

Supriya Munshaw, Ph.D.

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Education

Ph.D., Computational Biology and Bioinformatics, Duke University, Durham, NC

May 2010

B.A, Natural Sciences and Mathematics, Bard College, Annandale on Hudson, NY (Distinguished Science Scholar).

May 2004

Experience

TCP Venture Capital

March 2019 - present

Investment Partner

- Evaluate Baltimore-based startups for investment from the Propel Baltimore II fund.
- Appointed to General Partner in February 2021

Johns Hopkins Carey Business School, Baltimore, MD

Senior Lecturer

August 2018 - Present

Lecturer

August 2013 - August 2018

- Courses Developed:
 - **Technology Entrepreneurship**: Developed and managed an Executive Education course focused on helping participants bring their ideas to market
 - **Entrepreneurship Bootcamp**: Co-developed and managed the JHU Summer Entrepreneurship Bootcamp, a workshop aimed to assist Johns Hopkins faculty, staff and, students to move their ideas towards commercialization
 - **Pharmaceutical Strategy (online and onsite)**: developed a new course that provides overview of scientific, clinical, legal, financial, strategic and ethical perspectives and focuses on new developments in the biotechnology and pharmaceutical industries.
 - **Flipped model of Statistical Analysis**: modified existing Statistical Analysis course into a flipped model where students watch recorded lectures outside of class and work on case studies and problems in class.
 - **Analysis for Product & Services Innovation**: a new product and service innovation course, re-designed the syllabus and taught to master's students in the Marketing Curriculum
- Courses taught:
 - **Discovery to Market**: Managing and independently teaching a program where students learn to assess commercial potential of early scientific discoveries and technological innovations through lectures and experiential learning.
 - **Statistical Analysis (online and onsite)**: taught an introductory statistics course to MS Finance, MS Marketing and Part-time MBA
 - **Business Leadership & Human Values (online and onsite)**: taught a class in business ethics and leadership to MS Healthcare and Part-time MBA students

Johns Hopkins Carey Business School, Baltimore, MD

August 2012 - August 2013

Program Manager, Discovery to Market Program

- Managed and coached student teams to determine the commercial potential of technology innovations
- Advised students on understanding basic science of technologies, searching scientific literature and intellectual property landscape, performing market research analyses and developing business models
- Instructed and led workshops on conducting patent searches, library and scientific research
- Developed collaborations and partnerships with industry, Johns Hopkins Technology Ventures, small businesses and federal laboratories to source technology commercialization projects

Johns Hopkins School of Medicine, Baltimore, MD

June 2010 - July 2012

Postdoctoral Fellow, Viral Hepatitis Center

- Teaching assistant for an introductory immunology course designed for medical students at Perdana University Graduate School of Medicine in Kuala Lumpur, Malaysia (February and March 2012)
- Designed a synthetic representative Hepatitis C Virus using sequence and phylogenetic analysis tools (Publications 2, 11-12, patent issued)
- Identified markers of fibrosis progression by microarray analysis using Bioconductor in R of Hepatitis C Infected livers (Publication 10)
- Studied epidemiology of parainfluenza (Publication 8), HCV (Publication 7) and HIV-1 (Publications 4-6, 7, 13, 15) using various phylogenetic techniques

Graduate Student, Center for Computational Immunology

- Thesis – Computational Methods to Study Diversification in Pathogens (HIV-1), and Invertebrate (Purple Sea Urchin) and Vertebrate (Human) Immune Systems
- Developed an Oracle SQL database and performed statistical analysis to study biases in antibody sequences from acute HIV-1 and influenza infected patients (Publications 3, 14, 16, 18)
- Developed and implemented algorithm in C# using a Hidden Markov Model to study antibody sequences (Publication 17)
- Developed and implemented algorithm in C++ to study within-patient HIV-1 evolution (Publication 20)
- Studied diversity in immune receptor genes of the Purple Sea Urchin (Publication 19)

