Kynon Jade **Benjamin**

K99 Postdoctoral Fellow · Computational Geneticist

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***Research Interests**: Neurological disorders, health disparities, bioinformatics, computational biology, machine learning*

Summary

COMPUTATIONAL GENETICIST with expertise in bioinformatics, machine learning, and molecular biology. Authored and/or contributed to 9 publications, 25 presented posters and presentations national, regional, and local meetings, receiving 6 awards including 3 first place. Experience in computational pipeline developed and implementation.

Education

Lieber Institute for Brain Development & Johns Hopkins University School of Medicine — *Baltimore, MD*

Postdoctoral Fellowship — *Oct 2017 - Dec 2023*

Primary Mentors: Drs. Shizhong Han and Daniel R Weinberger

Texas A&M University — *College Station, TX*

Doctor of Philosophy in Genetics — *Aug 2012 - Aug 2017*

Advisor: Dr. Scott V Dindot

Rensselaer Polytechnic Institute — *Troy, NY*

Bachelor of Science in Biomedical Engineering — *Aug 2010 - May 2012*

Indiana University Purdue University Indianapolis — *Indianapolis, IN*

Bachelor of Science in Biomedical Engineering (*transferred*) — *Aug 2009 - May 2010*

Research Experience

Lieber Institute for Brain Development & JHUSOM, Departments of Neurology, Neuroscience, and Psychiatry — *Baltimore, MD*

Postdoctoral Fellow: ``Genetic and environmental regulation of gene expression in neuropsychiatric disorders'' — *Oct 2017 - Current*

- Computational analysis in four postmortem brain regions for genetic and epigenetic ancestry (**Python, R, Machine learning**)
  - Identified and characterized ancestry-related expression differences in postmortem brain from AA and EA individuals
  - Designed, developed, and implemented GPU-based eQTL and fine-mapping analysis pipeline
  - Designed, developed, and implemented mash modeling pipelines for differential expression and eQTL analyses
  - Designed, developed, and implemented pipeline for determining genetic bases of ancestry-related expression differences
- Sex differences in schizophrenia across three brain regions (**Python, R, Machine learning**)
  - Identified sex-specific expression for schizophrenia in the postmortem brain
  - Trained, mentored, and supervised the differential analysis
  - Designed, developed, and implemented GPU-based sex interaction eQTL analysis
  - Designed, developed, and implemented fine-mapping and colocalization for sex-interaction eQTL
- Computational analysis in postmortem brain for schizophrenia (**Python, R, Linux, Machine learning**)
  - Identified new insights into the role of the caudate in schizophrenia and potential new lines of treatment
  - Designed, developed, and implemented genotype imputation pipeline for eQTL analysis
  - Designed, developed, and implemented limma-voom differential expression pipeline for post-mortem samples
  - Designed, optimized, and implemented machine learning pipelines with feature reduction and ranking
  - Prioritized genes and genetic variants associated with schizophrenia risk via functional genomics (**TWAS, Colocalization, SMR**)
  - Examined dopamine system and the affect of antipsychotics within the caudate nucleus
  - Designed, developed, and implemented co-expression network analysis (**Autoencoders, WGCNA**)
- Human cell lines and organoids for neurodevelopment (**Python, R, Linux**)
  - Collaborated with bench biologist bulk and single-cell RNA-sequencing and genotyping
  - Designed, developed, and implemented single-cell RNA-sequencing pipeline
  - Designed and preformed genetic verification of postmortem dura-derived induced pluriponent stems cells
- NIH T32 Training Program in Psychiatry
- MOSAIC Postdoctoral Career Transition Award to Promote Diversity (K99/R00): K99MD0169640

Texas A&M University, Department of Veterinary Pathobiology *College Station, TX*

PH.D. IN GENETICS; DISSERTATION: ``UNDERSTANDING THE IMPRINTING MECHANISM OF *UBE3A* FOR THERAPEUTIC INTERVENTION'' *Aug 2012 - Aug 2017*

