Karthik Shekhar - Curriculum Vitae

Dept. of Chemical and Biomolecular Engineering
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EDUCATION

Ph.D. in Chemical Engineering   September 2008 - May 2014
Massachusetts Institute of Technology
Thesis: Dimensionality Reduction in Immunology: From Viruses to Cells
Mentor: Prof. Arup K. Chakraborty
Thesis Committee: Prof. Mehran Kardar, Prof. J. Christopher Love, and Dr. Bruce D. Walker

Dual Degree (B.Tech + M. Tech) in Chemical Engineering   August 2003 - May 2008
Indian Institute of Technology, Bombay
Thesis: Effects of Mass Transfer Limitations on Cyclohexane Oxidation Kinetics
Thesis Mentor: Prof. A. K. Suresh
Internship Mentor: Prof. Doraiswami Ramkrishna, Purdue University (May - August 2006)

PROFESSIONAL APPOINTMENTS

- **Assistant Professor**   January 2020 - Present
  Chemical and Biomolecular Engineering
  University of California, Berkeley

- **Faculty Member**   January 2020 - Present
  Helen Wills Neuroscience Institute
  University of California, Berkeley

- **Faculty Affiliate**   January 2020 - Present
  Biophysics Graduate Group
  University of California, Berkeley

- **Faculty Affiliate**   January 2020 - Present
  Center for Computational Biology
  University of California, Berkeley

- **Postdoctoral Fellow**   October 2014 - December 2019
  Broad Institute of MIT and Harvard
  Mentor: Prof. Aviv Regev
  Collaborator: Prof. Joshua R. Sanes

- **Process Engineering Intern**, MIT Practice School   August 2010
  Cabot Superior Micropowders (Albuquerque, NM)

- **Process Engineering Intern**, MIT Practice School   June-July 2010
  Novartis Pharmaceuticals Corporation (East Hanover, NJ)

HONORS AND AWARDS

- **NIH Pathway to Independence Award (K99/R00)** March 2018-March 2023
- **Outstanding Graduate Teaching Assistant** 2013
  MIT Department of Chemical Engineering
- **Best Graduate Student Seminar** 2013
  MIT Department of Chemical Engineering
- **Poitras pre-doctoral fellowship for Biomedical Research** 2011
  MIT
- **Jerry & Geraldine S. McAfee Fellowship** 2009
  MIT Department of Chemical Engineering
- **Institute Silver Medal** 2008
  IIT Bombay
- **Manudhane Award for Best M. Tech Thesis** 2008
  Department of Chemical Engineering, IIT Bombay
- **SURF visiting scholar** 2006
  Purdue University

PAPERS AND PREPRINTS

*equal contributions, ‡corresponding author

1. Shekhar, K.‡ and Sanes, J. R.‡, Generating and using transcriptomically based retinal cell atlases., *Annual Review of Vision Science*, (2021) *(in press)*

2. Beyaz, S., Roper, J., Xifaras, M.E., Bauer-Rowe, K.E., Ergin, I., Dohnalova, L., Biton, M., Shekhar, K., Mou, H., Eskiocak, O. and Ozata, D.M., et al. Dietary suppression of MHC-II expression in intestinal stem cells enhances intestinal tumorigenesis. *bioRxiv*, (2020)

3. Kölsch, Y., Hahn, J., Sappington, A., Stemmer, M., Fernandes, A.M., Helmbrecht, T.O., Lele, S., Butrus, S., Laurell, E., Arnold-Ammer, I., Shekhar, K.‡, Sanes, J.R.‡, and Baier, H.‡, Molecular classification of zebrafish retinal ganglion cells links genes to cell types to behavior. *bioRxiv*, `https://doi.org/10.1101/2020.07.29.226050` (2020) *in press at Neuron*

4. Yan, W.*, Peng, Y.R.*, van Zyl, T.*, Regev, A., Shekhar, K., Juric, D. and Sanes, J.R.‡, Cell Atlas of the Human Fovea and Peripheral Retina. *bioRxiv*, `https://doi.org/10.1101/2020.02.11.943779` (2020)

5. van Zyl, T.*, Yan, W.*, McAdams, A., Peng, Y.R., Shekhar, K., Regev, A., Juric, D. and Sanes, J.R.‡, Cell atlas of aqueous humor outflow pathways in eyes of humans and four model species provides insight into glaucoma pathogenesis. *Proceedings of the National Academy of Sciences*, 117(19), pp.10339-10349, (2020).

