Paul L. Maurizio

Contact Information

NIH/NIAID, Vaccine Research Center
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Education

DOCTOR OF PHILOSOPHY (PhD), Bioinformatics & Computational Biology 05/2018
- The University of North Carolina at Chapel Hill (UNC-CH); Department of Genetics

MASTER OF SCIENCE (ScM), Molecular Microbiology & Immunology 08/2011
- Johns Hopkins Bloomberg School of Public Health
- Certificate in Vaccine Science & Policy, Department of International Health

BACHELOR OF ARTS (BA), Double Major: Biochemistry; Religion 05/2005
- Swarthmore College
- Deans' Award

Professional Employment

NATIONAL INSTITUTES OF HEALTH, Vaccine Research Center 06/2023–Present
National Institute of Allergy & Infectious Diseases (NIAID) via Kelly Government Solutions
Bioinformatics Scientist [C], Cellular Immunology Section
Federal Task Leader: Robert A. Seder, MD
- Implement and optimize bioinformatics pipelines for multi-omics single-cell data including CITE-seq and ATAC-seq analysis; characterize cell types and states using statistical and mathematical modeling approaches
- Lead end-to-end CITE-seq workflows for nonhuman primate and murine studies of chronic lung disease, cancer immunotherapy, and *M. tuberculosis* vaccination using Seurat, limma, and CellChat while troubleshooting and optimizing analysis tools
- Develop cell-cell ligand-receptor analysis approaches, receiving Distinguished Achievement Award for analytical contributions to research and development pipeline
- Integrate pulmonary spatial imaging data with single-cell transcriptomics profiles to map immune subpopulations and interactions in vaccination and infection studies, applying immunology and infectious disease expertise
- Oversee computational analyses and data management across concurrent research objectives while establishing reproducible workflows using Python, R, SQL, and bash on HPC clusters and cloud platforms (Google Cloud, Terra)
- Collaborate with multi-disciplinary experimental and computational teams, mentor junior researchers, and prepare publication-ready data visualizations and analyses
- Demonstrate multitasking across diverse projects in a timely manner while maintaining meticulous attention to detail and demonstrating strong analytical, organizational, and interpersonal skills

THE UNIVERSITY OF CHICAGO, Section of Genetic Medicine 08/2018–05/2023
Postdoctoral Fellow (06/2020–05/2023) | **Postdoctoral Scholar** (08/2018–05/2020)
Supervisor: Luis B. Barreiro, PhD
- Modeled gene regulation in >130,000 single-cell RNA-seq profiles from peripheral blood immune cells using empirical Bayesian methods, variant calling, and machine learning approaches including gradient boosting and network analysis
- Pioneered dynamic eQTL analysis for human macrophage tuberculosis infection response, developing statistical frameworks and incorporating genotype effects
- Led integrative analysis combining scRNA-seq and ATAC-seq to examine social stress effects in non-human primates, and contributed to published research on stress effects on immunity
- Secured over $200K in competitive research funding, including NIH F32 fellowship and UChicago pilot grant, while developing scalable pipelines for HPC cluster workflows
- Applied advanced statistical methods (Bayesian analysis, variance component modeling) and used public population genetic dataset repositories (GWAS, Ensembl, GEO)

JOHNS HOPKINS UNIVERSITY, Dept. of Molecular Microbiology & Immunology
Visiting Scholar, Bloomberg School of Public Health 07/2011–06/2012
Supervisor: Fidel Zavala, MD
- Conducted preclinical vaccine research, including molecular parasitology, transgenic model development, and adjuvant evaluations, resulting in co-authored publication that advanced translational and clinical efforts

Additional Professional Experience

Bioinformatics Consultant, Teiko Bio Inc., Salt Lake City, UT (remote) 09/2021–10/2021
- Analyzed human mass cytometry data (CyTOF) for clinical cancer research clients

Staff Research Associate, University of California, Los Angeles, CA 10/2007–07/2009
Department of Microbiology, Immunology & Molecular Genetics
Supervisor: M. Carrie Miceli, PhD
- Conducted preclinical testing of muscular dystrophy therapeutics in mouse models and managed shared flow cytometry instrument for multiple research groups

Research Specialist, University of Pennsylvania, Philadelphia, PA 10/2005–09/2007
Department of Pathology & Laboratory Medicine
Supervisor: Yongwon Choi, PhD
- Characterized TRAF6 ubiquitination in innate immune signaling using biochemical and immunological approaches, contributing to published research on NFκB activation