- Computational and molecular characterization of the expression patterns of long non-coding RNA of *Ube3a/UBE3A* antisense and novel *Ube3a* isoform 4 in the imprinting of *Ube3a*
  - Analyzed more than **5 TB** of RNA-seq, stranded and unstranded, paired- and single-end datasets for mouse and human over a range of tissues and cell types for spatiotemporal regulation (**R, Linux**)
  - My pipeline reduced overall processing time by 90%, decreased storage by 60% by removing unnecessary intermediate conversion files, increased quality control and improved novel isoform detection
  - ANOVA, student's T-test, post-hoc Tukey's HSD statistical analysis conducted in **R** significantly reducing computational time from programs like **PRISM** and **Excel**
  - Utilized quantitative real-time PCR, Sanger sequencing, electrophoresis, and cloning for long non-coding RNA analysis and alternative splicing verification
- Developed interactive **R** script to analyze **1.2 TB** of fluorescent image based high-throughput screening data assay to reactivate paternal *Ube3a* allele in ES cell derived neurons for therapeutic intervention (**Stem cells, ImageJ, R**)
  - Developed **Shiny** web application for automatic high-throughput screen analysis and logistic regression algorithm for hit analysis (**Shiny, Octave, R**)
  - Supervised a team of undergraduates in molecular data acquisition and basic laboratory work
  - Utilized immunofluorescence microscopy and mouse embryonic stem cell technology
- Findings:
  1. Neuron-specific spatiotemporally regulated *Ube3a* antisense is an extensively processed transcript with 5' capping, 3' polyadenylation and alternative splicing
  2. Proposed new model for imprinting mechanism of *Ube3a* involving a temporally regulated novel paternal specific isoform, denoted isoform 4
  3. Developed high-throughput screening assay for drug discovery in ES cell-derived neurons

Publications

Published/Accepted

1. **Benjamin, KJM**, Katipalli, T, and Apuã CM Paquola. ``dRFEtools: Dynamic recursive feature elimination for 'omics''. *Bioinformatics*. 2023. PMID: 37632789.

2. Sawada, T, Barbosa, A, Araujo, B, McCord, AE, D'Ignazio, L, **Benjamin, KJM**, Sheehan, B, Zabolocki, M, Feltrin, A, Arora, R, Brandtjen, A, Kleinman, JE, Hyde, TM, Bardy, C, Weinberger, DR, Paquola, ACM, and Jennifer A Erwin. ``Recapitulation of perturbed striatal gene expression dynamics of donor's brains with ventral forebrain organoids derived from the same individuals with schizophrenia''. *American Journal of Psychiatry*. 2023. PMID: 37915216.

3. **Benjamin, KJM**, Chen, Q, Jaffe, AE, Stolz, JM, Collado-Torres, L, Huuki-Myers, LA, Burke, EE, Arora, R, Feltrin, AS, Barbosa, AR, Radulescu, E, Pergola, G, Shin, JH, Ulrich, WS, Deep-Soboslay, A, Tao, R, the BrainSeq Consortium, Hyde, TM, Kleinman, JE, Erwin, JA, Weinberger, DR, and Apuã CM Paquola. ``Analysis of the caudate nucleus transcriptome in individuals with schizophrenia highlights effects of antipsychotics and novel risk genes''. *Nature Neuroscience*. 2022. PMID: 36319771.

4. D'Ignazio, L, Jacomini, RS, Qamar, B, **Benjamin, KJM**, Arora, R, Sawada, T, Diffenderfer, KE, Pankonin, AR, Hendriks, WT, Bragg, DC, Paquola, ACM, and Jennifer A Erwin. ``Variation in TAF1 expression in female carrier induced pluripotent stem cells and human brain ontogeny has implications for adult neostriatum vulnerability in X-linked Dystonia Parkinsonism''. *eNeuro*. 2022. PMID: 35868859.

