MICHAEL WIECKOWSKI, PH.D.

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OVERVIEW

As a founder and principle engineer at Canopy Design Lab, I am always interested in finding new problems, exploring unusual and different approaches, and mapping out a concrete plan for success. We have an established history of tackling the toughest engineering challenges across multiple industries ranging from low level silicon design to underground radar systems to consumer electronics. In every case, we have found a way to advance the state of the art and generate a competitive advantage for the underlying business model.

EDUCATION

University of Rochester, Rochester, NY

Ph.D. Electrical and Computer Engineering   **April 2007**
   Low Power VLSI Design and Optoelectronics, Advisor: Prof. Martin Margala
M.S. Electrical and Computer Engineering, *Wireless Communication*   **May 2004**
B.S. Electrical and Computer Engineering, *Mathematics Minor, 3.92 / 4.0*   **May 2003**

RECENT PROJECTS

**Customer references available upon request.

Industrial Motion Sensor (2022)
   Custom PCB for six-axis motion recording featuring an RS-485 streaming interface with ModBus control protocol. Device includes a bootloader for field firmware upgrades and integration with a custom ruggedized enclosure for high temperature environments.

Wearable Neurostimulation Device (2022)
   A wrist-watch like device for monitoring the movement of a patient's arm and applying appropriate haptic stimulation as a response. Included Bluetooth LE controls, LiPo rechargeable power supply, and a custom class-D driver for linear resonant actuation.

Neural Network Classifier For Bacterial Colony Counting (2021)
   Python implementation and training of a custom YOLO neural network for classifying and counting bacterial colonies within photographs of various types of surfaces. Included fully customized Google cloud instances for training and inferences.

Embedded Alarm For Child Safety (2021)
   Development of a 3D printable flower with embedded electronics for sensing when a car door is opened or closed. An integrated audio processor and speaker driver sounded various alarms to prevent accidentally locking a child in a car.

Ultrasonic Doppler Shunt Characterization (2020)
   A clinical medical tool for evaluating occlusions in implantable shunts using doppler ultrasound. An integrated Raspberry Pi based computer provided analysis tools and a custom UI for gathering shunt status and patient data.

Intraoperative Neurophysiologic Monitoring (2019)
   Feasibility study and prototype development of wireless neurophysiological stimulators and wireless EMG recorders for monitoring during surgery. High voltage, rechargeable battery power supply, wireless, prototyping.

tDCs Medical Stimulation Device (2018)
   High voltage constant current stimulator with WiFi, SD Card logging, OLED display, and custom enclosure for research and clinical trials on tDCs neuroceuticals.

Ohmic Array Water Heater (2017)
   Firmware and electronics redesign for a water heater based on ohmic heating. PID control, high voltage and high power PCB design, transformerless power supply, DFM and production support.

Near Field Communication Interface (2016)
   NFC to RS485 link for sending commands and reading data from a medical device using an Android tablet or phone.

Custom Bluetooth Pillcap (2015)
> Redesigned a PCB and underlying circuits for a Bluetooth enabled pill container cap. Device changed colors over time and worked with patient's health care provider and app to encourage proper intake of medication.

SOFTWARE DEVELOPMENT COMPETENCY

- Python, C (++), C#, Javascript, Swift, iOS, Android.
- Web: PHP, Javascript, HTML, CSS. Experience with Shopify and Wordpress.
- Project management including version control (Git), code collaboration, and testing. Focused on code reuse, proper programming practices and design patterns, maintainability, and extensibility.

EMBEDDED / DISCRETE DESIGN

- Embedded firmware development in C, assembly, MIPS, and full custom.
- Microchip suite of tools (ICD4, XC8-XC32, DSPIC, Harmony, MCC)
- STM32 suite of tools and experience with all families of ST microcontrollers
- Experience with multiple embedded environments (ST, TI, ARM, BlueGiga, Cypress, SiLabs)
- FreeRTOS, Cooperative Multitasking, AWS IoT
- System level schematic design including power supply (linear, switching), standard busses and interfaces (USB, SPI, I²C, JTAG, Bluetooth, NI), analog I/O (ADC, DAC, signal conditioning, filter design), and processing/storage (controllers, EEPROM, FLASH, SRAM).
- Test and validation frameworks in Labview (CVI, DAQmx, VISA, GPIB), Measurement Computing.
- Multilayer PCB design using Altium and Cadsoft Eagle. Draftsman, DFM, DFA, DFT.
- Mechanical design in Onshape, Fusion 360. 3D printing, light machining.

