

Curriculum Vitae
Craig E. Cameron, Ph.D.
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1. Personal Information

Craig E. Cameron
109 Turvey Court
Chapel Hill, NC 27514
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2. Education

Postdoctoral Fellow, The Pennsylvania State University (PSU), University Park, PA, 1994 – 1997, Enzymology
Postdoctoral Scholar, Case Western Reserve University School of Medicine (CWRU), Cleveland, OH, 1993, Virology
Ph.D., CWRU, Cleveland, OH, 1988 – 1993, Biochemistry
B.S., *magna cum laude*, Howard University, Washington, DC, 1983-1987, Chemistry (major) and Mathematics (minor)

3. Professional Experience – Employment History

Professor and Chair of Microbiology and Immunology, University of North Carolina School of Medicine (UNC-SOM), 2019 – present
Member, Molecular Carcinogenesis Program, Penn State Hershey Cancer Institute, 2015 – 2019
Holder of the Eberly Chair in Biochemistry and Molecular Biology, Department of Biochemistry and Molecular Biology (BMB), PSU, 2013 – 2019
Associate Head for Research and Graduate Education, BMB, PSU, 2011 – 2012
Member, Training Faculty, Penn State MD-PhD Program, Penn State College of Medicine, 2007 – 2019
Paul Berg Professor of Biochemistry and Molecular Biology, BMB, PSU, 2005 – 2012
Louis Martarano Associate Professor of Biochemistry and Molecular Biology (tenured), BMB, PSU, 2002 – 2005
Member, Graduate Program Faculty, Huck Institute for the Life Sciences (HILS), PSU, 1997 – present
Member, Center for Biomolecular Structure and Function, HILS, PSU, 1997 – 2010
Member, NSF Research Training Program in Microbial Structural Biology, PSU, 1997 – 2003
Assistant Professor of Biochemistry and Molecular Biology, BMB, PSU, 1997 – 2002
Postdoctoral Fellow, Department of Chemistry, PSU, 1994 – 1997
Postdoctoral Scholar, Department of Biochemistry, CWRU, 1993
Graduate Assistant, Department of Biochemistry, CWRU, 1988 – 1993

4. Honors, Awards and Noteworthy Service to the Profession

Inaugural Diversity Award, International Society for Antiviral Research (2021)
Member, Editorial Committee, *Annual Review of Virology* (2021 – 2025)
Associate Editor, *Science Advances* (2020 – 2022)
Member, Board of Scientific Counselors, Vaccine Research Center, NIAID, NIH (2020 – present)
Member, Review Panel, HHMI 2021 Investigator Competition (2020)
Jeffrey Houtp Distinguished Investigator, UNC-SOM (2019 – present)

President-elect, President, then Past-president, American Society for Virology (ASV) (2019 – 2022)
Associate Editor, Journal of Biological Chemistry (JBC) (2019 – 2024)
NIH R37 MERIT Award (2018 – 2028)
Member, Molecular Genetics B Study Section, Center for Scientific Review, NIH (2016 – 2020)
Fellow, American Academy of Microbiology (2016)
Member, National Science Advisory Board for Biosecurity (secret security clearance), Office of the Director, NIH (2014 – 2021)
Member, Advisory Committee, Research Center for Emerging Viral Infections, Chang Gung University, Taoyuan, Taiwan (2014 – present)
Fellow, American Association for the Advancement of Science (2014)
Special Recognition Award, Medical Alumni Board, CWRU (2014)
Genesis Scholar Award, HBCU Digest (2014)
Eberly Family Chair in Biochemistry and Molecular Biology (PSU, 2013 – 2019)
Member (elected), Public Affairs Advisory Committee, American Society for Biochemistry and Molecular Biology (ASBMB) (2012-2015)
Member, Nominations Committee, ASV (2011 – 2012)
Dean's Climate and Diversity Award, Eberly College of Science (2011)
Distinguished Service Award, Eberly College of Science Alumni Society (2010)
Councilor for Animal Virology, ASV (2009 – 2012)
Member, Keystone Symposia Biochemistry/Structural Biology Study Group (2009)
Member, Board of Scientific Counselors, National Institute of Diabetes and Digestive and Kidney Diseases, NIH (2008 – 2013)
Chair-Elect, Chair, then Counselor, Division T (RNA Viruses) of the American Society for Microbiology (ASM) (2008 – 2011)
Member, ASBMB Today Editorial Advisory Board (2007 – 2013)
Fellow, Academic Leadership Program, Committee on Institutional Cooperation (2007 – 2008)
Paul Berg Professorship (PSU, 2005 – 2012)
Member, Molecular Genetics A Study Section, Center for Scientific Review, NIH (2005 – 2009)
Member, Editorial Board, Journal of Virology (2004 – present)
Chair, Minority Affairs Committee, ASBMB, (2008 – 2011)
Member, Editorial Board, JBC (2003 – 2008; 2010 – 2015; 2017 – 2019)
Established Investigator Award, American Heart Association (2003 – 2007)
Louis Martarano Career Development Professorship (PSU, 2002 – 2005)
Chair, Local Organizing Committee, 2005 Annual Meeting of the ASV (2002 – 2005)
Member, International and Cooperative Projects Study Section, Center for Scientific Review, NIH (2001 – 2005)
Howard Temin Award, National Cancer Institute (1997 – 2002)
National Research Service Award (Postdoctoral Fellowship), NIH (1994 – 1997)
Marcus Singer Award for Excellence in Graduate Research (CWRU, 1992)
National Research Service Award (MARC Predoctoral Fellowship), NIH (1989 – 1992)
Phi Beta Kappa (1987)
Beta Kappa Chi Scientific Honor Society (1987)
Golden Key National Honor Society (1987)
MARC Undergraduate Scholarship, NIH (1985 – 1987)
Howard University Trustee Scholarship (1983 – 1985)
Howard University Dean's List (1983 – 1987)

5. Bibliography and Products of Scholarship

Books and Edited Volumes

- 1) **Cameron, C.E.** and Cline S.D. (2012). Mitochondrial Gene Expression. **Biochimica et Biophysica Acta (BBA)- Gene Regulatory Mechanisms**. Volume 1819, Issues 9-10, 913-1112.
- 2) **Cameron, C.E.**, Götte, M., and Raney K.D. (2009). Viral Genome Replication. Springer Publishers, NY.

Book Chapters

- 1) Yeager, C, Shengjuler, D, Sun, S, Cremer, P.S., and **Cameron, C.E.** (2021) Characterization of Protein-Phospholipid/Membrane Interactions Using a "Membrane-on-a-Chip" Microfluidic System. **Methods Mol Biol.** **2251**, 199-210.
- 2) Gajewski, J. P., Arnold, J. J., Salminen, T. S., Kaguni, L. S., and **Cameron, C. E.** (2016). Expression and Purification of Mitochondrial RNA Polymerase and Transcription Factor A from *Drosophila melanogaster*. **Methods Mol Biol.** **1351**, 143-156.
- 3) Lee, C. A., August, A., Arnold, J. J., and **Cameron, C. E.** (2016). Polymerase Mechanism-Based Method of Viral Attenuation. **Methods Mol Biol.** **1349**, 83-104.
- 4) Boehr, D.D., Arnold, J.J., Moustafa, I.M., and **Cameron, C.E.** (2013). Structure, dynamics and fidelity of RNA-dependent RNA polymerases. In **Nucleic Acid Polymerases**. Murakami, K. and Trakselis, M. eds. Springer Publishers, NY, pp. 309-333.
- 5) Smidansky, E., Arnold, J.J., Sholders, A., Peersen, O.B., and **Cameron, C.E.** (2008). Nucleic acid polymerase fidelity and viral population fitness. In **Origin and Evolution of Viruses**. Domingo, E., Parrish, C., and Holland, J.J. eds. Academic Press (Elsevier), London, pp. 135-160.
- 6) Ng, K.K., Arnold, J.J., and **Cameron, C.E.** (2008). Structure-function relationships among RNA-dependent RNA polymerases. In **Current Topics in Microbiology and Immunology**. Paddison P., and Vogt, P., eds. Springer Publishers, NY, pp. 137-156.
- 7) Graci, J.D. and **Cameron, C.E.** (2005). Lethal mutagenesis: Exploiting error-prone replication of riboviruses for antiviral therapy. In **Antiviral Drug Discovery for Emerging Diseases and Bioterrorism Threats**. Torrence, P.F., ed. John Wiley & Sons, Hoboken, NJ, pp. 203-220.
- 8) Korneeva, V., Gohara D.W., and **Cameron, C.E.** (2003). The RNA-dependent RNA polymerase: Structure, function and mechanism. In **Mechanisms of Replication and Transcription of RNA Viruses**. Zhang, X., ed. Research Signpost, Kerala, India, pp. 17-36.

- 9) Huang, L., Gledhill, J., and **Cameron, C.E.** (2003). The RNA-dependent RNA polymerase. In **Gene Silencing**. Hannon G., ed. Cold Spring Harbor Press, Cold Spring Harbor, NY., pp. 175-203.
- 10) **Cameron, C.E.**, Gohara, D.W., and Arnold, J.J. (2002). Poliovirus RNA-dependent RNA polymerase (3Dpol): Structure, function and mechanism. In **Molecular Biology of Picornaviruses**. Semler, B.L. and Wimmer, E., eds. ASM Press, Washington, D.C., pp. 255-267.
- 11) Benkovic, S.J. and **Cameron, C.E.** (1995). Kinetic analysis of nucleotide incorporation and misincorporation by the Klenow fragment of *E. coli* DNA polymerase I. In **Methods in Enzymology (vol. 262)**. Campbell, J.L., ed. Academic Press, San Diego, CA, pp. 257-270.
- 12) Le Grice, S.F.J., **Cameron, C.E.**, and Benkovic, S.J. (1995). Purification and characterization of human immunodeficiency virus type 1 reverse transcriptase. In **Methods in Enzymology (vol. 262)**. Campbell, J.L., ed. Academic Press, San Diego, CA, pp. 130-147.
- 13) **Cameron, C.E.**, Burstein, H., Ridky, T., Weber, I.T., Wlodawer, A., Skalka, A.M., and Leis, J. (1995). Identification of amino acid residues of the retroviral aspartic proteinase important for substrate specificity and catalytic efficiency. In **Advances in Experimental Molecular Biology (vol. 362)**. Takahashi, K., ed. Plenum Publishing, New York, NY, pp. 399-406.
- 14) Leis, J., Bizub, D., Weber, I., **Cameron, C.**, Wlodawer, A., and Skalka, A. (1989). Structure-function analysis of the retroviral aspartic proteinase. In **Current Communications in Molecular Biology: Viral Proteinases as Targets for Chemotherapy**. Krausslich, H., Oroszlan, S., and Wimmer, E., eds. Cold Spring Harbor Press, Cold Spring Harbor, NY, pp. 175-180.

