# Shashank Gandhi, Ph.D.

**Division of Biology and Biological Engineering**

California Institute of Technology
MC 139-74, Pasadena, CA 91125


## I. EDUCATION

**Ph.D., Developmental Biology** - California Institute of Technology — 2015-2021
Thesis Advisor: Dr. Marianne Bronner

**M.S., Biology** - New York University — 2013-2015
Thesis Advisor: Dr. Lionel Christiaen

**B.E., Biotechnology** - Panjab University — 2008-2012
Thesis Advisor: Dr. Sanjeev Puri

## II. GRANTS AND FUNDING

| | |
|---|---|
| Schmidt Science Fellowship, Schmidt Futures in partnership with the Rhodes Trust | 2021-2022 |
| Miller Research Fellowship, Miller Institute for Basic Research in Science, UC Berkeley | 2021-2024 |
| The Company of Biologists traveling fellowship, Award No. DEVTF18119 | 2019 |
| American Heart Association predoctoral fellowship, Award No. 18PRE34050063 (percentile rank 0.19%) | 2018-2020 |
| Biology Master's Research Grant, New York University | 2015 |
| Biology Master's Research Grant, New York University | 2014 |

## III. PUBLICATIONS (* = equal contributors; # = co-corresponding authors)

1. **Gandhi, S.,** Bronner, M.E. (in press). Seq your destiny: neural crest fate determination in the genomic era. *Annual Reviews of Genetics* 55.
2. **Gandhi, S.#,** Li, Y., Tang, W., Christensen, J.B., Urrutia, H.A., Vieceli, F.M., Piacentino, M.L., Bronner, M.E.# (2021). A single-plasmid approach for genome editing coupled with long-term lineage analysis in chick embryos. *Development* 148 (7), dev.193565. https://doi.org/10.1242/dev.193565
3. **Gandhi, S.#**, Hutchins, E.J., Maruszko, K., Park, J.H., Thomson, M., Bronner, M.E.# (2020). Bimodal function of chromatin remodeler *Hmga1* in neural crest induction and Wnt-dependent emigration. *eLife* 2020;9:e57779. https://doi.org/10.7554/eLife.57779
4. Li, Y., Gonzalez, W., Andreev, A., Tang, W., **Gandhi, S.**, Cunha, A., Prober, D., Lois, C., Bronner, M.E. (2020). Macropinocytosis-mediated membrane recycling via microtubules drives neural crest migration by delivering F-actin to the lamellipodium. *Proceedings of the National Academy of Sciences,* 117 (44), 27400-27411. https://doi.org/10.1073/pnas.2007229117
5. **Gandhi, S.**, Ezin, M., Bronner, M.E. (2020). Reprogramming neural crest cell identity to rescue congenital heart defects. *Developmental Cell*, 53 (3), 300-315.e4. https://doi.org/10.1016/j.devcel.2020.04.005
6. Martik, M.L., **Gandhi, S.**, Uy, B.R., Green, S.A., Gillis, J.A., Simoes-Costa, M., Bronner, M.E. (2019). Evolution of the vertebrate New Head by progressive acquisition of neural crest regulatory subcircuits. *Nature*, 574 (7780), 675-678. https://doi.org/10.1038/s41586-019-1691-4
7. Tang, W., Li, Y., **Gandhi, S.**, Bronner, M.E. (2019). Multiplex clonal analysis in the chick embryo using retrovirally-mediated combinatorial labeling. *Developmental Biology,* 450(1), 1-8. https://doi.org/10.1016/j.ydbio.2019.03.007

8. Tani-Matsuhana, S.*, Vieceli, F.M.*, **Gandhi, S.**, Inoue, K., Bronner, M.E. (2018). Transcriptome profiling of the cardiac neural crest reveals a critical role for MafB. *Developmental Biology*, 444 (1), 209-218. https://doi.org/10.1016/j.ydbio.2018.09.015

9. **Gandhi, S.**, Bronner, M.E. (2018). Insights into neural crest development from studies of avian embryos. *International Journal of Developmental Biology*, 62 (1-2-3), 183-194. Review article. https://doi.org/10.1387/ijdb.180038sg

10. **Gandhi, S.**, Piacentino, M.L., Vieceli, F.M., Bronner, M.E. (2017). Optimization of CRISPR/Cas9 genome editing for loss-of-function in the early chick embryo. *Developmental Biology*, 432 (1), 86-91. https://doi.org/10.1016/j.ydbio.2017.08.036

11. **Gandhi, S.**, Haeussler, M., Razy-Krajka, F., Christiaen, L., Stolfi, A. (2017). Evaluation and rational design of guide RNAs for efficient CRISPR/Cas9-mediated mutagenesis in Ciona. *Developmental Biology*, 425 (1), 8-20. https://doi.org/10.1016/j.ydbio.2017.03.003

12. Weitzman, M., Yusufali, A.H., Bali, F., Vilcassim, M.J., **Gandhi, S.**, Peltier, R., Nadas, A., Sherman, S., Lee, L., Hong, Z., Shearston, J., Park, S.H., Gordon, T. (2017). Effects of hookah smoking on indoor air quality in homes. *Tobacco Control*, 26, 586-591. http://dx.doi.org/10.1136/tobaccocontrol-2016-053165

