

## **RAVI NAGARAJAN, Ph.D.**

Assistant Project Scientist  
Genomic Variation Lab  
Department of Animal Science  
University of California Davis  
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<https://gvl.ucdavis.edu/>

### **EDUCATION**

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- Ph.D., Genetics** 2008  
University of California, Davis  
Dissertation Title: The Role of MeCP2 in Autism Spectrum Disorders
- B.S., Microbiology** 1996  
Indiana University, Bloomington

### **EXPERIENCE**

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- Assistant Project Scientist, Genomic Variation Laboratory** June 2018 – Present  
University of California, Davis
- Project management, perform laboratory experiments, grant and publication writing, mentorship
  - Environmental DNA metabarcoding of aquatic species in the San Francisco Estuary
  - CRISPR-based environmental DNA detection methods for the endangered Delta Smelt
- Investigator, Cancer Epigenetics Discovery Performance Unit** October 2014 – September 2017  
GlaxoSmithKline Oncology R&D, Collegeville, PA
- Pre-clinical biologist supporting epigenetic oncology drug development
  - Successfully brought CRISPR methodology into Cancer Epigenetics group
  - Presented “deep dives” on potential new cancer epigenetic targets to team leaders
- Postdoctoral Scholar** 2008 – 2014  
Advisor: Dr. Joseph F. Costello, Professor, Department of Neurosurgery  
University of California, San Francisco
- Development of next generation sequencing-based methods for genome-wide DNA methylation
  - Analysis of genome-wide DNA methylation in normal human cells and glioblastoma
  - Contributor to UC-BC-WashU Reference Epigenome Mapping Consortium
- Doctoral Research** 2002 – 2008  
Advisor: Dr. Janine LaSalle, Professor, Department of Medical Microbiology and Immunology  
University of California, Davis
- Quantification of methyl CpG binding protein 2 (MeCP2) expression in autism brain and related neurodevelopmental disorders
  - Genetic and epigenetic causes of defective MeCP2 expression in autism brain
- Laboratory Technician** 1998 – 2002  
Supervisor: Dr. Yan Chen, Assistant Professor, Department of Medical and Molecular Genetics  
Indiana University School of Medicine

- Signal transduction biology of the transforming growth factor – beta (TGF- $\beta$ ) pathway, focusing on transcriptional regulation by Smad proteins

#### Laboratory Contractor

Eli Lilly and Company, Indiana

1997 – 1998

- Fermentation microbiology of a novel anti-fungal antibiotic: Bioreactor run optimization, sample extraction, HPLC analysis, microscopy

#### **PUBLICATIONS: UNDER REVIEW**

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**Nagarajan RP**, et al. Environmental DNA Methods for Ecological Monitoring and Biodiversity Assessment in Estuaries. Under review at *Estuaries and Coasts*.

#### **PUBLICATIONS**

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Baerwald M, Goodbla A, **Nagarajan RP**, Gootenberg J, Abudayyeh, Schreier A. (2020) Rapid and Accurate Species Diagnostics for Ecological Monitoring using CRISPR-based SHERLOCK. *Molecular Ecology Reports*. 20(4): 961-970. doi: 10.1111/1755-0998.13186.

**Nagarajan RP**, Goodbla A, Graves E, Baerwald M, Holyoak M, Schreier A. (2020) Non-invasive genetic monitoring for the threatened valley elderberry longhorn beetle. *PLoS One*. 2020 Jan 17;15(1):e0227333. doi: 10.1371/journal.pone.0227333.

Su DS, Qu J, Schulz M, Blackledge C, Yu H, Zeng J, Burgess J, Reif A, Stern M, **Nagarajan RP**, Pappalardi M, Wong K, Graves A, Elkins T, Carson J, McHugh C, Mohammad H, Kruger R, Carpenter C, Heerding DA, Luengo J, Creasy CL. (2019) Discovery of Isoxazole Amides as Potent and Selective SMYD3 Inhibitors. *ACS Med Chem Lett*. 2019 Dec 27;11(2):133-140. doi: 10.1021/acsmchemlett.9b00493.