Refereed Journal Articles

- 1) Li, C., Shi, J., Wang, H., Rivera-Serrano, E.E., Yang, D., Zhou, G., Sun, C., **Cameron, C.E.**, and Yu, L. (2020). Polymerase fidelity contributes to foot-and-mouth disease virus pathogenicity and transmissibility in vivo. **J Virol** **95**, e01569-20.
- 2) Schloss, P.D., Junior, M., Alvania, R., Arias, C.A., Baumler, A., Casadevall, A., Detweiler, C., Drake, H., Gilbert, J., Imperiale, M.J., Lovett, S., Maloy, S., McAdam, A.J., Newton, I.L.G., Sadowsky, M.J., Sandri-Goldin, R.M., Silhavy, T.J., Tontono, P., Young, J.H., **Cameron, C.E.**, Cann, I., Fuller, A.O., and Kozik, A.J. (2020). The ASM Journals Committee Values the Contributions of Black Microbiologists. **J Virol** **94**, e01473-20; **J Clin Microbiol** **58**, e01855-20; **Antimicrob Agents Chemother** **64**, e01540-20; **Infect Immun** **88**, e00445-20; **Mol Cell Biol** **40**, e00356-20; **J Bacteriol** **202**, e00420-20; **Appl Environ Microbiol** **86**, e01773-20; **J Microbiol Biol Educ** **21**, 21.2.58; **mSystems** **5**, e00678-20; **mSphere** **5**, e00719-20; **Microbiol Mol Biol Rev** **84**, e00122-20; **mBio** **11**, e01998-20; **Microbiol Resour Announc** **9**, e00833-20; **Clin Microbiol Rev** **33**, e00203-20; **Microbiol Spectr** **8**.

- 3) Seifert, M., van Nies, P., Papini, F. S., Arnold, J. J., Poranen, M. M., **Cameron, C. E.**, Depken, M., and Dulin, D. (2020). Temperature controlled high-throughput magnetic tweezers show striking difference in activation energies of replicating viral RNA-dependent RNA polymerases. **Nucleic Acids Res** pii: gkaa233.
- 4) Kim, H., Ellis, V. D. 3rd, Woodman, A., Zhao, Y., Arnold, J. J., and **Cameron, C. E.** (2019). RNA-dependent RNA polymerase speed and fidelity are not the only determinants of the mechanism of efficiency of recombination. **Genes** **10**, pii: E968.
- 5) Liu, W., Calgar, M. U., Mao, Z., Woodman, A., Arnold, J. J., Wilke, C. O., and **Cameron, C. E.** (2019). More than efficacy revealed by single-cell analysis of antiviral therapeutics. **Sci Adv** **5**, eaax4761.
- 6) Boehr, A. K., Arnold, J. J., Oh, H. S., **Cameron, C. E.**, and Boehr, D. D. (2019). 2'-C-methylated nucleotides terminate virus RNA synthesis by preventing active site closure of the viral RNA-dependent RNA polymerase. **J Biol Chem** **294**, 16897-16907.
- 7) Shi, J., Perryman, J. M., Yang, X., Liu, X., Musser, D. M., Boehr, A. K., Moustafa, I. M., Arnold, J. J., **Cameron, C. E.**, and Boehr, D. D. (2019). Rational control of poliovirus RNA-dependent RNA polymerase fidelity by modulating motif-D loop conformational dynamics. **Biochemistry** **58**, 3735-3743.
- 8) Li, C., Wang, H., Shi, J., Yang, D., Zhou, G., Chang, J., **Cameron, C. E.**, Woodman, A., and Yu, L. (2019). Senecavirus-p-specific recombination assays reveal the intimate link between polymerase fidelity and RNA recombination. **J Virol** **93**, pii: e00576-19
- 9) Woodman, A., Lee, K. M., Janissen, R., Gong, Y. N., Dekker, N. H., Shih, S. R., and **Cameron, C. E.** (2019). Predicting intraserotypic recombination in enterovirus 71. **J Virol** **93**, pii: e02057-18.
- 10) Oh, H. S., Banerjee, S., Aponte-Diaz, D., Sharma, S. D., Aligo, J., Lodeiro, M. F., Ning, G., Sharma, R., Arnold, J. J., and **Cameron, C. E.** (2018). Multiple poliovirus-induced organelles suggested by comparison of spatiotemporal dynamics of membranous structures and phosphoinositides. **PLoS Pathog** **14**, e1007036.
- 11) Li, C., Wang, H., Yuan, T., Woodman, A., Yang, D., Zhou, G., **Cameron, C. E.**, and Yu, L. (2018). Foot-and-mouth disease virus type O specific mutations determine RNA-dependent RNA polymerase fidelity and virus attenuation. **Virology** **518**, 87-94.
- 12) Lee, K. M., Gong, Y. N., Hsieh, T. H., Woodman, A., Dekker, N. H., **Cameron, C. E.**, and Shih, S. R. (2018). Discovery of Enterovirus A71-like nonstructural genomes in recent circulating viruses of the Enterovirus A species. **Emerg Microbes Infect** **7**, 111.
- 13) Guo, L., Sharma, S. D., Debes, J., Beisang, D., Rattenbacher, B., Vlasova-St Louis, I., Wiesner, D. L., **Cameron, C. E.**, and Bohjanen, P. R. (2018). The hepatitis C viral nonstructural protein 5A stabilizes growth-regulatory human transcripts. **Nucleic Acids Res** **46**, 2537-2547.
- 14) Gizzi, A. S., Grove, T. L., Arnold, J. J., Jose, J., Jangra, R. K., Garforth, S. J., Du, Q., Cahill, S. M., Dulyaninova, N. G., Love, J. D., Chandran, K., Bresnick, A. R., **Cameron,**

- C. E.**, and Almo, S. C. (2018). A naturally occurring antiviral ribonucleotide encoded by the human genome. **Nature** **558**, 610-614.
- 15) Fitzsimmons, W. J., Woods, R. J., McCrone, J. T., Woodman, A., Arnold, J. J., Yennawar, M., Evans, R., **Cameron, C. E.**, and Lauring, A. S. (2018). A speed-fidelity trade-off determines the mutation rate and virulence of an RNA virus. **PLoS Biol** **16**, e2006459.
 - 16) Banerjee, S., Aponte-Diaz, D., Yeager, C., Sharma, S. D., Ning, G., Oh, H. S., Han, Q., Umeda, M., Hara, Y., Wang, R. Y. L., and **Cameron, C. E.** (2018). Hijacking of multiple phospholipid biosynthetic pathways and induction of membrane biogenesis by a picornaviral 3CD protein. **PLoS Pathog**. **14**, e1007086.
 - 17) Arena, G., Cisse, M. Y., Pyrdziak, S., Chatre, L., Riscal, R., Fuentes, M., Arnold, J. J., Kastner, M., Gayte, L., Bertrand-Gaday, C., Nay, K., Angebault-Prouteau, C., Murray, K., Chabi, B., Koechlin-Ramonatxo, C., Orsetti, B., Vincent, C., Casas, F., Marine, J. C., Etienne-Manneville, S., Bernex, F., Lombes, A., **Cameron, C. E.**, Dubouchaud, H., Ricchetti, M., Linares, L. K., and Le Cam, L. (2018). Mitochondrial MDM2 Regulates Respiratory Complex I Activity Independently of p53. **Mol Cell** **69**, 594-609 e598.
 - 18) Yang, X., Liu, X., Musser, D. M., Moustafa, I. M., Arnold, J. J., **Cameron, C. E.**, and Boehr, D. D. (2017). Triphosphate Reorientation of the Incoming Nucleotide as a Fidelity Checkpoint in Viral RNA-dependent RNA Polymerases. **J Biol Chem** **292**, 3810-3826.
 - 19) Uchida, A., Murugesapillai, D., Kastner, M., Wang, Y., Lodeiro, M. F., Prabhakar, S., Oliver, G. V., Arnold, J. J., Maher, L. J., Williams, M. C., and **Cameron, C. E.** (2017). Unexpected sequences and structures of mtDNA required for efficient transcription from the first heavy-strand promoter. **Elife** **6**
 - 20) Shengjuler, D., Sun, S., Cremer, P. S., and **Cameron, C. E.** (2017). PIP-on-a-chip: A Label-free Study of Protein-phosphoinositide Interactions. **J Vis Exp**
 - 21) Shengjuler, D., Chan, Y. M., Sun, S., Moustafa, I. M., Li, Z. L., Gohara, D. W., Buck, M., Cremer, P. S., Boehr, D. D., and **Cameron, C. E.** (2017). The RNA-Binding Site of Poliovirus 3C Protein Doubles as a Phosphoinositide-Binding Domain. **Structure** **25**, 1875-1886 e1877.
 - 22) Murugesapillai, D., Bouaziz, S., Maher, L. J., Israeloff, N. E., **Cameron, C. E.**, and Williams, M. C. (2017). Accurate nanoscale flexibility measurement of DNA and DNA-protein complexes by atomic force microscopy in liquid. **Nanoscale** **9**, 11327-11337.
 - 23) Li, S., Ma, F., Bachman, H., **Cameron, C. E.**, Zeng, X., and Huang, T. J. (2017). Acoustofluidic bacteria separation. **J Micromech Microeng** **27**
 - 24) Huang, P. N., Jheng, J. R., Arnold, J. J., Wang, J. R., **Cameron, C. E.**, and Shih, S. R. (2017). UGGT1 enhances enterovirus 71 pathogenicity by promoting viral RNA synthesis and viral replication. **PLoS Pathog** **13**, e1006375.
 - 25) Guo, F., Li, S., Caglar, M. U., Mao, Z., Liu, W., Woodman, A., Arnold, J. J., Wilke, C. O., Huang, T. J., and **Cameron, C. E.** (2017). Single-Cell Virology: On-Chip Investigation of Viral Infection Dynamics. **Cell Rep** **21**, 1692-1704.

