

Exponent®
Engineering & Scientific Consulting

Daniel Palmer, Ph.D., FSE, P.E.

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Professional Profile

Dr. Palmer has extensive experience in many aspects of electrical and computer engineering. Built on primary expertise in integrated circuit (IC) design, his knowledge extends into control theory, robotics, and data analysis.

Prior to joining Exponent, he completed his Ph.D. at Cornell University, where he spearheaded the design and testing of power-autonomous optoelectronic chips for the tracking and control of tiny mobile platforms, including honey bees and microrobots. Throughout this work, Dr. Palmer conducted every aspect of chip design, from initial design conception and specification, to schematic development and physical layout instantiation using industry-standard Cadence Virtuoso design software, and finally to testbench assembly and analysis of test results. To support this testing, Dr. Palmer also designed and populated many Printed Circuit Boards (PCBs), hand-packaged the chips to be tested, and performed a variety of cleanroom processes. Dr. Palmer's work has been published in several conferences and journals to date.

Each of Dr. Palmer's chip designs constituted a comprehensive system-on-chip, for which he designed the optoelectronic signal detection circuitry, on-chip memory, digital data processing, power supply scavenging modules, and an embedded near-field communication (NFC) antenna. Design of these system components required the use of many different software tools in conjunction with the standard Cadence Virtuoso IC development environment, including Advanced Design System (ADS) for electromagnetic simulation and a custom MATLAB program for simulation of the optoelectronic components. Testing required the development of a PCB-level RF receiver, the use of automated rotational stages on an optical test bench for precision orientation control of chips under illumination, and programmatic control of signal sources and data loggers. Other software proficiency includes Altium Designer for PCB design, MATLAB for system modeling, data analysis, and data visualization, and Python for general applications.

The holistic nature of Dr. Palmer's research and education has prepared him to assist clients within the electronics space in a multitude of ways. For instance, Dr. Palmer can provide pre-emptive safety analysis and forensic failure mode analysis of both ICs and PCBs, and he can consult on intellectual property matters related to the field. Furthermore, Dr. Palmer can travel to product failure sites in order to inspect damages in support of insurance claim adjustment.

Academic Credentials & Professional Honors

Ph.D., Electrical & Computer Engineering, Cornell University, 2022

M.S., Electrical & Computer Engineering, Cornell University, 2020

B.S., Engineering, Swarthmore College, 2016

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Phi Beta Kappa, Swarthmore College, 2016

Tau Beta Pi, Swarthmore College, 2015

Licenses and Certifications

Functional Safety Engineer (FSE)

Prior Experience

Research Assistant, Electrical & Computer Engineering, Cornell University, 2016-2022

Teaching Assistant, Electrical & Computer Engineering, Cornell University, 2020

Professional Affiliations

Institute of Electrical and Electronics Engineers (IEEE)

Publications

H. M. Abdel-Raziq, D. M. Palmer, A.C. Molnar, K. H. Petersen, “Mapping Unknown Environments with Instrumented Honey Bees,” in 2022 IEEE International Conference on Robotics and Automation, May 2022.

D. M. Palmer and A. C. Molnar, " An Autonomous, Optically-Powered, Direct-to-Digital Sun-Angle Recorder for Honey Bee Flight Tracking," in IEEE Transactions on Circuits and Systems II: Express Briefs, vol. 68, no. 5, pp. 1680-1684, May 2021, doi: 10.1109/TCSII.2021.3067033.

H. M. Abdel-Raziq, D. M. Palmer, P. A. Koenig, et al., “System design for inferring colony-level pollination activity through miniature bee-mounted sensors,” in Scientific Reports, vol. 11, no. 4239, Feb 2021, doi: /10.1038/s41598-021-82537-1.

P. A. Koenig, M. L. Smith, L. H Horowitz, D. M. Palmer, et al., “Artificial shaking signals in honey bee colonies elicit natural responses,” in Scientific Reports, vol. 10, no. 3746, Feb. 2020, doi:/10.1038/s41598-020-60421-8.

Presentations

D. M. Palmer, “An Autonomous, Optically-Powered, Direct-to-Digital Sun-Angle Recorder for Honey Bee Flight Tracking,” presented at the IEEE International Symposium on Circuits and Systems, Daegu, South Korea, May 22-28, 2021.