Technical Skills & Training

Programming & Computing: R, RStudio, Python, Pandas, NumPy, SQL, Matlab, Mathematica, Seurat, Homebrew, Docker, Stan, bash, Unix, git, GitHub, STATA, MCMCglmm, EMMREML, matrixEQTL, coloc, mashr, plotly, R Shiny, R Markdown, Azure; data management

Statistical & Machine Learning: k-means clustering, dimensionality reduction, non-negative matrix factorization, imputation, logistic regression, generalized linear mixed modeling, Gibbs sampling, Bayesian analysis, variance component analysis

NGS, Genomics & Epigenetics Analysis: RNA-seq, ATAC-seq, ChIP-seq, scRNA-seq, CITE-seq; 10X Genomics analysis workflows; gene expression and spatial modeling skills

Machine Learning & AI (Recently Enhanced): Advanced artificial intelligence applications, applied machine learning frameworks; TensorFlow, Scikit-learn, Keras, gradient boosting, artificial neural networks for imaging and classification

Relevant Graduate Coursework: Bayesian Statistics, Databases, Mathematical Modeling, Sequence Analysis, Infectious Disease Dynamics, Introduction to Statistical Modeling, Statistical Methods in Public Health, Structural Bioinformatics, Topics in Computer Science: Computational Genetics, Topics in Population Genetics

Graduate Research

UNC-CHAPEL HILL 05/2013–07/2018
- Advisors: Mark T. Heise, PhD & William Valdar, PhD
- Committee: Terrence S. Furey, PhD (chair); Fernando Pardo-Manuel de Villena, PhD; Ralph S. Baric, PhD; Jeremy E. Purvis, PhD

UNC-CHAPEL HILL (Rotations) 07/2012–05/2013
- Advisors: David M. Margolis, MD; Aravinda M. de Silva, PhD; Kristina De Paris, PhD

JOHNS HOPKINS UNIVERSITY 08/2009–08/2011
- Advisor: Douglas E. Norris, PhD

Grants, Fellowships & Scholarships

Awardee, NIH/NIAID LRP, Loan Repayment Program 2022–2023
- Research in Emerging Areas Critical to Human Health (L70)

PI, NIH/NIA F32, Ruth L. Kirschstein National Research Service Award 2020–2023
- Sponsors: Luis B. Barreiro, PhD; Matthew Stephens, PhD (Statistics)
- Title: "Quantifying gene expression and network regulation in single cells to reveal the consequences of stress on the immune response" (#F32AG064883)

PI, UChicago Pilot Grant, Department of Medicine 2019–2023
- Advisors: Luis B. Barreiro, PhD; Patrick Wilson, PhD (Rheumatology)
- Title: "Modeling the effects of social stress on cell-to-cell variation in the immune response to influenza vaccination"

Fellow, NIH T32 Fellowship, Virology Training Grant, UNC-CH 2015–2016
Scholar, Master's Tuition Scholarship, JHU 2010–2011
Fellow, Joshua Lippincott Fellowship, Swarthmore College 2009–2010
Fellow, NSF Summer REU in Prokaryotic Biology, University of Georgia
- Advisor: Juergen Wiegel, PhD, Department of Microbiology

Fellow, NASA Astrobiology Summer Program, Penn State University
- Advisor: Hiroshi Ohmoto, PhD, Department of Geosciences

Honors & Awards

Award, Distinguished Achievement, Kelly Government Solutions, Rockville, MD 2024
Award, Biological Sciences Division, UChicago 2022
Associate, Intersections Science Fellows Symposium (ISFS) 2021
Award, Travel, 2nd Annual Symposium, National Science Policy Network, NYC, NY 2018
Award, Notable Poster, 1st Annual Research Computing Symposium, UNC-CH 2014
Award, Student Membership, Tropical Medicine Dinner Club of Baltimore 2010 & 2011
Award, Blue Ribbon Poster, Johns Hopkins Global Health Day, JHU 2011
Award, Global Health Field Research, JHU Center for Global Health 2010
Award, Simpson Student Fund, Tropical Medicine Dinner Club of Baltimore 2010

Peer-Reviewed Publications

Parrett JM, Lukasiewicz A, Chmielewski S, Szubert-Kruszynska A, **Maurizio PL**, Grieshop K and Radwan J. **2023**. A sexually-selected male weapon characterised by strong additive genetic variance and no evidence for sexually antagonistic polyphenic maintenance. *Evolution*. 77(6):1289-1302. doi:10.1093/evolut/qpad039. PMID: 36848265.

