Kynon Jade **Benjamin**

Research Scientist · 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**$^{+}$, 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''. *Accepted* at *Nature Communications*. 2024. DOI: `https://doi.org/10.1101/2022.09.30.22280452`.

2. **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 ancestry differences in gene expression in the human brain''. *Accepted* at *Nature Neuroscience*. 2024. PMID: 37034760.

3. 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.

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

5. **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.

6. 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.

7. 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.

8. 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. Tietze, E, Barbosa, AR, Araujo, BHS, Euclydes, V, Cho, HJ, Lee, YK, Feltrin, A, Spiegelberg, B, Lorenzetti, A, van de Leemput, J, Di Carlo, P, Sawada, T, Ursini, G, **Benjamin, KJ**, Brentani, H, Kleinman, JE, Hyde, TM, Weinberger, DR, McKay, R, Shin, JH, Paquola, ACM, and Jennifer A Erwin. ``A single cell trajectory of human archetypal pluripotent stem cells reveals induction of endogenous BMP5/7 and GATA3 without transitioning through a naive state''. [pre-print]. 2020. *In revision* at *Scientific Reports*. 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 - Jul 2024*

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

American Society of Human Genetics — *Washington, DC*

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

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

Bioinformatics Advances

One review per year — *2022-2023*

Biological Psychiatry

One review per year — *2022-2023*

Schizophrenia Bulletin

One to Two reviews per year — *2021-2023*

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--2023*

Society for Neuroscience

Member *2017--2020*

National Society of Black Engineers

Member/Chapter Treasurer *2010--2016*