

CURRENT POSITIONS	Assistant Professor, Cell & Developmental Biology, Northwestern University	2022-
	Core Member, Center for Synthetic Biology, Northwestern University	2022-
	Full Member, Robert H. Lurie Comprehensive Cancer Center, Northwestern University	2022-
	Courtesy Appointment, Chemical & Biological Engineering, Northwestern University	2022-
	Courtesy Appointment, Biomedical Engineering, Northwestern University	2022-
EDUCATION	Princeton University , U.S.	2012-17
	Ph.D., Chemical and Biological Engineering (CBE) Thesis: Quantitative biology of developmental Ras signaling: from molecules to morphologies Advisors: Stanislav Y. Shvartsman and Gertrud M. Schüpbach	
	Indian Institute of Technology (IIT) Gandhinagar , India	2008-12
	B.Tech. (Honors), Chemical Engineering	
RESEARCH EXPERIENCE	Postdoctoral Fellow , Arjun Raj, University of Pennsylvania, U.S.	Nov 2017-Dec 2021
	Developed experimental and mathematical frameworks to monitor biochemical trajectories guiding non-genetic plasticity and reprogramming in single melanoma cells exposed to anti-cancer therapies.	
	Research Intern , Genentech, U.S.	Jul-Sep 2016
	Assisted in identifying novel regulatory mechanisms underlying the epigenetic control of tumorigenesis in acute myeloid leukemia.	
	Research Intern , Washington University in St. Louis, U.S.	May-Aug 2010
	Developed data-driven regression models to predict the yield of metabolic products for multiple microbial species under different physiological conditions and carbon sources.	
	Research Intern , IIT Bombay, India	May-Jun 2009
	Performed experiments and quality control tests to produce biodiesel from local feedstocks.	
FELLOWSHIPS & AWARDS	Post-Ph.D.	
	Young Investigator Award, Cancer Research Foundation [\$100,000]	2023
	Young Alumni Outstanding Academic Achievement Award, IIT Gandhinagar	2022
	STAT Wunderkinds 2021	2021
	Burroughs Wellcome Fund Career Awards at the Scientific Interface [\$500,000]	2020-27
	Jane Coffin Childs Memorial Fund Fellowship [\$168,000]	2018-22
	Schmidt Science Fellowship, in partnership with the Rhodes Trust [\$100,000]	2018-19
	Ph.D.	
	Gordon Wu Fellowship: Highest honor for an incoming engineering graduate student, Princeton University [\$19,000 supplement]	2012-16
	William R. Schowalter Travel Fund, Princeton University [\$500/travel]	2015, 2017
	People's Choice Award, Art of Science, Princeton University	2014
	Undergraduate	
	Institute Gold Medal: First rank, Chemical Engineering, IIT Gandhinagar	2012
	Outstanding Research Award: Graduating Class of 2012, IIT Gandhinagar	2012
	Award for Undergraduate Publications, IIT Gandhinagar [₹50,000]	2012
Scholarship for Academic Excellence, IIT Gandhinagar [₹20,000]	2011-12	
International Travel Grant, Government of India [₹100,000]	2011	
Merit-cum-Means Scholarship, IIT Gandhinagar [Full tuition + stipend]	2010-11	
Travel Grant, McDonnell International Scholars Academy [\$1,500]	2010	
MAGEEP Fellowship, Washington University in St. Louis [\$5,000]	2010	

#**Goyal Y.**, ..., and #Raj A. “Pre-determined diversity in resistant fates emerges from homogenous cells after anti-cancer drug treatment”, Nature, 2023.

Pillai M., Hojel E., #Jolly M.K., and #**Goyal Y.**, “Unraveling non-genetic heterogeneity in cancer with dynamical models and computational tools”, Nature Computational Science, 2023.

*Grody E., *Abraham A., #Shukla V., and #**Goyal Y.**, “Towards a systems-level probing of tumor clonality”, iScience, 2023.