- 26) Griesemer, S. B., Kramer, L. D., Van Slyke, G. A., Pata, J. D., Gohara, D. W., **Cameron, C. E.**, and Ciota, A. T. (2017). Mutagen resistance and mutation restriction of St. Louis encephalitis virus. **J Gen Virol** **98**, 201-211.
- 27) Dulin, D., Arnold, J. J., van Laar, T., Oh, H. S., Lee, C., Perkins, A. L., Harki, D. A., Depken, M., **Cameron, C. E.**, and Dekker, N. H. (2017). Signatures of Nucleotide Analog Incorporation by an RNA-Dependent RNA Polymerase Revealed Using High-Throughput Magnetic Tweezers. **Cell Rep** **21**, 1063-1076.
- 28) Woodman, A., Arnold, J. J., **Cameron, C. E.**, and Evans, D. J. (2016). Biochemical and genetic analysis of the role of the viral polymerase in enterovirus recombination. **Nucleic Acids Res** **44**, 6883-6895.
- 29) Oran, A. R., Adams, C. M., Zhang, X. Y., Gennaro, V. J., Pfeiffer, H. K., Mellert, H. S., Seidel, H. E., Mascioli, K., Kaplan, J., Gaballa, M. R., Shen, C., Rigoutsos, I., King, M. P., Cotney, J. L., Arnold, J. J., Sharma, S. D., Martinez-Outschoorn, U. E., Vakoc, C. R., Chodosh, L. A., Thompson, J. E., Bradner, J. E., **Cameron, C. E.**, Shadel, G. S., Eischen, C. M., and McMahon, S. B. (2016). Multi-focal control of mitochondrial gene expression by oncogenic MYC provides potential therapeutic targets in cancer. **Oncotarget** **7**, 72395-72414.
- 30) Li, S., Ren, L., Huang, P. H., Yao, X., Cuento, R. A., McCoy, J. P., **Cameron, C. E.**, Levine, S. J., and Huang, T. J. (2016). Acoustofluidic Transfer of Inflammatory Cells from Human Sputum Samples. **Anal Chem** **88**, 5655-5661.
- 31) Chan, Y. M., Moustafa, I. M., Arnold, J. J., **Cameron, C. E.**, and Boehr, D. D. (2016). Long-Range Communication between Different Functional Sites in the Picornaviral 3C Protein. **Structure** **24**, 509-517.
- 32) Baumgart, B. R., Wang, F., Kwagh, J., Storck, C., Euler, C., Fuller, M., Simic, D., Sharma, S., Arnold, J. J., **Cameron, C. E.**, Van Vleet, T. R., Flint, O., Bunch, R. T., Davies, M. H., Graziano, M. J., and Sanderson, T. P. (2016). Effects of BMS-986094, a Guanosine Nucleotide Analogue, on Mitochondrial DNA Synthesis and Function. **Toxicol Sci** **153**, 396-408.
- 33) Van Slyke, G. A., Arnold, J. J., Lugo, A. J., Griesemer, S. B., Moustafa, I. M., Kramer, L. D., **Cameron, C. E.**, and Ciota, A. T. (2015). Sequence-Specific Fidelity Alterations Associated with West Nile Virus Attenuation in Mosquitoes. **PLoS Pathog** **11**, e1005009.
- 34) van der Linden, L., Vives-Adrian, L., Selisko, B., Ferrer-Orta, C., Liu, X., Lanke, K., Ulferts, R., De Palma, A. M., Tanchis, F., Goris, N., Lefebvre, D., De Clercq, K., Leyssen, P., Lacroix, C., Purstinger, G., Coutard, B., Canard, B., Boehr, D. D., Arnold, J. J., **Cameron, C. E.**, Verdaguer, N., Neyts, J., and van Kuppeveld, F. J. (2015). The RNA template channel of the RNA-dependent RNA polymerase as a target for development of antiviral therapy of multiple genera within a virus family. **PLoS Pathog** **11**, e1004733.
- 35) Reynolds, K. A., **Cameron, C. E.**, and Raney, K. D. (2015). Melting of Duplex DNA in the Absence of ATP by the NS3 Helicase Domain through Specific Interaction with a Single-Strand/Double-Strand Junction. **Biochemistry** **54**, 4248-4258.

- 36) Moustafa, I. M., Uchida, A., Wang, Y., Yennawar, N., and **Cameron, C. E.** (2015). Structural models of mammalian mitochondrial transcription factor B2. **Biochim Biophys Acta** **1849**, 987-1002.
- 37) Moustafa, I. M., Gohara, D. W., Uchida, A., Yennawar, N., and **Cameron, C. E.** (2015). Conformational Ensemble of the Poliovirus 3CD Precursor Observed by MD Simulations and Confirmed by SAXS: A Strategy to Expand the Viral Proteome? **Viruses** **7**, 5962-5986.
- 38) Liu, X., Musser, D. M., Lee, C. A., Yang, X., Arnold, J. J., **Cameron, C. E.**, and Boehr, D. D. (2015). Nucleobase but not Sugar Fidelity is Maintained in the Sabin I RNA-Dependent RNA Polymerase. **Viruses** **7**, 5571-5586.
- 39) Li, S., Ding, X., Mao, Z., Chen, Y., Nama, N., Guo, F., Li, P., Wang, L., **Cameron, C. E.**, and Huang, T. J. (2015). Standing surface acoustic wave (SSAW)-based cell washing. **Lab Chip** **15**, 331-338.
- 40) Kolli, S., Meng, X., Wu, X., Shengjuler, D., **Cameron, C. E.**, Xiang, Y., and Deng, J. (2015). Structure-function analysis of vaccinia virus H7 protein reveals a novel phosphoinositide binding fold essential for poxvirus replication. **J Virol** **89**, 2209-2219.
- 41) Zafar, M. K., Ketkar, A., Lodeiro, M. F., **Cameron, C. E.**, and Eoff, R. L. (2014). Kinetic analysis of human PrimPol DNA polymerase activity reveals a generally error-prone enzyme capable of accurately bypassing 7,8-dihydro-8-oxo-2'-deoxyguanosine. **Biochemistry** **53**, 6584-6594.
- 42) Yang, S., Slotcavage, D., Mai, J. D., Guo, F., Li, S., Zhao, Y., Lei, Y., **Cameron, C. E.**, and Huang, T. J. (2014). Electrochemically Created Highly Surface Roughened Ag Nanoplate Arrays for SERS Biosensing Applications. **J Mater Chem C Mater** **2**, 8350-8356.
- 43) Moustafa, I. M., Korboukh, V. K., Arnold, J. J., Smidansky, E. D., Marcotte, L. L., Gohara, D. W., Yang, X., Sanchez-Farran, M. A., Filman, D., Maranas, J. K., Boehr, D. D., Hogle, J. M., Colina, C. M., and **Cameron, C. E.** (2014). Structural dynamics as a contributor to error-prone replication by an RNA-dependent RNA polymerase. **J Biol Chem** **289**, 36229-36248.
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- 45) Li, S., Guo, F., Chen, Y., Ding, X., Li, P., Wang, L., **Cameron, C. E.**, and Huang, T. J. (2014). Standing surface acoustic wave based cell coculture. **Anal Chem** **86**, 9853-9859.
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efficiency are suppressed by HIV nucleocapsid protein. **Proc Natl Acad Sci U S A** **94**, 6700-6705.

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Review Articles

- 1) Rivera-Serrano E.E., Gizzi, A.S., Arnold, J.J., Grove, T.L., Almo, S.C., and **Cameron, C.E.** (2020). Viperin reveals its true function. **Annu. Rev. Virol.** **7**, 421-446,
- 2) **Cameron, C.E.**, Moustafa, I.M. and Arnold, J.J. (2016). Fidelity of nucleotide incorporation by the RNA-dependent RNA polymerase from poliovirus. **Enzymes** **39**, 293-323.
- 3) Li, S., Kiehne, J., Sinoway, L.I., **Cameron, C.E.** and Huang, T.J. (2013). Microfluidic opportunities in the field of nutrition. **Lab Chip**, **13**, 3993-4003. PMC3875330.
- 4) **Cameron, C.E.** (2013). Future virology: A mitochondriac's perspective. **Future Virol.** **8**, 933-935.
- 5) Arnold, J.J., Smidansky E.D., Moustafa, I.M., and **Cameron, C.E.** (2012). Human mitochondrial RNA polymerase: Structure-function, mechanism and inhibition. **Biochim. Biophys. Acta.** **1819**, 948-60.
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- 7) **Cameron, C.E.**, Oh, H.S. and Moustafa, I.M. (2010). Expanding knowledge of P3 proteins in the poliovirus lifecycle. **Future Microbiol.** **5**, 867-81.
- 8) Raney, K.D., Sharma, S.D., Moustafa, I.M. and **Cameron, C.E.** (2010). Hepatitis C virus non-structural protein 3 (HCV NS3): A multifunctional antiviral target. **J. Biol. Chem.** **285**, 22725-31.
- 9) **Cameron, C.E.**, Moustafa, I.M. and Arnold, J.J. (2009). Dynamics: The missing link between structure and function of the viral RNA-dependent RNA polymerase? **Curr. Opin. Struct. Biol.** **19**, 768-74.
- 10) Graci, J.D. and **Cameron C.E.** (2008) Therapeutically targeting RNA viruses via lethal mutagenesis. **Future Virology** **3**, 553-566.
- 11) Graci, J.D., and **Cameron, C.E.** (2006). Mechanisms of action of ribavirin against distinct viruses. **Rev. Med. Virol.** **16**, 37-48.