6. Tran, N.M.*, Shekhar, K.*, Whitney, I.E.*, Jacobi, A.*, Benhar, I., Hong, G., Yan, W., Adiconis, X., Arnold, M.E., Lee, J.M., Levin, J.Z. et al., Single-cell profiles of retinal ganglion cells differing in resilience to injury reveal neuroprotective genes. *Neuron*, 104(6), pp.1039-1055, (2019).

7. Peng, Y.R.*, Shekhar, K.*, Yan, W., Herrmann, D., Sappington, A., Bryman, G.S., van Zyl, T., Do, M.T.H., Regev, A. and Sanes, J.R.‡, Molecular classification and comparative taxonomics of foveal and peripheral cells in primate retina. *Cell*, 176(5), pp.1222-1237 (2019).

8. Moffitt, J.R.*, Bambah-Mukku, D.*, Eichhorn, S.W., Vaughn, E., Shekhar, K., Perez, J.D., Rubinstein, N.D., Hao, J., Regev, A., Dulac, C.‡ and Zhuang, X.‡, Molecular, spatial, and functional single-cell profiling of the hypothalamic preoptic region. *Science*, 362(6416), (2018).

9. Biton, M.*, Haber, A.L.*, Rogel, N., Burgin, G., Beyaz, S., Schnell, A., Ashenberg, O., Su, C.W., Smillie, C., Shekhar, K., Chen, Z. et al., T helper cell cytokines modulate intestinal stem cell renewal and differentiation. *Cell*, 175(5), pp.1307-1320, (2018).

10. Farrell, J.A.*, Wang, Y.*, Riesenfeld, S.J., Shekhar, K., Regev, A.‡ and Schier, A.F.‡, Single-cell reconstruction of developmental trajectories during zebrafish embryogenesis. *Science*, 360(6392), (2018).

11. Pandey, S., Shekhar, K., Regev, A. and Schier, A.F.‡, Comprehensive identification and spatial mapping of habenular neuronal types using single-cell RNA-seq. *Current Biology*, 28(7), pp.1052-1065, (2018).

12. Haber, A.L.*, Biton, M.*, Rogel, N.*, Herbst, R.H., Shekhar, K., Smillie, C., Burgin, G., Delorey, T.M., Howitt, M.R., Katz, Y., Tirosh, I. et al., A single-cell survey of the small intestinal epithelium. *Nature*, 551(7680), pp.333-339. (2017).

13. Habib, N.*, Avraham-Davidi, I.*, Basu, A.*, Burks, T., Shekhar, K., Hofree, M., Choudhury, S.R., Aguet, F., Gelfand, E., Ardlie, K., Weitz, D.A. et al., Massively parallel single-nucleus RNA-seq with DroNc-seq. *Nature Methods*, 14(10), pp.955-958., (2017).

14. Kaczorowski, K.J., Shekhar, K., Nkulikiyimfura, D., Dekker, C.L., Maecker, H., Davis, M.M.‡, Chakraborty, A.K.‡ and Brodin, P.‡, Continuous immunotypes describe human immune variation and predict diverse responses. *Proceedings of the National Academy of Sciences*, 114(30), pp.E6097-E6106, (2017).

15. Villani, A.C.*, Satija, R.*, Reynolds, G., Sarkizova, S., Shekhar, K., Fletcher, J., Griesbeck, M., Butler, A., Zheng, S., Lazo, S., Jardine, L. et al., Single-cell RNA-seq reveals new types of human blood dendritic cells, monocytes, and progenitors. *Science*, 356(6335), (2017).

16. Werley, C.A., Chien, M.P., Gaublomme, J., Shekhar, K., Butty, V., Yi, B.A., Kralj, J.M., Bloxham, W., Boyer, L.A., Regev, A. and Cohen, A.E.‡, 2017. Geometry-dependent functional changes in iPSC-derived cardiomyocytes probed by functional imaging and RNA sequencing. *PloS One*, 12(3), p.e0172671, (2017).

17. Stadinski, B.D., Shekhar, K., Gómez-Touriño, I., Jung, J., Sasaki, K., Sewell, A.K., Peakman, M., Chakraborty, A.K. and Huseby, E.S.. Hydrophobic CDR3 residues promote the development of self-reactive T cells. *Nature Immunology*, 17(8), pp.946-955, (2016).