SILICON DESIGN

- Silicon level design using Cadence, Assura, Calibre, Encounter, Spectre, HSpice, Ultrasim
- ST(45nm, 65nm, 90nm), TSMC(0.18μm, 0.25μm, 0.35μm), AMI (0.5μm)
- VLSI specific programming: SKILL(++), Ocean, TCL, Perl, Verilog(A), VHDL
- Experience in SRAM, DC-DC converters, linear regulators, sigma-delta modulators.

PROFESSIONAL EXPERIENCE

Canopy Design Lab, LLC, *Charleston, SC*   **January 2014 – Present**
> *Founder* – Provide engineering consulting services to clients with challenging electrical / electromechanical / software design problems. Maintains a networks of highly talented professionals to collaborate with in areas ranging from biology, chemistry, and FDA approval to semiconductor chip design, high volume manufacturing, and industrial design. In house design of circuits, PCB's, embedded firmware, and computer software.

Heatworks Technologies Inc., *Charleston, SC*   **April 2014 – Sept. 2019**
> *Chief Technology Officer* – Developed core technology and managed development teams to bring our flagship product, the MODEL 3 tankless electric water heater, from napkin sketch to production. Road mapping for future products and research endeavors, and managing a team of engineers and consultants to bring them to market. Cultivating key relationships with potential technology partners and working daily with the CEO on incorporating them into business strategy. Strengthening e-commerce channels including direct to consumer online sales and online retail partners. Working daily with production team to ensure product quality and reliability through laboratory testing and long term field studies.

Mala Geoscience USA, *Charleston, SC*   **Sept. 2010 – April 2014**
> *Senior Research Engineer* – Directed U.S. research and development efforts for new products in ground penetrating radar applications. Worked with a team in Sweden to specify technical requirements. Lead the designs from schematic stage through PCB design, testing, manufacturing, and assembly. Included high-speed analog front ends and ADC's, FPGA data collection and control using LVDS DDR I/O, 32-bit microcontroller integration, and communication via Ethernet, WiFi, Bluetooth, and USB. Responsible for firmware and software development including Verilog FPGA code, C microcontroller code, Python test code, and Objective C / Cocoa interfaces. Involved in quality control and testing, specifically noise reduction, long-term reliability, and serviceability.

Shutterbug Remote, *Charleston, SC* **Jan. 2013 – Jan. 2015**

Founder, Inventor – Designed and crowd-funded a consumer product for controlling a digital camera from an iOS device using the Bluetooth LE wireless protocol. Development effort from concept to market including hardware design, firmware development, production and packaging, marketing material, and sales. Sold in retail stores around the country and online via ShutterbugRemote.com. Designed and developed the iOS and Android applications. Featured in Nuts and Volts magazine, DPReview.com, PhotographyBlog, and Today's iPhone.

University of Michigan, *Ann Arbor, MI* **June 2007 – Sept. 2010**

Post-doctoral Research Fellow – Acted as a researcher, lab manager, and mentor spanning a variety of disciplines. Lead the effort in upgrading and maintaining a 12 station testing facility for automated validation of integrated circuits, including equipment purchasing and setup for probe stations, temperature chambers, surface mount assembly, and computer interfacing. As a mentor in a group of over 20 students, participated in the design of numerous projects from the transistor level up to timeline creation and task assignment. Pursued several self directed research projects in low voltage sensor platforms and CAD software.

University of Rochester Medical Center, *Rochester, NY* **2003 - 2007**

Embedded systems engineer – System design, PCB layout, installation, and test of custom embedded systems for neuro-biological research. Complexity ranging from assembly level programs on small 8-bit microcontroller to high level C frameworks running on high performance 32-bit digital signal processors.