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- 13) Freistadt, M.S., Meades, G.D., and Cameron, C.E. (2004). Lethal mutagens: Broad-spectrum antivirals with limited potential for development of resistance? **Drug Resist. Updat.** **7**, 19-24.
- 14) Graci, J.D. and **Cameron, C.E.** (2004). Challenges for the development of ribonucleoside analogues as inducers of error catastrophe. **Antivir. Chem. Chemother.** **15**, 1-13.
- 15) Crotty, S., **Cameron, C.**, and Andino, R. (2002). Ribavirin's antiviral mechanism of action: lethal mutagenesis? **J. Mol. Med.** **80**, 86-95.
- 16) Hong, Z. and **Cameron, C.E.** (2002). Pleiotropic mechanisms of ribavirin antiviral activities. **Prog. Drug Res.** **59**, 41-69.
- 17) Graci, J.D. and **Cameron, C.E.** (2002). Quasispecies, error catastrophe and the antiviral activity of ribavirin. **Virology** **298**, 175-180.
- 18) **Cameron, C.E.** and Castro, C. (2001). The mechanism of action of ribavirin: Lethal mutagenesis of RNA virus genomes mediated by the viral RNA-dependent RNA polymerase. **Curr. Opin. Infect. Dis.** **14**, 757-764.
- 19) Leis, J.P. and **Cameron, C.E.** (1994). Engineering proteases with altered specificity. **Curr. Opin. Biotechnol.** **5**, 403-408.

Book Reviews

- 1) **Cameron, C.E.** (1999). A review of: Hepatitis C Protocols. Methods in Molecular Medicine, Volume 19 (Edited by Johnson Yiu-Nam Lau). **Quarterly Review in Biology** **74**, 509-510.

Manuscripts (under review, under revision, or in press)

- 1) Bera, S.C., Seifert, M., Kirchdoerfer, R.N., van Nies, P., Wubulikasimu, Y., Quack, S., Papini, F.S., Arnold, J.J., Canard, B., **Cameron, C.E.**, Depken, M., and Dulin D. (2021). The nucleotide addition cycle of the SARS-CoV-2 polymerase. bioRxiv 2021, 437309 doi: <https://doi.org/10.1101/2021.03.27.437309>
- 2) Seifert, M., Bera, S.C., van Nies, P., Kirchdoerfer, R.N., Shannon, A., Le, T-T-N., Grove, T.L., Papini, F.S., Arnold, J.J., Almo, S.C., Canard, B., Depken, M., **Cameron, C.E.**, and Dulin, D. (2020). Signatures and mechanisms of efficacious therapeutic ribonucleotides against SARS-CoV-2 revealed by analysis of its replicase using magnetic tweezers. bioRxiv 2020.08.06.240325; doi: <https://doi.org/10.1101/2020.08.06.240325>
- 3) Janissen, R., Woodman, A., Lee, K.-M., Moustafa, I., Fitzgerald, F., Huang, P.-N., Kuijpers, L., Perkins, A.L., Harki, D.A., Arnold, J.J., Solano B., Shih, S.-R., Cameron, C.E., and Dekker N.H. (2020). Induced copy-back RNA synthesis as a novel therapeutic

mechanism against RNA viruses. bioRxiv 2020.02.12.946558; doi:
<https://doi.org/10.1101/2020.02.12.946558>

- 4) Acevedo, A., Woodman, A., Arnold, J.J., Yeh, M.T., Evans, D., Cameron, C.E., and Andino R. (2018). Genetic recombination of poliovirus facilitates subversion of host barriers to infection. bioRxiv 273060; doi: <https://doi.org/10.1101/273060>

Abstracts:

(Only abstracts for 2018 are shown; the name of the presenting author is underlined.)

- 1) Yeager C., Shengjuler, D., Li, Z., Buck, M., and **Cameron, C. E.** (2018). Multiple phosphoinositide-binding surfaces on poliovirus polymerase. **American Society for Virology 37th Annual Meeting.** (College Park, MD) (Talk)
- 2) Woodman, A., Janissen, R., Lee, K. M., Shih, S. R., Dekker, N.H., and **Cameron, C. E.** Recombination in Enterovirus 71. **American Society for Virology 37th Annual Meeting.** (College Park, MD) (Talk)
- 3) Thomas, N., Aponte-Diaz D., Sharma, S. D., and **Cameron C. E.** (2018). Monitoring spatiotemporal dynamics of virus-host interactions. **Annual Biomedical Research Conference (ABRCMS).** (Indianapolis, IN) (Poster)
- 4) Sharma, S. D., Cordek, D. G., Arnold, J. J., Sourisseau, M., Klumpp, K., Evan, M., Meulman, P., Lindenbach, B. D., Rountree, C. B., and **Cameron, C. E.** (2018). New, functional forms of HCV NS5A protein in vivo? **American Society for Virology 37th Annual Meeting.** (College Park, MD) (Poster)
- 5) Kastner, M. and **Cameron, C. E.** (2018). Human mitochondrial transcription investigated by in-vitro transcription assays and high-resolution atomic force microscopy (AFM). **Third Huck Life Science Symposium.** (University Park, PA) (Poster)
- 6) Kastner, M., Oliver, G., and **Cameron, C. E.** (2018). Biophysical and biochemical analysis of a homozygous missense variant in the mitochondrial transcription factor A (TFAM): Impact on promoter binding, loop formation, and transcriptional regulation. **Eighth Translational Research in Mitochondria, Aging and Disease Symposium (TRiMAD).** (University Park, PA) (Talk)
- 7) Kastner, M. and **Cameron, C. E.** (2018). Correlative Optical and Atomic Force Microscopy: Nanoscale Characterization of Biological Systems. **Consortium for Interdisciplinary Image Informatics and Visualization (CI3V) Symposium.** (Hershey, PA) (Talk)
- 8) Hsiung, C.-H., Korboukh, V., Paul, A. V., Wimmer, E., **Cameron, C. E.** (2018). Post-replication defect in poliovirus lifecycle caused by mutation in polymerase-coding sequence. **American Society for Virology 37th Annual Meeting.** (College Park, MD) (Talk)
- 9) Ellis, III V., Woodman, A. and **Cameron, C. E.** (2018). Viral determinants of enterovirus recombination. **Eberly College of Science Summer Undergraduate Research Program** (State College, PA) (Poster)

- 10) Bien-Aime, M., Yeager, C., and **Cameron, C. E.** (2018). Observing the viral RNA-dependent RNA polymerase binding to phosphoinositide-containing membranes. **Eberly College of Science Summer Undergraduate Research Program** (State College, PA) (Poster)
- 11) Arnold, J. J., Chib, S. Shuler, M., Perryman, J., Sharma, R., Ciota, A. T., Raney, K. D., and **Cameron C. E.** (2018). Towards assembly and characterization of the Flavivirus replicase. **American Society for Virology 37th Annual Meeting.** (College Park, MD) (Poster)
- 12) Arnold, J. J., Gizzi, A. S., Grove, T. L., Jose, J., Almo, S. C. and **Cameron, C. E.** (2018). The viral RNA-dependent RNA polymerase as the mediator of the antiviral activity of viperin. **European Study Group on the Molecular Biology of Picornaviruses (EUROPIC).** (Egmond aan Zee, Netherlands) (Poster)
- 13) Arnold, J. J., Gizzi, A. S., Grove, T. L., Jose, J., Almo, S. C. and **Cameron, C. E.** (2018). The viral RNA-dependent RNA polymerase as the mediator of the antiviral activity of viperin. **International Symposium on RNA Viruses.** (Tzu Chi University, Taiwan) (Talk)
- 14) Aponte-Diaz D., Banerjee S., Yeager C., Sharma S.D., and **Cameron C.E.** (2018). Control of multiple phospholipid biosynthetic pathways and membrane biogenesis by a single picornaviral protein using genetically-separable mechanisms. **American Society for Virology 37th Annual Meeting.** (College Park, MD) (Talk)
- 15) Aponte-Diaz D., Banerjee S., Yeager C., Sharma S.D., and **Cameron C.E.** (2018). Control of multiple phospholipid biosynthetic pathways and membrane biogenesis by a single picornaviral protein using genetically-separable mechanisms. **European Study Group on the Molecular Biology of Picornaviruses (EUROPIC).** (Egmond aan Zee, The Netherlands) (Talk)

Invited Talks:

International meetings and workshops

- 1) TBD
Keynote Lecture, 8th Annual RNA Symposium
The RNA Institute, SUNY Albany
March 2022
- 2) TBD
Keynote Speaker, ACS Infectious Disease Young Investigator Award Symposium
2021 Fall American Chemical Society Meeting
August 2021, Atlanta, GA
- 3) “My career-long fascination with antiviral therapeutics”
34th International Conference on Antiviral Research
March 2021, VIRTUAL

- 4) "Moving virology and virologists towards the personal and the precise"
Annual Meeting of the Association of Medical School Microbiology and Immunology Chairs
January 2021, VIRTUAL
- 5) "Antiviral therapy: Towards the personal and the precise"
Black Queer Town Hall in STEM
January 2021, VIRTUAL
- 6) "Phosphoinositides in the lifecycle of an RNA virus"
2020 FASEB SRC: "The Phospholipid Conference: Dynamic Lipid Signaling in Health and Disease"
August 2020, Steamboat Springs, CO
Cancelled because of COVID-19
- 7) "Antiviral strategies for EV-D68 and other enteroviruses"
Workshop on AFM Preparedness: Addressing EV-D68 and other AFM-associated Enteroviruses NIAID, NIH
February 2020, Rockville, MD
- 8) "Single-cell analysis of enterovirus infection dynamics"
Symposium on: "The Social Lives of Viruses" American Society for Microbiology Annual Meeting (ASM Microbe) 2019
June 2019, San Francisco, CA
- 9) "Targeting a viral polymerase for antiviral therapy: Insight from studies of single molecules and single, infected cells"
26th Enzyme Mechanisms Conference
January 2019, New Orleans, LA
- 10) "Single-cell analysis of enterovirus replication dynamics"
Working Group on Multi-level Selection in Virus Populations
Santa Fe Institute
November 2018, Santa Fe, NM
- 11) "Distinct organelles for genome replication and virus assembly during poliovirus replication"
2018 FASEB Virus Structure and Assembly Meeting
July 2018, Steamboat Springs, CO
- 12) "Single-cell virology: On-chip investigation of viral infection dynamics"
Satellite Symposium on Single-Cell Virology
2018 Annual Meeting of the American Society for Virology
University of Maryland
July 2018, College Park, MD

