



Exponent[®]

Engineering & Scientific Consulting

Kyle Naughton, Ph.D.

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Professional Profile

Dr. Naughton's experience spans several disciplines, from applied electrical/ device engineering, to material characterization, to theory and simulation of bioelectronic systems. By virtue of specializing in biophysics, he maintains expertise in biological fields, namely cell culturing, microbiology, and marine biology.

Dr. Naughton has extensive knowledge of optical spectroscopy and X-ray characterization of polymeric, semi-conductive, and living materials. He also has expertise with a large range of experimental, theoretical, statistical and analytical tools. Experimental tools include scanning electron microscopy (SEM), IV characterization, photoluminescence (PL) spectroscopy, X-ray diffraction (XRD), small-angle X-ray scattering (SAXS), circular dichroism (CD), dynamic light scattering (DLS), and optical microscopy. Theoretical/ modeling tools include MATLAB and COMSOL. Moreover, he maintains knowledge of C/C++ and Python software languages for performing statistical analysis, contributing to data science efforts, and developing software.

Prior to joining Exponent, Dr. Naughton earned a Physics Ph.D. at the University of Southern California studying biophysics. His work focused in part on characterizing biomaterials that enable bioelectricity and engineering experimental devices for biochemical measurements. His work also revolved around developing theories and simulations of bio-inorganic interfaces. Moreover, he contributed to theoretical projects modeling emergence in complex systems, e.g. the interactions networks among microbes, cells, insects, and people.

During his bachelor's (UC Santa Barbara) and master's degrees (UC Irvine), he engineered devices, materials, and textiles inspired by octopus, squid, and cuttlefish. In this spirit, he performed failure analysis testing, quality control experiments, and extensive bioelectronic and material science characterization. He also performed computational finite element analysis of material self-assembly. He holds a patent for a thermoregulatory cloth inspired by cephalopods with industry partners and the US Department of Energy. He has worked with various defense contractors to develop opto-electronic devices. Prior to graduate school, Dr. Naughton worked as a process engineer at a start-up microfabrication company in Santa Barbara making microfluidic devices for the biotech industry.

Academic Credentials & Professional Honors

Ph.D., Physics, University of Southern California, 2021

M.S., Physics, University of California, Irvine, 2017

B.S., Physics, University of California, Santa Barbara, 2012

Prior Experience

Graduate Research Assistant, University of Southern California, Los Angeles, CA, 2018-2021
Research Fellow, Complexity Interactive, Santa Fe Institute, Santa Fe New Mexico (2021)
Research Fellow, Phillips Group, California Institute of Technology, Pasadena California (2019)
Research Fellow, Physiology, Marine Biology Lab, Woods Hole, Massachusetts (2018)
Graduate Research Assistant, University of California, Irvine, CA 2014-2017
Undergraduate Research Assistant, University of California, Santa Barbara, CA 2008-2012
Chief Process and Manufacturing Engineer, Invenios, Santa Barbara, 2013 – 2014

Professional Affiliations

American Physical Society (APS), Member

Publications

Naughton, K. L., Boedicker, J. Q., Simulations to Aid in the Design of Microbes for Synthesis of Metallic Nanomaterials, *ACS Synthetic Biology* 2021; 10:3475-3488.

Naughton, K.L., Microbial Electron Transfer and Biogenic Nanomaterials: Experiments, Theory, and Simulations at the Bacterial-Inorganic Interface. Ph.D. Dissertation, University of Southern California, Los Angeles, CA, 2021.

Zhao, F., Chavez, M.S., Naughton, K.L., Cole, C.M., Gralnick, J.A., El-Naggar, J.A., Boedicker, J.Q., Light-induced Patterning of Electroactive Bacterial Biofilms, *bioRxiv* 2021.

Boedicker, J.Q., Gangan, M., Naughton, K.L., Zhao, F., Gralnick, J.A., El-Naggar, M.Y., Engineering Biological Electron Transfer and Redox Pathways for Nanoparticle Synthesis, *Bioelectricity* 2021; 3:126-135.

Umerani, M.J., Pratakshya, P., Chatterjee, A., Sanchez, J.A.C., Kim, H.S., Ilc, G., Kovačič, M., Magnan, C., Marmioli, B., Sartori, B., Kwansa, A.L., Orins, H., Bartlett, A.W., Leung, E.M., Feng, Z., Naughton, K.L., Norton-Baker, B., Phan, L., Long, J., Allevato, A., Leal-Cruz, J.E., Lin, Q., Baldi, P., Bernstorff, S., Plavec, J., Yingling, Y.G., Gorodetsky, A.A., Structure, self-assembly, and properties of a truncated reflectin variant. *Proceedings of the National Academy of Sciences* 2020; 117:32891-32901.

Ostovar, G., Naughton, K.L., Boedicker, J.Q., Computation in bacterial communities. *Physical Biology* 2020; 17:061002.

Laxhuber, K.S., Morrison, M.J., Chure, G., Belliveau, N.M., Strandkvist, C., Naughton, K.L., Phillips, R., Theoretical investigation of a genetic switch for metabolic adaptation. *PLoS ONE* 2020; 5:e0226453.