18. Shekhar, K.*, Lapan, S.W.*, Whitney, I.E.*, Tran, N.M., Macosko, E.Z., Kowalczyk, M., Adiconis, X., Levin, J.Z., Nemesh, J., Goldman, M. and McCarroll, S.A.. Comprehensive classification of retinal bipolar neurons by single-cell transcriptomics. *Cell*, 166(5), pp.1308-1323, (2016).

19. Ndhlovu, Z.M., Kamya, P., Mewalal, N., Kløverpris, H.N., Nkosi, T., Pretorius, K., Laher, F., Ogunshola, F., Chopera, D., Shekhar, K. and Ghebremichael, M., Magnitude and kinetics of CD8+ T cell activation during hyperacute HIV infection impact viral set point. *Immunity*, 43(3), pp.591-604, (2015).

20. Macosko, E.Z., Basu, A., Satija, R., Nemesh, J., Shekhar, K., Goldman, M., Tirosh, I., Bialas, A.R., Kamitaki, N., Martersteck, E.M., Trombetta, J.J. et al., Highly parallel genome-wide expression profiling of individual cells using nanoliter droplets. *Cell*, 161(5), pp.1202-1214, (2015).

21. Quadeer, A.A., Louie, R.H., Shekhar, K., Chakraborty, A.K., Hsing, I.M. and McKay, M.R.‡, Statistical linkage analysis of substitutions in patient-derived sequences of genotype 1a hepatitis

C virus nonstructural protein 3 exposes targets for immunogen design. *Journal of Virology*, 88(13), pp.7628-7644, (2014).

22. Shekhar, K.*, Brodin, P.*, Davis, M.M.[‡] and Chakraborty, A.K.[‡], Automatic classification of cellular expression by nonlinear stochastic embedding (ACCENSE). *Proceedings of the National Academy of Sciences*, 111(1), pp.202-207, (2014)

23. Quadeer, A.A., Louie, R.H., Shekhar, K., Chakraborty, A.K., Hsing, I. and McKay, M.R.[‡], Discovering statistical vulnerabilities in highly mutable viruses: A random matrix approach. *2014 IEEE Workshop on Statistical Signal Processing (SSP) (pp. 5-8). IEEE*, (2014).

24. Barouch, D.H.[‡], Whitney, J.B., Moldt, B., Klein, F., Oliveira, T.Y., Liu, J., Stephenson, K.E., Chang, H.W., Shekhar, K., Gupta, S., Nkolola, J.P. et al., Therapeutic efficacy of potent neutralizing HIV-1-specific monoclonal antibodies in SHIV-infected rhesus monkeys. *Nature*, 503(7475), pp.224-228, (2013).

25. Shekhar, K., Ruberman, C.F., Ferguson, A.L., Barton, J.P., Kardar, M. and Chakraborty, A.K.[‡], Spin models inferred from patient-derived viral sequence data faithfully describe HIV fitness landscapes. *Physical review E*, 88(6), p.062705, (2013).

26. Dahirel, V.*, Shekhar, K.*, Pereyra, F., Miura, T., Artyomov, M., Talsania, S., Allen, T.M., Altfeld, M., Carrington, M., Irvine, D.J., Walker, B.D.[‡] and Chakraborty, A.K.[‡], Coordinate linkage of HIV evolution reveals regions of immunological vulnerability. *Proceedings of the National Academy of Sciences*, 108(28), pp.11530-11535, (2011).

BOOK CHAPTERS

1. Shekhar, K.[‡] and Menon, V.[‡], Identification of cell types from single-cell transcriptomic data. In *Computational Methods for Single-Cell Data Analysis* (pp. 45-77). Humana Press, New York, NY, (2019).

2. Villani, A.C.[‡] and Shekhar, K.[‡], Single-cell RNA sequencing of human T cells. In *T-Cell Differentiation* (pp. 203-239). Humana Press, New York, NY, (2017).

PATENTS

1. Haber, A., Biton, M., Herbst, R.H., Shekhar, K., Smillie, C., Rozenblatt-Rosen, O., Xavier, R., Regev, A., Ordovas-Montanes, J., Shalek, A.K. and Rogel, N., Modulation of intestinal epithelial cell differentiation, maintenance and/or function through t cell action. U.S. Patent Application 16/348,911, (2019).

