Reese Richardson

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Education

Northwestern University – Evanston, IL **Fall 2019 – Fall 2024**
PhD in Interdisciplinary Biological Sciences (IBiS)
Thesis: *Metascientific studies in reproducibility, bias and fraud*
Biotechnology Training Program (NIGMS T32 GM008449)

North Central College – Naperville, IL **Graduation: June 2019**
Bachelor of Science in Physics & Applied Mathematics

Research Experience

Graduate Researcher – Northwestern University – Evanston, IL **Fall 2019 – Fall 2024**
Thesis Research in Laboratory of Dr. Luis Amaral
- ❖ Developing methods for identifying and quantifying undocumented biases in RNA-seq pipelines
- ❖ Characterizing networks underlying industrialized scientific fraud and developing methods for inferring irreproducibility in the published literature

Spring 2020 Rotation in Laboratory of Dr. Jaline Gerardin
- ❖ Developed COVID-19 epidemiological models for use by Office of the Governor of Illinois and Illinois Department of Public Health

Winter 2020 Rotation in Laboratory of Dr. Guillermo Ameer
- ❖ Engineered and fabricated micro-patterned surfaces on 3D-printable bioresorbable vascular scaffolds

Fall 2019 Rotation in Laboratory of Dr. Luis Amaral
- ❖ Designed, performed, and analyzed simulations to assess biases in popular RNA-seq quantification software packages

Computational Biology Intern – Envisagenics – New York City, NY **Summer 2024**
- ❖ Benchmarked pipelines for reconstruction of alternative splicing events from RNA-seq data

Public Service Intern – Chicago Department of Public Health – Chicago, IL **Fall 2020 – Fall 2022**
- ❖ Developed and executed pipelines for COVID-19 sentinel surveillance from outpatient diagnostic testing and hospital admissions data in Chicago
- ❖ Delivered weekly reports on sentinel surveillance to Director of Epidemiology

Undergraduate Researcher – North Central College – Naperville, IL **Fall 2018 – Spring 2019**
North Central College Richter Grant Recipient
- ❖ Designed study to investigate the formation of complex pores during the electroporation of *E. coli*
- ❖ Developed novel technique of delayed probe delivery to describe lifetime of pore closure after electroporation

Undergraduate Researcher – Northern Illinois University – DeKalb, IL **Summer 2017 – Spring 2019**
REU Program - NSF-REU Grant CHE-1659548

- Initiated, completed, and structurally analyzed molecular dynamics simulations of ionic liquid systems in LAMMPS
- Developed statistical technique of First-Neighbor Analysis to quantify aggregation in simulated systems

Awards & Honors

Outstanding Dissertation Award, IBiS, Northwestern University, 2024
Moderna Global Fellowship, Moderna Inc., 2023 – 2025
CoDEx Best Poster, Northwestern University, 2024
Dr. John N Nicholson Fellowship, Northwestern University, 2022-2023
NIH-NIGMS Biotechnology Training Program (NIGMS T32 GM008449), 2020-2022
Love Data Week Data Visualization Contest 2nd Place Winner, Northwestern University, 2021
Outstanding Contribution to Student Life Award, North Central College, 2019
Making the Invisible Visible Award, Department of Physics & Chemistry, 2018
Changemaker of the Year Award, North Central College, 2018
Member, Pi Mu Epsilon Mathematics Honor Society, 2016-present
Member, Alpha Delta Pi Disability Honor Society, 2016-present
Fermilab Science Award, 2015
National Merit Scholar, 2015