Chellamuthu, P., Naughton, K.L., Pirbadian, S., Silva, K.T.P., Chavez, M.S., El-Naggar, M.Y., Boedicker, J.Q., Biogenic control of manganese doping in zinc sulfide nanomaterial using *Shewanella oneidensis* MR-1. *Frontiers in Microbiology* 2019; 10:938.

Leung, E.M., Escobar, M.C., Stiubianu, G.T., Jim, S.R., Vyatskikh, A.L., Feng, Z., Garner, N., Patel, P., Naughton, K.L., Follador, M., Karshalev, E., Trexler, M.D., Gorodetsky, A.A., A dynamic thermoregulatory material inspired by squid skin. *Nature Communications* 2019; 10:1-10.

Naughto, K.L., Towards Understanding a Dynamic Cephalopod Protein Reflectin. M.S. Dissertation, University of California, Irvine, CA, 2017.

Phan, L., Kautz, R., Leung, E., Naughton, K.L., Van Dyke, Y., Gorodetsky, A.A., Dynamic materials inspired by cephalopods. *Chemistry of Materials* 2016; 28:6804-6816.

Naughton, K.L., Phan, L., Leung, E.M., Kautz, R., Lin, Q., Van Dyke, Y., Marmioli, B., Sartori, B., Arvai, A., Li, S., Pique, M.E., Naeim, M., Kerr, J.P., Aquino, M.J., Roberts, V.A., Getzoff, E.D., Zhu, C., Bernstorff, S., Gorodetsky, A.A., Self-Assembly of the Cephalopod Reflectin. *Advanced Materials*; 28:8405-8412.

Pueyo, N.C., Raub, A.G., Jackson, S., Metz, M.M., Mount, A.C., Naughton, K.L., Eaton, A.L., Thomas, N.M., Hastings, P., Greaves, J., Blumberg, B., Collins, T.J., Sogo, S.G., Oxidation of ethidium bromide using TAMM activators: a model for high school research performed in partnership with university scientists. *Journal of Chemical Education*; 90:326-331.

Presentations

Naughton, K.L., Boedicker, J.Q., Heterodimer Transcription Factors as Novel Gene Regulators, Presentation, APS March Meeting, Boston, MA, 2019.

Naughton, K.L., Boedicker, J.Q., Light Inducible Cell Patterning and Biogenic Lithography, American Society of Cell Biology (ASCB) Annual Meeting, San Diego, Poster Presentation, CA, 2018.

Naughton, K.L., Chellamuthu, P., Boedicker, J.Q., Engineering bacteria to synthesize nanomaterials, Society of Industrial Microbiology and Biotechnology (SIMB) Annual Meeting, Poster Presentation, San Diego, CA, 2018.

Naughton, K.L., Phan, L., Leung, E.M., Kautz, R., Lin, Q., Van Dyke, Y., Marmioli, B., Sartori, B., Arvai, A., Li, S., Pique, M.E., Naeim, M., Kerr, J.P., Aquino, M.J., Roberts, V.A., Getzoff, E.D., Zhu, C., Bernstorff, S., Gorodetsky, A.A., Self-assembly of the cephalopod structural protein reflectin, American Chemical Society (ACS) Annual Meeting, Presentation, San Diego, CA, 2017.

Naughton, K.L., Phan, L., Leung, E.M., Kautz, R., Lin, Q., Van Dyke, Y., Marmioli, B., Sartori, B., Arvai, A., Li, S., Pique, M.E., Naeim, M., Kerr, J.P., Aquino, M.J., Roberts, V.A., Getzoff, E.D., Zhu, C., Bernstorff, S., Gorodetsky, A.A., Self-assembly of the cephalopod structural protein reflectin, Materials Research Society (MRS) Annual Meeting, Presentation, Phoenix, AZ, 2017.

Naughton, K.L., Biophysical Characterization of Reflectin Isoforms from Cephalopods" American Association of Crystal Growth and Epitaxy (AACGE) Annual Meeting, Invited Talk, Lake Tahoe, CA, 2016.

Naughton, K.L., Characterization of the cephalopod structural protein reflectin, American Chemical Society (ACS) Annual Meeting, Presentation, San Diego, CA, 2016.

Additional Education & Training

A/B Testing, Udacity, 2021

Fundamentals of Machine Learning; Scaling Theory; Computation in Complex Systems, Santa Fe Institute, 2020

Google Data Analytics, Coursera, 2022

Research Grants

Investigating energy efficiency, information processing and control architectures of microbial community interaction networks, W911NF1910269, United States Army, 2019-2024

Nanoparticle characterization system for analysis of microbial vesicles in relation to biological communication networks and applications in microbial biosynthetic technologies, N000142112931 Office of Naval Research, 2021-2022

Livtronics: Living Electronics for Biologically-Enhanced Sensing, Computing, and Signal Transmission, N000141812632, Office of Naval Research, 2018-2021

Thermocomfort Cloth, ARPA-E, DELTA, 2015-2018

Equipment for Characterization of Nanostructures, N000141712564, Office of Naval Research, 2017

Open Manufacturing: Cephalod-Inspired Reconfigurable Camouflage, HR00111510008, DARPA, 2015-2016

Peer Reviews

eLife

Journal of Chemical Biology