Richman L.P., **Goyal Y.**, Jiang C.L., and Raj A., “ClonoCluster: a method for using clonal origin to inform transcriptome clustering”, Cell Genomics, 2023.

Dardani I.P., Emert B., **Goyal Y.**, Jiang C.L., Kaur A., Rouhanifard S.H., Alicea G.M., Fane M.E., Xiao M., Herlyn M., Weeraratna A.T., and Raj A., “clampFISH 2.0 enables rapid, scalable amplified RNA detection *in situ*”, Nature Methods, 2022.

Kiani K., Sanford E., **Goyal Y.**, and Raj A., “Changes in chromatin accessibility are not concordant with transcriptional changes for single-factor perturbations”, Molecular Systems Biology, 2022.

Jiang C.L., **Goyal Y.**, Jain N., Wang Q., Truitt R.E., Cote A.J., Emert B., Mellis I.A., Kiani K., Yang W., Jain R., and Raj A., “Cell type determination for cardiac differentiation occurs soon after seeding of human-induced pluripotent stem cells”, Genome Biology, 2022.

Colonna M., **Goyal Y.**, Johnson H.E., Syal S., Schedl P., and Deshpande G., “Preformation and epigenesis converge to specify primordial germ cell fate in the early Drosophila embryo”, PLoS Genetics, 2022.

*Zhu L. and ***Goyal Y.**, “Art as a toolkit for data science”, Marg, 2021.

Mellis I.A., Edelstein H.I., Truitt R., **Goyal Y.**, Beck L.E., Symmons O., Dunagin M.C., Saldana R.A.L., Shah P.P., Perez-Bermejo J.A., Padmanabhan A., Yang W., Jain R., and Raj A., “Responsiveness to perturbations is a hallmark of transcription factors that maintain cell identity in vitro.”. Cell Systems, 2021.

*Marmion R.A., *Yang L., **Goyal Y.**, Jindal G.A., Wetzel J.L., Singh M., Schüpbach T., and Shvartsman S.Y., “Molecular mechanisms underlying cellular effects of human MEK1 mutations”, Molecular Biology of the Cell, 2021.

Schuh L., Saint-Antoine M.S., Sanford E.M., Emert B.L., Singh A., Marr C., Raj A., and #**Goyal Y.**, “Gene networks with transcriptional bursting recapitulate rare transient coordinated expression states in cancer”, Cell Systems, 2020.

Media coverage: [Schmidt Science Fellows](#).

Featured article: [Cell Systems](#).

Paul S., Yang L., Mattingly H.H., **Goyal Y.**, Shvartsman S.Y., and Veraksa A., “Activation-induced substrate engagement in Erk signaling”, Molecular Biology of the Cell, 2020.

Zhu L. and #**Goyal Y.**, “Art and Science: intersections through time and paths forward”, EMBO Reports, 2019.

Goyal Y., Schüpbach T., and Shvartsman S.Y., “A quantitative model of developmental RTK signaling”, Developmental Biology, 2018.

*Jindal G.A., *Goyal Y., Humphreys J.M., Yeung E., Tian K., Patterson V.L., He H., Burdine R.D., Goldsmith E.J., and Shvartsman S.Y., “How activating mutations affect MEK1 regulation and function”, Journal of Biological Chemistry, 2017.

Highlighted by: [Special virtual issue, Journal of Biological Chemistry](#).

Cuellar T. L., Herzner A-M., Zhang X., Goyal Y., Watanabe C., Friedman B.A., Janakiraman V., Durink S., Stinson J., Arnott D., Cheung T.K., Chaudhuri S., Modrusan Z., Doerr J.M., Classon M., and Haley B., “Silencing of retrotransposons by SETDB1 inhibits the interferon response in acute myeloid leukemia”, Journal of Cell Biology, 2017.

Previewed by: Robbez M.L., Tie H.C., and Rowe H.M., Journal of Cell Biology, 2017.

*Goyal Y., *Levario T.J., Mattingly H.H., Holmes S., Shvartsman S.Y., and Lu H., “Parallel imaging of *Drosophila* embryos for quantitative analysis of genetic perturbations of the Ras pathway”, Disease Models & Mechanisms, 2017.