Grieshop K, **Maurizio PL**, Arnqvist G and Berger D. **2021**. Selection in males purges the mutation load on female fitness. *Evol Letters*. 5(4):328-343. doi:10.1002/evl3.239. PMID: 34367659.

Sanz J, **Maurizio PL**, Snyder-Mackler N, Simons ND, Voyles T, Kohn J, Michopoulos V, Wilson M, Tung J and Barreiro LB. **2020**. Social history and exposure to pathogen signals modulate social status effects on gene regulation in rhesus macaques. *Proc Natl Acad Sci USA*. 117(38):23317-22. doi:10.1073/pnas.1820846116. PMID:31611381.

Maurizio PL†, Fuseini H, Tegha G, Hosseinipour M and De Paris K. **2019**. Signatures of divergent anti-malarial treatment responses in peripheral blood from adults and young children in Malawi. *Malaria J*. 18(1):205. doi:10.1186/s12936-019-2842-7. PMID:31234875. († = corresp. author)

Shorter JR*, **Maurizio PL***, Bell TA, Shaw GD, Miller DR, Gooch TJ, Spence JS, McMillan L, Valdar W and Pardo-Manuel de Villena F. **2019**. A diallel of the mouse Collaborative Cross founders reveals strong strain-specific maternal effects on litter size. *G3: Genes, Genomes, Genetics*. 9(5):1613-1622. doi:10.1534/g3.118.200847. PMID:30877080. (* = equal contribution)

Maurizio PL, Ferris MT, Keele GR, Miller DR, Shaw GD, Whitmore AC, West A, Morrison CR, Noll KE, Plante KS, Cockrell AS, Threadgill DW, Pardo-Manuel de Villena F, Baric RS, Heise MT and Valdar W. **2018**. Bayesian diallel analysis reveals *Mx1*-dependent and *Mx1*-independent effects on response to influenza A virus in mice. *G3: Genes, Genomes, Genetics*. 8(2): 427-445. doi:10.1534/g3.117.300438. PMID:29187420.

Turner SD, **Maurizio PL**, Valdar W, Yandell BS and Simon PW. Dissecting the genetic architecture of shoot growth in carrot (*Daucus carota* L.) using a diallel mating design. **2018**. *G3: Genes, Genomes, Genetics*. 8(2): 411-426. doi:10.1534/g3.117.300235. PMID:29187419.

Espinosa DA, Yadava A, Angov E, **Maurizio PL**, Ockenhouse CF and Zavala F. **2013**. Development of a chimeric *Plasmodium berghei* strain expressing the repeat region of the *P. vivax* circumsporozoite protein for in vivo evaluation of vaccine efficacy. *Infection and Immunity*. 81(8):2882-2887. doi:10.1128/IAI.00461-13. PMID:23716612.

Walsh MC, Kim GK, **Maurizio PL**, Molnar EE and Choi Y. **2008**. TRAF6 auto-ubiquitination-independent activation of the NFκB and MAPK pathways in response to IL-1 and RANKL. *PLoS One*. 3(12):e4064. doi:10.1371/journal.pone.0004064. PMID:19112497.

Preprints, Abstracts & Other Contributions (selected)

Maurizio PL, Dahlvang JD, Bucsan AN, Lehman CC, Robertson M, Roederer M, Darrah PA and Seder RA. **2024**. Single cell analysis reveals gene regulatory impacts of IV BCG on blood and airway immune cell populations before and after Mtb challenge in macaques. NIH/FDA Immunology Interest Group Annual Retreat, Washington, DC, Jan 29th–30th. (*abstract*)

Maurizio PL, Aguirre-Gamboa R, Sanz J, Giraud-Gatineau A, Randolph HE, Von Platen C, Loulergue P, Launay O, Yotova V, Dumaine A, Brosch R, Tailleux L* and Barreiro LB*. **2022**. Dynamic genetic control of the gene expression response to *Mycobacterium tuberculosis* infection in human macrophages. Biology of Genomes, May 10th–14th. (*abstract*; * co-senior)