5. Sawada, T, **Benjamin, KJM**, Brandtjen, AC, Tietze, E, Allen, SJ, Paquola, ACM, Kleinman, JE, Hyde, TM, and Jennifer A Erwin. ``Generation of four postmortem dura-derived iPS cell lines from four control individuals with genotypic and brain-region-specific transcrptomic data available through the BrainSEQ consortium''. *Stem Cell Research*. 2020. PMID: 32446240.

6. Sawada, T, Chater, TE, Sasagawa, Y, Yoshimura, M, Fujimori, N, Tanaka, K, **Benjamin, KJ**, Paquola, ACM, Erwin, JA, Goda, Y, Nikaido, I, and Tadafumi Kato. ``Developmental Excitation-Inhibition Imbalance Underlying Psychoses Revealed by Single-Cell Analyses of Discordant Twins-Derived Cerebral Organoids''. *Molecular Psychiatry*. 2020. PMID: 32764691.

In Revision

1. **Benjamin, KJM**, Chen, Q, Eagles, NJ, Huuki-Myers, LA, Collado-Torres, L, Stolz, JM, Shin, JH, Paquola, ACM, Hyde, TM, Kleinman, JE, Jaffe, AE, Han, S, and Daniel R Weinberger. ``Genetic and environmental contributions to ances-

try differences in gene expression in the human brain''. [pre-print]. 2023. *In revision* at *Nature Neuroscience*. PMID: 37034760.

2. **Benjamin, KJM**[+], Arora, R[+], Feltrin, AS, Pertea, G, Giles, H, Stolz, JM, D'Ignazio, L, Collado-Torres, L, Shin, JH, Hyde, TM, Kleinman, JE, Weinberger, DR, Paquola, ACM, and Jennifer A Erwin. ``How sex affects transcriptional associations with schizophrenia across the dorsolateral prefrontal cortex, hippocampus, and caudate nucleus''. [pre-print]. 2022. *In revision* at *Nature Communications*. DOI: `https://doi.org/10.1101/2022.09.30.22280452`.

Submitted/Under Review

1. Tietze, E, Barbosa, AR, Euclydes, V, Cho, HJ, Lee, YK, Feltrin, A, van de Leemput, J, Di Carlo, P, Sawada, T, **Benjamin, KJ**, Brentani, H, Kleinman, JE, Hyde, TM, Weinberger, DR, Ursini, G, McKay, R, Paquola, ACM, Shin, JH, and Jennifer A Erwin. ``Single-cell analysis of human trophoblast stem cell specification reveals activation of fetal cytotrophoblast expression programs including coronavirus associated host factors and human endogenous retroviruses''. [pre-print]. 2020. DOI: `https://doi.org/10.1101/2020.08.29.273425`.

Scholarship

Extramural Funding

NIMHD K99MD0169640: MOSAIC — *Baltimore, MD*

Comprehensive Computational Analysis of Genetic and Regulatory Differences Between Individuals With African and European Ancestries Across Four Brain Regions; $947000 — *Dec 2021 - Nov 2023*

NIMH T32MH015330: Fellowship — *Baltimore, MD*

Analysis of the caudate nucleus transcriptome in individuals with schizophrenia highlights effects of antipsychotics and novel risk genes; Supports NIH level salary and professional development — *Jun 2019 - May 2021*

Great Lakes STEM Scholarship — *College Station, TX*

$2500 award — *July 2014*

Intramural Funding

CVM Advanced Developmental Training Travel Award — *College Station, TX*

Upto $2500 for travel expensives — *May 2015*

CVM Graduate Student Research Trainee Grant — *College Station, TX*

$5000 seed money research and supplies to generate preliminary data — *May 2014*

Texas A&M Institute for Genome Sciences and Society (WSGI) Graduate Traineeship — *College Station, TX*

Computational analysis of 50 idiopathic Angelman Syndrome patients; Supports half of salary — *Sep 2013 - Aug 2014*

Presentations

Invited Talk/Oral Presentations

International Conference on Intelligent Biology and Medicine — *Philadelphia, PA*

Oral: ``dRFEtools: Dynamic recursive feature elimination for omics'' — *August 2022*