Highlighted by: [The Node](#).

*Rogers W.A., *Goyal Y., Yamaya K., Shvartsman S.Y., and Levine M.S., “Uncoupling neurogenic gene networks in the *Drosophila* embryo”, Genes & Development, 2017.

Previewed by: Crews S., Genes & Development, 2017.

*Goyal Y., *Jindal G.A., Pelliccia J.L., Yamaya K., Yeung E., Futran A.S., Burdine R.D., Schüpbach T., and Shvartsman S.Y., “Divergent effects of intrinsically active MEK variants on developmental Ras signaling”, Nature Genetics, 2017.

Highlighted by: [F1000Prime](#).

Media coverage: [MedicalXpress](#), [EurekAlert](#), [Technology Org](#), [Medical News](#), [Princeton](#).

*Jindal G.A., *Goyal Y., Yamaya K., Futran A.S., Kountouridis J., Schüpbach T., Burdine R.D., and Shvartsman S.Y., “In vivo severity ranking of Ras pathway mutations associated with developmental disorders”, PNAS, 2017.

*Johnson H.E., *Goyal Y., Pannucci N., Schüpbach T., Shvartsman S.Y., and Toettcher J.E., “The spatiotemporal limits of developmental Erk signaling”, Developmental Cell, 2017.

Awarded: [Best of 2017, Developmental Cell](#).

Journal cover: [January 23, 2017 issue](#).

Previewed by: Shilo B. and Barkai N., Developmental Cell, 2017.

Highlighted by: [F1000Prime](#).

*Jindal G.A., *Goyal Y., Burdine R.D., Rauen K.A., and Shvartsman S.Y., “Rasopathies: unraveling mechanisms with animal models”, Disease Models & Mechanisms, 2015.

Jenni S., Goyal Y., Grotthuss M.V., Shvartsman S.Y., and Klein D.E., “Structural basis of neurohormone perception by the receptor tyrosine kinase torso”, Molecular Cell, 2015.

Goyal Y., Kumar M., and Gayen K., “Metabolic engineering for enhanced hydrogen production: a review”, Canadian Journal of Microbiology, 2013.

Kumar M., Goyal Y., Sarkar A., and Gayen K., “Comparative economic assessment of ABE fermentation based on cellulosic and non-cellulosic feedstocks”, Applied Energy, 2012.

Sahu M., Wu B., Zhu L., Jacobson C., Wang W., Jones K., Goyal Y., Tang Y.J., and Biswas P., “Role of dopant concentration, crystal phase, and particle size on microbial inactivation of Cu-doped TiO₂ nanoparticles”, Nanotechnology, 2011.

*Colletti P. F., *Goyal Y., Varman A. M., Feng X., Wu B., and Tang Y.J., “Evaluating factors that influence microbial synthesis yields by linear regression with numerical and ordinal variables”, Biotechnology and Bioengineering, 2011.

Highlighted by: [Two year metabolic engineering issue, Biotechnology and Bioengineering](#).

INVITED TALKS	Theoretical Approaches in Cancer Progression and Treatment, India	2024
	Keynote, IITGN-UM SAFRON Event, University of Miami, U.S.	2023
	Society for Mathematical Biology Annual Meeting, U.S.	2023
	Joan and William Caro Lectureship in Dermatology, Northwestern University, U.S.	2023
	Biochemistry and Molecular Biology Department, Johns Hopkins University, U.S.	2023
	Physical Genomics and Transcriptional Engineering Workshop, Telluride, U.S.	2023
	Lurie Cancer Center Basic Science Research Seminar, Northwestern University, U.S.	2023
	Biomedical Engineering Department, Northwestern University, U.S.	2023
	Molecular Biosciences Department, Northwestern University, U.S.	2022
	Lineages and Development conference, Simons Foundation, India	2022
	Institute of Systems, Molecular and Integrative Biology, University of Liverpool, U.K.	2022
	BioSystems Science and Engineering Department, IISc Bangalore, India	2021
	Simpson Querrey Institute for Epigenetics BEAM, Northwestern University, U.S.	2021
	Society for Mathematical Biology Annual Meeting, U.S.	2021
	Alumni MasterClass, IIT Gandhinagar, India	2020
	[public lecture] The Rhodes House, University of Oxford, U.K.	2019
	The Francis Crick Institute, U.K.	2019
	Helmholtz Zentrum München, Germany	2019
	Institute of Bioengineering, EPFL, Switzerland	2018
	Chemical Engineering Department, Indian Institute of Science Bangalore, India	2017
	Mathematical Institute, University of Oxford, U.K.	2017
	Molecular Biosciences Department, Imperial College London, U.K.	2017
	Discovery Oncology, Genentech, U.S.	2016
Biophysics, UT Southwestern Medical Centre, U.S.	2016	
Chemical Engineering Department, IIT Gandhinagar, India	2013	

