Deborah Plana

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EDUCATION

Harvard Medical School (HMS)/MIT MD-PhD Program ▪ Boston, MA *June 2017-current*
Medical Scientist Training Program Grant Recipient
Candidate for M.D. in Harvard-MIT Program in Health Sciences and Technology (HST)
Candidate for Ph.D. in Harvard Systems, Synthetic, and Quantitative Biology Program

Massachusetts Institute of Technology ▪ Cambridge, MA *June 2013-June 2017*
Bachelor of Science in Biological Engineering *GPA 4.9/5.0*
Minor in Statistics and Data Science

HONORS AND AWARDS

Harvard Graduate Prize Fellowship ▪ HMS *March 2019*
Quantitative Sciences in Drug Development Best Poster ▪ Novartis-Academia Conference *August 2018*
Presidential Scholar ▪ HMS *August 2017, August 2018*
Medical Scientist Training Program T32GM007753 ▪ National Institutes of Health *June 2017-June 2025*
Reddy Family Undergraduate Research Opportunities Fund ▪ MIT *December 2016*
Tau Beta Pi Engineering Honor Society ▪ MIT *September 2016*
James E. Cunningham (1957) Memorial Scholar ▪ MIT *December 2015*
Industrial Advisory Council for Minority Education Student Prize ▪ MIT *December 2015*
MIT Biological Engineering Department Barry M. Goldwater Scholarship Nominee ▪ MIT *November 2015*
Office of Minority Education's Laureates and Leaders program ▪ MIT *August 2015*
Ilona Karmel Writing Prize ▪ MIT *May 2015*
Exceptional Research Opportunities Program Grant ▪ Howard Hughes Medical Institute *January 2015*

RESEARCH EXPERIECE

Sorger and Palmer Laboratories, HMS Laboratory of Systems Pharmacology ▪ Boston, MA *Jan 2018-current*
HMS/MIT MD-PhD Program and Harvard Systems, Synthetic, and Quantitative Biology Program Ph.D. Program
Estimating patient response to cancer therapies from clinical trial data. Biomarker discovery for personalized medicine.

- Invented a new statistical tool to identify treatment-sensitive tumor subgroups in 'basket trials' of cancer therapies.
- Developed an algorithm that more precisely estimates therapeutic efficacy for early-phase trials with small cohorts.
- Collaborated with Novartis to discover response biomarkers for novel ovarian cancer therapies in panels of PDXs.

Lauffenburger Laboratory, MIT Department of Biological Engineering ▪ Cambridge, MA *Jan 2015-June 2017*
Undergraduate Research Opportunities Program (UROP) and Summer Research Trainee Program (SRTP)
Characterizing a 3-D hydrogel model of endometriosis. Predicting melanoma patient response to therapy.

- Measured cytokine concentrations using Luminex assay to evaluate 3D hydrogel model of endometriosis.
- Analyzed Luminex data using MATLAB and R to understand the role of different cell types in endometriosis.
- Collaborated with the Massachusetts General Hospital (MGH) Cancer Center to develop blood-based assays in a CLIA space to stratify patients based on their likelihood of developing resistance to targeted therapies.
- Analyzed RNA-Seq and Affymetrix data from tumor-derived tissue and patient exosomes to predict melanoma patients' response to immune therapies.

Cepko Laboratory, HMS Department of Genetics ▪ Boston, MA *Jun-Aug 2015*
Howard Hughes Medical Institute Exceptional Research Opportunities Program (ExROP)
Identifying DNA cis-regulatory elements responsible for Otx2 regulation in retinal cell differentiation.

- Cloned and tested novel DNA reporter plasmids to understand the role of putative *Otx2* DNA enhancer elements in retinal development.
- Performed mouse retinal dissections, in-vivo and explant electroporations to characterize novel retinal cell subpopulations.

Tonegawa Laboratory, MIT Picower Institute for Learning and Memory ▪ Cambridge, MA *Jan-Dec 2014*
Undergraduate Research Opportunities Program (UROP)
Dissociating the role of sensory, association and motor brain areas in memory formation.

- Performed mouse behavioral training, brain perfusions, virus injections and implants to optogenetically label neurons active in memory formation.
- Used vibratome sectioning, immunohistochemistry, and confocal microscopy to dissociate the functional role of different brain regions involved in memory formation.