Skills

- Fluent in methods pertaining to technology commercialization such as market research and business model generation
- Knowledge of intellectual property, reimbursement and FDA laws pertaining to biomedical technology commercialization
- Fluent in the use of various programming languages such as C++, Perl, and C# in MS Visual Studio and Unix environments and R (including Bioconductor)
- Fluent in the use of classical statistical methods for exploratory data analysis and knowledge of Bayesian and Markov Chain Monte Carlo methods
- Fluent in use of Phylogenetic Software jModelTest, PAUP*, MrBayes, GARLI, MEGA and Phylip
- Knowledge of Oracle-based SQL, C, Java and in use of Amazon Cloud Computing EC2
- Knowledge and experience in laboratory techniques such as PCR mutagenesis, molecular cloning, qPCR, DNA and RNA extraction cell culture, serum activity assays, ELISA.
- Fluent in English, Hindi and Gujarati. Basic knowledge of French.

Awards

- Carey Teaching Innovation Grant, 2020
- Dean's Award for Faculty Excellence, 2018 and 2019
- Diversity Recognition Award, 2019
- Rustgi Family Fund for Entrepreneurship Award, 2015

Cases

1. **Munshaw S. & Black C. (2021).** Venturing into Retail. Accepted for publication. **Finalist for *The Case for Women* competition.**
2. **Munshaw S. & Black C. (2021).** **The Values-Driven Startup.** Accepted for publication. ***The Case for Women.***
3. **Munshaw, S. & Chawla, A., (2019).** Pricing a new drug. In SAGE Business Cases.

Research Publications

1. Adam A, Jain A, Pletnikova A, Bagga R, Vita A, N Richey L, Gould N, **Munshaw S**, Misrilall K, Peters ME. Use of a Mobile App to Augment Psychotherapy in a Community Psychiatric Clinic: Feasibility and Fidelity Trial. *JMIR Form Res.* 2020 Jul 3;4(7): e17722. doi: 10.2196/17722. PMID: 32618572; PMCID: PMC7367543.
2. **Munshaw, S.**, Lee, S. H., Phan, P., & Marr, K. 2019. The influence of human capital and perceived university support on patent applications of biomedical investigators. *J Technol Transf* **44**, 1216–1235 (2019)
3. Wasilewski L, El-Diwanly R, **Munshaw S**, Snider A, Brady J, Osburn W.O., Ray S.C, and Bailey J.R. (2016). A hepatitis C virus envelope polymorphism confers resistance to neutralization by polyclonal sera and broadly neutralizing monoclonal antibodies. *J Virol.* 90(7): 3773-82.
4. Kepler T.B., **Munshaw S**, Wiehe K., Zhang R., Yu J.S., Woods C.W., Denny T.N., Tomaras G.D., Alam S.M., Moody M.A., Kelsoe G., Liao H.X., Haynes B.F. (2014). Reconstructing a B-Cell Clonal Lineage. II. Mutation, Selection, and Affinity Maturation. *Front Immunol.* Apr 22;5:170.
5. Grabowski, M. K., Lessler, J., Redd, A. D., Kagaayi, J., Laeyendecker, O., Ndyanabo, A., Nelson, M. I., Cummings, D. A., Bwanika, J. B., Mueller, A. C., Reynolds, S. J., **Munshaw, S.**, Ray, S. C., Lutalo, T., Manucci, J., Tobian, A. A., Chang, L. W., Beyrer, C., Jennings, J. M., Nalugoda, F., Serwadda, D., Wawer, M. J., Quinn, T. C., Gray, R. H. (2014). The Role of Viral Introductions in Sustaining Community-Based HIV Epidemics in Rural Uganda: Evidence from Spatial Clustering, Phylogenetics, and Egocentric Transmission Models.. *PLoS medicine*, 11(3), e1001610.
6. Ng, O. T., Laeyendecker, O., Redd, A. D., **Munshaw, S.**, Grabowski, M. K., Paquet, A. C., Evans, M. C., Haddad, M., Huang, W., Robb, M. L., Reynolds, S. J., Gray, R. H., Wawer, M. J., Serwadda, D., Eshleman, S. H., Quinn, T. C. (2014). HIV type 1 polymerase gene polymorphisms are associated with phenotypic differences in replication capacity and disease progression.. *The Journal of infectious diseases*, 209(1), 66-73.
7. Mullis, C. E., **Munshaw, S.**, Grabowski, M. K., Eshleman, S. H., Serwadda, D., Brookmeyer, R., Nalugoda, F., Kigozi, G., Kagaayi, J., Tobian, A. A., Wawer, M., Gray, R. H., Quinn, T. C., Laeyendecker, O. (2013). Differential specificity of HIV