Publications

- **Richardson, R.A.K.,** Wise, N.H., Hong, S.S., Draper, M.J. *Exploitation of patents for the manipulation of academic reputations.* Under review (2024).
- **Richardson, R.A.K.**, Hong, S.S., Byrne, J.A., Stoeger, T., Amaral, L.A.N. *The organizations enabling scientific fraud at scale are large, resilient, and growing rapidly.* Under review (2024).
- **Richardson, R.A.K.**, Moon, J., Hong, S.S., Amaral, L.A.N. *Widespread misidentification of SEM instruments in the peer-reviewed materials science and engineering literature.* Under review (2024). OSF Preprints (2024). https://doi.org/10.31219/osf.io/4wqcr
- Oste, D.J., Pathmendra, P., **Richardson, R.A.K.**, Johnson, G., Ao, Y., Arya, M.D., Enochs, N.R., Hussein, M., Kang, J., Lee, A., Danon, J.J., Cabanac, G., Labbé, C., Capes-Davis, A., Stoeger, T., Byrne, J.A. *Misspellings or "miscellings"-non-verifiable cell lines in cancer research publications.* International Journal of Cancer, 1-12 (2024). https://doi.org/10.1002/ijc.34995
- **Richardson, R.A.K.**, Tejedor Navarro, H., Amaral, L.A.N., Stoeger, T. *Meta-Research: understudied genes are lost in a leaky pipeline between genome-wide assays and reporting of results.* eLife (2024). https://doi.org/10.7554/eLife.93429
- Toh, K.B., Runge, M., **Richardson, R.A.K.**, Hladish, T.J., Gerardin, J. *Design of effective outpatient sentinel surveillance for COVID-19 decision making: a modeling study.* BMC Infectious Diseases, **23(1)**, 287 (2023). https://doi.org/10.1186/s12879-023-08261-5
- Elasser, S., Elia, L.P., Morimoto, R.I., Powers, E.T., Finley, D., Costa, B., Budron, M., Tokuno, Z., Wang, S., Iyer, R.G., Barth, B., Mockler, E., Finkbeiner, S., Gestwicki, J.E., **Richardson, R.A.K.**, Stoeger, T., Tan, E.P., Xiao, Q., Cole, C.M., Massey, L.A., Garza, D., Kelly, J.W., Rainbolt, T.K., Chou, C., Masto, V.B., Frydman, J., Nixon, R.A. *A Comprehensive Enumeration of the Human Proteostasis Network. 2. Components of the Autophagy-Lysosome Pathway.* bioRxiv 2023.03.22.533675. https://doi.org/10.1101/2023.03.22.533675

- Byrne, J.A., Park, Y., **Richardson, R.A.K.**, Pathmendra, P., Sun, M., Stoeger, T. *Protection of the human gene research literature from contract cheating organizations known as research paper mills.* Nucleic Acids Research, gkac1139 (2022). https://doi.org/10.1093/nar/gkac1139
- **Richardson, R.A.K.**, Jorgensen, E., Arevalo, P., Holden, T.M., Pacilli, M., Ghinai, I., Lightner, S., Cobey, S., Gerardin, J. *Tracking changes in SARS-CoV-2 transmission with a novel outpatient sentinel surveillance system in Chicago, Illinois, USA.* Nature Communications **13**, 5547 (2022). https://doi.org/10.1038/s41467-022-33317-6
- Runge, M., **Richardson, R.A.K.**, Clay, P., Eagan, A., Holden, T.M., Singam, M., Tsuboyama, N., Arevalo, P., Fornoff, J., Patrick, S., Ezike, N.O., Gerardin, J. *Modeling robust COVID-19 intensive care unit occupancy thresholds for imposing mitigation to prevent exceeding capacities*. PLOS Global Public Health **2**, 5 (2022). https://doi.org/10.1371/journal.pgph.0000308
- Xavier, J., Monk, J.M., Poudel, S., Norsigian, C.J., Sastry, A.V., Liao, C., Bento, J., Suchard, M.A., Arrieta-Ortiz, M.L., Peterson, E.J.R., Baliga, N.S., Stoeger, T., Ruffin, F., **Richardson, R.A.K.**, Gao, C.A., Horvath, T.D., Haag, A.M., Yeaman, M.R. *Mathematical models to study the biology of pathogens and the infectious diseases they cause.* iScience, 104079 (2022). https://doi.org/10.1016/j.isci.2022.104079
- Burke, J.A., Zhang, X. Bobbala, S.K.R., Frey, M.A., Bohorquez Fuentes, C., Freire Haddad, H., Allen, S.D., **Richardson, R.A.K**, Ameer, G.A., Scott, E.A. *Subcutaneous nanotherapy repurposes the immunosuppressive mechanism of rapamycin to enhance allogeneic islet graft viability.* Nature Nanotechnology (2022). https://doi.org/10.1038/s41565-021-01048-2
- Holden, T.M.*, **Richardson, R.A.K.***, Arevalo, P., Duffus, W.A., Runge, M., Whitney, E., Wise, L., Ezike, N.O., Patrick, S., Cobey, S., Gerardin, J. *Geographic and demographic heterogeneity of SARS-CoV-2 diagnostic testing in Illinois, USA, March to December 2020.* BMC Public Health **21,** 1105 (2021). https://doi.org/10.1186/s12889-021-11177-x

Presentations

Computation and Data Exchange (CoDEx) – Northwestern University **April 2024**

"Widespread misidentification of SEM instruments in the peer-reviewed materials science and engineering literature"

AIMOS Conference 2023 – Brisbane, Australia (Remote) **November 2023**

"Journal hopping by research paper mills after a preferred journal is de-indexed"