- 13) "The P3 A, B, C, and D's of picornavirus genome replication"
European Study Group on the Molecular Biology of Picornaviruses
June 2018, Egmond aan Zee, The Netherlands
- 14) "Induction of phospholipid biosynthesis and membrane biogenesis by an RNA virus"
2018 International Symposium on RNA viruses
Tzu Chi University,
March 2018, Hualien, Taiwan
- 15) "A new mechanistic class of antiviral ribonucleoside discovered by using magnetic tweezers to monitor the activity of a viral polymerase"
Nucleosides, Nucleotides & Oligonucleotides Gordon Research Conference
June 2017, Newport, RI
- 16) "Unexpected sequences and structures of mtDNA required for efficient transcription from the first heavy-strand promoter"
Translational Research in Mitochondria, Aging and Disease (TRiMAD) Symposium
Center for Mitochondrial and Epigenomic Medicine
Children's Hospital of Philadelphia
October 2016, Philadelphia, PA
- 17) "Single-cell virology: On-chip investigation of viral infection dynamics"
European Study Group on the Molecular Biology of Picornaviruses
September 2016, les Diablerets, Switzerland
- 18) "Regulation of Mitochondrial Transcription by TFAM-directed Sequence-specific mtDNA Looping"
Mitochondrial Medicine 2016 Symposium
United Mitochondrial Disease Foundation
June 2016, Seattle, WA
- 19) "New Functional Forms of HCV NS5A Protein in vivo?"
Session on: "Recombination, Replication Fidelity and RdRp Structure"
Keystone Symposia: Positive-Strand RNA Viruses
May 2016, Austin, TX
- 20) "Next-Gen Virology: Use of microfluidics and live-cell imaging to study poliovirus replication at the single-cell level"
Viral Diseases Panel, 18th International Conference on Emerging Infectious Diseases
US-Japan Cooperative Medical Sciences Program
January 2016, Bethesda, MD
- 21) "New paradigms for regulation of human mitochondrial transcription"

Session on: "Mitochondrial Genome Dynamics: New Concepts in Function and Disease"

Annual Meeting of the Biophysical Society

February 2015, Baltimore, MD

- 22)** "Next-Gen Virology: Use of microfluidics and live-cell imaging to study poliovirus replication at the single-cell level"
2014 International Symposium on RNA Viruses
Chang Gung University
October 2014, Taoyuan, Taiwan
- 23)** "New paradigms for regulation of human mitochondrial transcription"
Session on: "Emerging Roles of Mitochondria in Cell signaling, Physiology and Disease"
American Society for Microbiology Annual Meeting (Division T Symposium)
April 2014, San Diego, CA
- 24)** "Misregulated transcription in human mitochondria and disease"
11th International Conference on Environmental Mutagens
Foz do Iguassu, PR, Brazil
November 2013
- 25)** "Misregulated transcription in human mitochondria and disease"
2013 FASEB conference: Mitochondrial Assembly and Dynamics in Health, Disease and Aging
June 2013, Big Sky, MT
- 26)** "Contributions of HCV NS5a phosphorylation to viral replication and persistence"
Viruses and Cells Gordon Conference
May 2013, Il Ciocco, Barga, Italy
- 27)** "When the genome is not enough: how hepatitis C virus expands its proteome"
2013 Meeting of the Society for General Microbiology (UK)
March 2013, Manchester, UK
- 28)** "The implications of population genetics theory on survival and virulence of an RNA virus"
Workshop in Virus Evolution
March 2013, Hershey, PA
- 29)** "Principles and applications of RNA virus population diversity"
2012 International Symposium on Infectious Disease and Signal Transduction
November 2012, College of Medicine, National Cheng Kung University, Tainan City, Taiwan
- 30)** "HCV persistence and inhibition"

2012 International Symposium on RNA Viruses
Chang Gung University, Taoyuan, Taiwan
November 2012

- 31) "Regulation of mammalian mitochondrial transcription"
2011 FASEB conference: Mitochondrial Assembly and Dynamics in Health,
Disease and Aging
July 2011, Steamboat Grand Resort, CO
- 32) "Regulation of mammalian mitochondrial transcription"
2011 FASEB conference: Mechanism and Regulation of Prokaryotic
Transcription
June 2011, Saxtons River, VT
- 33) "Human mitochondrial transcription"
Mitochondrial Medicine 2011 Symposium
United Mitochondrial Disease Foundation
June 2011, Schaumburg, IL
- 34) "Human mitochondrial transcription"
The Expanding Roles of Mitochondria in Cell Biology and Disease
Howard Hughes Medical Institute
May 2011, Janelia Farm Research Center, VA
- 35) "Human mitochondrial transcription"
RNAP2010 – Structure, function and evolution of RNA polymerases
Biochemical Society (UK) and Wellcome Trust
September 2010, Hinxton, Cambridgeshire, England
- 36) "Towards a universal mechanism for viral attenuation and vaccine development"
American Society for Microbiology Annual Meeting (Division T Symposium)
May 2010, San Diego, CA
- 37) "New strategies to treat and prevent viral infection revealed from studies of
mechanisms of ribavirin resistance"
10th Annual Symposium on Antiviral Drug Resistance
November 2009, Wyndham, VA
- 38) "Dynamics of the viral RNA-dependent RNA polymerase: Determinant of
incorporation fidelity and viral virulence and universal platform for live-virus
vaccine design"
Enzymes, Coenzymes, and Metabolic Pathways Gordon Research Conference
July 2009, Waterville Valley, NH
- 39) "Picornavirus genome replication"
American Society for Virology Annual Meeting
July 2008, Ithaca, NY

- 40) "Components of the picornavirus genome-replication machinery function in genome encapsidation"
2008 FASEB Virus Structure and Assembly Meeting
June 2008, Saxtons River, VT
- 41) "Pre- and post-replication functions for the picornavirus 3CD protein"
European Study Group on the Molecular Biology of Picornaviruses
May 2008, Sitges (Barcelona), Spain
- 42) "A universal strategy for vaccine development"
Session on: "Integrating Discovery and Applications"
American Society for Biochemistry and Molecular Biology Annual Meeting
April 2008, San Diego, CA
- 43) "RNA-dependent RNA polymerase (in)fidelity: Mechanisms, consequences and applications"
EMBL Workshop on RNA Viruses
August 2007, Vienna, Austria
- 44) "Incorporation fidelity of the viral RNA-dependent RNA polymerase"
European Study Group on the Molecular Biology of Picornaviruses
May 2005, Lunteren, The Netherlands
- 45) "Biochemical analysis of HCV NS5a protein"
Tenth International Symposium on Hepatitis C Virus and Related Viruses
December 2003, Kyoto, Japan
- 46) "Lethal mutagens: A promising new class of antiviral agents"
Case Western Reserve University Center for Aids Research
Mechanisms of Viral Latency: HIV and Its Co-factors (Session 4 – Evolution/Escape Mechanisms/Drug Resistance)
May 2003, Cleveland, Ohio
- 47) "Quasispecies, Error Catastrophe and the Antiviral Activity of Ribavirin"
Viruses and Cells Gordon Conference
June 2001, Tilton, New Hampshire
- 48) "Quasispecies, Error Catastrophe and the Antiviral Activity of Ribavirin"
NCI HIV Drug Resistance Program Symposium on "Understanding Antiviral Drug Resistance"
December 2000, Chantilly, Virginia
- 49) "Biochemical Analysis of Poliovirus RNA Synthesis"
Satellite Symposium on "Viral RNA Replication and Transcription"
American Society for Virology – 18th Annual Meeting

July 1999, Amherst, Massachusetts

- 50) “Kinetic Analysis of Poliovirus RNA-dependent RNA Polymerase (3Dpol): Jumps in the Right Direction”
Fifth International Symposium on “Positive Strand RNA Viruses”
May 1998, St. Petersburg, Florida
- 51) “Mechanism of HIV RT-catalyzed DNA Strand Transfer Reactions”
Keystone Symposium on “Viral Genome Replication”
March 1996, Tamarron, Colorado

Universities or research institutions

- 1) “Antiviral therapy: Towards the personal and the precise”
Salk Institute for Biological Studies
La Jolla, CA
December 2021
- 2) “Antiviral therapy: Towards the personal and the precise”
Department of Microbiology and Immunology
Columbia University
New York, NY
November 2021
- 3) “Antiviral therapy: Towards the personal and the precise”
Department of Microbiology
Boston University School of Medicine
Boston, MA
November 2021
- 4) “Antiviral therapy: Towards the personal and the precise”
Barbara McClintock Life Sciences Lecture Series
Cornell University
Ithaca, NY
October 2021
- 5) “Antiviral therapy: Towards the personal and the precise”
Department of Microbiology and Immunology
Drexel University College of Medicine
Philadelphia, PA
September 2021
- 6) “Antiviral therapy: Towards the personal and the precise”
Ragon Institute of MGH, MIT, and Harvard
Cambridge, MA
June 2021 (VIRTUAL)

- 7) “Antiviral therapy: Towards the personal and the precise”
PROVIDES Seminar Series
UT Southwestern Medical Center
Dallas, TX
May 2021 (VIRTUAL)
- 8) “Antiviral therapy: Towards the personal and the precise”
Department of Biochemistry
University of Wisconsin – Madison
Madison, WI
April 2021 (VIRTUAL)
- 9) “Antiviral therapy: Towards the personal and the precise”
Department of Immunobiology
University of Arizona
Tucson, AZ
April 2021 (VIRTUAL)
- 10) “Antiviral therapy: Towards the personal and the precise”
Department of Pathology Grand Rounds
University of North Carolina School of Medicine
April 2021 (VIRTUAL) POSTPONED
- 11) “Antiviral therapy: Towards the personal and the precise”
Committee on Microbiology Seminar Series
University of Chicago
Chicago, IL
March 2021 (VIRTUAL)
- 12) “Targeting a viral polymerase for antiviral therapy: Insight from studies of single molecules and single, infected cells”
Department of Molecular Genetics and Microbiology
Duke Center for Virology
Duke University Medical Center
Durham, NC
January 2020
- 13) “Targeting a viral polymerase for antiviral therapy: Insight from studies of single molecules and single, infected cells”
Department of Molecular Biosciences
University of Kansas
Lawrence, KS
October 2019