MERIT Emerging Leaders Symposium — *New York, NY*

Invited talk: ``Large-scale computational genomics: new, reuse, and develop'' — *July 2022*

Johns Hopkins Postdoctoral Conference — *Baltimore, MD*

Oral: ``Computational analysis of genetic and transcriptional landscapes of the caudate nucleus in schizophrenia'' — *April 2019*

Defense Threat Reduction Agency — *Fort Belvoir, VA*

Invited talk: ``Understanding the imprinting mechanism of *Ube3a* for therapeutic intervention'' — *July 2017*

Center for Computational Biology & Bioinformatics (UCSD) — *San Diego, CA*

Invited talk: ``Understanding the imprinting mechanism of *Ube3a* for therapeutic intervention'' — *June 2017*

Inova Translational Medicine Institute — *Falls Church, VA*

Invited talk: ``The *Ube3a* antisense transcript undergoes extensive processing and is spatiotemporally regulated in the brain'' — *June 2017*

Laboratory of Molecular Virology & Pathogenesis (MHRP) — *Silver Spring, MD*

Invited talk: ``The *Ube3a* antisense transcript undergoes extensive processing and is spatiotemporally regulated in the brain'' — *June 2017*

Texas A&M Student Research Week — *College Station, TX*

Oral: ``Investigating novel *Ube3a* isoform 4 in the imprinting of *Ube3a*'' — *March 2016*

Genetics and Genomics (G2) Seminar Series — *College Station, TX*

Invited talk: ``Investigating novel *Ube3a* isoform 4 in the imprinting of *Ube3a*'' — *February 2016*

College of Veterinary Medicine (CVM) Neuroscience — *College Station, TX*

Invited talk: ``Neurodevelopmental Disorders: Instability of Chromosome 15q11-q13'' — *April 2015*

Texas A&M Student Research Week — *College Station, TX*

Oral: ``Development of embryonic stem cell-derived neuronal cultures for high-throughput drug screening'' — *February 2014*

Poster Presentations

Biology of Genomes — *Cold Spring Harbor, NY*

Poster: ``Genetic and environmental contributions to ancestry differences in gene expression in the human brain'' — *May 2023*

American Society of Human Genetics — *Los Angeles, CA*

Poster: ``Genetic and environmental regulation of caudate nucleus transcriptome in schizophrenia'' — *October 2022*

Society of Neuroscience — *San Diego, CA*

Poster: ``Computational analysis of genetic and transcriptional landscapes of the caudate nucleus in schizophrenia'' — *November 2018*

Texas A&M Imaging Sciences Spotlight Series — *College Station, TX*

Poster: ``High-throughput drug screening of mouse embryonic stem cell-derived neurons'' — *January 2016*

College of Veterinary Medicine (CVM) Symposium — *College Station, TX*

Poster: ``High-throughput drug screening of mouse embryonic stem cell-derived neurons'' — *January 2016*

Texas A&M Health Science Center Symposium — *College Station, TX*

Poster: ``Development of embryonic stem cell-derived neuronal cultures for high-throughput drug screening'' — *April 2014*

Texas A&M Genetics Graduate Student Recruiting Symposium — *College Station, TX*

Poster: ``Development of embryonic stem cell-derived neuronal cultures for high-throughput drug screening'' — *February 2014*

National Society of Black Engineers Fall Regional Conference — *Rochester, NY*

Poster: ``Drug loading of naproxen sodium on the degradation characteristics of polycaprolactone'' — *October 2011*

Biomedical Engineering Society Annual Meeting — *Hartford, CT*

Poster: ``Drug loading of naproxen sodium on the degradation characteristics of polycaprolactone'' — *October 2011*

NSF LSAMP/RPI SURP — *Troy, NY*

Poster: ``Drug loading of naproxen sodium on the degradation characteristics of polycaprolactone'' — *August 2011*

