Biochemistry and Molecular Genetics

Chair Newsletter Fall 2020 - Spring 2021



Fall 2020 - Spring 2021

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ON THE COVER. A close-up view of a chromosome with histones and DNA. Cover designed and created by Brianna Monroe, MS and Nicole Ethen, MS



LETTER FROM THE CHAIR

"Scientific research is one of the most exciting and rewarding of occupations."

-Fredrick Sanger

Welcome to Spring of 2021! There are moments during the deep-freeze of the quiet COVID winter when one could hardly imagine a warm breeze or the brown, brittle trees ever producing green leaves again, but they do, and they are right now. Spring always comes. Life pushes through. And it is in this simple, yet utterly mystifying power of biology that many of us were first intrigued and inspired to pursue a life in science and of discovery questioning why and how.

Fredrick Sanger, two-time Nobel Prize winner, ignited the field of biochemistry, molecular biology, and modern medicine as we know it when he was the first person to obtain protein, RNA and DNA sequences. Sanger won his first Nobel Prize in 1958 for his pioneering work on the structure and sequencing of protein and his second one in 1980 for the introduction of "dideoxy" chain-termination and the marvel of DNA sequencing. Without these two fundamental biochemical discoveries, we would not be where we are today. Sanger is said to have wanted to be a problem solver, I am sure he never imagined that his work and the work of many biochemists before and after him would be the springboard for the world to develop the critically important recombinant vaccine technology towards SARS-CoV-2. I wrote an Editorial about the impact of biochemistry in the



time of corona about a year ago in May of 2020 (<u>https://advances.sciencemag.org/content/6/23/</u> <u>eabc2800</u>) which describes many of such findings and how they have and will save the world.

So, as you spend countless hours coming to the lab, sometimes seven days a week and working very hard towards the "why" and "how" questions you are trying to address, remember Sanger's words that biochemistry and molecular genetics is indeed very exciting. You never know how your work may one day save the world as the work of many biochemists before you did today.

Below please find many of the great accomplishments of our BMG colleagues from the past 6 months.

GRANTS AND AWARDS

Feng Yue, Associate Professor – Yue Lab Received an 8% score on an R01 grant from NHGRI: Computational methods to identify neo-TADs and enhancer-hijacking in rearranged genomes

Dan Foltz, Associate Professor – Foltz Lab Received an NIH – The Common Fund 4D Nucleome grant in collaboration with Dr. Paul Kaufmann and Dr. Sui Huang Title: "The role of the nucleolus in human genome organization in normal and disease states."

Dan Foltz, Associate Professor – Foltz Lab Issam Ben-Sahra, Co-PI – Ben-Sahra Lab Received a 2% score on a new R01 grant at NIGMS Title: Histone chaperone networks for new and evicted histones.

David Amici, Postdoctoral Fellow – Mendillo Lab Awarded an NIH F30 (1F30CA264513-01): Elucidating the role of C16orf72 in the cellular stress response network

Roger Smith, MSTP Student - Mendillo Lab Awarded as an ARCS Foundation Scholar (Achievement Rewards for College Scientists) Link

Marc Mendillo, Assistant Professor – Mendillo Lab Received an ACS-IRG: C16orf72: Coordinates Stress Response Systems to Promote the Stress Resilience of Cancer

Marc Mendillo, Assistant Professor - Mendillo Lab with co-PIs Dan Foltz, Associate Professor and Dileep Varma, Assistant Professor Received an H Foundation Collaboration Award: Identification of novel stress response pathways in cancer

DEPARTMENTAL NEWS



Sonia Brockway (PhD DGP) – Mendillo Lab Quantitative and Multiplexed Chemical-Genetic Phenotyping Reveals the Architecture of the Proteostasis Network in Breast Cancer

Li Lab



BRANDON CHO Research Technician

Shilatifard Lab



ZACH DUMAR Research Technician



BRIANNA MONROE Medical Illustrator/Animator

Wang Lab



NATSUMI TSUBOYAMA Research Technician Visiting PhD student from University of Tokyo

PUBLICATIONS

BEN-SAHRA LABORATORY

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i

FOLTZ LABORATORY



CENP-A overexpression promotes aneuploidy with karyotypic heterogeneity

Roshan L. Shrestha, Austin Rossi1, Darawalee Wangsa, Kimberly S. Zaldana, Evelyn Suva, Yang Jo Chung, Chelsea L. Sanders, Ann K. Hogan, Simone Difilippantonio, Tatiana S. Karpova, Baktiar Karim, Daniel R. Foltz, Daniele Fachinetti, Peter D. Aplan, Thomas Ried and Munira A. Basrai.