- incidence assays in HIV subtypes A and D-infected individuals from Rakai, Uganda.. *AIDS research and human retroviruses*, 29(8), 1146-50.
8. Bailey, J. R., Laskey, S., Wasilewski, L. N., **Munshaw, S.**, Fanning, L. J., Kenny-Walsh, E., Ray, S. C. (2012). Constraints on viral evolution during chronic hepatitis C virus infection arising from a common-source exposure. *Journal of virology*, 86(23), 12582-90.
 9. Sydnor, E. R., Greer, A., Budd, A. P., Pehar, M., **Munshaw, S.**, Neofytos, D., Perl, T. M., Valsamakis, A. (2012). An outbreak of human parainfluenza virus 3 infection in an outpatient hematopoietic stem cell transplantation clinic. *American journal of infection control*, 40(7), 601-5.
 10. Cousins, M. M., Ou, S. S., Wawer, M. J., **Munshaw, S.**, Swan, D., Magaret, C. A., Mullis, C. E., Serwadda, D., Porcella, S. F., Gray, R. H., Quinn, T. C., Donnell, D., Eshleman, S. H., Redd, A. D. (2012). Comparison of a high-resolution melting assay to next-generation sequencing for analysis of HIV diversity.. *Journal of clinical microbiology*, 50(9), 3054-9.
 11. **Munshaw, S.**, Hwang, H. S., Torbenson, M., Quinn, J., Hansen, K. D., Astemborski, J., Mehta, S. H., Ray, S. C., Thomas, D. L., Balagopal, A. (2012). Laser captured hepatocytes show association of butyrylcholinesterase gene loss and fibrosis progression in hepatitis C-infected drug users.. *Hepatology (Baltimore, Md.)*, 56(2), 544-54.
 12. Burke, K. P., **Munshaw, S.**, Osburn, W. O., Levine, J., Liu, L., Sidney, J., Sette, A., Ray, S. C., Cox, A. L. (2012). Immunogenicity and cross-reactivity of a representative ancestral sequence in hepatitis C virus infection.. *Journal of immunology (Baltimore, Md. : 1950)*, 188(10), 5177-88.
 13. **Munshaw, S.**, Bailey, J. R., Liu, L., Osburn, W. O., Burke, K. P., Cox, A. L., Ray, S. C. (2012). Computational reconstruction of Bole1a, a representative synthetic hepatitis C virus subtype 1a genome.. *Journal of virology*, 86(10), 5915-21.
 14. Eshleman, S. H., Hudelson, S. E., Redd, A. D., Wang, L., Debes, R., Chen, Y. Q., Martens, C. A., Ricklefs, S. M., Selig, E. J., Porcella, S. F., **Munshaw, S.**, Ray, S. C., Piwowar-Manning, E., McCauley, M., Hosseinipour, M. C., Kumwenda, J., Hakim, J. G., Chariyalertsak, S., de Bruyn, G., Grinsztejn, B., Kumarasamy, N., Makhema, J., Mayer, K. H., Pilotto, J., Santos, B. R., Quinn, T. C., Cohen, M. S., Hughes, J. P. (2011). Analysis of genetic linkage of HIV from couples enrolled in the HIV Prevention Trials Network 052 trial.. *The Journal of infectious diseases*, 204(12), 1918-26.