13. Yao, X., Maity, S., **Gandhi, S.**, Imielenski, M., Vogel, C. (2017). iSUMO – integrative prediction of functionally relevant SUMOylated proteins. *BioRxiv.* https://doi.org/10.1101/056564

14. Stolfi, A., **Gandhi, S.**, Salek, F., Christiaen, L. (2014). Tissue-specific genome editing in Ciona embryos by CRISPR/Cas9. *Development*, 141, 4115-4120. https://doi.org/10.1242/dev.114488

15. **Gandhi, S.**, Puri, V., Puri, S. (2012). Gankyrin: a potential target for drug therapy against hepatocellular carcinoma. *Journal of Biomedical Science and Engineering*, 5, 469-475. https://doi.org/10.4236/jbise.2012.58059

## IV. PUBLICATIONS (in preparation; * = equal contributors; # = co-corresponding authors)

1. **Gandhi, S.**, Raja, D.A., Williams, R., Ling, I.T.C., Gao, F., Sauka-Spengler, T., Bronner, M.E. Dissection of a global gene regulatory network underlying cardiac neural crest specification.

2. **Gandhi, S.**, Li, Heyun, Hochrein, L.M., Bronner, M.E.#, Pierce, N.A.# Spatiotemporal regulation of gene expression using conditional guide RNAs in avian embryos.

3. Ezin, M.*, Flytzanis, N.C.*, Hutchins, E.J., Piacentino, M., **Gandhi, S.**, Gradinaru, V., Bronner, M.E. Bringing CLARITY to the classics: embryonic neural crest contribution in 3D.

## V. BOOK CHAPTERS

1. **Gandhi, S.**, Razy-Krajka, F., Christiaen, L., and Stolfi, A. (2018). CRISPR Knockouts in Ciona Embryos. In Sasakura Y. (Ed.) Transgenic Ascidians. *Advances in Experimental Medicine and Biology*, Vol 1029. Springer, Singapore. https://doi.org/10.1007/978-981-10-7545-2_13

## VI. AWARDS AND HONORS

| | |
|---|---|
| **eSymposia Scholarship,** Keystone Research Symposia, USA | 2021 |
| **Journal of Cell Biology Norton B. Gilula Award,** Rockefeller University Press, USA. | 2020 |
| **eSymposia Scholarship,** Keystone Research Symposia, USA | 2020 |
| **Travel Grant**, Scientific Committee, International Tunicate Meeting, Japan. | 2015 |
| **Biology Student Travel Grant**, Department of Biology, NYU. | 2015 |

**Runner-up for Best Poster Presentation**, 17th M.S. Poster Presentation Session, Department of Biology, NYU. 2015

**Graduate School of Arts and Science Dean's Student Travel Grant**, NYU. 2014

**Biology Student Travel Grant**, Department of Biology, NYU. 2014

**Second Runner-up for Best Poster Presentation**, 16th M.S. Poster Presentation Session, Department of Biology, NYU. 2014

**Finalist**, Threesis Academic Challenge, Graduate School of Arts and Science, NYU. 2014

**Travel Grant**, Indian Society of Nephrology (ISN), India. 2012

**Winner**, Bio-Paradigm, a working model making competition, Society for Biological Engineers – UIET Student Chapter, Panjab University. 2010

## VII. INVITED TALKS

"Seq your destiny - Neural crest plasticity and determination of cell fate" – **Bioinformatics in Biology Seminar Series**, Caltech, USA (Virtual). 2021

"A single-plasmid approach for genome editing coupled with long-term lineage analysis in chick embryos" – **Northwest Developmental Biology Meeting** (Virtual). 2021

"Genetic determinants of the unique developmental potential of the cardiac neural crest lineage" – **Weinstein Webinar on Cardiac Lineages and Heart Fields** (Virtual). 2020

"Neural crest plasticity and its application to rescuing congenital heart defects" – **Center for Molecular Medicine Seminar Series**, Caltech, USA (Virtual). 2020

"Bimodal function of chromatin remodeler Hmga1 in neural crest induction and Wnt dependent emigration" – **ASCB|EMBO Cell Bio Virtual 2020 Meeting** (Virtual). 2020

"Dissection of the global gene regulatory network governing cardiac neural crest development" – **Single Cell Biology Virtual Conference,** Wellcome Genome Campus, Cambridge, UK (Virtual). 2020

"Reprogramming axial level identity to rescue neural-crest-related congenital heart defects" – **Keystone eSymposia on Tissue Plasticity: Preservation and Alteration of Cellular Identity,** Colorado, USA (Virtual). 2020

"Bimodal function of chromatin remodeler Hmga1 in neural crest induction and Wnt dependent emigration" – **Northwest Developmental Biology Meeting** (Virtual). 2020

"Reprogramming neural crest axial identity to rescue congenital heart defects" – **2019 Caltech Biology and Biological Engineering Retreat**, Long Beach, CA, USA. 2019

