LEOPOLD N. GREEN

MENTOR · EDUCATOR · SYNTHETIC BIOLOGIST

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EDUCATION & TRAINING

California Institute of Technology — April 2017 - Current
Post-Doctoral Researcher in Biology and Biological Engineering — *Pasadena, CA*

University of California, Riverside — December 2016
Ph.D. in Bioengineering — *Riverside, CA*

Hampton University — May 2011
B.S. in Chemistry — *Hampton, VA*

RESEARCH INTERESTS

Keywords: Synthetic biology, Control theory, Inter-kingdom signaling, Chemistry, Biosensors, Microbiome, Personalized medicine, Microscopy,and image processing, Data Analysis (Python, MATLAB)

Detailed Projects:

1. Identify interkingdom signals produced by bio-films of either environmentally relevant or medically relevant signals and chemical toxins for real-time contamination/pathogen detection.
2. Expound on current synthetic biology toolkit by designing, integrating, and characterizing functional circuits in environmentally and medically relevant pathogenic or commensal microbial strains (e.g., *Pseudomonas aeruginosa*; *Staphylococcus aureus*).
3. Design, model, and implement bacterial controllers that sense and respond to pathogen-induced interkingdom signals, improving the conditions of concern (e.g., biofilm production; healing dynamics of chronic conditions).

RESEARCH EXPERIENCE

Caltech — May 2017 - Current
Post-doctoral Research Fellow — *Pasadena, CA*
Advisor: *Richard Murray*, Collaborator: *Sarkis Mazmanian*

I am project lead for multiple, concurrent projects where I am responsible for both coordinating high-level strategic visions and implementing ideas experimentally. Scientifically I engineer the regulation of multi-cellular systems that enable the expansion of synthetic biology tools and systems. By integrating concepts of control theory and inter-kingdom biomedical signaling processes (host to microbes), I am engineering multi-cellular population circuits in both synthetic and *in vivo* microbial communities for potential health applications; promoting chronic to acute conditions using microbial interactions. (Projects are funded by DAPRA Biological Control; NSF AGEP; Caltech Rosen Grant).

University of California Riverside — August 2011 - December 2016
Dept. of Bioengineering and Mechanical Engineering — *Pasadena, CA*
Advisor: *Elisa Franco (now at UCLA)*

I engineered nucleic-acid based biosensors as self-assembling tile motifs (DNA nanotubes) whose dynamic assembly were modulated via environmental biosignals; nucleic-acid inputs regulated by synthetic transcriptional oscillator or environmental pH. (Projects are funded by NSF GRFP).

Hampton University September 2009 - May 2011
Dept. of Chemistry and Physics *Hampton, VA*
Advisor: *Kesete Ghebreyessus, Uwe Hommerich*

I synthesized lanthanide luminescence Yb^{3+}/Er^{3+} co-doped LaF^{3+} nano-crystals for 2-photon up-conversion fluorescence. Using laser spectroscopy, I quantified luminescent properties of the nano-particles.

University of Rochester Medical Center Summer 2009
Dept. of Dermatology - McNair Scholar *Rochester, NY*
Advisor: *Lisa DeLouise*

I chemically modified the surface of toxic, heavy metal core quantum dots and analyzed absorption and penetration of quantum dots on ex-vivo skin samples using flow cytometry.

INDUSTRY EXPERIENCE

Holoclara 2019
Technical Consultant *Pasadena, CA*

Thermo Fisher Scientific, One Lambda June 2016 - December 2016
R&D Project Manager *Canoga Park, CA*

UNCF - Merck & Co. Summer 2010
R&D Process Chemistry Intern *Rahway, NJ*

HONORS & AWARDS

California AGEP Postdoctoral Fellowship	Caltech	2019
Rosen Center Pilot Grant Awards	Caltech	2018
National Science Foundation GRFP	UC Riverside	2013
Ford Fellowship Foundation Honorable Mention	UC Riverside	2012, 2013
U.S. Department of Education GAANN	UC Riverside	2012
Future Nobel Laureate	Hampton University	2011
United Negro College Fund MERCK	Undergraduate Fellow	2010
Ronald E. McNair Fellowship Program	Undergraduate Fellow	2009

SELECTED PUBLICATIONS

8. "Engineering Logical Inflammation Sensing Circuit for Gut Modulation.". Liana N. Merk, Andrey S. Shur, Ayush Pandey, Richard M. Murray, and Leopold N. BioRXiv. 2020.
7. "Bacterial controller aided wound healing: A Case study in dynamical population controller design". Leopold N. Green, Chelsea Y. Hu, Xinying Y. Ren, and Richard M. Murray. BioRXiv. 2019.
6. "Autonomous dynamic control of DNA nanostructure self-assembly". Leopold N. Green, Hari K. K. Subramanian, Vahid Mardanlou, Jongmin Kim, Rizal F. Hariadi, and Elisa Franco. Nature Chemistry. 2019.
5. "T7 RNA polymerase can transcribe and induce disassembly of DNA nanostructures". Samuel Schaffter, Leopold N. Green, Joanna Schneider , Hari K. K. Subramanian, Rebecca Schulman, and Elisa Franco. Nucleic Acids Research. 2018.
4. "Control of bacterial population density with population feedback and molecular sequestration". Reed D. McCardell, Shan Huang, Leopold N. Green, and Richard M. Murray. BioRXiv. 2017.
3. "pH-driven reversible self-assembly of micron-scale DNA scaffolds". Leopold N. Green, Alessia Amodio, Hari K. K. Subramanian, Francesco Ricci, and Elisa Franco. Nano Letters. 2017.

2. "A coarse-grained model captures the temporal evolution of DNA nanotube length distributions".Vahid Mardanlou, Kimia C. Yaghoubi, Leopold N. Green, Hari K. K. Subramanian, Rizal F. Hariadi, Jongmin Kim, and Elisa Franco. Natural Computing. 2017.

1. "Screening Chelating Agents and Carbon or Silica Gel-Based Binary Systems for a Cost-Effective Method to Remove Palladium from Pharmaceutical Intermediates and APIs". Lijun Wang, Leopold N. Green, et. al. Organic Process Research & Development ACS. 2011.

SCHOLARLY ACTIVITIES

Teaching

- Adjunct Professor: Elementary Chemistry at Long Beach City College (2018 - 2020)
- Guest Lecturer: Synthetic Biology - Bi1x Introductory to Biology Lab at Caltech (2018, 2019)
- Science Lecturer: TRiO and Upward Bound at UC Riverside (2014, 2015)

Leadership

- Recruitment Liaison: Center for Diversity at Caltech (2018 - Current)
- Member: Caltech Postdoc Association; Career development committee (Summer 2019)
- Member: Black Scientists and Engineers at Caltech (BSEC) (2017 - Current)
- Graduate Advisor: National Society of Black Engineers (NSBE) (2012 - 2018)
- Mentor: Graduate Student Mentorship Program (2013 - 2016)
- President: Bioengineering Graduate Student Association (GSA) (2012 - 2013)

Community

- Speaker: Hackaday Los Angeles Meetup (2019)
- Speaker: Dropping Knowledge ODDBalls Summit (2019)
- Speaker: European Congress on Cell-Free Synthetic Biology (2016)

REFERENCES

Richard Murray, Ph.D
Postdoctoral Research Advisor
Professor, Control & Dynamical Systems, Biology and Biological Engineering
Caltech
Email: murray@cds.caltech.edu

Elisa Franco, Ph.D
Graduate Studies Research Advisor
Assistant Professor, Department of Mechanical Engineering
University of California, Los Angeles
Email: efranco@seas.ucla.edu