Curriculum Vitae

Merrick Pierson Smela

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Education		
Harvard University	2019 - present	
PhD student, joint Chemistry and Chemical Biology / Chemical Biology		
University of Cambridge	2018 - 2019	
MPhil in Biological Science		
University of Minnesota	2015 - 2018	
B.S. in Chemistry, B.S. in Biochemistry, and minor in Mathematics Summa cum laude with high distinction		
University of Minnesota (Part-time enrollment as a high school student)	2013 - 2015	

Research Experience

Harvard University:

2019 - present

Advisor: Prof. George Church

Currently conducting a variety of research in synthetic biology. My main project is on *in vitro* oogenesis from human pluripotent stem cells. I have developed protocols to generate germline and somatic components of the ovary by transcription factor-mediated differentiation. This has led to two papers on transcription factor screening methods, and a first-author paper on producing ovarian granulosa-like cells. I have also released one preprint describing my work generating germ cells and oogonia, and contributed to two additional preprints describing clinical use of granulosa-like cells. Recently, I have raised funding from philanthropists to investigate the induction of meiosis *in vitro*.

While labs were shut down due to COVID-19, I also did a side project on computational classification of T-box riboswitches, predicting structures and functional characteristics from sequences and building a database website. This led to a first-author publication.

Previously, as a rotation student in Prof. Jack Szostak's lab, I helped develop a system to demonstrate RNA-catalyzed RNA ligation within lipid vesicles, leading to a preprint.

University of Cambridge: Advisor: Prof. Azim Surani 2018 - 2019

Investigated the gene regulatory networks involved in primordial germ cell specification, mainly through use of auxin-induced degron gene tagging in a model system derived from human embryonic stem cells. This led to two publications (one first-author). During this time, I also conducted a computational chemistry side project on cucurbituril host-guest complexes, leading to an additional publication.

Harvard University:

Advisor: Prof. Emily Balskus

Using both high-throughput screening and rational inhibitor design, found compounds that inhibit the conversion of choline to trimethylamine by gut bacteria.

University of Minnesota:

Advisor: Prof. Thomas Hoye

Synthesized substituted dibenzofurans using the HDDA reaction and analyzed them by UV and NMR spectroscopy to determine their suitability for use as active layers in organic LEDs, leading to a patent application. Developed a synthetic strategy using traceless tethers to expand the scope of the HDDA reaction, leading to one first-author and one second-author publication.

Teaching Experience

Horizon Academic Research Program:

Developed and taught a summer course on CRISPR and gene editing	2020 - 2022
Harvard University:	
Teaching fellow, Organic Chemistry Lab (CHEM27)	Spring 2020
Mentor for undergraduate researchers in the Church lab	2022 - present
University of Minnesota:	
Honors Program Mentor	2016 - 2017
ChemFoundations tutoring leader for Honors Organic Chemistry	2016

Peer-Reviewed Publications

(*denotes joint first authorship)

Merrick Pierson Smela^{*}, Christian Kramme^{*}, Patrick Fortuna, Jessica L Adams, Rui Su, Edward Dong, Mutsumi Kobayashi, Garyk Brixi, Venkata Srikar Kavirayuni, Emma Tysinger, Richie E Kohman, Toshi Shioda, Pranam Chatterjee, George M Church. Directed differentiation of human iPSCs to functional ovarian granulosa-like cells via transcription factor overexpression. *eLife* 2023, 12 (e83291) https://doi.org/10.7554/eLife.83291

This work received media coverage by the <u>Boston Globe</u>, <u>New Yorker</u>, <u>CBS</u>, and NPR.

Summer 2017

2015 - 2018

Mandy Lynn, *Merrick Pierson Smela*, Thomas R Hoye. Silicon as a powerful control element in HDDA chemistry: redirection of innate cyclization preferences, functionalizable tethers, and formal bimolecular HDDA reactions. *Chemical Science* **2021**, 12 (41) <u>https://doi.org/10.1039/D1SC04082K</u> This work was <u>highlighted in Nature Reviews Chemistry</u>.

