Christopher D McFarland

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Education

Ph.D. Biophysics	Harvard University	2014

The role of deleterious passenger mutations in cancer

B.S. Physics & B.S. Biochemistry	University of Rochester	2008

Magna cum laude

Affiliations

CASE WESTERN RESERVE UNIVERSITY　　　　　　　　　　　2021 – *present*
　　Assistant Professor of Genetics & Genome Sciences
　　Case Comprehensive Cancer Center, Member
　　Systems Biology & Bioinformatics, Trainer

PAST SCIENTIFIC EMPLOYERS
　　Dmitri A Petrov, *Postdoctoral Scholar*
　　Monte M Winslow, *Postdoctoral Scholar*
　　Leonid A Mirny, *PhD Student*
　　Mark E Dumont, *Undergraduate Reseracher*
　　Randall Morse, *High School Student*

Awarded Grants

R01, NCI　　　　　　　　　　　　　　　　　　　　　　　　2022
　　PI, Tumor-barcoding coupled with high-throughput sequencing for quantitative radiogenomics of the abscopal response in NSCLC*, $1,396,660 (CA271540)

Case Comprehensive Cancer Center: Pilot Grant　　　　　　　2021
　　PI, *Cancer evolution under androgen receptor inverse agonist,* $80,000

K99/R00, NCI: PATHWAY TO INDEPENDENCE　　　　　　　　2018
　　PI, *Quantifying the sources and dynamics of tumor growth variability using Tuba-seq,* $985,260 (CA226506)

VELOSANO, CLEVELAND CLINIC: RACING FOR THE CURE　　　2018
　　Co-Investigator (PI: Omar Mian, MD, PhD), *Establishing the function of key differentially-expressed genes in small-cell carcinoma of the bladder*, $100,000

R01, NCI: TRANSLATIONAL CLINICAL IGR　　　　　　　　　2016
　　Co-author (PI: Monte Winslow), *A quantitative multiplexed platform for the pharmacogenomic analysis of lung cancer*, $554,000 (CA207133)

U54, NCI PS-OC: YOUNG-INVESTIGATORS AWARD　　　　　　2013
　　PI, *Direct visualization of the role of horizontal gene transfer in the evolution of drug resistance in cancer*, $15,000 (CA143874)

U54, NCI PS-OC: TRANS-NETWORK GRANT　　　　　　　　　2011
　　Co-Author (PI: Leonid Mirny), *Genotypic determinants of metastatic fitness: a delicate balance of passenger and driver mutations*, $400,000 (CA143874)

Teaching Experience

CASE WESTERN RESERVE UNIVERSITY	2022 – *present*

GENE 505: Genetics Journal Club, Course Director
GENE 503: Readings and Discussions in Genetics, Instructor

HARVARD UNIVERSITY, DEPARTMENT OF CHEMISTRY	2010

Teaching Assistant for both undergraduate- and graduate-level Statistical Thermodynamics, Instructor: Dr. Eugene Shakhnovich

JOHNS HOPKINS UNIVERSITY, CENTER FOR TALENTED YOUTH	2008

Teaching Assistant for Nuclear Science (Instructor: Dr. Yuliya Kuznetsova) and Fast-Paced High School Physics (Instructor: Dr. William M. Kallfelz)

UNIVERSITY OF ROCHESTER, DEPARTMENT OF BIOLOGY	2008

Teaching Assistant for Introduction to Biochemistry, Instructor: Dr. Terry Platt

Scholarships & Awards

Scholarship to Physicists working on Cancer, Weizmann Institute of Science	2018
CSBS Postdoctoral Fellowship, Stanford University	2015
CEHG Postdoctoral Fellowship, Stanford University	2014
Scholarship to Emergent Order in Biology, IAS, Cargèse, France	2012
Best Poster Award, NCI Physical Sciences in Oncology Investigator's Meeting	2011
Phi Beta Kappa, University of Rochester	2008
Martin Tiernan Scholarship, University of Rochester	2005

Invited Talks

Grand Rounds, University of Cincinnati	2024
Department of Genetics, University of Georgia	2023
Max Planck for Evolutionary Biology, Plön Germany	2020
Integrative Genetics and Genomics Graduate Group, UC Davis	2019
Center for Theoretical Evolutionary Genomics Seminar, UC Berkeley	2018
Molecular Biology & Genetics Seminar, Johns Hopkins University	2018
THOR Seminar, Clevland Clinic, Case Western Reserve	2017

Patents

Winslow, MM; Petrov, DA; **McFarland CD**; Rogers ZN; Winters IP. 2017. *Compositions and Methods for Multiplexed Quantitative Analysis of Cell Lineages*. US Patent Application 62481067, filed April 2017. Patent Pending.