2. Shekhar, K., Lapan, S., Whitney, I., Macosko, E., Mccarroll, S., Cepko, C., Regev, A. and Sanes, J., Harvard College, Massachusetts Institute of Technology and Broad Institute Inc, Method for determination and identification of cell signatures and cell markers. U.S. Patent Application 15/680,127, (2018).

PRESENTATIONS

1. Retinal cells in development and dysfunction, *Opthalmology Grand Rounds at Stanford Byers Eye Institute*, (November 2020) **Invited Lecture**

2. Single-cell transcriptomic dissection of selective vulnerability in the CNS, *Virtual Conference on Development and Regeneration in Neural Circuits: Common Themes and Important Differences, Society for Neuroscience*, (September 2020) **Invited Lecture**

3. Making and using a retinal cell atlas, *Workshop on recent advances in single-cell genomics, ASCB EMBO meeting, Washington D.C.*, (December 2019) **Invited Lecture**

4. Single-cell transcriptomic inference of the postmitotic diversification of 45 types of retinal ganglion cells, *Society for Neuroscience Annual Meeting*, (November 2019) **Contributed Poster**

5. Molecular classification of retinal neurons: from form to function, *Lawrence Berkeley Laboratory, Division of Biosciences*, (June 2019) **Invited Lecture**

6. Of Mice and Monkeys: single-cell analysis of the mammalian retina, *Halıcıoğlu Data Science Institute Special Seminar, University of California, San Diego*, (May 2019) **Invited Lecture**

7. Of Mice and Monkeys: single-cell analysis of the vertebrate retina, *Department of Pathology Seminar, University of Massachusetts Medical School, Worcester MA*, (April 2019), **Invited Lecture**

8. Of Mice and Monkeys: single-cell analysis of the mammalian retina, *Gladstone Institute of Neurological Disease and Bakar Computational Health Sciences, University of California, San Francisco*, (March 2019) **Invited Lecture**

9. Of Mice and Monkeys: single-cell analysis of the mammalian retina, *Department of Chemical Engineering, Stanford University*, (February 2019) **Invited Lecture**

10. Single-cell inference of retinal neuronal diversity, *Department of Bioengineering, University of California, San Diego*, (February 2019) **Invited Lecture**

11. Of Mice and Monkeys: single-cell analysis of the mammalian retina, *Department of Chemical and Biomolecular Engineering, University of California, Berkeley*, (February 2019) **Invited Lecture**

12. Of Mice and Monkeys: single-cell transcriptomic classification of the vertebrate retina, *USC Stem Cell and Broad CIRM Center, University of Southern California*, (February 2019) **Invited Lecture**

13. Of Mice and Monkeys: single-cell transcriptomic classification of the vertebrate retina, *Center for Computational and Integrative Biology, Massachusetts General Hospital, Boston*, (January 2019) **Invited Lecture**

14. Single-cell transcriptomic classification of the mammalian retina, *Neurology Seminar, Northwestern University Feinberg School of Medicine, Chicago* (December 2018) **Invited Lecture**

15. Molecular Survey of the Vertebrate Retina at Single-cell Resolution, *Society for Neuroscience Annual Meeting*, (November 2018) **Contributed Dynamic Poster**

16. Of Mice and Monkeys - Cell Types in the Mammalian Retina: From Form to Function, *Molecular and Systems Biology Seminar, Dartmouth College*, (September 2018) **Invited Lecture**

17. Molecular specification of cell types underlying central vision in primates, *Klarman Cell Observatory (KCO) Scientific Advisory Board (SAB) Meeting at Broad Institute*, Cambridge, MA (June 2018) **Invited Presentation**

18. Comprehensive Neuronal Taxonomy of the Mammalian Retina, *Sixth Annual KCO Retreat, Broad Institute, Cambridge, MA*, (January 2018) **Invited Presentation**

19. A Cell Atlas of the Retina, *Society for Neuroscience Annual Meeting*, (November 2017) Contributed Dynamic Poster (included among 2017 SfN's *Hot Topics* book)

20. A Complete Molecular Address Book of Retinal Neuronal Types: Structure, Development and Dysfunction, *Single Cell Genomics, Weizmann Institute of Science, Israel*, (October 2017), **Contributed Poster**