Christian Kramme, Alexandru M. Plesa, Helen H. Wang, Bennett Wolf, *Merrick Pierson Smela*, Xiaoge Guo, Richie E Kohman, Pranam Chatterjee, George M. Church. An integrated pipeline for mammalian genetic screening. *Cell Reports Methods* 2021, 1 (6) https://doi.org/10.1016/j.crmeth.2021.100082

Christian Kramme, Alexandru M. Plesa, Helen H. Wang, Bennett Wolf, *Merrick Pierson Smela*, Xiaoge Guo, Richie E Kohman, Pranam Chatterjee, George M. Church. MegaGate: A toxin-less gateway molecular cloning tool. *STAR Protocols* 2021, 2 (4) <u>https://doi.org/10.1016/j.xpro.2021.100907</u>

Jorge Marchand^{*}, *Merrick Pierson Smela*^{*}, Thomas Jordan, Kamesh Narasimhan, George M. Church. TBDB – A database of structurally annotated T-box riboswitch:tRNA pairs. *Nucleic Acids Research* **2021**, 49 (D1) <u>https://doi.org/10.1093/nar/gkaa721</u>

Anthony Tabet, Thomas Gebhart, Guanglu Wu, Charlie Readman, *Merrick Pierson Smela*, Vijay K. Rana, Cole Baker, Harry Bulstrode, Polina Anikeeva, David H. Rowitch, Oren A. Scherman. Applying support-vector machine learning algorithms toward predicting host–guest interactions with cucurbit[7]uril. *Physical Chemistry Chemical Physics* 2020 <u>https://doi.org/10.1039/c9cp05800a</u>

Anastasiya Sybirna, Walfred W.C. Tang, *Merrick Pierson Smela*, Sabine Dietmann, Wolfram H. Gruhn, Ran Brosh, M. Azim Surani. A critical role of PRDM14 in human primordial germ cell fate revealed by inducible degrons. *Nature Communications* 2020, 11 (1282) <u>https://doi.org/10.1038/s41467-020-15042-0</u>

*Merrick Pierson Smela**, Anastasiya Sybirna*, Fredrick Wong, M. Azim Surani. Testing the role of SOX15 in human primordial germ cell fate. *Wellcome Open Research* 2019, 4 (122) <u>https://doi.org/10.12688/wellcomeopenres.15381.2</u>

Merrick Pierson Smela and Thomas Hoye. A Traceless Tether Strategy for Achieving Formal Intermolecular Hexadehydro-Diels–Alder Reactions. *Organic Letters* 2018, 20 (17), pp 5502–5505 <u>https://doi.org/10.1021/acs.orglett.8b02473</u>

Preprints

Alexa Giovannini, Sabrina Piechota, Maria Marchante, Kathryn S Potts, Graham Rockwell, Bruna Paulsen, Alexander D Noblett, Alexandra B Figueroa, Caroline Aschenberger, Dawn A Kelk, Marcy Forti, Shelby Marcinyshyn, Ferran Barrachina, Klaus Wiemer, Marta Sanchez, Pedro Belchin, *Merrick Pierson Smela*, Patrick R.J. Fortuna, Pranam Chatterjee, David H McCulloh, Daniel Ordonez-Perez, Joshua U Klein, Christian C Kramme. Improved rescue of immature oocytes obtained from conventional gonadotropin stimulation cycles via human induced pluripotent stem cellderived ovarian support cell co-culture. *bioRxiv* 2023 <u>https://doi.org/10.1101/2023.03.27.534477</u>

This work was <u>covered by STAT News</u>.

Sabrina Piechota, Maria Marchante, Alexa Giovannini, Bruna Paulsen, Kathryn S Potts, Graham Rockwell, Caroline Aschenberger, Alexander D Noblett, Alexandra B Figueroa, Marta Sanchez, Ferran Barrachina, Klaus Wiemer, Luis Guzman, Pedro Belchin, *Merrick Pierson Smela*, Patrick R.J. Fortuna, Pranam Chatterjee, Nam D Tran, David H McCulloh, Silvia Ortiz, Peter Klatsky, Daniel Ordonez-Perez, Christian C Kramme. Human induced pluripotent stem cell-derived ovarian support cell co-culture improves oocyte maturation in vitro after abbreviated gonadotropin stimulation. *bioRxiv* 2023 <u>https://doi.org/10.1101/2023.03.27.534479</u> This work was <u>covered by STAT News.</u>