Fedoriw A, Rajapurkar SR, O'Brien S, Gerhart SV, Mitchell LH, Adams ND, Rioux N, Lingaraj T, Ribich SA, Pappalardi MB, Shah N, Laraio J, Liu Y, Butticello M, Carpenter CL, Creasy C, Korenchuk S, McCabe MT, McHugh CF, **Nagarajan R**, Wagner C, Zappacosta F, Annan R, Concha NO, Thomas RA, Hart TK, Smith JJ, Copeland RA, Moyer MP, Campbell J, Stickland K, Mills J, Jacques-O'Hagan S, Allain C, Johnston D, Raimondi A, Porter Scott M, Waters N, Swinger K, Boriack-Sjodin A, Riera T, Shapiro G, Chesworth R, Prinjha RK, Kruger RG, Barbash O, Mohammad HP. (2019) Anti-tumor Activity of the Type I PRMT Inhibitor, GSK3368715, Synergizes with PRMT5 Inhibition through MTAP Loss. *Cancer Cell* 8;36(1):100-114.

McNulty DE, Bonnette WG, Qi H, Wang L, Ho TF, Waszkiewicz A, Kallal LA, **Nagarajan RP**, Stern M, Creasy CL, Graves AP, Annan RS, Sweitzer SM, Holbert MA. (2017) A High-Throughput Dose-Response Cellular Thermal Shift Assay for Rapid Screening of Drug Target Engagement in Living Cells, Exemplified Using SMYD3 and IDO1. *SLAS Discovery* 22, 2017 Sept.

Baerwald MR, Meek MH, Stephens MR, **Nagarajan RP**, Goodbla AM, Tomalty KM, Thorgaard GH, May B, Nichols KM. (2016) Migration-related phenotypic divergence is associated with epigenetic modifications in rainbow trout. *Molecular Ecology* 25(8):1785-1800.

Bell RJ, Rube HT, Kreig A, Mancini A, Fouse SD, **Nagarajan RP**, Choi S, Hong C, He D, Pekmezci M, Wiencke JK, Wrensch MR, Chang SM, Walsh KM, Myong S, Song JS, Costello JF. (2015) The transcription factor GABP selectively binds and activates the mutant TERT promoter in cancer. *Science* 348(6238):1036-1039.

Roadmap Epigenomics Consortium. (2015) Integrative analysis of 111 reference human epigenomes. *Nature* 518(7539):317-330. (junior author)

Gascard P, Bilenky M, Sigaroudinia M, Zhao J, Li L, Carles A, Delaney A, Tam A, Kamoh B, Cho S, Griffith M, Chu A, Robertson G, Cheung D, Li I, Heravi-Moussavi A, Moksa M, Mingay M, Hussainkhel A, Davis B, **Nagarajan RP**, Hong C, Echipare L, O'Geen H, Hangauer MJ, Cheng JB, Neel D, Hu D, McManus MT, Moore R, Mungall A, Ma Y, Plettner P, Ziv E, Wang T, Farnham PJ, Jones SJ, Marra MA, Tlsty TD, Costello JF, Hirst M. (2015) Epigenetic and transcriptional determinants of the human breast. *Nature Communications* 6:6351.

Ameri K, Jahangiri A, Rajah AM, Tormos KV, **Nagarajan R**, Pekmezci M, Nguyen V, Wheeler ML, Murphy MP, Sanders TA, Jeffrey SS, Yeghiazarians Y, Rinaudo PF, Costello JF, Aghi MK, Maltepe E. (2015) HIGD1A Regulates Oxygen Consumption, ROS Production, and AMPK Activity during Glucose Deprivation to Modulate Cell Survival and Tumor Growth. *Cell Reports* 10(6):891-899.

**Nagarajan RP\***, Zhang B\*, Bell RJ, Johnson BE, Olshen AB, Sundaram V, Li D, Graham AE, Diaz A, Fouse SD, Smirnov I, Song J, Paris PL, Wang T, Costello JF. (2014) Recurrent epimutations activate gene body promoters in primary glioblastoma. *Genome Research* 24(5), 761-774.