21. A Part's List of the Retina, *presentation delivered to members of the Chan Zuckerberg Initiative at the Broad Institute, Cambridge, MA*, (September 2017) **Invited Presentation**

22. Single-cell analysis of retinal neuronal diversity and development, *nference Inc., Cambridge MA*, (July 2017) **Invited Lecture**

23. Telling forests from trees: the role of analysis in single-cell transcriptomics, *Human Cell Atlas (HCA) computational working group, Cambridge, MA*, (June 2017) **Invited Lecture**

24. Molecular address-book of retinal neurons, *KCO SAB meeting at the Broad Institute, Cambridge, MA*, (June 2017) **Invited Presentation**

25. Single-cell RNA-sequencing efforts to map the brain, *United States Patent and Trademark Office Technology Fair, Washington DC*, (April 2017) **Invited Presentation**

26. Molecular specification of neuronal types using single-cell transcriptomics, *Chemical Engineering Department Seminar, IIT Bombay*, (January 2017) **Invited Presentation**

27. Comprehensive classification of single retinal neurons using massively parallel RNA-seq, *Single Cell Genomics, Cambridge, UK*, (September 2016) **Contributed Poster**

28. Deciphering cellular organization, development and disruption using single cell transcriptomics, *VIB Brain Mosaic conference, Leuven, Belgium*, (September 2016) **Invited Lecture**

29. A molecular taxonomy of the mouse retina, *Fourth Annual Broad-ISF Cell Circuits Symposium, Cambridge, MA, USA* (June 2016) **Contributed Poster**

30. Massively parallel single-cell RNA sequencing of the mouse retina, *Single Cell Genomics, Utrecht, Netherlands* (September 2015) **Contributed Poster**

31. Massively parallel single-cell RNA sequencing of the mouse retina, *Third Annual Broad-ISF Cell Circuits Symposium, Jerusalem, Israel* (June 2015) **Contributed Poster**

32. Introduction to single cell RNA-seq analysis, *Cytomining Hackathon, Broad Institute, Cambridge, USA*, (May 2016) **Invited Lecture**

33. Structural insights into the development of autoreactive T cells, *Cold Spring Harbor Laboratory Meetings : Fundamental Immunology and its therapeutic potential, NY* (April 2015) **Contributed Poster**

34. Automatic Classification of Cellular Expression by Nonlinear Stochastic Embedding (ACCENSE), *Winter q-bio meeting, Kona HI* (Feb 2014) **Contributed Poster**

35. Automatic Cellular Classification through Nonlinear Dimensionality Reduction, *Division of Biomedical Engineering, Hong Kong University of Science and Technology*, (January 2014) **Invited Lecture**

36. Coevolution in HIV proteins and its relevance for vaccine design, *Seminar at the Biosciences Department, IIT Bombay*, (December 2013) **Invited Lecture**

37. Automated immune phenotype detection from high-throughput single cell data, *AIChE Annual Meeting, Session on Paradigms in Systems Biology, San Francisco CA* (Nov 2013) **Contributed Presentation**

38. Robust inference of viral fitness landscapes from patient-derived viral sequence data, *Winter q-bio meeting, Honolulu HI* (Feb 2013) **Contributed Poster**

39. Robust inference of viral fitness landscapes from patient-derived viral sequence data, *Biophysical Society 57th Annual Meeting, Philadelphia PA* (Feb 2013) **Contributed Poster**

40. Collective Evolution in HIV Proteins : Sequences to Immunogens, *Workshop presentation, Keystone symposium on HIV vaccines, Keystone, CO*, (March 2012) **Invited Presentation**

41. Analysis of collective coevolution in HIV proteins reveals strategies for rational immunogen design, *Biophysical Society 56th Annual Meeting, San Diego CA* (Feb 2012) **Contributed Presentation**

42. Random Matrix Theory reveals the immunologic vulnerability of HIV, *13th Greater Boston Area Statistical Mechanics Meeting, Brandeis University, MA* (October 2011) **Contributed Presentation**

43. Finding HIV's Achilles' Heel: Sequence Analysis to Vaccine Design, *Dept. of Chemical Engineering, MIT, Cambridge, MA*, (October 2011) **Graduate Student Seminar**

44. Some effects of mass transfer limitations on hydrocarbon oxidation kinetics, with A. K. Suresh, *18th International Congress of Chemical and Process Engineering, Prague* (2008) **Contributed Presentation**