PUBLICATIONS AND PATENTS

Journal Publications

1. Z. Foo, D. Devescery, M. Ghaed, I. Lee, A. Madhavan, Y. Park, A. Rao, Z. Renner, N. Roberts, A. Schulman, V. Vinay, M. Wieckowski, D. Yoon, C. Schmidt, T. Schmid, P. Dutta, P. Chen, D. Blaauw, "A Low-cost Audio Computer for Information Dissemination among Illiterate People Groups," *IEEE Transactions on Circuits and Systems 1 (TCAS)*, Vol. 60, Iss. 8, pp. 2039-2050, June 2013.
2. R. G. Dreslinski, D. Fick, B. Giridhar, G. Kim, S. Seo, M. Fojtik, S. Satpathy, Y. Lee, D. Kim, N. Liu, **M. Wieckowski**, G. Chen, T. Mudge, D. Sylvester, and D. Blaauw, "Centip3De: A 64-Core, 3D Stacked, Near-Threshold System," IEEE Micro, Vol. 33, Iss. 2, pp. 8-16, Jan. 2013.
3. M. Ghaed, G. Chen, R. Haque, **M. Wieckowski**, Y. Kim, G. Kim, Y. Lee, I. Lee, D. Fick, D. Kim, M. Seok, K. Wise, D. Blaauw, and D. Sylvester, "Circuits for a Cubic-Millimeter Energy-Autonomous Wireless Intraocular Pressure Monitor," *IEEE Transactions on Circuits and Systems 1 (TCAS), In Press.*
4. D. Fick, R. G. Dreslinski, B. Giridhar, G. Kim, S. Seo, M. Fojtik, S. Satpathy, Y. Lee, D. Kim, N. Liu, **M. Wieckowski**, G. Chen, T. Mudge, D. Blaauw, and D. Sylvester, "Centip3De: A Cluster-Based NTC Architecture with 64 ARM Cortex-M3 Cores in 3D Stacked 130nm CMOS," *IEEE Journal of Solid State Circuits (JSSC),* Vol. 48, Iss. 1, pp. 104-117, Jan. 2013.
5. M. Seok, G. Chen, S. Hanson, **M.Wieckowski**, D. Blaauw, and D. Sylvester, "Mitigating variability in near-threshold computing," *IEEE Journal on Emerging Topics in Circuits and Systems (CAS-FEST), Vol. 1, Iss. 1, pp. 42-49, May 2011.*
6. R.G. Dreslinski, **M. Wieckowski**, D. Blaauw, D. Sylvester, and T. Mudge, "Near-threshold voltage scaling for energy optimal systems," *Proceedings of the IEEE*, pp. 253-266, February 2010. [invited]
7. **M. Wieckowski**, R. Dreslinski, D. Blaauw, D. Sylvester, "Circuit Design Advances For Ultra-low Power Sensing Platforms", *Society of Photographic Instrumentation Engineers (SPIE) Journal, In press.*
8. R. Dreslinski, **M. Wieckowski**, D. Blaauw, D. Sylvester, T. Mudge, "Near-Threshold Computing: Reclaiming Moore's Law Through Energy Efficient Integrated Circuits," *Proceedings of the IEEE,* Vol. 98, Iss. 2, pp. 253-266, February 2010.
9. **M. Wieckowski**, M. Margala, M. H. Hu, H. K. Nguyen, "Differential Resistance Testing For InP Based Semiconductor Optical Amplifiers," *Journal of Lightwave Technology (JLT)*, Vol. 27, Iss. 7, pp. 893-900, April 2009.
10. **M. Wieckowski**, M. Margala, "Practical Considerations for Waveguide-Ballistic Thermal Energy Conversion," *Journal of Heat Transfer,* Vol. 130, Iss. 4, April 2008.
11. **M. Wieckowski**, S. Patil, M. Margala, "Portless SRAM - A High-Performance Replacement For The 6T Methodology," *IEEE Journal of Solid State Circuits (JSSC),* Vol. 42, Iss. 11, pp 2600-2610, Nov. 2007.

Conference Publications

1. Z. Foo, D. Devescery, M. Ghaed, I. Lee, A. Madhavan, Y. Park, A. Rao, Z. Renner, N. Roberts, A. Schulman, V. Vinay, M. Wieckowski, D. Yoon, C. Schmidt, T. Schmid, P. Dutta, P. Chen, D. Blaauw, "A Low-cost Audio Computer for Information Dissemination among Illiterate People Groups," *Proceedings IEEE Custom Integrated Circuits Conference*, pp. 1-4, 2012

2. D. Fick, R. G. Dreslinski, B. Giridhar, G. Kim, S. Seo, M. Fojtik, S. Satpathy, Y. Lee, D. Kim, N. Liu, **M. Wieckowski**, G. Chen, T. Mudge, D. Sylvester, D. Blaauw, "Centip3De: A 3930DMIPS/W Configurable Near-Threshold 3D Stacked System with 64 ARM Cortex-M3 Cores," *IEEE International Solid-State Circuits Conference*, pp. 190-192, Feb. 2012.

3. R. G. Dreslinski, D. Fick, B. Giridhar, G. Kim, S. Seo, M. Fojtik, S. Satpathy, Y. Lee, D. Kim, N. Liu, **M. Wieckowski**, G. Chen, T. Mudge, D. Sylvester, and D. Blaauw, "Centip3De: A 64-Core, 3D Stacked, Near-Threshold System," Proc. HOTCHIPS, 2012.