- 14) "Targeting a viral polymerase for antiviral therapy: Insight from studies of single molecules and single, infected cells"
Neuroinfectious Diseases Seminar Series
NINDS, NIH
Bethesda, MD
May 2019
- 15) "Targeting a viral polymerase for antiviral therapy: Insight from studies of single molecules and single, infected cells"
- 16) Department of Biochemistry and Molecular Genetics
School of Medicine
University of Alabama at Birmingham
Birmingham, AL
April 2019
- 17) "Targeting a viral polymerase for antiviral therapy: Insight from studies of single molecules and single, infected cells"
- 18) Department of Microbiology and Molecular Genetics
School of Medicine
University of California, Irvine
Irvine, CA
April 2019
- 19) "Targeting a viral polymerase for antiviral therapy: Insight from studies of single molecules and single, infected cells"
- 20) Department of Microbiology
University of Illinois
Urbana-Champaign, IL
March 2019
- 21) "Targeting a viral polymerase for antiviral therapy: Insight from studies of single molecules and single, infected cells"
- 22) Graduate School of Biomedical Sciences and Engineering
Hanyang University
Seoul, South Korea
March 2019
- 23) "Targeting a viral polymerase for antiviral therapy: Insight from studies of single molecules and single, infected cells"
- 24) Graduate Institute of Biomedical Sciences
Chang Gung University

Taoyuan, Taiwan
March 2019

- 25)** “Targeting a viral polymerase for antiviral therapy: Insight from studies of single molecules and single, infected cells”

26) Department of Microbiology and Immunology
University of North Carolina School of Medicine
Chapel Hill, NC
June 2018

- 27)** “Single-cell Virology”

28) 20th Annual Norman P. Salzman Symposium in Virology
NIAID, NIH
Bethesda, MD
November 2018

29) “Targeting a viral polymerase for antiviral therapy: Insight from studies of single molecules and single, infected cells”
Department of Biochemistry and Molecular Biology
Emory University School of Medicine
Atlanta, GA
October 2018

- 30)** “Targeting a viral polymerase for antiviral therapy: Insight from studies of single molecules and single, infected cells”

31) Department of Microbiology and Immunology
University of Michigan School of Medicine
Ann Arbor, MI
June 2018

32) “Targeting a viral polymerase for antiviral therapy: Insight from studies of single molecules and single, infected cells”
Microbiology Graduate Program Seminar Series
Department of Microbial Pathogenesis
Yale University School of Medicine
New Haven, CT
April 2018

33) “Targeting a viral polymerase for antiviral therapy: Insight from studies of single molecules and single, infected cells”
Department of Molecular and Cellular Biochemistry
Indiana University
Bloomington, IN

April 2018

- 34)** “Targeting a viral polymerase for antiviral therapy: Insight from studies of single molecules and single, infected cells”
T32 Trainee-Invited Speaker
Department of Pharmacology and Physiology
University of Rochester Medical Center
Rochester, NY
April 2018
- 35)** Dr. Milton J. Hernandez Lecture in Mentoring Excellence
NIAID Bridging the Career Gap: Promoting Diversity in Biological Research
NIAID, NIH
Rockville, MD
October 2017
- 36)** “New Approaches to Study the Mechanism and Biology of Antiviral Nucleos(t)ides”
Department of Biology
Gettysburg College
Gettysburg, PA
September 2017
- 37)** “Single-cell virology: On-chip investigation of viral replication dynamics”
Ernie Simms Lecture
Department of Microbiology
Washington University of St. Louis
St. Louis, MO
May 2017
- 38)** “Single-cell virology: On-chip investigation of viral replication dynamics”
Department of Chemistry and Biochemistry
University of Texas at Arlington
Arlington, TX
April 2017
- 39)** “Single-cell virology: On-chip investigation of viral replication dynamics”
Distinguished Scientist Seminar Series
College of Medicine
University of South Alabama
Mobile, AL
March 2017
- 40)** “Single-cell virology: On-chip investigation of viral replication dynamics”
Graduate Institute of Biomedical Sciences
Chang Gung University

Taoyuan, Taiwan
February 2017

- 41)** “Single-cell virology: On-chip investigation of viral replication dynamics”
Department of Medical Laboratory Science and Biotechnology
China Medical University at Taichung
Taichung, Taiwan
February 2017
- 42)** “Single-cell virology: On-chip investigation of viral replication dynamics”
Department of Microbiology
Hong Kong University
Hong Kong
February 2017
- 43)** “Next-Gen Virology: Use of microfluidics and live-cell imaging to study poliovirus replication at the single-cell level”
Department of Molecular Biosciences
University of Texas at Austin
Austin, TX
May 2016
- 44)** “Next-Gen Virology: Use of microfluidics and live-cell imaging to study poliovirus replication at the single-cell level”
Chang Gung University
TaoYuan, Taiwan
March 2016
- 45)** “Next-Gen Virology: Use of microfluidics and live-cell imaging to study poliovirus replication at the single-cell level”
Department of Life Science and Institute of Biotechnology
National Dong Hwa University
Hualien, Taiwan
March 2016
- 46)** “Next-Gen Virology: Use of microfluidics and live-cell imaging to study poliovirus replication at the single-cell level”
Harbin Veterinary Research Institute
Harbin, People's Republic of China
September 2015
- 47)** “Next-Gen Virology: Use of microfluidics and live-cell imaging to study poliovirus replication at the single-cell level”
Department of Biochemistry and Molecular Biology
Thomas Jefferson University
Philadelphia, PA

September 2015

- 48)** "Misregulated mitochondrial transcription and disease"
University of Kansas Cancer Center
Kansas City, KS
April 2015
- 49)** "The viral RNA-dependent RNA polymerase: A target for antiviral therapy and viral attenuation"
Taichung Medical University
Taichung, Taiwan
October 2014
- 50)** "Next-Gen Virology: Use of microfluidics and live-cell imaging to study poliovirus replication at the single-cell level"
Division of Structural Biology and Biochemistry
School of Biological Sciences
Nanyang Technological University
Singapore
October 2014
- 51)** "Next-Gen Virology: Use of microfluidics and live-cell imaging to study poliovirus replication at the single-cell level"
Novartis Institute for Tropical Diseases
Singapore
October 2014
- 52)** "Next-Gen Virology: Use of microfluidics and live-cell imaging to study poliovirus replication at the single-cell level"
UCSF Program in Host-Pathogen Systems and Evolution (Symposium/Retreat)
University of California San Francisco, Mission Bay Campus
San Francisco, CA
August 2014
- 53)** "Misregulated mitochondrial transcription and disease"
Department of Chemistry and Biochemistry
University of Maryland Baltimore County
Baltimore, MD
May 2014
- 54)** "Hepatitis C virus persistence and inhibition"
Department of Microbiology and Immunology
University of Texas Health Science Center San Antonio
San Antonio, TX
April 2014

- 55)** "mtDNA mutations and cancer"
Department of Biochemistry
University of Illinois
Urbana-Champaign, IL
October 2013
- 56)** "Human mitochondrial transcription"
National Institute of Environmental Health Sciences
Research Triangle Park, NC
September 2013
- 57)** "Hepatitis C virus persistence and inhibition"
Program in Infection and Pathobiology
Baker Institute for Animal Health
College of Veterinary Medicine
Cornell University
Ithaca, NY
March 2013
- 58)** "Hepatitis C virus persistence and inhibition"
Department of Microbiology and Immunology
Penn State College of Medicine
Hershey, PA
October 2012
- 59)** "Hepatitis C virus persistence and inhibition"
2012 Diversity and Health Disparity Symposium
Intramural Research Program, National Institute of Drug Abuse
Baltimore, MD
August 2012
- 60)** "Transitioning to the translational: Hepatitis C virus persistence and inhibition"
Department of Molecular Biology and Microbiology and Immunology
School of Medicine, Case Western Reserve University
Cleveland, OH
June 2012
- 61)** "Transitioning to the translational: Hepatitis C virus persistence and inhibition"
Center for Mitochondrial and Epigenetic Medicine
Children's Hospital of Philadelphia and University of Pennsylvania
Philadelphia, PA
May 2012
- 62)** "Transitioning to the translational: Hepatitis C virus persistence and inhibition"
Department of Microbiology and Immunology, University of Buffalo School of
Medicine

Buffalo, NY
May 2012

- 63)** “Transitioning to the translational: Hepatitis C virus persistence and inhibition”
Department of Biomolecular Chemistry, University of Wisconsin School of
Medicine and
Public Health
Madison, Wisconsin
May 2012
- 64)** “Principles and applications of RNA virus population diversity”
Molecular Basis of Disease Distinguished Lecture Series
Department of Biology, Georgia State University
Atlanta, GA
October 2011
- 65)** “NS5A: The Swiss army knife of the hepatitis C virus”
Department of Molecular Microbiology and Immunology
University of Missouri-Columbia
Columbia, MO
September 2011
- 66)** “Human mitochondrial transcription”
Department of Animal Biology, School of Veterinary Medicine, University of
Pennsylvania
Philadelphia, PA
April 2011
- 67)** “Principles and applications of RNA virus population diversity”
Microbial and Viral Evolution Program, Kavli Institute of Physics, University of
California
Santa Barbara, CA
February 2011
- 68)** “NS5A: The Swiss army knife of the hepatitis C virus”
Department of Microbiology and Immunology and Division of Infectious Diseases,
Johns
Hopkins Medical Institutions
Baltimore, MD
November 2010
- 69)** “NS5A: The Swiss army knife of the hepatitis C virus”
Department of Biochemistry and Molecular Biology, University of Arkansas for
Medical Sciences
Little Rock, AR
November 2010

- 70)** “NS5A: The Swiss army knife of the hepatitis C virus”
Department of Biological Sciences, Rutgers University
Newark, NJ
October 2010
- 71)** “NS5A: The Swiss army knife of the hepatitis C virus”
Department of Chemistry, The City College of New York
New York, NY
August 2010
- 72)** “RNA-dependent RNA polymerase (in)fidelity: Mechanisms, consequences and applications”
Department of Chemistry, St. Francis University
Loretto, PA
November 2009
- 73)** “Exploiting the RNA virus quasispecies for antiviral and vaccine development”
Department of Microbiology and Immunology, Indiana University School of Medicine (IUPUI)
Indianapolis, IN
September 2009
- 74)** “Exploiting the RNA virus quasispecies for antiviral and vaccine development”
Center for Biologics Evaluation and Research, U.S. Food and Drug Administration
Bethesda, MD
June 2009
- 75)** “Exploiting the RNA virus quasispecies for antiviral and vaccine development”
Department of Microbiology and Immunology, Georgetown University Medical Center
Washington, DC
April 2009
- 76)** “Exploiting the RNA virus quasispecies for antiviral and vaccine development”
Distinguished Lecture Series, Huck Institutes of the Life Sciences, Pennsylvania State University
State College, PA
December 2008
- 77)** “Exploiting the RNA virus quasispecies for antiviral and vaccine development”
Carolina Vaccine Institute, University of North Carolina
Chapel Hill, NC
November 2008