Journal of Cell Biology, 04/2021 Read more



NOTCH1-driven UBR7 stimulates nucleotide biosynthesis to promote T cell acute lymphoblastic leukemia.

Srivastava S, Sahu U, Zhou Y, Hogan AK, Sathyan KM, Bodner J, Huang J, Wong KA, Khalatyan N, Savas JN, Ntziachristos P, Ben-Sahra I, Foltz DR.

In collaboration with Issam Ben-Sahra, Assistant Professor and Panos Nztiachristos, Assistant Professor

Science Advances, 01/2021

Read more

KELLEHER LABORATORY



Decoding the protein composition of whole nucleosomes with Nuc-MS

Luis F. Schachner, Kevin Jooß, Marc A. Morgan, Andrea Piunti, Matthew J. Meiners, Jared O. Kafader, Alexander S. Lee, Marta Iwanaszko, Marcus A. Cheek, Jonathan M. Burg, Sarah A. Howard, Michael-Christopher Keogh, Ali Shilatifard & Neil L. Kelleher

Nature Methods, 03/2021

Read more Dideo

LI LABORATORY



Elucidating the regulatory mechanism of Swi1 prion in global transcription and stress responses.

Du Z, Regan J, Bartom E, Wu WS, Zhang L, Goncharoff DK, Li L



Science Reports, 12/2020 Read more

MEEKS LABORATORY



Subtype-associated epigenomic landscape and 3D genome structure in bladder cancer

Tejaswi Iyyanki, Baozhen Zhang, Qixuan Wang, Ye Hou, Qiushi Jin, Jie Xu, Hongbo Yang, Tingting Liu, Xiaotao Wang, Fan Song, Yu Luan, Hironobu Yamashita, Ruby Chien, Huijue Lyu, Lijun Zhang, Lu Wang, Joshua Warrick, Jay D. Raman, Joshua J. Meeks, David J. DeGraff & Feng Yue

Genome Biology, 04/2021

Read more

MENDILLO LABORATORY



NZTIACHRISTOS LABORATORY



NOTCH1-driven UBR7 stimulates nucleotide biosynthesis to promote T cell acute lymphoblastic leukemia.

Srivastava S, Sahu U, Zhou Y, Hogan AK, Sathyan KM, Bodner J, Huang J, Wong KA, Khalatyan N, Savas JN, Ntziachristos P, Ben-Sahra I, Foltz DR.

In collaboration with Issam Ben-Sahra, Assistant Professor and Panos Nztiachristos, Assistant Professor

Science Advances, 01/2021

SHILATIFARD LABORATORY



Decoding the protein composition of whole nucleosomes with Nuc-MS

Luis F. Schachner, Kevin Jooß, Marc A. Morgan, Andrea Piunti, Matthew J. Meiners, Jared O. Kafader, Alexander S. Lee, Marta Iwanaszko, Marcus A. Cheek, Jonathan M. Burg, Sarah A. Howard, Michael-Christopher Keogh, Ali Shilatifard & Neil L. Kelleher

Nature Methods, 03/2021

Read more



The roles of Polycomb repressive complexes in mammalian development and cancer.

Piunti A, Shilatifard A.

Nature Reviews Molecular and Cellular Biology, 03/2021

Read more



Acute perturbation strategies in interrogating RNA polymerase II elongation factor function in gene expression.

Zheng B, Aoi Y, Shah AP, Iwanaszko M, Das S, Rendleman EJ, Zha D, Khan N, Smith ER, Shilatifard A.

nature Solar FLAR Genes and Development, 02/2021 Read more

Circuits between infected macrophages and T cells in SARS-CoV-2 pneumonia

Rogan A. Grant, Luisa Morales-Nebreda, Nikolay S. Markov, Suchitra Swaminathan, Melissa Querrey, Estefany R. Guzman, Darryl A. Abbott, Helen K. Donnelly, Alvaro Donayre, Isaac A. Goldberg, Zasu M. Klug, Nicole Borkowski, Ziyan Lu, Hermon Kihshen, Yuliya Politanska, Lango Sichizya, Mengjia Kang, Ali Shilatifard, Chao Qi, Jon W. Lomasney, A. Christine Argento, Jacqueline M. Kruser, Elizabeth S. Malsin, Chiagozie O. Pickens, Sean B. Smith, James M. Walter, Anna E. Pawlowski, Daniel Schneider, Prasanth Nannapaneni, Hiam Abdala-Valencia, Ankit Bharat, Cara J. Gottardi, G. R. Scott Budinger, Alexander V. Misharin, Benjamin D. Singer, Richard G. Wunderink & The NU SCRIPT Study Investigators-Show fewer authors

Nature, 02/2021

Read more

mature reviews genetics

COMPASS and SWI/SNF complexes in development and disease.