 15. Liao, H. X., Chen, X., **Munshaw, S.**, Zhang, R., Marshall, D. J., Vandergrift, N., Whitesides, J. F., Lu, X., Yu, J. S., Hwang, K. K., Gao, F., Markowitz, M., Heath, S. L., Bar, K. J., Goepfert, P. A., Montefiori, D. C., Shaw, G. C., Alam, S. M., Margolis, D. M., Denny, T. N., Boyd, S. D., Marshal, E., Egholm, M., Simen, B. B., Hanczaruk, B., Fire, A. Z., Voss, G., Kelsoe, G., Tomaras, G. D., Moody, M. A., Kepler, T. B., Haynes, B. F. (2011). Initial antibodies binding to HIV-1 gp41 in acutely infected subjects are polyreactive and highly mutated.. *The Journal of experimental medicine*, 208(11), 2237-49.
 16. Ng, O. T., **Munshaw, S.**, Lamers, S. L., Chew, K. K., Lin, L., Redd, A. D., Manucci, J., Quinn, T. C., Ray, S. C., Chua, A., Leo, Y. S., Laeyendecker, O. (2011). Molecular epidemiology of HIV type 1 in Singapore and identification of novel CRF01_AE/B recombinant forms.. *AIDS research and human retroviruses*, 27(10), 1135-7.
 17. Moody, M. A., Zhang, R., Walter, E. B., Woods, C. W., Ginsburg, G. S., McClain, M. T., Denny, T. N., Chen, X., **Munshaw, S.**, Marshall, D. J., Whitesides, J. F., Drinker, M. S., Amos, J. D., Gurley, T. C., Eudailey, J. A., Foulger, A., DeRosa, K. R., Parks, R., Meyerhoff, R. R., Yu, J. S., Kozink, D. M., Barefoot, B. E., Ramsburg, E. A., Khurana, S., Golding, H., Vandergrift, N. A., Alam, S. M., Tomaras, G. D., Kepler, T. B., Kelsoe, G., Liao, H. X., Haynes, B. F. (2011). H3N2 influenza infection elicits more cross-reactive and less clonally expanded anti-hemagglutinin antibodies than influenza vaccination.. *PLoS one*, 6(10), e25797.
 18. **Munshaw, S.**, Kepler, T. B. (2010). SoDA2: a Hidden Markov Model approach for identification of immunoglobulin rearrangements.. *Bioinformatics (Oxford, England)*, 26(7), 867-72.
 19. Liao, H. X., Levesque, M. C., Nagel, A., Dixon, A., Zhang, R., Walter, E., Parks, R., Whitesides, J., Marshall, D. J., Hwang, K. K., Yang, Y., Chen, X., Gao, F., **Munshaw, S.**, Kepler, T. B., Denny, T., Moody, M. A., Haynes, B. F. (2009). High-throughput isolation of immunoglobulin genes from single human B cells and expression as monoclonal antibodies.. *Journal of virological methods*, 158(1-2), 171-9.
 20. Buckley, K. M., **Munshaw, S.**, Kepler, T. B., Smith, L. C. (2008). The 185/333 gene family is a rapidly diversifying host-defense gene cluster in the purple sea urchin *Strongylocentrotus purpuratus*.. *Journal of molecular biology*, 379(4), 912-28.
 21. **Munshaw, S.**, Kepler, T. B. (2008). An information-theoretic method for the treatment of plural ancestry in phylogenetics.. *Molecular biology and evolution*, 25(6), 1199-208.
 22. **Munshaw S**, Cutler RW, Wongsiri W, Chantawannakul P. 2004. A genome-wide analysis of *Apis mellifera*: Insights into small diverse high copy number ORFs. *Journal of Apicultural Research* 43(4):172-175

