Award For Teaching Excellence* offered by the Kaneb Teaching Center of the University of Notre Dame (Recommended by Professor Douglas Hall) (2007)
- *Special Award* at the National Student Conference, Hungary (2001)
- *1st place* at the Student Conference of the Technical University of Budapest for work titled "Optimization of adiabatic CMOS circuits and verification of result by test chip design and fabrication" (2000)
- *2nd place* at the Annual Microelectronics Competition organized by the Department of Electron Devices, Technical University of Budapest, Hungary (1999)

PUBLICATIONS

Peer-reviewed journals

- S.A. Shenton, M.D. Cooke, **Z. Rácz**, C. Balocco and D. Wood, "*The Effect of Humidity on Microwave Characteristics of Screen Printed Paper-Based Electronics,*" submitted to Advanced Materials.
- G. Wei, S. Thomas, M. Cole, **Z. Rácz** and J.W. Gardner, "*Ratiometric decoding of pheromones for a biomimetic infochemical communication system,*" submitted to Biosensors and Bioelectronics.
- **Z. Rácz**, E.M. Hackney and D. Wood, "*Soft Elastomeric Capacitive Sensor for Structural Health Monitoring,*" Procedia Engineering, vol. 168, pp. 721-724 (2017).
- T.C. Pearce, S. Karout, A. Capurro, **Z. Rácz**, M. Cole and J.W. Gardner, "*Robust Ratiometric Infochemical Communication in a Neuromorphic 'Synthetic Moth',*" Living Machines 2013, Springer Lecture Notes in Computer Science, vol. 8064, pp. 204-215 (2013).
- T.C. Pearce, S. Karout, **Z. Rácz**, A. Capurro, M. Cole and J.W. Gardner, "*Rapid Processing of Chemosensor Transients in a Neuromorphic Implementation of the Insect Macroglomerular Complex*," Frontiers in Neuromorphic Engineering, vol. 7, 119 (2013).
- Y. Jian, **Z. Rácz**, J.W. Gardner, M. Cole and H. Chen, "*Ratiometric info-chemical communication system based on polymer-coated surface acoustic wave microsensors,*" Sensors and Actuators: B. Chemical, Volume 173, pp. 547-554 (2012).
- J.L. Vivancos, **Z. Rácz**, M. Cole, J.W. Gardner and J. Soto, "*Surface acoustic wave based analytical system for the detection of liquid detergents,*" Sensors and Actuators: B. Chemical, 171-172, pp. 469-477 (2012).
- **Z. Rácz**, M. Cole, J.W. Gardner, M.F. Chowdhury, W.P. Bula, J.G.E. Gardeniers, S. Karout, A. Capurro and T.C. Pearce, "*Design and Implementation of a Modular Biomimetic Infochemical Communication System*," International Journal of Circuit Theory and Applications – Nanocircuits special issue, 2012. [in press]

- J.L. Vivancos, **Z. Rácz**, M. Cole, J. Soto, J.W. Gardner, "*Detergents sensing system based on SH-SAW devices*," Procedia Engineering, Volume 25, pp. 1125-1128 (2011).
- **Z. Rácz**, S.B. Olsson, J.W. Gardner, T.C. Pearce, B.S. Hansson, M. Cole**,** "*Challenges of Biomimetic Infochemical Communication*," Procedia Computer Science, 7, pp. 106-109 (2011).
- S. Pathak, M.D. Jordan, **Z. Rácz**, R.A.J. Challiss, J.W. Gardner and M. Cole, "*Detection of ligand-elicited secondary cellular responses using Surface Acoustic Wave biosensors,*" Procedia Computer Science, 7, pp. 346-347 (2011).
- M. Cole, J.W. Gardner, S. Pathak, **Z. Rácz**, R.A.J. Challiss and D. Markovic, "*Cell-based Acoustic Sensors for Biomedical Applications*," Biomedical Engineering, vol.1, 680-054 (2010).
- M. Cole, J.W. Gardner, **Z. Rácz**, S. Pathak, T.C. Pearce, J. Challiss, D. Markovic, A. Guerrero, L. Muñoz, G. Carot, B.S. Hansson, S. Olsson, L. Kübler, J.G.E. Gardeniers, N. Dimov and W. Bula, "*Biomimetic insect infochemical communication system,"* IEEE Sensors, 1-3, pp. 1295-1298 (2009).
- M. Cole, J.W. Gardner, S. Pathak, T.C. Pearce, and **Z. Rácz**, "*Towards a biosynthetic infochemical communication system,"* Procedia Chemistry, 1, pp. 305-308 (2009).