Beth Israel Deaconess Medical Center Faculty Hour ▪ Boston, MA *Jan-Mar 2014*
Faculty Hour Team Member
Improving early identification and care of the critically ill post-operative patient.

- Collected, analyzed, and presented data on patients' conditions and waiting times.
- Assisted in writing official hospital protocols, such as hospital guidelines on the care of post-anesthesia care unit patients.

WORK EXPERIENCE

Longitude Capital ▪ Research Fellow ▪ Boston, MA *August 2020-current*
Sourced and evaluated early-stage companies for biotechnology investment team.
Investigated therapeutic areas of interest and created presentation materials to summarize research findings.

PEER-REVIEWED PUBLICATIONS AND PREPRINTS

Adam C. Palmer*, **Deborah Plana***, Peter K. Sorger. "Comparing the efficacy of cancer therapies between subgroups in basket trials." *Cell Systems.* 2020. doi :https://doi.org/10.1016/j.cels.2020.09.003. *These authors contributed equally.

Adam Palmer*, **Deborah Plana***, Hui Gao*, Joshua Korn, Guizhi Yang, John Green, Xiamei Zhang, Roberto Velazquez, Margaret McLaughlin, David Ruddy, Colleen Kowal, Julie Goldovitz, Caroline Bullock, Stacy Rivera, Daniel Rakiec, GiNell Elliott, Paul Fordjour, Ronald Meyer, Alice Loo, Esther Kurth, Jeffrey Engelman, Hans Bitter, William Sellers, Juliet Williams. "Biomarker-guided treatment strategies for ovarian cancer identified from a heterogeneous panel of patient-derived tumor xenografts." *Cancer Research*. 2020. doi:10.1158/0008-5472.CAN-19-3850. *These authors contributed equally.

Alvin Shi, Gyulnara G. Kasumova , William A. Michaud, Jessica Cintolo-Gonzalez, Marta Díaz-Martínez, Jacqueline Ohmura, Arnav Mehta, Isabel Chien, Dennie T. Frederick, Sonia Cohen, **Deborah Plana,** Douglas B. Johnson, Keith T. Flaherty, Ryan J. Sullivan, Manolis Kellis, and Genevieve M. Boland. "Plasma-derived exosomal analysis and deconvolution enables prediction and tracking of melanoma checkpoint blockade response." *Science Advances.* 2020. doi: 10.1126/sciadv.abb3461.

Arash Mostaghimi*, Marc-Joseph Antonini*, **Deborah Plana*,** Philip D. Anderson, Brandon Beller, Edward W. Boyer, Amber Fannin, Jacob Freake, Richard Oakley, Michael S. Sinha, Leanne Smith, Christopher Van, Helen Yang, Peter K. Sorger, Nicole R. LeBoeuf, Sherry H. Yu. "Regulatory and safety considerations in deploying a locally fabricated, reusable, face shield in a hospital responding to the COVID-19 pandemic." *Med.* 2020. doi:10.1016/j.medj.2020.06.003. *These authors contributed equally.

Kevin Tyan, Adriane Levin, Alejandra Avalos-Pacheco, **Deborah Plana**, Eleanor A Rand, Helen Yang, Laura E Maliszewski, Lily A Chylek, Lyla Atta, Mark A Tye, Mary M Carmack, N Synclaire Oglesby, Susan Burgin, Sherry H Yu, Nicole R LeBoeuf, Jacqueline M Kemp. "Considerations for the Selection and Use of Disinfectants Against SARS-CoV-2 in a Health Care Setting." *Open Forum Infectious Diseases*. 2020. https://doi.org/10.1093/ofid/ofaa396.

Raphael Koch, Amanda L. Christie, Jennifer L. Crombie, Adam C. Palmer, **Deborah Plana**, Kay Shigemori, Sara N. Morrow, Alexandria Van Scoyk, Wenchao Wu, Elizabeth A. Brem, J. Paul Secrist, Lisa Drew, Alwin G. Schuller, Justin Cidado, Anthony Letai and David M. Weinstock. "Biomarker-driven strategy for MCL1 inhibition in T-cell lymphomas". *Blood*. 2019. doi: 10.1182/blood-2018-07-865527.

