

# Reese Richardson

2145 Sheridan Road M426, Evanston, IL 60208

E-mail: richardsonr43@gmail.com • [LinkedIn](#) • [GitHub](#) • [ORCID](#) • [Blog](#)

## Education

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**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** **Fall 2015 – Summer 2019**

Bachelor of Science in Physics & Applied Mathematics

## Research Experience

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**Postdoctoral Fellow – Northwestern University – Evanston, IL** **Fall 2024 – Present**

Laboratory of Dr. Luís Amaral

- ❖ Characterizing networks underlying industrialized scientific fraud and developing methods for inferring irreproducibility in the published literature

**Graduate Researcher – Northwestern University – Evanston, IL** **Fall 2019 – Fall 2024**

Thesis Research in Laboratory of Dr. Luís Amaral

- ❖ Developed methods for identifying and quantifying undocumented biases in RNA-seq pipelines
- ❖ Investigated inequality in research attention to human genes, developed *Find My Understudied Genes*

Volunteer 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. Luís 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**

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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 2<sup>nd</sup> 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**

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- ❖ **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

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<b>Computation and Data Exchange (CoDEX) – Northwestern University</b>	<b>April 2024</b>
<i>"Widespread misidentification of SEM instruments in the peer-reviewed materials science and engineering literature"</i>	
<b>AIMOS Conference 2023 – Brisbane, Australia (Remote)</b>	<b>November 2023</b>
<i>"Journal hopping by research paper mills after a preferred journal is de-indexed"</i>	
<b>IBiS Scientific Retreat – Delavan, Wisconsin</b>	<b>September 2023</b>
<i>"Where there's smoke, there's fire: identifying fraud and paper mill activity in the biomedical literature"</i>	
<b>ICSSI 2023 – Northwestern University</b>	<b>June 2023</b>
<i>"A rationally designed tool to promote the investigation of understudied genes"</i>	
<b>Metascience 2023 – Washington D.C.</b>	<b>May 2023</b>
<i>"Journal hopping by research paper mills after a preferred journal is de-indexed"</i>	
<b>IPHAM Population Health Forum – Northwestern University</b>	<b>December 2022</b>
<i>"Tracking changes in SARS-CoV-2 transmission with a novel outpatient sentinel surveillance system in Chicago, Illinois, USA"</i>	

<b>5<sup>th</sup> Meeting on Biological Data Science – Cold Spring Harbor, New York</b>	<b>November 2022</b>
<i>“A rationally designed tool to promote the investigation of understudied genes”</i>	
<b>IBiS Scientific Retreat – Delavan, Wisconsin</b>	<b>September 2022</b>
<i>“Temporal evolution of the human gene bibliography”</i>	
<b>Conference on Quantitative Approaches in Biology – Northwestern University</b>	<b>March 2022</b>
<i>“Tracking changes in SARS-CoV-2 transmission with a novel outpatient sentinel surveillance system in Chicago, Illinois, USA”</i>	
<b>International Meeting on Emerging Diseases and Surveillance – Online</b>	<b>November 2021</b>
<i>“Tracking changes in SARS-CoV-2 transmission with a novel outpatient sentinel surveillance system in Chicago, Illinois, USA”</i>	
<b>IBiS Scientific Retreat – Delavan, Wisconsin</b>	<b>September 2021</b>
<i>“What are we missing? Identifying bias in gene expression platforms via meta-analysis”</i>	
<b>National Science Foundation Conference on COVID-19 Modeling – Online</b>	<b>January 2021</b>
<i>“Estimating incident SARS-CoV-2 infection detection rates with mortality data”</i>	
<b>Biology/Chemistry Seminar – North Central College</b>	<b>April 2019</b>
<i>“Fluorescence Methods for Quantifying Porosity and Lifetimes of Pore Closure during Electroporation of Escherichia Coli”</i>	
<b>Biophysical Society Annual Conference – Baltimore, Maryland</b>	<b>February 2019</b>
<i>“Fluorescence Methods for Quantifying Porosity and Lifetimes of Pore Closure during Electroporation of Escherichia Coli”</i>	
<b>Rall Symposium for Undergraduate Research – North Central College</b>	<b>May 2018</b>
<i>“Long-Range Ordering in 1-Methyl-1-alkylpyrrolidinium Bis(trifluoromethylsulfonyl)imide Ionic Liquids”</i>	
<b>National Conference on Undergraduate Research – University of Central Oklahoma</b>	<b>April 2018</b>
<i>“Long-Range Ordering in 1-Methyl-1-alkylpyrrolidinium Bis(trifluoromethylsulfonyl)imide Ionic Liquids”</i>	
<b>National Science Foundation REU Conference – Alexandria, Virginia</b>	<b>October 2017</b>
<i>“Long-Range Ordering in 1-Methyl-1-alkylpyrrolidinium Bis(trifluoromethylsulfonyl)imide Ionic Liquids”</i>	

## Technical Skills

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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

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<b>Teaching Assistant – IBI 402 – Eukaryotic Molecular Biology</b>	<b>Fall 2022</b>
❖ Assisted with instruction of 7 graduate students	
<b>Teaching Assistant – BIOL_SCI 378 – Functional Genomics</b>	<b>Winter 2022</b>
❖ Wrote course content and instructed 36 undergraduate students ( <a href="#">GitHub</a> )	
<b>Teaching Assistant – BIOL_SCI 221 – Molecular and Cellular Processes Laboratory</b>	<b>Winter 2021</b>
❖ Instructed 54 undergraduate students remotely in cell biology laboratory course	
<b>Assistant Speech Coach – DG South High School – Downers Grove, IL</b>	<b>Winter 2017 – Spring 2019</b>
❖ Provided coaching and mentorship for 60+ high school speech competitors	
<b>President – Students for Social Innovation – North Central College</b>	<b>Fall 2016 – Spring 2019</b>
❖ Founded and led unique student congress for social change	
<b>Competitor – Speech and Debate Team – North Central College</b>	<b>Fall 2015 – Spring 2018</b>

- ❖ 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