Book Chapters

- A. De Luca, F. Udrea, G. Li, Y. Zeng, N. André, G. Pollissard-Quatremère, L.A. Francis, D. Flandre, **Z. Racz**, J.W. Gardner, Z.S. Ali, O. Buiu, B. C. Serban, C. Cobianu and T. Wotherspoon "Sensors and Sensor Systems for Harsh Environment Applications," in Semiconductor Devices in Harsh Conditions, CRC Press, 2016.

Peer-reviewed conference proceedings

- S. A. Shenton, M. D. Cooke, **Z. Rácz** and D. Wood, "Optimum fabrication methods and substrates for paper-based electronics," EMRS Spring Meeting, Paper BB.VII-4, May 11-15, 2015, Lille, France.
- S. Z. Ali, A. De Luca, **Z. Rácz**, P. Tremlett, T. Wotherspoon, J. W. Gardner and F. Udrea, "*Low Power NDIR CO2 Sensor based on CMOS IR Emitter for Boiler Applications*," The 12th Annual IEEE Conference on Sensors, November 4-6, 2013, Baltimore, United States.
- S. Thomas, M. Cole, **Z. Rácz**, J.W. Gardner, "*Dual High-Frequency Surface Acoustic Wave Resonator for Ultrafine Particle Sensing*," The 12th Annual IEEE Conference on Sensors, November 4-6, 2013, Baltimore, United States.
- A. De Luca, **Z. Rácz**, M.T. Cole, S.Z. Ali, F. Udrea, J.W. Gardner and W.I. Milne, "In-Situ *Grown Carbon Nanotubes for Enhanced CO2 Detection in Non-Dispersive-Infra-Red System*," The 12th Annual IEEE Conference on Sensors, November 4-6, 2013, Baltimore, United States.
- S. Thomas, **Z. Rácz**, M. Cole, J.W. Gardner, "*High-frequency One-port Colpitts SAW Oscillator for Chemical Sensing*," The 6th International Conference on Advances in Circuits, Electronics and Micro-electronics, Barcelona, Spain.
- M. Cole, **Z. Rácz**, J.W. Gardner and T.C. Pearce, „*A novel biomimetic infochemical communication technology: From insects to robots*," The 11th Annual IEEE Conference on Sensors, October 28-31, 2012, Taipei, Taiwan. (invited talk)
- M. Cole, S. Thomas, **Z. Rácz**, J.W. Gardner, M. Jordan and R.A.J. Challis, "*Cell-based surface acoustic wave sensor with transfected olfactory receptors OR67d and OR22a for a highly specific chemo-receiver*," 22nd Anniversary World Congress on Biosensors, 15-18 May 2012.
- S. Thomas, S.L.T. Leong, **Z. Rácz**, M. Cole, and J.W. Gardner, "*Design and Implementation of a High-Frequency Surface Acoustic Wave Sensor Array for Pheromone Detection in an Insect-inspired Infochemical Communication System*," The 14th International Meeting on Chemical Sensors, May 20- 23, 2012, Nürnberg, Germany.
- **Z. Rácz**, Y. Jian, J.W. Gardner and M. Cole, "*Volatile-based Ratiometric Infochemical Communication System Using Polymer-coated Piezoelectric Sensor Arrays*," The 10th Annual IEEE Conference on Sensors, October 28-31, 2011, Limerick, Ireland.
- M.F. Chowdhury, **Z. Rácz**, J.W. Gardner and M. Cole, "*ASIC for Hybrid Biosynthetic Infochemical Chemoreceiver*," The 10th Annual IEEE Conference on Sensors, October 28-31, 2011, Limerick, Ireland.
- S.B. Olsson, **Z. Rácz**, W.P. Bula, N. Dimov, G. Carot-Sans, M.D. Jordan, S. Karout, L.S. Kuebler, D. Markovic, L. Muñoz, S. Pathak, R.A.J. Challiss, M. Cole, J.W. Gardner, J.G.E. Gardeniers, A. Guerrero, B.S. Hansson and T.C. Pearce, "iChem: An insect-inspired biomimetic infochemical communication system," 12th European Symposium for Insect Taste and Olfaction (ESITO), September 19-25, 2011, St. Petersburg, Russia.

- **Z. Rácz**, M. Cole, J.W. Gardner, S. Pathak, M.D. Jordan and R.A.J. Challis, "*Cell-based Surface Acoustic Wave Resonant Microsensor for Biomolecular Agent Detection,*" The 16th International Conference on Solid-State Sensors, Actuators and Microsystems, June 5-9, 2011, Beijing, China.
- S. Karout, **Z. Rácz**, A. Capurro, M. Cole, J.W. Gardner and T.C. Pearce, "*Ratiometric Chemical Blend Processing with a Neuromorphic Model of the Insect Macroglomerular Complex,*" International Symposium on Olfaction and Electronic Nose, May 2 - 5, 2011, New York City, United States.