Cenik BK, Shilatifard A.

Nature Reviews Genetics, 01/2021

SHILATIFARD LABORATORY

<page-header><section-header></section-header></page-header>	Therapeutic targeting of transcriptional elongation in diffuse intrinsic pontine glioma		
	Hiroaki Katagi, Nozomu Takata, Yuki Aoi, Yongzhan Zh Yusuke Tomita, Takahiro Sasaki, Amanda M Saratsis, Al Smith, Lihua Zou, Ali Shilatifard, Rintaro Hashizume	ang, Emily J Rendleman, Gavin T Blyth, Frank D Eckerdt, kihide Kondo, Stewart Goldman, Oren J Becher, Edwin	
	Neuro-oncology, 01/2021	ead more	
Science Translational Medicine	Lung transplantation for patients with severe COVID-1	9	
	Ankit Bharat, Melissa Querrey, Nikolay S Markov, Samu Manerikar, Ali Shilatifard, Rade Tomic, Yuliya Politanska Lomasney, Alexander V Misharin, G R Scott Budinger	ıel Kim, Chitaru Kurihara, Rafael Garza-Castillon, Adwaiy a, Hiam Abdala-Valencia, Anjana V Yeldandi, Jon W	
	Science Translational Medicine, 12/2020	ead more	
nature genetics	Reevaluating the roles of histone-modifying enzymes transcriptional regulation.	and their associated chromatin modifications in	
	Morgan MAJ, Shilatifard A.		
	$\ll~$ This article is featured on the cover of the journal		
	Nature Genetics, 12/2020 Read more		
PNASS Using manodecoys to treat COVID-19	DOT1L-controlled cell-fate determination and transcri	iption elongation are independent of H3K79 methylation.	
	Cao K, Ugarenko M, Ozark PA, Wang J, Marshall SA, Re Shilatifard A.	ndleman EJ, Liang K, Wang L, Zou L, Smith ER, Yue F,	
	Proceedings of the National Academy of Sciences, 11/	/2020 Read more	
Advances	COVID-19: Rescue by transcriptional inhibition.		
	Shilatifard A.		

Science Advances, 07/2020

Read more

SHILATIFARD LABORATORY



The Human Integrator Complex Facilitates Transcriptional Elongation by Endonucleolytic Cleavage of Nascent Transcripts

Felipe Beckedorff, Ezra Blumenthal, Lucas Ferreira daSilva, Yuki Aoi, Pradeep Reddy Cingaram, Jingyin Yue, Anda Zhang, Sadat Dokaneheifard, Monica Guiselle Valencia, Gabriel Gaidosh, Ali Shilatifard, Ramin Shiekhattar

Cell Reports, 07/2020

Read more

WANG LABORATORY



WANG LABORATORY



A small UTX stabilization domain of Trr is conserved within mammalian MLL3-4/COMPASS and is sufficient to rescue loss of viability in null animals.

Ryan Rickels, Lu Wang, Marta Iwanaszko, Patrick A Ozark, Marc A Morgan, Andrea Piunti, Natalia Khalatyan, Shimaa HA Soliman, Emily J Rendleman, Jeffrey N Savas, Edwin R Smith, Ali Shilatifard.

Genes & Development, 10/2020

Read more

YUE LABORATORY



YUE LABORATORY



DOT1L-controlled cell-fate determination and transcription elongation are independent of H3K79 methylation.

Cao K, Ugarenko M, Ozark PA, Wang J, Marshall SA, Rendleman EJ, Liang K, Wang L, Zou L, Smith ER, Yue F, Shilatifard A.

Proceedings of the National Academy of Sciences, 11/2020

Read more



IKAROS and CK2 regulate expression of BCL-XL and chemosensitivity in high-risk B-cell acute lymphoblastic leukemia

Chunhua Song , Zheng Ge , Yali Ding , Bi-Hua Tan , Dhimant Desai , Krishne Gowda , Shantu Amin , Raghavendra Gowda , Gavin P. Robertson , Feng Yue , Suming Huang , Vladimir Spiegelman , Jonathon L. Payne , Mark E. Reeves , Zafer Gurel , Soumya Iyer , Pavan Kumar Dhanyamraju , Meixian Xiang , Yuka Imamura Kawasawa , Nathalia M. Cury , José Andrés Yunes , Mary McGrath , Joe Schramm , Ruijun Su , Yiping Yang , Zhijun Zhao , Xiaoguang Lyu , Markus Muschen , Kimberly J. Payne , Chandrika Gowda , Sinisa Dovat

Blood, 09/2020

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