Campbell CR, **Maurizio PL**, Simons ND, Batista J, Voyles T, Cobb M, Dumaine A, Michopoulos V, Barreiro L and Tung J. **2021**. Social behavioral control of cell-to-cell gene expression variance in rhesus macaque immune cells. Biology of Genomes, May 11th–14th. (*abstract*)

Hampton BK, Jensen KL, Whitmore AC, Linnertz CL, **Maurizio P**, Miller DR, Morrison CR, Noll KE, Plante KS, Shaw GD, West A, Baric RS, Pardo-Manuel de Villena F, Heise MT and Ferris MT. **2021**. Genetic regulation of homeostatic immune architecture in the lungs of Collaborative Cross mice. bioRxiv 2021.04.09.439180. doi:10.1101/2021.04.09.439180. (*preprint* 2021-04-10)

Simons ND, **Maurizio PL**, Batista J, Michopoulos V, Barreiro LB and Tung J. **2020**. Parallel gene regulatory signatures of social stress and aging in rhesus macaques. 289th Annual Meeting of the American Association of Physical Anthropologists, April 15th–18th. (*abstract*)

Keele GR, **Maurizio PL**, Oreper D and Valdar W. **2018**. Bayesian decision theoretic design of two-founder experimental crosses given diallel data. bioRxiv 489682. doi:10.1101/489682. (*working paper* 2018-10-07)

Maurizio PL. **2018**. Modeling the Host Genetic Determinants of Influenza Virus Pathogenesis in Mice. Doctor of Philosophy (PhD) Dissertation. University of North Carolina at Chapel Hill. 270 pp. (*dissertation*)

Maurizio PL and Ferris MT. **2017**. "The Collaborative Cross Resource for Systems Genetics Research of Infectious Diseases." *Methods in Molecular Biology: Systems Genetics - Methods and Protocols*. Springer/Humana Press: New York, NY. Editors: Klaus Schughart, Robert Williams. doi:10.1007/978-1-4939-6427-7_28. PMID:27933545. (*chapter*)

Maurizio PL. **2011**. Detection and vertical transmission of *Culex* flavivirus in *Culex quinquefasciatus* (Diptera: Culicidae) mosquitoes from Zambia, Africa. Master of Science (ScM) thesis. Johns Hopkins University. 127 pp. (*thesis*)

Conference Abstracts & Presentations (selected)

Abstract, Tuberculosis: The Host-Pathogen Interface, Keystone, CO 2024
"Single cell analysis of blood and airway cells uncovers IV BCG specific gene regulatory impacts on immune cell populations before and after *Mtb* challenge"

Poster, Biology of Genomes, Cold Spring Harbor, NY 2022
"Dynamic genetic control of the gene expression response to *Mycobacterium tuberculosis* infection in human macrophages"

Flash Talk, Intersections Science Fellows Symposium (virtual) 2021
"Uncovering cell-type-specific effects of social stress on the immune response in macaques"

Talk, Division of Aging Biology New Investigators Forum, NIH/NIA 2021
"Uncovering cell-type-specific effects of social stress on the immune response"

Talk (*), 15th Complex Trait Community Meeting: Memphis, TN 2017
"Diallel analysis reveals *Mx1*-dependent and independent effects driving influenza virus severity"

Poster, Gordon Research Conference: Lucca (Barga), Italy 2015
Quantitative Genetics & Genomics; "Characterization of parent-of-origin effects on host response to influenza A virus in reciprocal cross mice."

Oral, Southeastern Regional Virology Conference: Atlanta, GA. 2014
"Influenza infections in a diallel cross of mice reveal parent-of-origin effects influencing viral pathogenesis"

Poster (*), Entomological Society of America Eastern Branch 2011
82nd Annual Meeting: Harrisburg, PA.