Walter Lincoln Hawkins '32 Graduate Research Conference — *Troy, NY*

Poster: ``Comparison of MCPM-TCP and MCPM-HA cement degradation'' — *April 2011*

Purdue Biomaterials Research Symposium — *West Lafayette, IN*

Poster: ``Comparison of MCPM-TCP and MCPM-HA cement degradation'' — *April 2010*

Life-Health Sciences Internship Poster Session — *Indianapolis, IN*

Poster: ``Comparison of MCPM-TCP and MCPM-HA cement degradation'' — *April 2010*

Annual Glenn Research Center Summer Poster Session — *Cleveland, OH*

Poster: ``Biofuels as an alternative fuel source for aviation'' — *August 2009*

Panels

Hopkins URM Accepted Applicants Virtual Visit — *Virtual*

Panel: ``Hopkins Graduate Accepted Applicants Visit Faculty/Fellows Panel'' — *March 2021*

Johns Hopkins, School of Medicine; Second Look Visit — *Baltimore, MD*

Panel: ``Johns Hopkins Graduate Biomedical Education Programs Accepted Applicants, Faculty and Postdoctoral Fellows Panel'' — *March 2019*

Johns Hopkins, School of Medicine; Biomedical Scholars Association Event — *Baltimore, MD*

Panel: ``Navigating and Preparing for a Conference'' — *November 2018*

Teaching

LIBD rstats Club
Baltimore, MD

Journal Club Session Leader — *Apr 2020 - Current*

- Suggested R programming related topics for discussion
- Developed lesson plan for R programming topics in bioinformatics
- Lecture history of session: `https://bit.ly/30gpcZk`

Summer Undergraduate Research Virtual Exchange (SURVE)
Baltimore, MD

Lecturer — *Jul 2020 - Aug 2020*

- Development learning objectives and activities for SURVE
- Collaborative virtual lecturer

Basic Science Institute (BSI)- Summer Internship Program (SIP)
Baltimore, MD

Journal Club Group Leader — *Jun 2020 - Jul 2020*

- Primary instructor for virtual journal club, where I helped development 8-week journal club curriculum
- Development activities for article critique, and demonstrated and evaluated presentations.

Texas A&M University, Department of Biochemistry
College Station, TX

Graduate Teaching Assistant — *Aug 2012 - Jun 2013*

- Laboratory instructor for Genetics course
- Primary instructor for one class and assisted with second class each semester
- Gave introductory lecture, followed by hands-on supervising of student experiements
- Evaluated student performance and assigned grades

Graduate Teaching Association/Academy for Future Facility
College Station, TX

Steering Committee Member — *Jan 2014 - Jul 2016*

- Worked collaboratively in the committee, where I helped run workshops and seminars for professional development, including but not limited to:
  - Philosophy of Teaching Statement
  - Teaching in Large Classes
  - Teaching with Technology
  - Developing Assessments
- Maintained and troubleshoot Blackboard, including but not limited to:
  - Generating assessments
  - Transferring **15 GB** of data between website platforms
  - Troubleshooting any computer technological issues experienced by other committee members

Honors & Distinctions

2022 **Recipient**, International Conference on Intelligent Biology and Medicine: Travel Award
2021 **MOSAIC (K99/R00) Fellow**, NIMHD, Lieber Institute for Brain Development
2019 **T32 Postdoctoral Fellow**, Johns Hopkins School of Medicine, Department of Psychiatry
2019 **1st Place**, Johns Hopkins Postdoctoral Conference: Oral Presentation
2017 **Scholar Finalist**, Data Incubator
2016 **Nomination**, Excellence in Research at Texas A&M Student Research Week
2016 **Honorable Mention**, Texas A&M Imaging Sciences Spotlight Series
2015 **Recipient**, CVM Advanced Developmental Training Travel Award
2015 **Recipient**, Cold Spring Harbor *Drosophila* Neurobiology Course
2014 **Recipient**, Great Lakes STEM Scholarship
2014 **4th Place**, Texas A&M Genetics Graduate Student Recruiting Symposium Poster Presentation
2014 **Recipient**, CVM Graduate Student Research Trainee Grant
2013 **Recipient**, Texas A&M Institute for Genome Sciences and Society (WSGI) Graduate Traineeship
2011 **Recipient**, NSF funded LSAMP Research Experience for Undergraduates at RPI
2011 **1st Place**, Walter Lincoln Hawkins '32 Graduate Research Conference: Poster Presentation
2011 **1st Place**, National Society of Black Engineers Fall Regional Conference: Poster Presentation
2011 **Recipient**, Rensselaer's Professional Leadership Program
2009 **Recipient**, NASA Science Technology Institute Summer Scholars Program
2009 **Recipient**, Life Health Science Internship