Other

Developed and maintain several software packages:
   fast_prng – Fastest exponential & normal pseudorandom number generator in C
   tuba-seq – Processing & interpretation of ultra-deep DNA barcode sequencing

Publications

J Maltas, DS Tadele, A Durmaz, **CD McFarland**, M Hinczewski, JG Scott. (2024) Frequency-dependent ecological interactions increase the prevalence, and shape the distribution, of pre-existing drug resistance. *PRX Life,* In Press.

J Sax, **CD McFarland**, B Carroll. (2024) Limitations of the Commercially Available Gene Expression Test in Predicting Cutaneous Squamous Cell Carcinoma Metastasis and Clinical Outcomes. *J Am Acad Derm,* **10:**1016.

Y Wang, A Khalil, A Kamar, M Du, T Dinh, **CD McFarland**, Zhenghe Wang. (2023) Unveiling immune checkpoint regulation: exploring the power of in vivo CRISPR screenings in cancer immunotherapy. *Front in Genetics,* **14:**1304425.

T Dinh, M Rahm, Z Wang, **CD McFarland**, Athar Khalil. (2023) Exploring the molecular landscape of NNK-induced transformation: A comprehensive genome-wide CRISPR/Cas9 screening. *Genes & Diseases,* **11:**101131.

J Tian, **CD McFarland**, J Woodard. (2023) Structural understanding of the functional consequences of missense mutation. *Front in Genetics*, **14:**1325326.

S Tilk, S Tkachenko, C Curtis, DA Petrov, **CD McFarland.** (2022) Most cancers carry a substantial deleterious load due to Hill-Robertson interference. *eLife,* 67790.

C Li, WY Lin, H Rizvi, H Cai, **CD McFarland**, ZN Rogers, M Yousefi, IP Winters, CM Rudin, DA Petrov, MM Winslow. (2021) Quantitative in vivo analyses reveal a complex pharmacogenomic landscape in lung adenocarcinoma. *Cancer Res,* **8:**5472.

H Cai, SK Chew, C Li, MK Tsai, L Andrejka, CW Murray, NW Hughes, EG Shuldiner, EL Ashkin, R Tang, KL Hung, LC Chen, SC Lee, M Yousefi, WY Lin, CA Kunder, L Cong, **CD McFarland**, DA Petrov, C Swanton, MM Winslow. (2021) A Functional Taxonomy of Tumor Suppression in Oncogenic KRAS–Driven Lung Cancer. *Cancer Discov,* **20:**1325.

ZN Rogers*, **CD McFarland***, IP Winters, JA Seoane, JJ Brady, S Yoon, C Curtis, DA Petrov, MM Winslow. (2018) Mapping the in vivo fitness landscape of lung adenocarcinoma tumor suppression in mice. *Nat Genetics*, **50**:483-6.

IP Winters, SH Chiou, NK Paulk, **CD McFarland**, PV Lalgudi, RK Ma, L Lisowski, AJ Connolly, DA Petrov, MA Kay, MM Winslow. (2017) Multiplexed in vivo homology-directed repair and tumor barcoding enables parallel quantification of Kras variant oncogenicity. *Nat Commun,* **8**:2053-69.

ZN Rogers*, **CD McFarland***, IP Winters*, S Naranjo, CH Chuang, DA Petrov, MM

Winslow. (2017) A quantitative and multiplexed approach to uncover the fitness landscape of tumor suppression in vivo. *Nat Methods,* **14**:737-42.
   "Research Highlight" at *Nat Rev Genetics*, **18**:456.

CD McFarland*, JA Yaglom*, JW Wojtkowiak*, JG Scott, DL Morse, MY Sherman, LA Mirny. (2017) The damaging effect of passenger mutations on cancer progression. *Cancer Res*, **77**:4763-72.

BM Grüner, CJ Schulze, D Yang, D Ogasawara, MM Dix, ZN Rogers, C Chuang, **CD McFarland**, S Chiou, JM Brown, BF Cravatt, M Bogyo, MM Winslow. (2016) An in vivo multiplexed small-molecule screening platform. *Nat Methods,* **13**:883–9.

CD McFarland. (2015) A modified ziggurat algorithm for generating exponentially and normally distributed pseudorandom numbers. *J Statist Comput Simulations,* **86**:1281-94.

CD McFarland, LA Mirny, KS Korolev. (2014) A tug-of-war between driver and passenger mutations in cancer and other adaptive processes. *PNAS,* **111**:15138-43.
   "Editor's Choice" at *Science,* **306**:597.

JA Yaglom, **CD McFarland**, LA Mirny, MY Sherman. (2014) Oncogene-triggered suppression of DNA repair leads to DNA instability in cancer. *Oncotarget*, **5**:8367-78.

CD McFarland, KS Korolev, GV Kryukov, SR Sunyaev, LA Mirny (2013). Impact of deleterious passenger mutations on cancer progression. *PNAS*, **110**:2910-2915.
   "Research Highlight" at *Nat Rev Cancer*, **13**:219.

*Contributed Equally