\* these authors contributed equally

Zhang B, Zhou Y, Lin N, Lowdon RF, Hong C, **Nagarajan RP**, et al. (2013) Functional DNA methylation differences between tissues, cell types, and across individuals discovered using the M&M algorithm. *Genome Research* 23(9), 1522-1540.

**Nagarajan RP**, Fouse SD, Bell RJ, Costello JF. (2013) Methods for Cancer Epigenome Analysis. *Advances in Experimental Medicine and Biology* 754, 313-338. Review.

Harris RA, Wang T, Coarfa C, **Nagarajan RP**, et al. (2010) Sequence-based profiling of DNA methylation: comparisons of methods and catalogue of allelic epigenetic modifications. *Nature Biotechnology* 28(10), 1097-1105.

Maunakea AK\*, **Nagarajan RP\***, Bilenky M, Ballinger TJ, et al. (2010) Conserved Role of Intragenic DNA Methylation in Regulating Alternative Promoters. *Nature* 466(7303), 253-257.

\* these authors contributed equally

Fouse SD, **Nagarajan RP**, Costello JF. (2010) Genome-scale DNA methylation analysis. *Epigenomics* 2(1), 105-117. Review.

**Nagarajan RP** and Costello JF. (2009) Molecular epigenetics and genetics in neuro-oncology. *Neurotherapeutics* 6(3), 436-446. Review.

**Nagarajan RP** and Costello JF. (2009) Epigenetic mechanisms in glioblastoma multiforme. *Seminars in Cancer Biology* 19(3), 188-197. Review.

Swanberg SE, **Nagarajan RP**, Peddada S, Yasui DH, et al. (2009) Reciprocal co-regulation of EGR2 and MECP2 is disrupted in Rett Syndrome and autism. *Human Molecular Genetics* 18(3), 525-534.

**Nagarajan RP**, Patzel KA, Martin MR, Yasui DH, et al. (2008) *MECP2* promoter methylation and X-inactivation in autism. *Autism Research* 1(3), 169-178.

Yasui DH, Peddada S, Bieda MC, Vallero RO, Hogart AR, **Nagarajan RP**, Thatcher KN, Farnham PJ, LaSalle JM. (2007) Integrated epigenomic analyses of neuronal MeCP2 reveal a role for long-range interaction with active genes. *Proceedings of the National Academy of Sciences* 104(49), 19416-19421.

Hogart AR, **Nagarajan RP**, Patzel KA, Yasui DH, and LaSalle JM. (2007) 15q11-13 GABA<sup>A</sup> receptor genes are normally biallelically expressed in brain yet are subject to dysregulation in autism-spectrum disorders. *Human Molecular Genetics* 16(6), 691-703.

**Nagarajan RP**, Hogart AR, Gwye Y, Martin MR, LaSalle JM. (2006) Decreased MeCP2 expression is frequent in autism frontal cortex and correlates with aberrant *MECP2* promoter methylation. *Epigenetics* 1(4), 172-182.

Samaco RC, **Nagarajan RP**, Braunschweig D, and LaSalle JM. (2004). Multiple pathways regulate MeCP2 expression in normal human brain development and exhibit defects in autism-spectrum disorders. *Human Molecular Genetics* 13, 629-639.

Chen F, Ogawa K, **Nagarajan RP**, Zhang M, Kuang C, Chen Y. (2003) Regulation of TG-interacting factor by transforming growth factor-beta. *Biochemical Journal* 371(Pt 2): 257-263.

Liu X, **Nagarajan RP**, Vale W, Chen Y. (2002) Phosphorylation regulation of the interaction between Smad7 and activin type I receptor. *FEBS Letters* 519(1-3): 93-98.

Li W, Chen F, **Nagarajan RP**, Liu X, Chen Y. (2001) Characterization of the DNA binding property of Smad5. *Biochemical and Biophysical Research Communications* 286(5), 1163-1169.