Service

Professional Activities

Lieber Institute for Brain Development Postdoctoral Association (LIBD-PDA) — *Baltimore, MD*

President — *Apr 2020 - Dec 2023*

- Established LIBD-PDA
- Obtained universal transportation benefit for all LIBD employees
- Obtained pipeline for joint appointments for all LIBD postdoctoral fellows
- Managed, planned, and organized first LIBD-PDA Virtual Retreat

Johns Hopkins Postdoctoral Association — *Baltimore, MD*

Co-President — *Aug 2019 - Jul 2020*

- Advocated for postdoc interests during COVID19 pandemic
- Secured funding for Annual Postdoctoral Conference
- Advocated for inclusion of postdocs in Faculty Learner Misconduct Policy
- Secured improvements for LGBTQ+ health insurance
- Advocated and advised JHU university wide postdoctoral database

JHPDA Policy and Advocacy Committee — *Baltimore, MD*

Co-Chair — *Aug 2018 - Jul 2019*

- Advocated for minority mental health support
- Organized annual postdoctoral survey
- Organized seminars on domestic and international financial wellness
- Advocated and secured improvements for postdoc childcare options

Genetics Graduate Student Association — *College Station, TX*

Treasurer — *Jul 2013 - Jul 2015*

- Organized meetings and annual symposium
- Managed and maintained budget

CVM Graduate Student Association — *College Station, TX*

Treasurer — *Jul 2014 - Jul 2015*

- Organized meetings and yearly outreach event
- Managed and maintained budget

Journal Reviewer

Biological Psychiatry

One review per year — *2022-2023*

Schizophrenia Bulletin

Two review per year — *2022-2023*

Schizophrenia Bulletin

One review per year — *2021-2022*

Committees

2020--2023	**President**, Lieber Institute for Brain Development Postdoctoral Association	*Baltimore, MD*
2019--2020	**Co-President**, Johns Hopkins Postdoctoral Association	*Baltimore, MD*
2019--2020	**Postdoctoral Representative**, Faculty Senate; Johns Hopkins, School of Medicine	*Baltimore, MD*
2019--2020	**Postdoctoral Representative**, Postdoctoral Affairs Advisory Board	*Baltimore, MD*
2019--2020	**Postdoctoral Representative**, Institute for Excellence in Education Board of Directors	*Baltimore, MD*
2018--2023	**Member**, JHPDA Diversity Postdoctoral Alliance Committee	*Baltimore, MD*
2018--2019	**Member/Co-Chair**, JHPDA Policy and Advocacy Committee	*Baltimore, MD*
2018--2019	**Postdoc Member**, JHU University Health Services Committee	*Baltimore, MD*
2013--2016	**Member**, Graduate Teaching Association/Academy for Future Faculty Steering Committee	*College Station, TX*
2015--2016	**Student Member**, Genetics Graduate Student Association Academics Committee	*College Station, TX*
2014--2015	**Student Member**, Genetics Graduate Student Association Awards Committee	*College Station, TX*

Professional Memberships

International Society for Computational Biology

Member *2022--*

American Society of Human Genetics

Member *2022--*

International Conference on Intelligent Biology and Medicine

Member *2022--*

Society for Neuroscience

Member *2017--2020*

National Society of Black Engineers

Member/Chapter Treasurer *2010--2016*