OTHER TALKS	CSHL Systems Biology: Global regulation of gene expression, U.S.	2020
	AICHE Annual Meeting, U.S.	2016
	Molecular Biology, Genentech, U.S.	2016
	Developmental Colloquium, Princeton University, U.S.	2016
	Graduate Student Symposium, Princeton University, U.S.	2015
	64 th Annual IChE meeting, India	2011

SELECTED	EMBO: The Identity and Evolution of Cell Types [†] , Germany	2019
POSTER	Keystone Symposia Conference: Cellular Plasticity, U.S.	2019
PRESENTATIONS	Bioengineering Day ^{††} , Princeton University, U.S.	2015
	4 th International RASopathies Symposium, U.S.	2015
	56 th Annual <i>Drosophila</i> Research Conference, U.S.	2015

[†]Selected for lightening talk

^{††}Poster award, \$200

MENTORING
EXPERIENCE **At Northwestern University**
Graduate students

Jonas Braun ^{†,††} , Visiting Mathematics Scholar, Technische Universität München	Feb 2022-
Emanuelle Grody ^{†††} , PhD student, Northwestern University	June 2022-
Nicolas Bodkin, MD-PhD student, Northwestern University	Aug 2022-
Madeline Melzer, PhD student (with Luisa Arispe), Northwestern University	June 2023-
Tito Chai, Masters Thesis student, Northwestern University	Nov 2022-

[†]DAAD IFI Fellowship

^{††}Invited talk, European Conference on Mathematical and Theoretical Biology, Germany

^{†††}NSF Synthesizing Biology Across Scales, National Research Traineeship

Undergraduate students

Sharon Choi*, Northwestern University	Apr 2022-
Sarah Sajjad, Northwestern University	Apr 2022-
Julia Jiminez**, SynBio NSF REU student, Elmhurst University	Jun-Aug 2022
Emilia Hojel, Northwestern University	Jul 2022-

*Northwestern University Office of Undergraduate Research Academic Year Grant
**Travel Award, ABRCMS conference in California, U.S.

Before Northwestern University

Graduate students

Karun Kiani, Genetics and Epigenetics, University of Pennsylvania	2019-22
Naveen Jain [†] , Genetics and Epigenetics, University of Pennsylvania	2019-22
Connie Jiang [†] , Genetics and Epigenetics, University of Pennsylvania	2019-21
Eric Sanford ^{††} , Genomics and Computational Biology, University of Pennsylvania	2019-20
Lea Schuh ^{†††} , Mathematics, Technische Universität München	2018-19
Shannon Keenan, Chemical Engineering, Princeton University	2016-17
Eyan Yeung, Molecular Biology, Princeton University	2016-17