Saurja DasGupta, Stephanie J. Zhang, *Merrick Pierson Smela*, Jack W. Szostak. RNA-catalyzed RNA Ligation within Prebiotically Plausible Model Protocells. *bioRxiv* 2023 <u>https://doi.org/10.1101/2023.02.09.527907</u>

Christian Kramme^{*}, *Merrick Pierson Smela*^{*}, Bennett Wolf, Patrick R. Fortuna, Garyk Brixi, Kalyan Palepu, Edward Dong, Jessica Adams, Suhaas Bhat, Sabrina Koseki, Emma Tysinger, Teodora Stan, Richie E. Kohman, Songlei Liu, Mutsumi Kobayashi, Toshi Shioda, George M. Church, Pranam Chatterjee. Efficient Human Germ Cell Specification from Stem Cells via Combinatorial Expression of Transcription Factors. *bioRxiv* 2022 <u>https://doi.org/10.1101/2022.07.11.499564</u> This work was highlighted by a review in Development.

Other Publications, Patents, and Presentations

Merrick Pierson Smela, Christian Kramme, Jessica Adams, Patrick Fortuna, Pranam Chatterjee, Toshi Shioda, George Church. "Transcription factor mediated differentiation

of human iPSCs to oogonia-like and ovarian granulosa-like cells." (Oral and poster presentation given at the 2023 Gordon Research Conference on Germinal Stem Cell Biology)

Merrick Pierson Smela, Sutharshan Ganesan, and Gavriel Kleinwaks. "<u>Universal</u> <u>Influenza Vaccine Summary</u>" (Report prepared for 1 Day Sooner, January 2021)

Merrick Pierson Smela, Gavriel Kleinwaks, Nicole Sexton, and Ginny Schmit. "FAQ: Long-Term Effects of COVID-19" (Report prepared for 1 Day Sooner, September 2020)

Merrick Pierson Smela. "Investigating Human Primordial Germ Cell Specification by Manipulation of Regulatory Proteins" (MPhil thesis presentation, given August 2019 at the Gurdon Institute)

Thomas Hoye, Feng Xu, Sean Ross, Xiao Xiao, and *Merrick Pierson Smela*. "Compounds and Devices Containing Such Compounds." (US Patent Application on compounds for OLED active layers. Number <u>WO2018014028</u>, filed 2017 July 17, published 2018 January 18.)

Merrick Pierson Smela. "Removable Linkers for the Hexadehydro-Diels-Alder Reaction" (Undergraduate senior thesis presentation, given December 2017 at the University of Minnesota Chemistry department)

Merrick Pierson Smela. "Developing Inhibitors of Bacterial Choline Metabolism" (Oral presentation, given August 2017 as part of the Harvard Amgen Scholars program.)

Honors and Awards

NIH F31 Fellowship	2022
Nominated for Regeneron Prize for Creative Innovation	2021
NSF Graduate Research Fellowship	2018
Amgen Scholar	2017
University of Cambridge	
Churchill Scholarship	2018
University of Minnesota, Twin Cities:	
Astronaut Scholarship	2017
Goldwater Scholarship (Honorable Mention)	2017
Sigma Xi	2017

Harvard University

UROP Grant Recipient	2016, 2017
Heisig-Gleysteen Fellowship	2016
J. Lewis Maynard Memorial Prize in Advanced Inorganic Chemistry	2016
Bentson Family Scholarship	2015 - 2018
Gold Scholar Award	2015 - 2018
Cyrus and Mary Field Scholarship	2015 - 2018
Dean's List	2015 - 2018
Notable awards during PSEO period:	
US Chemistry Olympiad, High Honors	2015
National Merit Scholarship	2015
Harvard Prize Book Award	2014
Leadership and Service	
1 Day Sooner	
Consultant on COVID-19 and vaccine research	2020 - 2021
Harvard University	
Emerging Tech Policy Network	2019 - 2020
University of Minnesota	
Alpha Chi Sigma	2015 - 2018
Treasurer	2017 - 2018
Executive Board member	2017 - 2018
Public Relations Alchemist (head of outreach)	2017
Representative to the Science and Engineering Student Board	2016
Outreach Committee member	2016 - 2018
University of Minnesota iGEM Team	2017 - 2018
American Chemical Society Student Chapter	2016 - 2018
Treasurer	2016 - 2018
Synthetic Biology Society	2016 - 2018
Officer	2017 - 2018