**Nagarajan RP**, Chen Y. (2000) Structural basis for the functional difference between Smad2 and Smad3 in FAST-2 (forkhead activin signal transducer-2)-mediated transcription. *Biochemical Journal* 350 (Pt 1), 253-259.

**Nagarajan RP**, Chen F, Li W, Vig E, Harrington MA, Nakshatri H, Chen Y. (2000) Repression of transforming growth factor-beta-mediated transcription by nuclear factor kappaB. *Biochemical Journal* 348 (Pt 3), 591-596.

**Nagarajan RP** Zhang J, Li W, Chen Y. (1999) Regulation of Smad7 promoter by direct association with Smad3 and Smad4. *Journal of Biological Chemistry* 274(47), 33412-33418.

**Nagarajan RP**, Liu J, Chen Y. (1999) Smad3 inhibits transforming growth factor-beta and activin signaling by competing with Smad4 for FAST-2 binding. *Journal of Biological Chemistry* 274(44), 31229-35.

## **LIMITED DISTRIBUTION**

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**Nagarajan R**, Schreier A, Baerwald M, Goodbla A, Graves E, Holyoak M. Using fecal DNA survey protocols to optimize traditional exit hole surveys. Final Report submitted to United States Fish and Wildlife Service, 08/17/18.

## **BOOK CHAPTERS**

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**Nagarajan RP** and Costello JF. (2009) Epigenetic profiling of gliomas. Chapter in *CNS Cancer: Models, Prognostic Factors and Targets*, Erwin G. Van Meir, editor. Humana Press, 2009, 615-650.

## **TEACHING, MENTORING AND PRESENTATIONS**

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- Laboratory research mentor for graduate students, undergraduates, and interns 2008–present
- Interview Subject, Undergraduate “Bridge to Biotech” Program, City College of San Francisco 2014
- Research presentation at Bay Area Illumina Users Group meeting 2011
- Research presentation at Bay Area Autism Consortium Retreat 2011
- Guest lecturer, undergraduate course in Modern Mathematical Methods in Molecular Biology, SFSU 2011
- Guest lecturer, SUNY Oswego Evolution course 2008
- Guest lecturer, Davis High School Biotechnology course, Davis, CA 2007
- Laboratory internship mentor for Davis High School Biotechnology Program 2006–2008
- Grader for UC Davis undergraduate genetics course (Genes and Gene Expression) 2006
- Research mentor for two undergraduates and two high school students, UC Davis 2003 – 2007
- Teaching Assistant, UC Davis Transmission Genetics graduate course 2003

## **FELLOWSHIPS, AWARDS AND GRANTS**

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- Co-Principal Investigator, 2021 Delta Science Research Award July 2022–2024  
Funded by the Delta Stewardship Council and US Bureau of Reclamation  
*Non-invasive environmental DNA monitoring to support tidal wetland restoration*
- Co-Principal Investigator, US Fish and Wildlife Service grant 2019–2021  
*Expanded Bay Delta Monitoring – EDSM and the SHERLOCK Method*
- Co-Principal Investigator, CA Dept of Fish and Wildlife/Proposition 1 grant 2019–2022  
*Developing an eDNA metabarcoding protocol to improve fish and mussel monitoring in the San Francisco Estuary*
- UC Davis Academic Federation Travel Award 2019
- Co-Principal Investigator, Companion Animal Health Grant, UC Davis School of Veterinary Medicine 2011–2013
- NIH/NCI Ruth L. Kirschstein National Research Service Award (NRSA) 2009–2011

for Individual Postdoctoral Fellows (F32)

- NIH/NCI Institutional Research Service Award in Molecular and Cellular Mechanisms in Cancer Postdoctoral Fellowship (T32) 2008–2009
- UC Davis M.I.N.D. Institute Predoctoral Fellowship, UC Davis 2004–2005
- Graduate Student Association Travel Award, UC Davis 2007
- Graduate Studies Travel Award, UC Davis 2005
- Genetics Graduate Group Fellowship Block Grant, UC Davis 2003
- Undergraduate Research Award, Indiana University 1995

## **ABSTRACTS**

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**Nagarajan R\***, Bedwell R\*, Holmes A, Sanches T, Acuña S, Baerwald M, Blankenship S, Connon R, Gille D, & Schreier A. A Path Forward for Environmental DNA Methods in the Bay-Delta. Bay-Delta Science Conference. April 6-9, 2021. Oral presentation. \*co-presenters.