4. D. Fick, R.G. Dreslinski, B. Giridhar, G. Kim, S. Seo, M. Fojtik, S. Satpathy, Y. Lee, D. Kim, N. Liu, **M. Wieckowski**, G. Chen, T. Mudge, D. Sylvester, and D. Blaauw, "Design and Implementation of Centip3De, a 7-layer Many-Core System," *ACM/IEEE Design Automation Conference*, DAC/ISSCC student design contest award winner, 2011.

5. G. Chen, **M. Wieckowski**, D. Blaauw, and D. Sylvester, "A dense 45nm half-differential SRAM with lower minimum operating voltage," *IEEE International Symposium on Circuits and Systems*, pp. 57-60, 2011.

6. **M. Wieckowski**, G. Chen, D. Kim, D. Blaauw, and D. Sylvester, "A 128kb high density portless SRAM using hierarchical bitlines and thyristor sense amplifiers," *IEEE International Symposium on Quality Electronic Design*, pp. 1-4, 2011.

7. G. Chen, H. Ghaed, R. Ul-Haque, **M. Wieckowski**, Y. Kim, G. Kim, D. Fick, D. Kim, M. Seok, K. Wise, D. Blaauw, and D. Sylvester, "A 1 cubic millimeter energy-autonomous wireless intraocular pressure monitor," *IEEE International Solid-State Circuits Conference*, pp. 310-312, Feb. 2011.

8. V. Joshi, **M. Wieckowski**, G.K. Chen, D. Blaauw, and D. Sylvester, "Analyzing the impact of double patterning lithography on SRAM variability in 45nm CMOS," *Proceedings IEEE Custom Integrated Circuits Conference*, pp. 1-4, 2010. [AMD/CICC Student Scholarship Award]

9. G. K. Chen, **M.Wieckowski**, D. Blaauw, D. Sylvester, "Crosshairs SRAM – An Adaptive Memory for Mitigating Parametric Failures," Proceedings of *2010 European Solid State Circuits Conference,* pp. 366-369*, 2010.*

10. M. Seok, S. Hanson, **M. Wieckowski**, G. Chen, Y-S. Lin, D. Blaauw, and D. Sylvester, "Circuit design advances to enable ubiquitous sensing environments," *IEEE International Symposium on Circuits and Systems*, 2010. [invited]

11. **M. Wieckowski**, V. Chandra, S. Idgunji, C. Pietrzyk, R. Aitken, D. Sylvester, D. Blaauw, "A Black Box Method For Stability Analysis of Arbitrary SRAM Cell Structures," *Proceedings of Design Automation and Test in Europe (DATE),* pp. 795-800, 2010.

12. P. Singh, Z. Foo, **M. Wieckowski**, S. Hanson, M. Fojtik, D. Blaauw, and D. Sylvester, "Early detection of oxide breakdown through in situ degradation sensing," *IEEE International Solid-State Circuits Conference*, pp. 190-191, 2010.

13. R. Dreslinski, **M. Wieckowski**, D. Blaauw, D. Sylvester, and T. Mudge, "Overcoming Moore's curse: techniques for powering large transistor counts in sub-micron technologies", *Workshop on New Directions in Computer Architecture (in conjunction with IEEE/ACM International Symposium on Microarchitecture),* pp. 20-21, 2009.

14. **M. Wieckowski**, G. K. Chen, M. Seok, D. Sylvester, D. Blaauw, "A Hybrid DC-DC Converter for Nanoampere Sub-1V Implantable Applications," *Proceedings of IEEE Symposium on VLSI Circuits (VLSI),* pp. 166-167, June 2009.

15. **M. Wieckowski**, Y. M. Park, C. Tokunaga, D. W. Kim, Z. Foo, D. Sylvester, D. Blaauw, "Timing Yield Enhancement Through Soft Edge Flip-Flop Based Design," *Proceedings of IEEE Custom Integrated Circuits Conference (CICC),* pp. 543-546, Sept. 2008.

16. **M. Wieckowski**, M. Margala, "A Portless SRAM Cell Using Stunted Wordline Drivers," *Proceedings of IEEE International Symposium on Circuits and Systems (ISCAS),* pp. 584-587, May 2008.

17. S. Patil, **M. Wieckowski**, M. Margala, "A Self-biased Charge-transfer Sense Amplifier," *Proceedings of IEEE International Symposium on Circuits and Systems (ISCAS)*, pp. 3030-3033, May 2007.