[†]NIH F30 Fellowship

^{††}Member of Mentoring Team for successful NIH F30 application

^{†††}Highest Masters thesis grade and DAAD PROMOS Fellowship

Undergraduate students

Jordan Pemberton*, Health, University of Houston Honors College	2020
Amy Azaria, Bioengineering, University of Pennsylvania	2019-20
Kaijia Tian**, Chemical Engineering, Princeton University [current: analyst]	2016-17
Kei Yamaya***, Molecular Biology, Princeton University [current: Ph.D. Stanford]	2015-17
Natalia Chen, Electrical Engineering, Princeton University [current: data scientist]	2015
An Chu, Chemistry, Princeton University [current: Ph.D. MIT]	2014-15
Nalin Ratnayeke, Physics and Biology, UT Austin [current: Ph.D. Stanford]	2014

*Best oral presentation, American Physician Scientists Association regional meeting

**Senior thesis award

***Sigma Xi

TEACHING

Lecturer, Northwestern University

DGP 480: Molecular Mechanisms of Carcinogenesis (lecture rating: 5/5)	Winter 2023
CHEMENG 395-0-22: Deconstructing Synthetic Biolog (lecture rating: 4.34/5)	Winter 2023
DGP 435: Signal Transduction and Human Diseases (lecture rating: 4.89/5)	Fall 2022
DGP 456: Topics in Developmental Biology (lecture rating: 4.86/5)	Spring 2022
DGP 456: Topics in Developmental Biology (lecture rating: 4.88/5)	Spring 2023

Workshop lead, Northwestern University

Effective Data Visualization and Figure Design (workshop rating: 4.83/5)	Winter 2022
Effective Data Visualization and Figure Design (workshop rating: 4.70/5)	Fall 2022

Guest Lecturer, University of Pennsylvania

BE 559: Multiscale Modeling of Biological Systems	Fall 2017
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Teaching Assistant, Princeton University

MAT/MAE 305: Mathematics in Engineering-I	2014
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Teaching Assistant and Grader, IIT Gandhinagar

CL 207: Chemical Process Calculations	Fall 2009
MA 102: Linear Algebra	Spring 2009
MA 104: Ordinary Differential Equations	Spring 2009

SERVICE: THESIS COMMITTEES	Northwestern University	
	Gauri Bora, Chemical and Biological Engineering Advisor: Dr. Joshua Leonard	Aug 2022-
	Yuheng Fu, Driskill Graduate Program Advisors: Drs. Rui Ye and Rosemary Braun	Sep 2022-
	Jenny Pokorny, Driskill Graduate Program Advisor: Dr. Kathleen Green	Sep 2022-
	Danielle Pi, Medical Scientist Training Program Advisor: Dr. Luisa Arispe	Sep 2022-
SERVICE: COMMITTEES	Lead Organizer, Quantitative Biology Symposium	Jun 2023
	Cell and Developmental Biology, Northwestern University	
	Advisory Committee Member, Transgenic and Targeted Mutagenesis	May 2023-
	Northwestern University	
	Member, 10th Academic Advisory Council	Jan 2023
	IIT Gandhinagar, India	
	Co-Chair, Minisymposium at the Annual Meeting	Sept 2022
	European Conference on Mathematical and Theoretical Biology, Germany	
	Member, Admissions Committee	Sept 2022
Medical Scientist Training Program, Northwestern University		
Co-Chair, Committee on “Experts in the Field” Seminar Series	2022-	
Cell & Developmental Biology, Northwestern University		
Member, Committee on Diversity, Equity, and Inclusion	2021-	
Cell and Developmental Biology, Northwestern University		
Member, Faculty Search Committee	2022-	
Cell and Developmental Biology, Northwestern University		
Organizer, Annual Retreat	2022	
Center for Synthetic Biology, Northwestern University		
SERVICE: MISCELLANEOUS	Editorial Board Member, NPJ Systems Biology and Applications	Jun 2023-
	Springer Nature	
	Qualifying Exam Committee, Rachel Daso	Jun 2023
	Department of Biomedical Engineering, Northwestern University	
	Poster Judge, LCC Symposium	Jun 2023
Robert H Lurie Comprehensive Cancer Center, Northwestern University		
Poster Judge, LCC Symposium	Jun 2022	
Robert H Lurie Comprehensive Cancer Center, Northwestern University		
Judge, CRS Reproductive Science and Medicine Summit	May 2022	
Center for Reproductive Science, Northwestern University		
SERVICE: REVIEWER	Reviewer, iScience; Development, Elife	2022-
	Reviewer, Nature Cell Biology; ACS Synthetic Biology	2021-
	Reviewer, Frontiers in Cell and Developmental Biology	2020-
	Reviewer, Scientific Reports; International Journal of Molecular Sciences	2019-
	Co-reviewer, Developmental Cell; Nature; Nature Communications	2019-
	Reviewer, PLOS Genetics; Journal of Developmental Biology	2018-
Reviewer, Biophysical Journal	2014-	