**Nagarajan R**, Holmes A, Myers D, Mouat J, Goodbla A, Bedwell M, Baerwald M, Schreier B, Rypel A, Brown L, & Schreier A. Building a Comprehensive and Accessible DNA Barcode Database for Fish and Invertebrates in the San Francisco Estuary. Interagency Ecological Program 2020 Annual Workshop. October 2020. Poster presentation.

**Nagarajan RP**, Goodbla A, Baerwald M, Graves E, Holyoak M, Schreier A. Non-Invasive Genetic Approach for Monitoring of the Threatened Valley Elderberry Longhorn Beetle. American Fisheries Society – The Wildlife Society Joint Meeting, Reno, NV, October 2, 2019. Oral presentation.

**Nagarajan R**, Barajas R, Mazor T, Phillips J, Ma J, Hong C, Johnson B, Dayal M, Cha S, Nakamura J, Berger M, Chang S, Furnari F, Taylor B, Costello J. (2014). GE-42: Integrated Radiographic and Phylogenetic Case Study of a Primary and Contralateral Recurrent Glioma. *Neuro-Oncology*, 16(Suppl 5), v105–v106. <https://doi.org/10.1093/neuonc/nou256.4> Poster presentation.

**Nagarajan RP**, Zhang B, Johnson BE, Bell RJ, Olshen AB, Fouse SD, Diaz A, Smirnov I, Kang R, Wang T, Costello JF. (2013) Tumor specific epigenetic activation of alternative promoters in the body of oncogenes. Society for Neuro Oncology (SNO) Annual Meeting, San Francisco, CA, November 22, 2013. Poster presentation.

Bell RAJ, **Nagarajan RP**, Zhang B, Diaz A, Wang T, Song J, Costello JF. (2013) Integrative epigenomics to identify driver epimutations in GBM. Society for Neuro Oncology (SNO) Annual Meeting, San Francisco, CA, November 22, 2013. Poster presentation.

**Nagarajan RP**, Johnson BE, Olshen AB, Smirnov I, Xie M, Wang J, Sundaram V, Paris P, Wang T, Costello JF. (2011) Aberrant transcriptional activation is associated with gene body hypomethylation in glioblastoma. Society for Neuro Oncology (SNO) Annual Meeting, Orange County, CA, November 19, 2011. Oral presentation.

Fouse SD, **Nagarajan RP**, Nakamura J, James CD, Chang S, Costello JF. (2011) Therapeutic response in primary glioblastoma neural stem cells relative to patient-matched non-stem tumor cells. Society for Neuro Oncology (SNO) Annual Meeting, Orange County, CA, November 19, 2011. Poster presentation.

**Nagarajan RP**, Johnson BE, Hong C, Fouse SD, Haussler D, Hirst M, Marra MA, Costello JF, Wang T. (2009) Deep sequencing of the DNA Methylome of Glioblastomas. Society for Neuro Oncology (SNO) Annual Meeting, New Orleans, LA, October 23, 2009. Poster presentation.

**Nagarajan RP**, Fouse SD, Hong C, Johnson BE, Wang T, Haussler D, Marra MA, Hirst M, Smirnov I, Rose S, Aghi M and Costello JF. (2009) Deep sequencing of GBM epigenomes. Helen Diller Cancer Research Institute Symposium, UCSF, August 19, 2009. Poster presentation

**Nagarajan RP**, Patzel KA, Hogart AR, Martin MR, LaSalle JM. (2007) Defects in *MECP2* expression and epigenetic regulation are common in autism brain. Keystone Symposium in Epigenetics: Regulation of Chromatin Structure in Development and Disease, Keystone, CO, April 14, 2007. Oral and poster presentations.