(*)=Presentation Award

Campus Presentations (selected)

Panelist, Virtual Alumni Panel, University Career Services, UNC-CH 2024

Panelist, Sharing of Diverse Perspectives: Postdoc Edition, UChicago 2021
- Graduate Recruitment Initiative Team

Presenter, Committee on Immunology Work-in-Progress, UChicago 2021

Panelist, Postdoctoral Association Seminar on Postdoc Fellowships, UChicago 2021

Presenter, Department of Human Genetics Work-in-Progress, UChicago 2019

Panelist, Carolina Grad Student Firsts, UNC-CH and Duke University 2018

Teaching & Mentorship

Mentor, Hopkins Connect Spring Virtual Mentorship Summit, JHU 2025

Mentor, Future Leaders Mentoring Fellowship, American Society for Microbiology 2023–2024

Champion Mentor, FLI Network 2018–2023
- Mentored two undergraduate STEM majors at UChicago during monthly meetings
- Advised on research mentor searches and successful applications to doctoral programs

Guest Speaker, Skype-A-Scientist (virtual) 2020–2021
- Ericson Elementary, 5th grade, San Diego, CA
- The Liberi School, 7th grade, Hudson, NY
- Leitch Elementary, 2nd grade, Fremont, CA

Coding Instructor, Introduction to R, How to Learn to Code, UNC-CH 2016
- Course overview: https://bit.ly/IntroToR-HTLTC

Coding Helper, Software Carpentry Workshop (Git, SQL), UNC-CH 2016

Teaching Assistant, Foundations in Population Genomics, UNC-CH 2014

Teaching Assistant, Global TEFL Network, Zhejiang University, Hangzhou, China 2007

Teaching Assistant, Biological Chemistry Laboratory, Swarthmore College

Professional Development

Student, Foundation for Advanced Education in the Sciences (FAES), Bethesda, MD
- Applied Machine Learning *(applied to classification in genomics workflows)* 2024
- Advanced Applications of Artificial Intelligence *(integrating into longitudinal transcriptomics analysis)* 2024

Selected Participant, Leadership U for Humanity (LUFH), Korn Ferry 2023

Selected Participant, Grant Writing Coaching Groups, The Leadership Alliance 2021–2022

Selected Participant, University of Pittsburgh Study 2020–2022
• Building up a diverse pipeline for the biomedical research workforce
Participant, Academic Job Market Working Groups, UChicagoGRAD 2021
Selected Participant, *GENETICS* Peer Review Training Program 2018–2020
Attendee, The Allied Genetics Conference 2020 (TAGC), April 22nd-25th (virtual) 2020
Attendee, The Genetics of Human Disease, Cell Press Symposium, Chicago, IL 2019
Participant, Scientific Writing from the Reader's Perspective Workshop, UNC-CH 2017
Participant, Rigor & Reproducibility Workshop, UNC-CH 2016
Student, Systems Genetics Course, The Jackson Lab, Bar Harbor, ME 2014
Participant, Next Generation Sequencing Workshop, UNC-CH 2014

Peer Review

Review Editor, Systems Immunology, *Frontiers in Immunology* 2023–Present
Reviewer, *PLoS Pathogens* 2023–Present
Reviewer, *Heredity* (Genetics Society) 2022–Present
Reviewer, *Microbiology Spectrum* (American Society for Microbiology) 2021–Present
Reviewer, *Journal of Virology* (American Society for Microbiology) 2020–Present
Reviewer, *Database* (Oxford University Press) 2019–Present
Reviewer, *Genetics* (Genetics Society of America) 2018–Present
Reviewer, Travel Awards, UChicago BSD Career Advancement for Postdocs 2021

Service & Outreach

Volunteer, UChicago-DuSable Museum of African American History Collaboration 2021–2023
Co-founder, Pan-Asian Resource Group, UChicago 2021–2023
Co-founder, Pan Asian Coalition, Biological Sciences Division, UChicago 2021–2023
Member, Postdoctoral Association (PDA) Steering Committee, UChicago 2020–2023
• **Chair**, Policy Committee
• **Co-organizer**, Fellowship Writing Accountability Group
• **Co-organizer**, Postdoc Support Survey
Invited Moderator, Office of Multicultural Student Affairs 2022
Presentation Judge, Chicago EYES on Cancer Research Symposium 2021
Board of Directors, Universities Allied for Essential Medicines, 501(c)(3) 2015–2019
Session Chair, Virology Colloquium, UNC-CH, Chapel Hill, NC 2015
Session Chair, Evolution 2014 Conference, Raleigh, NC 2014
Peer Mentor, 1st-Year Group, Biol. & Biomed. Sci. Program, UNC-CH 2013
Guest Blogger, 12th Annual World Vaccine Congress, National Harbor, MD 2012
HIV Tester & Counselor, Institute for Human Virology, Baltimore, MD 2010–2012
Tutor, Health Professions Recruitment and Exposure Program, JHU 2010