- 78)** “Composition, organization and assembly of the picornavirus VPg uridylylation complex”
Keynote address: Virology Training Program Retreat, University of Maryland
College Park, MD
October 2008
- 79)** “Towards a universal strategy for viral attenuation and vaccine development”
Department of Cell Biology and Molecular Genetics, University of Maryland
College Park, MD
October 2008
- 80)** “RNA-dependent RNA polymerase (in)fidelity: Mechanisms, consequences and applications”
Department of Microbiology and Immunology, University of Michigan School of Medicine
Ann Arbor, MI
September 2008
- 81)** “RNA-dependent RNA polymerase (in)fidelity: Mechanisms, consequences and applications”
Department of Biochemistry, Case Western Reserve University School of Medicine
Cleveland, OH
April 2008
- 82)** “RNA-dependent RNA polymerase (in)fidelity: Mechanisms, consequences and applications”
Department of Microbiology and Immunology, SUNY Buffalo School of Medicine
Buffalo, NY
October 2007
- 83)** “Building and Managing a Team”
1st NIAID New Investigator Workshop (A workshop sponsored by NIAID/NIH)
Bethesda, MD
October 2007
- 84)** “RNA-dependent RNA polymerase (in)fidelity: Mechanisms, consequences and applications”
Department of Biochemistry and Molecular Biology, Colorado State University
Fort Collins, CO
April 2007
- 85)** “RNA-dependent RNA polymerase (in)fidelity: Mechanisms, consequences and applications”
Department of Biomedical Sciences, Division of Microbial Pathogenesis & Immune Response,
Meharry Medical College

Nashville, TN
March 2007

- 86)** “RNA-dependent RNA polymerase (in)fidelity: Mechanisms, consequences and applications”
Department of Chemistry, Lincoln University
Lincoln University, PA
February 2007
- 87)** “RNA-dependent RNA polymerase (in)fidelity: Mechanisms, consequences and applications”
Department of Biochemistry and Molecular Biology, UMDNJ – New Jersey
Medical School
Newark, NJ
October 2006
- 88)** “RNA-dependent RNA polymerase (in)fidelity: Mechanisms, consequences and applications”
Department of Chemistry and Biochemistry, University of Maryland, Baltimore
County
Baltimore, MD
October 2006
- 89)** “More Than Two Metal Ions in the Mechanism for Phosphoryl Transfer Catalyzed by the Viral RNA-dependent RNA Polymerase”
Department of Biochemistry and Molecular Biology, Michigan State University
Kalamazoo, MI
April 2006
- 90)** “The Viral RNA-dependent RNA Polymerase: Forcing Riboviruses to the Edge of Catastrophe and Beyond”
Department of Microbiology and Molecular Genetics, Harvard Medical School
Boston, MA
March 2006
- 91)** “The Viral RNA-dependent RNA Polymerase: Forcing Riboviruses to the Edge of Catastrophe and Beyond”
DARPA Workshop on State-Dependent Delays in Regulatory Networks
Center for Discrete Mathematics & Theoretical Computer Science, Rutgers
University
Piscataway, NJ
March 2006
- 92)** “Biochemical and Biological Analysis of HCV NS5a Protein”
Department of Microbiology, Immunology and Molecular Genetics
University of Kentucky College of Medicine

November 2005

- 93)** “Exposure, Experience, Enthusiasm”
Bridging the Career Gap for Underrepresented Minorities (A workshop sponsored by NIAID/NIH)
Bethesda, MD
November 2005
- 94)** “More Than Two Metal Ions in the Mechanism for Phosphoryl Transfer Catalyzed by the Viral RNA-dependent RNA Polymerase”
Department of Biochemistry and Molecular Biology, University of Arkansas for Medical Sciences
Little Rock, AR
November 2004
- 95)** “More Than Two Metal Ions in the Mechanism for Phosphoryl Transfer Catalyzed by the Viral RNA-dependent RNA Polymerase”
Biochemistry Program, Ohio State University
Columbus, OH
October 2004
- 96)** “More Than Two Metal Ions in the Mechanism for Phosphoryl Transfer Catalyzed by the Viral RNA-dependent RNA Polymerase”
Department of Pharmacology, Case Western Reserve University School of Medicine
Cleveland, OH
September 2004
- 97)** “More Than Two Metal Ions in the Mechanism for Phosphoryl Transfer Catalyzed by the Viral RNA-dependent RNA Polymerase”
Department of Biophysics and Biophysical Chemistry, Johns Hopkins University School of Medicine
Baltimore, MD
May 2004
- 98)** “More Than Two Metal Ions in the Mechanism for Phosphoryl Transfer Catalyzed by the Viral RNA-dependent RNA Polymerase”
Department of Chemistry, Temple University
Philadelphia, PA
April 2004
- 99)** “Viral RNA-dependent RNA Polymerases: Structure, Function, Mechanism and Inhibition”
Division of Pediatric Infectious Diseases, Vanderbilt University School of Medicine
Nashville, TN

December 2003

- 100)** “Biochemical Analysis of HCV NS5a Protein”
Peking University Hepatology Institute
Beijing, China
November 2003
- 101)** “The Viral RNA-dependent RNA Polymerase: Forcing Riboviruses to the Edge of Catastrophe and Beyond”
Department of Microbiology & Immunology, University of Texas Health Science Center
San Antonio, TX
March 2003
- 102)** “The Viral RNA-dependent RNA Polymerase: Forcing Riboviruses to the Edge of Catastrophe and Beyond”
Department of Microbiology & Immunology, University of Texas Medical Branch, Galveston, TX
January 2003
- 103)** “Building the HCV Replisome: The bricks are in place and the mortar is on the way”
Department of Microbiology, Immunology and Parasitology, Louisiana State University
Health Sciences Center, New Orleans, LA
October 2002
- 104)** “The Viral RNA-dependent RNA Polymerase: Forcing Riboviruses to the Edge of Catastrophe and Beyond”
Department of Biochemistry, School of Medicine, Tulane University, New Orleans, LA
October 2002
- 105)** “Structure, Function and Mechanism of the Poliovirus RNA-dependent RNA Polymerase”
Center for the Study of Hepatitis C Virus, Rockefeller University, New York, NY
April 2002
- 106)** “Quasispecies, Error Catastrophe and the Antiviral Activity of Ribavirin”
Organized Research Unit in Animal Virology, University of California, Irvine, CA
March 2002
- 107)** “Structure, Function and Mechanism of the Poliovirus RNA-dependent RNA Polymerase”
Department of Molecular Genetics and Microbiology, SUNY, Stony Brook, NY
September 2001

- 108)** "Insight into Mechanism of Action of Ribavirin from Studies with Poliovirus Polymerase"
Department of Biochemistry and Microbiology, Cook College, Rutgers, New Brunswick, NJ
April 2001
- 109)** "Insight into Mechanism of Action of Ribavirin from Studies with Poliovirus Polymerase"
Department of Chemistry, Edinboro University of Pennsylvania, Edinboro, PA
April 2001
- 110)** "Towards a Pill for the Common Cold"
Department of Chemistry, Juniata College, Huntingdon, PA
September 2000
- 111)** "Towards a Pill for the Common Cold"
Department of Chemistry, Western Maryland College, Westminster, MD
September 2000
- 112)** "Insight into Mechanism of Action of Ribavirin from Studies with Poliovirus Polymerase"
Keynote Address for the 23rd Annual Student Research Symposium
UMDNJ-Robert Wood Johnson Medical School, Piscataway, NJ
July 2000
- 113)** "Insight into Mechanism of Action of Ribavirin from Studies with Poliovirus Polymerase"
Laboratoire de biochimie, Département de chimie, Université catholique de Louvain,
Brussels, Belgium
May 2000
- 114)** "Insight into Mechanism of Action of Ribavirin from Studies with Poliovirus Polymerase"
Department of Molecular Microbiology & Immunology, St. Louis University, St. Louis, MO
April 2000
- 115)** "Insight into Mechanism of Action of Ribavirin from Studies with Poliovirus Polymerase"
Department of Biochemistry and Molecular Biology, University of Arkansas for Medical Sciences, Little Rock, AR
March 2000

- 116)** “Insight into Mechanism of Action of Ribavirin from Studies with Poliovirus Polymerase”
Department of Biochemistry and Molecular Biology, Indiana University School of Medicine,
Indianapolis, IN
February 2000
- 117)** “Towards a Pill for the Common Cold”
Department of Biology, Washington and Jefferson College, Washington, PA
October 1999
- 118)** “Towards a Pill for the Common Cold”
Division of Science, Chatham College, Pittsburgh, PA
October 1999
- 119)** “Towards a Pill for the Common Cold”
Department of Chemistry, Shippensburg University, Shippensburg, PA
October 1999
- 120)** “Mechanistic Studies of Poliovirus RNA-dependent RNA Polymerase”
Department of Microbiology and Immunology, Pennsylvania State University
College of
Medicine, Hershey, PA
September 1999
- 121)** “Mechanistic Studies of Poliovirus RNA-dependent RNA Polymerase”
Laboratory of Infectious Diseases, NIAID, NIH, Bethesda, MD
April 1999
- 122)** “Mechanism of HIV RT-catalyzed DNA Strand Transfer Reactions”
Department of Microbiology and Immunology, Pennsylvania State University
College of
Medicine, Hershey, PA
March 1997
- 123)** “Mechanism of HIV RT-catalyzed DNA Strand Transfer Reactions”
Department of Molecular Genetics, University of Medicine and Dentistry of New Jersey,
Robert Wood Johnson Medical School, Piscataway, NJ
October 1996
- 124)** “Mechanism of HIV RT-catalyzed DNA Strand Transfer Reactions”
Center for Advanced Biotechnology and Medicine, Rutgers University,
Piscataway, NJ
August 1996