RESEARCH SUPPORT

- **Ongoing Research Support**
  - Chan Zuckerberg Initiative, "Cell Atlas of the Human Eye from Birth to Old Age", $266,800, co-PI (with Joshua R. Sanes), (07/01/2020 - 06/30/2022)
  - NIH R00, "Uncovering the molecular identity of retinal cell types, and their responses to nerve injury using single-cell transcriptomics", $749,000, PI (03/01/2020 - 02/28/2023)

- **Completed Research Support**
  - K99, "Uncovering the molecular identity of retinal cell types, and their responses to nerve injury using single-cell transcriptomics", $200,000, PI (trainee phase) (03/01/2018 - 12/31/2019)

PROFESSIONAL SERVICE

- **UC Berkeley**
  - Faculty Reviewer, Amgen Scholars Program (2020)

- **Chemical and Biomolecular Engineering, UC Berkeley**
  - Adhoc committee on Statistics in the Undergraduate Curriculum (2020)
  - Qualifying Exam Committees (2020)
  - Member, Graduate Admissions Committee (2019)

- **Peer reviewer** for Briefings in Functional Genomics, Developmental Cell, eLife, Genome Biology, Genome Research, Journal of Theoretical Biology, Nature Biotechnology, Nature Cell Biology, Nature Communications, Nature Methods, Nature Immunology, Neuron, Nucleic Acids Research, Frontiers in Genetics, PloS Biology, PloS Computational Biology, PloS One, Proteomics, Science Advances, Scientific Reports.

- **Grant Review**
  - The French Muscular Dystrophy Association (AFM)-Telethon, Nervous System (Motoneuron and Neuromuscular Junction), (2020)
  - Landsteiner Foundation for Blood Transfusion Research (LSBR), (2017)

- **Review Editor** for Frontiers in Neuroscience (2020 -)

- **Consultant**: Olaris Therapeutics Inc (2016-2017)

TEACHING

- **UC Berkeley** (Evaluation range 1-7, 1=low, 7=high)
  - CBE142: Chemical Kinetics and Reaction Engineering, Fall '20
  - CBE143: Data Analytics for Chemical Engineers, Spring '20 (with Prof. Ali Mesbah)
    * Instructor Effectiveness - 6.68, Lecture Quality - 6.77, Course Effectiveness - 6.44
- **Other**
  - 2018 Workshop on Genomics, Český Krumlov, Module on "Single-cell transcriptomics", January 2018
  - MIT 18.440 Analysis of Biological Networks, Lectures on "Single-cell RNA sequencing analysis", Spring 2017 (Guest Lecturer)
  - MIT 10.40 Chemical Engineering Thermodynamics, Fall 2011 (Teaching Assistant)
    * Overall Rating - 6.3/7
    * 2012 Best Teaching Assistant Award, Department of Chemical Engineering

ACADEMIC ADVISING

- **UC Berkeley**
  - <u>Ph.D. Students</u>
    1. Alhad Deshpande, (CBE, 2021 -)
    2. Pedro Guimares Martins, (CBE, 2021 -)
    3. Salwan Butrus, (CBE, 2020 -)
    4. Joshua Hahn, (CBE, 2020 -)
  - <u>Undergraduate Researchers</u>
    1. Srikant Sagireddy, (CBE, 2020 -)
    2. Shawn Koong, (CBE, 2020 -)
    3. Zaid Ahmad, (Mathematics and Statistics, 2020 -)
    4. Jason Hou, (CBE, 2020 -)
  - <u>Rotation Students</u>
    1. Jesse Dunnack, (Molecular and Cellular Biology, March-May 2020)
- **Before UC Berkeley**
  - <u>Broad Institute and Harvard University</u>
    * Anna Sappington (B.S., MIT), undergraduate researcher (2018-2019)
    * Qingyang (Alice) Wang (B.S., HKUST), undergraduate research (2017)
  - <u>MIT</u>
    * Jered Everson and Jonathan Wang, K-12 researchers (June-July 2014)
    * Sanjana Gupta (B.S, IIT Guwahati), undergraduate researcher (May-August 2013)

∗ Claire F. Ruberman (B.S., Pomona College), undergraduate researcher (May-August 2012)

∗ Shiv Talsania (B.S., Loughborough University), undergraduate researcher (May-August 2010)