Sarah B. Schrier, Abby S. Hill, **Deborah Plana,** Douglas A. Lauffenburger. "Synergistic Communication between CD4+ T Cells and Monocytes Impacts the Cytokine Environment." *Scientific Reports.* 2016. doi:10.1038/srep34942.

Avilash Cramer*, **Deborah Plana***, Helen L Yang*, Mary Carmack, Enze Tian, Michael S Sinha, David Krikorian, David Turner, Jinhan Mo, Ju Li, Rajiv Gupta, Heather Manning, Florence T Bourgeois, Sherry H Yu, Peter Sorger, Nicole R LeBoeuf. "Analysis of SteraMist Ionized Hydrogen Peroxide Technology in the Sterilization of N95 Respirators and Other PPE." *Scientific Reports*. In press. *These authors contributed equally.

Deborah Plana*, Enze Tian*, Avilash K. Cramer*, Helen Yang*, Mary M. Carmack, Michael S. Sinha, Florence T. Bourgeois, Sherry H. Yu, Peter Masse, Jon Boyer, Minjune Kim, Jinhan Mo, Nicole R. LeBoeuf, Ju Li, Peter K. Sorger. "Assessing the quality of nontraditional N95 filtering face-piece respirators available during the COVID-19 pandemic." *medRxiv*. 2020. doi: https://doi.org/10.1101/2020.07.25.20161968. Under review. *These authors contributed equally.

Marc-Joseph Antonini*, **Deborah Plana***, Shriya Srinivasan*, Lyla Atta, Aditya Achanta, Helen Yang, Avilash Cramer, Jacob Freake, Michael S. Sinha, Sherry H. Yu, Nicole R. LeBoeuf, Ben Linville-Engler, Peter K. Sorger. "A Crisis-Responsive Framework for Medical Device Development during the COVID-19 Pandemic." *Preprints*. 2020. doi: 10.20944/preprints202009.0577.v1. Under review. *These authors contributed equally.

Malia McAvoy,* Ai-Tram N. Bui*, Christopher Hansen*, **Deborah Plana***, Jordan T. Said, Zizi Yu, Helen Yang, Jacob Freake, Christopher Van, David Krikorian, Avilash Cramer, Leanne Smith, Liwei Jiang, Karen J. Lee, Sara J. Li, Brandon Beller, Michael Short, Sherry H. Yu, Arash Mostaghimi, Peter K. Sorger, Nicole R. LeBoeuf. "3D Printed frames to enable reuse and improve the fit of N95 and KN95 respirators." *medRxiv*. 2020. doi: https://doi.org/10.1101/2020.07.20.20151019. Under review. *These authors contributed equally.

ORAL PRESENTATIONS

Deborah Plana. "Making Precise Estimates of Drug Efficacy from Small Amounts of Patient Data." Computation and Modeling Session; NCI Center for Cancer Systems Pharmacology HMS Site Visit. Virtual. May 2020. Tumor Therapeutics and Resistance Session; Junior Investigator Meeting for the NCI Cancer Systems Biology Consortium, Physical Sciences – Oncology Network, and the Big Data Scientist Training Enhancement Program. Virtual. August 2020.

Deborah Plana. "Introduction to PanFab: Mobilizing a volunteer response to COVID-19" (Speaker); "Resiliency and Trust: Local, regional, and national response to PPE Shortages" (Panelist). Harvard-MIT Center for Regulatory Science Pandemic Response: Resilience and Recovery in the Era of COVID-19. Virtual. June 2020.

Deborah Plana. "Parametric fitting of over 100,000 individual patient events from clinical trials in oncology." Harvard-MIT Center for Regulatory Science Doctoral Student Symposium. Boston, MA. February 2020.

Deborah Plana. "Of mice and (small numbers of) men: Improving estimates of drug efficacy in oncology." Harvard Systems Biology Department Pizza Talk. Boston, MA. October 2019.

Deborah Plana. "Parametric fitting of clinical trial data in oncology." Harvard Institute for Therapeutic Sciences Symposium. Boston, MA. October 2019.

Deborah Plana, Ryan Sullivan. "Using blood-based assays and RNA data to predict melanoma patient response to therapy." Summer Research Trainee Program at the Massachusetts General Hospital. Boston, MA. June 2016.