Patents

A computational approach for generating representative hepatitis C virus genomic sequences. USPTO US9512183B2. Issued December 6, 2016.

Presentations (* indicates travel award winner)

Technology Transfer Society Conference 2016, Phoenix, AZ	November 2016
Technology Transfer Society Conference 2014, Baltimore, MD	October 2014
*18 th International Symposium on Hepatitis C Virus and Related Viruses, Seattle, WA	September 2011
Center for Computational Genomics Seminar, Johns Hopkins School of Medicine, Baltimore MD	November 2010
*AIDS Vaccine 2009, Paris, France	October 2009
Center for Genomic Sciences, Allegheny General Hospital, Pittsburgh PA	June 2009

NIAMS, National Institute of Health, Bethesda MD	May 2009
Center for Infectious Disease Dynamics, Penn State University, University Park PA	April 2009
Center for AIDS research, University of California San Diego, San Diego CA	February 2009
*International Society for Developmental and Comparative Immunology, Charleston, SC	July 2006
Biomeet 2006, Research Triangle Park, NC	April 2006

Posters (* indicates travel award winner, † indicates poster award winner)

*+Summer School and Symposium on Computational Immunology, Rochester, NY	June 2012
18 th International Conference on HIV, Evolution & Dynamics, Galway, Ireland	May 2011
*Keystone Symposia on HIV Vaccine (X5), Banff, Canada	March 2010
*Multi-scale modeling of Host/Pathogen Interactions, Pittsburgh, PA	June 2009
*Third Annual NIH National Graduate Student Research Festival, Bethesda MD	September 2008
4th International Society for Computational Biology Student Council Symposium 2008, Toronto, Canada	July 2008
†Center for AIDS Research Annual Meeting, Durham NC	September 2006

Media Mentions

1. Faculty Lounge HBSB (March 2, 2021) Finding your Enthusiasm <http://academic.hbsp.harvard.edu/2021-03-02-thefacultylounge>
2. Aguirre J.C. (July 30, 2020) “Trading Can Be Profitable but Vaccines Are Not”: How Boom-Bust Vaccine Speculation Kneecapped the U.S. Coronavirus Response. Retrieved from <https://www.vanityfair.com/news/2020/07/boom-bust-vaccine-speculation-kneecapped-covid-response>
3. Raman S. (April 23, 2020) COVID-19 vaccine development raises numerous questions. Retrieved from <https://www.rollcall.com/2020/04/23/covid-19-vaccine-development-raises-numerous-questions/>
4. Henkin, A (April 20, 2020) Daily Dose Coronavirus Podcast. Retrieved from <https://www.wypr.org/post/daily-dose-4-20-20>
5. Ercolano, P. (April 16, 2020) A Coronavirus Vaccine is in the works – but it won’t emerge overnight. Retrieved from https://hub.jhu.edu/2020/04/16/coronavirus-vaccine-timeline/?mc_cid=20b2757a25&mc_eid=fe3f2015a5

Leadership, Consulting and, Service

Johns Hopkins Carey Business School

Member, Carey Diversity, Equity, Inclusion and Belonging Taskforce	June 2020 - present
Faculty Lead, NEXT mentoring program	May 2020 - present
Mentor, Career Development Office, Technology and Entrepreneurship	August 2019 - present
Faculty Mentor, Innovation and Impact Club	August 2018 - present
Faculty Mentor, Rose (student startup)	August 2018 - August 2020
Co-Chair, Committee on Diversity and Inclusion	August 2016 - August 2020
Member, Grading Policy Committee	August 2019 - December 2019
Lead Organizer, Conference on Entrepreneurship, Civic Engagement and Innovative Programming	February 2019
Member, Faculty Mentoring Committee	August 2016 - May 2019
Member, Working group on Faculty Content Sharing	August 2018 - May 2019
Member, Grading Policy Committee	January 2016 - August 2016
Member, Faculty Diversity Initiative Committee	December 2015 - August 2016
Member, Working group on Parent Coaching Services	August 2016 - December 2016
Member, Committee on Diversity and Inclusion	August 2014 - August 2016
Faculty Mentor, Global Leadership Mentoring Program	October 2014 - May 2014
Member, Honor Council Committee	August 2013 - August 2016

External

Reviewer, SBIR Grants, NIH	May 2017 - present
Adjunct Faculty, NSF National I-Corps Program	October 2016 – October 2019
Consultant, Vixiar Medical Inc.	March 2016 - December 2016
Mentor, I-Corps Program, Johns Hopkins University	October 2015
Entrepreneurial Lead, I-Corps Program, Johns Hopkins University	February - March 2015
Head of Social Committee, Johns Hopkins Post-Doctoral Association, Baltimore MD	August 2010 - May 2011
Volunteer Teaching Assistant, ESL, Durham Literacy Center, Durham NC	November 2007 - March 2009
Graduate and Professional Student Council (GPSC), Duke University, Durham NC	September 2007 - May 2009