IBiS Scientific Retreat – Delavan, Wisconsin **September 2023**

"Where there's smoke, there's fire: identifying fraud and paper mill activity in the biomedical literature"

ICSSI 2023 – Northwestern University **June 2023**

"A rationally designed tool to promote the investigation of understudied genes"

Metascience 2023 – Washington D.C. **May 2023**

"Journal hopping by research paper mills after a preferred journal is de-indexed"

IPHAM Population Health Forum – Northwestern University **December 2022**

"Tracking changes in SARS-CoV-2 transmission with a novel outpatient sentinel surveillance system in Chicago, Illinois, USA"

5th Meeting on Biological Data Science – Cold Spring Harbor, New York **November 2022**

"A rationally designed tool to promote the investigation of understudied genes"

IBiS Scientific Retreat – Delavan, Wisconsin **September 2022**

"Temporal evolution of the human gene bibliograph"

Conference on Quantitative Approaches in Biology – Northwestern University **March 2022**

"Tracking changes in SARS-CoV-2 transmission with a novel outpatient sentinel surveillance system in Chicago, Illinois, USA"

International Meeting on Emerging Diseases and Surveillance – Online **November 2021**

"Tracking changes in SARS-CoV-2 transmission with a novel outpatient sentinel surveillance system in Chicago, Illinois, USA"

IBiS Scientific Retreat – Delavan, Wisconsin **September 2021**

"What are we missing? Identifying bias in gene expression platforms via meta-analysis"

National Science Foundation Conference on COVID-19 Modeling – Online **January 2021**

"Estimating incident SARS-CoV-2 infection detection rates with mortality data"

Biology/Chemistry Seminar – North Central College **April 2019**

"Fluorescence Methods for Quantifying Porosity and Lifetimes of Pore Closure during Electroporation of Escherichia Coli*"*

Biophysical Society Annual Conference – Baltimore, Maryland **February 2019**

"Fluorescence Methods for Quantifying Porosity and Lifetimes of Pore Closure during Electroporation of Escherichia Coli*"*

Rall Symposium for Undergraduate Research – North Central College **May 2018**

"Long-Range Ordering in 1-Methyl-1-alkylpyrrolidinium Bis(triflouromethylsulfonyl)imide Ionic Liquids"

National Conference on Undergraduate Research – University of Central Oklahoma **April 2018**

"Long-Range Ordering in 1-Methyl-1-alkylpyrrolidinium Bis(triflouromethylsulfonyl)imide Ionic Liquids"

National Science Foundation REU Conference – Alexandria, Virginia **October 2017**

"Long-Range Ordering in 1-Methyl-1-alkylpyrrolidinium Bis(triflouromethylsulfonyl)imide Ionic Liquids"

Technical Skills

Programming Languages: Python, R, STAN, MATLAB, Bash, C++, Java, LabView, LaTeX, Tcl-tk
Operating Systems: UNIX, Windows, Macintosh
Programs: Keras, Pytorch, Git, Slurm, TORQUE, LAMMPS, Fusion 360, OpenSCAD
Other: Machine learning, natural language processing, text and data mining, FDM and SLA additive manufacturing, hobbyist robotics and micro-computing

Service & Teaching

Teaching Assistant – IBiS 402 – Eukaryotic Molecular Biology **Fall 2022**

- Assisted with instruction of 7 graduate students

Teaching Assistant – BIOL_SCI 378 – Functional Genomics **Winter 2022**

- Wrote course content and instructed 36 undergraduate students (GitHub)

Teaching Assistant – BIOL_SCI 221 – Molecular and Cellular Processes Laboratory **Winter 2021**

- Instructed 54 undergraduate students remotely in cell biology laboratory course

Assistant Speech Coach – DG South High School – Downers Grove, IL **Winter 2017 – Spring 2019**

- Provided coaching and mentorship for 60+ high school speech competitors

President – Students for Social Innovation – North Central College **Fall 2016 – Spring 2019**

- Founded and led unique student congress for social change

Competitor – Speech and Debate Team – North Central College **Fall 2015 – Spring 2018**

- Developed excellent communication skills through seven years in high school and collegiate speech and debate, competing at state and national level

Advanced Laboratory Assistant – North Central College – Naperville, IL **Fall 2017**

- ❖ Built and calibrated apparatus demonstrating single-photon interference to be used in upper-level quantum physics courses

Laboratory Teaching Assistant – North Central College – Naperville, IL **Winter 2017 – Spring 2017**

Courses Taught: Physics II, Physics III, Physics of Music

- ❖ Worked alongside professor to guide introductory physics students through laboratory coursework