PUBLISHED ABSTRACTS, FEDERAL COMMENTS, AND BLOG POSTS

Deborah Plana, Andrea Arfè, and Michael S. Sinha. "Re-envisioning clinical trials during the COVID-19 pandemic." *Health Affairs Blog*. July 8, 2020. DOI: 10.1377/hblog20200702.963588.

Deborah Plana, Andrea Arfè, and Michael S. Sinha. FDA Guidance on Conduct of Clinical Trials of Medical Products during COVID-19 Pandemic; Guidance for Industry, Investigators, and Institutional Review Boards. July 13, 2020. https://www.regulations.gov/document?D=FDA-2020-D-1106-0139.

Gyulnara G. Kasumova, Alvin Shi, Jessica A. Cintolo-Gonzalez, Isabel Chein, Dennie T. Frederick, Roman Alpatov, William A. Michaud, **Deborah Plana**, David J. Panka, Ryan B. Corcoran, Keith T. Flaherty, Ryan J. Sullivan, Manolis Kellis and Genevieve M. Boland. "Abstract A35: BRAF inhibition increases exosomal PD-L1 protein expression in melanoma." *Cancer Immunol Res.* September 1 2018. (6) (9 Supplement) A35; DOI: 10.1158/2326-6074.TUMIMM17-A35.

Alvin Shi, Jessica A. Cintolo-Gonzalez, Isabel Chien, Dennis T. Frederick, Roman Alpatov, William Michaud, **Deborah Plana**, David Panka, Ryan Corcoran, Keith Flaherty, Ryan Sullivan, Manolis Kellis and Genevieve Boland. "Abstract B25: Exosomal transcriptomic signatures tracks and predicts response to checkpoint blockade immunotherapy." *Cancer Immunol Res.* September 1 2018. (6) (9 Supplement) B25; DOI: 10.1158/2326-6074.TUMIMM17-B25.

Alvin Shi, Gyulnara Kasumova, Isabel Chien, Jessica Cintolo-Gonzalez, Dennie T. Frederick, Roman Alpatov, William A. Michaud, **Deborah Plana**, Ryan Corcoran, Keith Flaherty, Ryan Sullivan, Manolis Kellis and Genevieve Boland. "Abstract 4282: Deconvolution of plasma-derived exosomes for tracking and prediction of immunotherapy across multiple tissues." *Cancer Res.* July 1 2018. (78) (13 Supplement) 4282; DOI: 10.1158/1538-7445.AM2018-4282.

Gyulnara G. Kasumova, Michelle S. Kim, Alvin Shi, Isabel Chein, Dennie T. Frederick, Roman Alpatov, William A. Michaud, **Deborah Plana,** David J. Panka, Ryan B. Corcoran, Keith T. Flaherty, Ryan J. Sullivan. "Exosomal PD-L1 Protein Expression Correlates with Targeted Therapy Resistance in Melanoma." *Annals of surgical oncology*. February 1st 2018. (25) (S183-S183); DOI: 10.1245/s10434-018-6349-1.

Jessica A. Cintolo-Gonzalez, Sonia Cohen, William A. Michaud, **Deborah Plana**, David J. Panka, Ryan Sullivan, Genevieve Boland. "Use of Circulating Microvesicles, Exosomes, as a Biomarker to Track Response to Immunotherapy." *Annals of surgical oncology*. February 1st 2017. (24) (S132-S133); DOI: 10.1245/s10434-017-5785-7.

Sonia Cohen, Jessica A. Cintolo-Gonzalez, **Deborah Plana**, Ryan Sullivan, Genevieve Boland. "Mixed Responder Cohort of Metastatic Melanoma Patients Treated with Anti Programmed Cell Death-1" *Annals of surgical oncology*. February 1st 2017. (24) (S133-S134); DOI: 10.1245/s10434-017-5785-7.

POSTER PRESENTATIONS

Deborah Plana, Adam C. Palmer, Peter K. Sorger**.** "Making Precise Estimates of Drug Efficacy from Small Amounts of Patient Data." NCI Center for Cancer Systems Pharmacology Annual Investigators Meeting. Virtual. September 2020.

Deborah Plana, Adam C. Palmer, Peter K. Sorger. "Predicting patient response to cancer combination therapies from clinical trial data." Novartis-Academia Conference on Quantitative Sciences in Drug Development. Cambridge, MA. August 2018.