PANELS	Alumni Panel Discussion, Foundation Program, IIT Gandhinagar Academic Job Search During the Pandemic, CEMB, University of Pennsylvania	Nov 2021 Sept 2021
MEMBERSHIPS	Member, American Chemical Society (ACS) Member, Society for Mathematical Biology (SMB) Associate Faculty Member, F1000Prime Student Member, American Institute of Chemical Engineers (AIChE) Student Member, Genetic Society of America (GSA) Institute Nominee Member, American Mathematical Society (AMS) Student Member, Indian Institute of Chemical Engineers (IChE) Student Member, Institute of Chemical Engineers, U.K. (ICChemE)	2022- 2021- 2018-20 2016-17 2015-16 2011-13 2011-12 2011-12
POSITIONS OF LEADERSHIP	President, Association of South Asians , Princeton University Revived leadership within the organization for South Asian graduate students at Princeton University. Duties included securing and managing funds, collaborating with university administrators, selecting association officers, and event management. CBE Departmental Representative , Princeton University Selected to represent CBE graduate students in the Graduate Engineering Council (GEC). GEC holds monthly meetings, plans, and executes events catering to the diverse engineering population at Princeton. Class Representative , CBE, Princeton University Elected as the class representative to express graduate students' concerns. Activities involved periodic meetings with the Director of Graduate Studies, attending advisory council meetings, and organizing monthly social events. Captain, Basketball Team , IIT Gandhinagar Led the institute team in regional and national tournaments. Involved in team selection and organizing tournaments. Captained the Chemical Engineering basketball team and won three inter-department championships in a row.	2013-16 2012-13 2008-10
VOLUNTEER & OUTREACH EXPERIENCE	Volunteer, Skype A Scientist Held several Skype A Scientist sessions with K-12 classrooms mostly located in remote and rural parts of the U.S. Volunteer, NYASA , IIT Gandhinagar Provided advice for and participated in activities organized by NYASA, an organization run by students dedicated to providing resources and services to local migrant construction laborers and their families. Founder and coordinator, Green Gang , IIT Gandhinagar Spearheaded activities in the local community such as education and cleanliness drives, and implemented survey regarding non-conventional energy sources. Our survey was highlighted in the media .	2017- 2011-12 2009-10
SCIENCE VIZUALIZATION/ COMMUNICATION	Data Visualization Workshop by David McCandless Working with Artists Webinar by Alan Alda Center for Communicating Science Presenting Data Visually Sessions by Bang Wong Science Communication Workshop by Alan Alda Center for Communicating Science	2020 2020 2018 2018
MEDIA COVERAGE	Research and Academics Schmidt Science Fellows , Breakthroughs Magazine Schmidt Science Fellows Princeton University Princeton Engineering	2022 2020 2017 2015

Amar Ujala, Dainik Jagran	2006
Awards and Fellowships	
STAT News	2021
Schmidt Science Fellows, Princeton University, University of Pennsylvania	2020
University of Pennsylvania	2018
Forbes, The Times of India, Princeton University, Dainik Bhaskar	2018
Art and Science	
The Wall Street Journal, Princeton Alumni Weekly, Princeton University	2018
Smithsonian, NBC, PhysOrg, Business Insider, New Scientist, Daily Mail	2014
Extracurricular Activities	
DNA India	2009
Hindustan Times, Amar Ujala, Punjab Kesri, Kashmir Times, Early Times	2006