18. **M. Wieckowski**, M. Margala, "Practical Considerations for Waveguide-ballistic Thermal Energy Conversion," *Proceedings of ASME Energy Nanotechnology International Conference*, June 2006.

19. **M. Wieckowski**, J. Liobe, Q. Diduck, M. Margala, "A New Test Methodology For DNL Error in Flash ADC's," *Proceeding of IEEE International Symposium on Defect and Fault Tolerance in VLSI Systems (DFT)*, pp. 582-590, Oct. 3-5, 2005.
20. **M. Wieckowski**, M. Margala, "A Novel Five-Transistor (5T) SRAM Cell for High Performance Cache," *Proceedings of IEEE International System-on-Chip Conference (SOCC)*, pp. 101-102, Sept. 25-28, 2005.
21. **M. Wieckowski**, M. Margala, "A 32KB SRAM Cache Using Current Mode Operation and Asynchronous Wave-Pipelined Decoders," *Proceedings of IEEE International System-on-Chip Conference (SOCC)*, Sep. 12-15, pp. 251-254, 2004.

Patents

1. David Theodore Blaauw, Dennis Michael Sylvester, David Alan Fick, **Michael John Wieckowski**, Scott McLean Hanson, Gregory Kengho Chen, "Operating parameter control of an apparatus for processing data," USPTO 8,407,025 B2
2. Scott Hanson, **Michael Wieckowski**, David Blaauw, and Dennis Sylvester, "Integrated circuit with sleep mode," UM file number 4657.
3. Scott Hanson, **Michael Wieckowski**, David Blaauw, and Dennis Sylvester, "Low leakage, low voltage memory cell," UM file number 4656.
4. **Michael Wieckowski** and Dennis Sylvester, "Low frequency, low power oscillator using monostable CMOS multivibrators," UM file number 4154.
5. **Michael Wieckowski**, Greg Chen, and Dennis Sylvester, "Hybrid DC-DC converter for ultra-low power, low voltage applications," UM file number 4155
6. Yoonmyung Lee, **Michael Wieckowski**, David Blaauw, Dennis Sylvester, "Logic Non-Volatile Memory with MIM Capacitor and Stacking," USPTO Provisional Patent No. 12/078,547
7. **Michael Wieckowski**, Martin Margala, "Novel Five-Transistor (5T) SRAM Cell For High Performance Cache," USPTO Provisional Patent No. 60/736,332
8. Yoonmyung Lee, **Michael John Wieckowski**, David Theodore Blaauw, Dennis Michael Chen Sylvester, "Memory cell structure, a memory device employing such a memory cell structure, and an integrated circuit having such a memory device," US-8107290-B2
9. Jeremiah M. Callahan, Eric J. Doesburg, Gregory S. Lyon, **Michael J. Wieckowski**, "Devices For Ohmically Heating A Fluid," US-2019271487-A1
10. **Michael J. Wieckowski**, Weston Scott Catron, Jeremiah M. Callahan, "Fluid heater with finite element control," US-10365013-B1
11. Jeremiah M. Callahan, Eric J. Doesburg, Gregory S. Lyon, **Michael J. Wieckowski**, "Recirculating Fluid Heating Systems," US-2018347830-A1

HONORS AND AWARDS

- University of Rochester Highest distinction in Electrical and Computer Engineering, 2003
  - Ranked first in electrical and computer engineering class, Dean's list all semesters
- Elected to Phi Beta Kappa Honors Society, 2003
- Elected to Tau Beta Pi Engineering Honor Society, 2001

PROFESSIONAL ACTIVITIES

- ECPI University Technical Advisory Board Member
- Research Gate: http://www.researchgate.net/profile/Michael_Wieckowski
- NY State Fundamentals of Engineering Exam
- Peer Reviewer:
  - *IEEE Journal of Solid State Circuits*
  - *IEEE Transactions on Circuits and Systems*
  - *IEEE Transactions on VLSI*
  - *IEEE International Symposium on Circuits and Systems*
  - *IEEE Defect and Fault Tolerance in VLSI Systems*
  - *IEEE International Workshop on Memory Technology, Design, and Testing*
  - *IEEE International System on Chip Conference*
  - *IEEE Journal of Electronic Testing, Theory, and Applications*

EXTRACURRICULARS

- www.MichaelWieckowski.com – my blog on programming, woodworking, photography, electronics, and aviation.
- Charleston men's ice hockey team, rock climbing enthusiast
- Private pilot, instrument rated, tailwheel / HP endorsements, working on commercial rating
- Trained pianist and self-taught guitarist
- Photography / Cinematography – creating short films, commercials, product shots, and promotionals.