Deborah Plana, Abby Hill, Christi Cook, Linda Griffith, Douglas Lauffenburger. "Characterizing a 3-D hydrogel model of the human endometrium and its interactions with immunological factors using mixed effects modeling." Biomedical Engineering Society Conference. Minneapolis, MN. October 2016.

Jessica Cintolo-Gonzalez, William Michaud, Sonia Cohen, **Deborah Plana**, David Panka, Ryan Sullivan, Genevieve Boland. "Use of Circulating Microvesicles, Exosomes, as a Biomarker to Track Disease Burden in Melanoma." Massachusetts General Hospital Clinical Research Day. Boston, MA. October 2016.

Deborah Plana, Sui Wang, Constance Cepko. "Characterization of retinal cell subpopulations expressing distinct Otx2 enhancers." Howard Hughes Medical Institute Exceptional Research Opportunities Program Meeting. Chevy Chase, MD. May 2016.

Deborah Plana, Abby Hill, Christi Cook, Linda Griffith, Douglas Lauffenburger. "Creating a 3-D hydrogel model of the human endometrium and its interactions with immunological factors." New England Science Symposium. Cambridge, MA. April 2016.

Deborah Plana, Cocchi, Sundar, Pleumann, Grzybinski, Shaefi, Brogna, Sisti, Butler, Small, Cain, Muret-Wagstaff, Foley, Talmor, Ma, Whyte, Kleinman, Simon. "Early Identification and Care of the Critically Ill Post-Operative Patient." Beth Israel Deaconess Medical Center Silverman Symposium. Boston, MA. April 2015.

LEADERSHIP AND TEACHING

Principles and Practices of Drug Development ▪ Teaching Assistant ▪ HMS and MIT *August 2020-current*
Created and presented course materials on pharmacology fundamentals, preclinical drug discovery, clinical trials, manufacturing and regulatory issues, as well as financing and marketing of new therapies.

Greater Boston Pandemic Fabrication Team ▪ Founding Member, Coordinator ▪ Harvard-MIT *March 2020-current*
Coordinated a team of over 100 students, scientists, clinicians, and engineers, in responding to medical supply shortages during the COVID-19 pandemic.
Guided preparation and publication of multiple research articles on the creation, reuse, and clinical testing of personal protective equipment during a crisis.

Medical School Admissions Committee for Harvard-MIT HST ▪ Member ▪ HMS *July 2019-current*
Reviewing applications, participating in interviews, contributing to discussions at subcommittee meetings, and submitting interview reports for medical school applicants.

Crimson Care Collaborative ▪ Co-director ▪ HMS *March 2018-current*
Directing quality improvement efforts across 7 clinical sites in the Greater Boston Area.
Implementing projects to register patients to vote and reduce clinic no-show rates.
Managing about 300 volunteers consisting of medical, dental and undergraduate students.

HST MD Student Diversity Ambassadors Group ▪ Founding member ▪ HMS *March 2018-current*
Building a more inclusive medical school community through prospective student outreach, working with ongoing diversity initiatives at HMS and MIT, and incorporating discussions of diversity into the medical school curriculum.

MD-PhD Advising Program ▪ Medical Student Director ▪ MIT *March 2018-March 2019*
Organized advising program to connect Harvard-MIT MD-PhD students with current MIT undergraduates.

Fields, Forces and Flows (2.793/6.023/20.330) ▪ Teaching Assistant ▪ MIT *January-May 2017*
Taught weekly recitations and office hours. Organized review sessions, graded exams, and moderated Piazza forum.
Course topics taught included electric fields, fluid flows, transport phenomena and their application to biological systems.

Latino Cultural Center (LCC) ▪ President ▪ MIT *May 2016-May 2017*
Official representative of about 150 students to the MIT administration and outside organizations.

CLINICAL CLERKSHIP ROTATIONS COMPLETED

Neurology (BWH), Radiology (BWH), Psychiatry (McLean)

TECHNICAL SKILLS

Coding and statistical analysis: Mathematica, R, Python, MATLAB, SAS, SPSS, EAST
Word, data, and image processing: Microsoft Office Suite (including Word, PowerPoint, and Excel), Adobe Creative Suite (including Illustrator, Photoshop, InDesign)

LANGUAGE SKILLS

English (Fluent), Spanish (Fluent), Italian (Conversational)