**Nagarajan RP**, Hogart AR, Martin MR, Gwye Y, LaSalle JM. (2006) Reduced MeCP2 expression is frequent in autism frontal cortex and correlates with aberrant *MECP2* promoter methylation. American Society for Human Genetics (ASHG), New Orleans, LA, October 12, 2006. Poster presentation.

Hogart AR, **Nagarajan RP**, Yasui DH, Patzel KA, LaSalle JM. (2006) Loss of bi-allelic expression of 15q11-13 GABA-A receptor subunit genes in Rett syndrome and autism. American Society for Human Genetics (ASHG), New Orleans, LA, October 12, 2006. Poster presentation

**Nagarajan RP**, Martin MR, Hogart AH, LaSalle JM. (2006) Reduced MeCP2 expression is frequent in autism frontal cortex and correlates with aberrant *MECP2* promoter methylation. International Meeting for Autism Research (IMFAR), Montreal, Canada, June 2, 2006. Oral presentation.

**Nagarajan RP**, Hogart AR, Gwye Y, LaSalle JM. (2005) Genetic and epigenetic analysis of MeCP2 expression defects in autism and other neurodevelopmental disorder brain samples. (poster) American Society for Human Genetics (ASHG), Salt Lake City, UT, October 10, 2005. Poster presentation.

Dragich JM, Malone B, Ham A, Peddada S, **Nagarajan RP**, LaSalle JM, Arnold AP, and Schanen NC. (2006) Evidence for tyrosine hydroxylase dysregulation within the striatum of the *Mecp2* knockout mice, an animal model of Rett Syndrome. FENS Forum, Vienna, Austria, September 7, 2006. Poster presentation.

**Nagarajan RP**, Samaco RC, Braunschweig D, LaSalle JM. (2004) MeCP2 expression defects in the cerebral cortex of autism patients may be a result of both transcriptional and posttranscriptional mechanisms. International Meeting for Autism Research (IMFAR), Sacramento, CA, May 8, 2004. Oral presentation.

#### **ACADEMIC SERVICE**

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- Mentorship of UC Davis students: 1 PhD student, 3 undergraduates, 2 PhD rotation student 2020 – present
- Member of planning committee for UC Davis eDNA Symposium 2020
- Co-lead, Open Science Subgroup, Interagency Ecological Program Genetics Project Work Team 2019 – 2020
- Volunteer, UC Davis Picnic Day 2019
- Journal manuscript co-review: *Biological Invasions*, *Nature* (2), *Journal of Neuroscience*, *Proceedings of the National Academy of Science*, *Neuro-oncology*, *Cancer Cell*, *New England Journal of Medicine*, *Genome Research* (2), *Nucleic Acids Research*, *Cell Reports* 2006 – present
- Journal manuscript review (independent): *Molecular Biology Reports*, *Frontiers in Epigenomics*, *Epigenomics*, *Journal of Neurochemistry* 2011 – present
- Student Representative to UC Davis Genetics Graduate Group Exec. Committee 2006 – 2007
- Alternate Representative to UC Davis Graduate Student Association 2006 – 2007
- Co-organizer of UC Davis Genetics Graduate Group Student Seminar Series 2006

#### **TRAINING AND WORKSHOPS**

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- UC Davis Data Carpentries Geospatial R Workshop November 2018
- UC Davis Bioinformatics Core Bioinformatics Prerequisites workshop September 2018
- Gene Editing with CRISPR (BioTrac 3-day lab and lecture course), Germantown, MD March 2017
- Course in Medicinal Chemistry in Drug Development, Drew University 2015
- “Using Technology for Effective Teaching” Workshop, UCSF School of Medicine 2014
- Mentored career development award (for NIH K awards) workshop, UCSF 2010
- Course in ethics and the responsible conduct of research, UCSF 2009
- Methyl-DNA immunoprecipitation workshop, UC Davis 2008
- Bioinformatics/next generation sequencing short course, UC Davis 2008
- Chromatin Immunoprecipitation-on-chip workshop, UC Davis 2007
- Chromatin Immunoprecipitation workshop, UC Davis 2006

- UC Santa Cruz Genome Browser training, Mountain View, CA