"Healing a broken heart – fixing congenital heart defects with genetically reprogrammed cells" – **82nd Annual Seminar Day**, Caltech, USA. 2019

"An optimized system for robust genome editing in chicken embryos using CRISPR/Cas9" – **Society for Developmental Biology West Coast Regional Meeting**, Yosemite, USA. 2017

"Systems Biology through microarray – a newer paradigm in understanding Autosomal Dominant Polycystic Kidney Disease" – **43rd Indian Society of Nephrology Conference**, Gujarat, India. 2012

## VIII. POSTER PRESENTATIONS

"Reprogramming axial level identity to rescue neural-crest-related congenital heart defects" – **79th Society for Developmental Biology meeting** (Virtual). 2020

"Reprogramming neural crest cell identity to rescue congenital heart defects" – **78th Society for Developmental Biology meeting**, Boston, USA. 2019

"Tissue-specific functional genomics using CRISPR/Cas9 in *Ciona intestinalis*" – **8th International Tunicate Meeting**, Aomori, Japan. 2015

"CRISPR/Cas9-mediated tissue-specific mutagenesis in the ascidian, *Ciona intestinalis*" – **17th M.S. Poster presentation session**, Department of Biology, NYU, New York, USA. 2015

"A next generation sequencing-based approach to validate a CRISPR/Cas9 genetic screen library for *Ciona intestinalis*" – **Keystone Symposia on Precision Genome Engineering and Synthetic Biology**, Montana, USA. 2015

"CRISPR/Cas9-mediated tissue-specific mutagenesis in the ascidian, *Ciona intestinalis*" – **16th M.S. Poster presentation session**, Department of Biology, NYU, New York, USA. 2014

"Gankyrin: a potential target for drug therapy against hepatocellular carcinoma" – **6th Chandigarh Science Congress**, Panjab University, Chandigarh, India. 2012

## IX. TEACHING AND MENTORING EXPERIENCE

**Mentor** of three graduate students and one postdoctoral researcher in the Bronner Lab, Caltech. 2017-2021

**Teaching Assistant**, *Stem Cells and Hematopoiesis*, Division of Biology and Biological Engineering, Caltech. 2020

**Mentor** for SURF (Summer Undergraduate Research Fellowship) and VURP (Visiting Undergraduate Research Program), Caltech. Mentored five undergraduate students enlisted in the two programs. 2017-2019

**Teaching Assistant**, *Introduction to Developmental Biology*, Division of Biology and Biological Engineering, Caltech. 2018

**Teaching Assistant**, *Introduction to Developmental Biology*, Division of Biology and Biological Engineering, Caltech. 2017

**Teaching Assistant**, *Genetics*, Division of Biology and Biological Engineering, Caltech. 2015

**Co-Mentor** of one master's student in the Christiaen Lab, NYU. 2015

**Recitation Leader**, *Molecular and Cellular Biology II*, Department of Biology, NYU. 2015

**Course Lab Assistant**, *Bioinformatics in Medicine and Biology*, Department of Biology, NYU. 2014

**Section Leader**, *Fundamentals of Bioinformatics*, Department of Biology, NYU. 2014

**Guest Faculty Member - Chemistry**, The Gurukul School, Panchkula (HR), India. 2013

**Department Head,** Department of Chemistry, Genesis Educates, Panchkula (HR), India. 2012-2013

**Junior Faculty Member**, Department of Biology and Chemistry, Genesis Educates, Panchkula (HR), India. 2009-2012

## X. PROFESSIONAL INTERNSHIPS

**Bioinformatics Intern**, IBI Biosolutions Pvt. Ltd., Panchkula (HR), India. Six-week hands-on training program on *in silico* modeling and docking of the protein integrase with AIDS as the disease model. 2011

**Vaccinology Intern,** Central Research Institute, Kasauli, India. Four-week training program focused on the basics of bioprocess technology of vaccine production, along with in-process quality control tests and analytical instrumentation at the in-house national Central Drugs Laboratory and Central Instrumentation and Analytical Laboratory. 2010

## XI. POSITIONS HELD

**President**, Caltech Cricket Club, Caltech. 2018-2020

**Graduate Student Recruitment Co-chair**, Division of Biology and Biological Engineering, Caltech. 2016-2017

**Treasurer**, Master's College Program Board, Graduate School of Arts and Science, NYU. 2013-2015

**Contributing Editor**, Society for Biological Engineers – UIET Student Chapter, Panjab University. 2011-2012

**Convener**, UIET Sports Committee, Panjab University. 2011-2012

## XII. SKILLS

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| **Programming Languages** | Python, R |
| **Bioinformatics Skills** | Bulk and single-cell RNA-seq and ATAC-seq data analysis, tool and pipeline development, UNIX-based command line tools |
| **Model Systems** | Chicken, Ciona, Cell culture (mouse embryonic stem cells, DF1 fibroblasts, HEK293), Mouse, Drosophila |
| **Computer Skills** | Git and version control, Adobe Creative Cloud, Microsoft Office, Inkscape |