- 125)** “Kinetic Mechanism of Dihydrofolate Reductase Revisited”
Department of Biochemistry, School of Medicine, Case Western Reserve
University,
Cleveland, OH
April 1996
- 126)** “Retrovirus Replication: Genesis and Exodus”
Department of Biochemistry and Molecular Biology, Pennsylvania State
University,
University Park, PA
February 1996
- 127)** “Mechanism of HIV RT-catalyzed DNA Strand Transfer Reactions”
Max-Planck-Institut für Biochemie, Martinsried, Germany
December 1995
- 128)** “Mechanism of HIV RT-catalyzed DNA Strand Transfer Reactions”
Unite de Physicochimie des Macromolecules Biologiques, Institut Pasteur, Paris,
France
December 1995

Companies

- 1)** “Targeting a viral polymerase for antiviral therapy: Insight from studies of single molecules and single, infected cells”
New England BioLabs, Ipswich, MA
May 2018
- 2)** “Avoiding a billion dollar mistake: Mitochondrial (dys)function as a contributor to drug toxicity”
AbbVie, Inc., North Chicago, IL
July 2015
- 3)** “Next-Gen Virology: Use of microfluidics and live-cell imaging to study poliovirus replication at the single-cell level”
PTC Therapeutics, South Plainfield NJ
April 2015
- 4)** “Avoiding a billion dollar mistake: Mitochondrial (dys)function as a contributor to drug toxicity”
Alnylam Pharmaceuticals, Boston, MA
September 2013
- 5)** “Avoiding a billion dollar mistake: Mitochondrial (dys)function as a contributor to drug toxicity”
PTC Therapeutics, South Plainfield NJ

September 2013 (via skype)

- 6) "Avoiding a billion dollar mistake: Mitochondrial (dys)function as a contributor to drug toxicity"
Alios Biopharma, San Francisco, CA
February 2013
- 7) "Anti-HCV therapeutics: Opportunities and complications"
Roche, Nutley, NJ
September 2011
- 8) "HCV NS5A Protein: Functions in Genome Replication, Genome Persistence and Antagonism of the Innate Immune Response"
Merck Frosst Centre for Therapeutic Research, Montreal, Quebec, Canada
June 2010
- 9) "Targets and mechanisms for development of antiviral therapeutics to treat infections by positive-strand RNA viruses"
Schering-Plough Research Institute, Kenilworth, NJ
March 2009
- 10) "HCV NS5A Protein: Functions in Genome Replication, Genome Persistence and Antagonism of the Innate Immune Response"
Roche Palo Alto, Palo Alto, CA
January 2009
- 11) "HCV NS5A Protein: Functions in Genome Replication, Genome Persistence and Antagonism of the Innate Immune Response"
Gilead Sciences, Foster City, CA
January 2009
- 12) "HCV NS5A Protein: Functions in Genome Replication, Genome Persistence and Antagonism of the Innate Immune Response"
Merck Research Laboratories, West Point, PA
October 2008
- 13) "HCV NS5A Protein: Functions in Genome Replication, Genome Persistence and Antagonism of the Innate Immune Response"
PTC Therapeutics, Inc., South Plainfield, NJ
March 2008
- 14) "Biochemical and Biological Analysis of HCV NS5a Protein"
Genelabs Technologies, Inc., Redwood City, CA
March 2006
- 15) "Biochemical and Biological Analysis of HCV NS5a Protein"

Pfizer Global Research and Development, La Jolla, CA
August 2005

- 16) "Biochemical and Biological Analysis of HCV NS5a Protein"
Valeant Pharmaceuticals International, Costa Mesa, CA
August 2004
- 17) "Biochemical and Biological Analysis of HCV NS5a Protein"
Roche Palo Alto, Palo Alto, CA
May 2004
- 18) "Biochemical and Biological Analysis of HCV NS5a Protein"
Bristol Myers Squibb Company, Wallingford, CT
March 2004
- 19) "The Viral RNA-dependent RNA Polymerase: Forcing Riboviruses to the Edge of Catastrophe and Beyond"
Gilead Sciences, San Francisco, CA
February 2003
- 20) "Designing Lethal Mutagens of the RNA Virus Genome"
ICN Pharmaceuticals, Costa Mesa, CA
February 2002
- 21) "Targeting the Viral RNA-dependent RNA Polymerase for Antiviral Drug Development"
Eli Lilly, Indianapolis, IN
October 2001
- 22) "Targeting the Viral RNA-dependent RNA Polymerase for Antiviral Drug Development"
Gilead Sciences, San Francisco, CA
August 2001
- 23) "Targeting the Viral RNA-dependent RNA Polymerase for Antiviral Drug Development"
Wyeth Ayerst Research, Pearl River, NY
August 2001
- 24) "Targeting the Viral RNA-dependent RNA Polymerase for Antiviral Drug Development"
ICN Pharmaceuticals, Inc., Costa Mesa, CA
October 2000
- 25) "Insight into Mechanism of Action of Ribavirin from Studies with Poliovirus Polymerase"

DuPont, West Point, PA
August 2000

26) "Insight into Mechanism of Action of Ribavirin from Studies with Poliovirus Polymerase"

BioChem Pharma, Montreal, Canada
February 2000

27) "Insight into Mechanism of Action of Ribavirin from Studies with Poliovirus Polymerase"

BioMega Research Division, Boehringer Ingelheim Canada Ltd., Laval, Canada
February 2000

28) "Insight into Mechanism of Action of Ribavirin from Studies with Poliovirus Polymerase"

Antiviral Therapy, Schering-Plough Research Institute, Kenilworth, NJ
November 1999

29) "Mechanistic Studies of Poliovirus RNA-dependent RNA Polymerase"

Antiviral Research, Merck Research Laboratories, West Point, PA
August 1999

30) "Mechanistic Studies of Poliovirus RNA-dependent RNA Polymerase"

Department of Molecular Virology and Host Defense, SmithKline Beecham Pharmaceuticals,
Collegeville, PA
May 1999

31) "Mechanistic Studies of Poliovirus RNA-dependent RNA Polymerase"

Antiviral Therapy, Schering-Plough Research Institute, Kenilworth, NJ
March 1999

32) "Mechanistic Studies of Poliovirus RNA-dependent RNA Polymerase"

Discovery Research, Viropharma, Inc., Exton, PA
February 1999

33) "Mechanism of HIV RT-catalyzed DNA Strand Transfer Reactions"

Discovery Research, Viropharma, Inc., Malvern, PA
August 1997

Inventions and Patents

US Provisional Patent Application Serial No.: 62/871,858

Title: High-throughput Microfluidic Isolation of Single Particles

PSU Inv. Disc. No.: 2019-4912

Inventors: Liu and Cameron

Filed: July 9, 2019

US Provisional Patent Application Serial No.: 62/548,425

Title: Broad Spectrum Viral Inhibitor

PSU Inv. Disc. No.: 2017-4657

Inventors: Almo, Grove, Gizzi, Cameron and Arnold

Filed: August 21, 2018

US Patent Application Serial No.: 12/686,200

Title: "Attenuated Viruses, Vaccines and Methods of use Thereof"

PSU Inv. Disc. No.: 2006-3279

Inventors: Cameron, Arnold and August

Filed: January 12, 2010

US Patent Application Serial No.: 11/963,930

Title: "Modified Polymerases and Attenuated Viruses and Methods of use Thereof"

PSU Inv. Disc. No.: 2006-3279

Inventors: Cameron, Arnold and Castro

Filed: December 24, 2007; Issued: March 10, 2010 (US 7,758,868)

PSU Inv. Dis. No. 2007-3400

Title: Analogues of 6-Methyl Purine Ribonucleosides as Antiviral Agents

Inventors: Petersen and Cameron

Filed: December 11, 2007

US Patent Application Serial No.: 60/803,442

PSU Inv. Dis. No. 2006-3199

Title: Indole Nucleosides as Antiviral Agents

Inventors: Petersen and Cameron

Filed: May 30, 2006

US Patent Application Serial No.: 11/119,587

Title: Compounds and Methods for Inhibiting Hepatitis C Virus Replication

Inventors: Raney, Cameron, Dave, Sakon, Lu, Mackintosh, and Jennings

Filed: May 1, 2005; Issued December 16, 2008 (US 7,465,537)

Patent Application No.: WO/2003/039450

Territories: US (20050043268), EP (EP1441744), JP (2003541742)

PSU Inv. Dis. No. 2002-2675

Title: Improvements in or Relating to Inhibition of Viruses

Inventors: Loakes, Brown, Negishi, Moriyama, Balzarini, Cameron, Arnold, Castro, Korneeva, and Graci.

Filed: May 7, 2004

US Patent Application Serial No.: 60/398,458

PSU Inv. Dis. No. 2002-2675

Title: Use of Nucleoside P to Treat Acute and Persistent RNA Virus Infections

Inventors: Loakes, Brown, Negishi, Moriyama, Balzarini, Cameron, Arnold, Castro, Korneeva, and Graci.

Filed: September 24, 2002

PSU Inv. Dis. No. 2002-2640

Title: Reagents to Study Hepatitis C Virus NS5a Protein

Inventors: Cameron

Filed: May 22, 2002

PSU Inv. Dis. No. 99-2100
Title: RNA-dependent RNA Polymerase Substrates
Inventors: Cameron and Arnold
Filed: May 28, 1999

Commercial Activity

- 2013-2018 Partnership with INDIGO Biosciences, Inc. (State College, PA) for distribution of the MitoVir™ platform of products for detection of off-target effects of synthetic nucleotides.
- 2008-2012 Partnership with Enzymax, LLC (Lexington, KY) for distribution of human mitochondrial transcription machinery.

6. Teaching Activities

Courses Taught:

University of North Carolina at Chapel Hill

(Student Rating of Teaching Effectiveness (SRTE) for “overall quality of instructor” on a scale from 1.00 to 5.00 is provided.)

<u>Semester</u>	<u>Course</u>	<u>Title</u>	<u>Lectures</u>	<u>Enrollment</u>	<u>SRTE</u>
FA 2020	MCRO 630	Virology	1	28	4.50

Pennsylvania State University

(Student Rating of Teaching Effectiveness (SRTE) for “overall quality of instructor” on a scale from 1.00 to 7.00 is provided.)

<u>Semester</u>	<u>Course</u>	<u>Title</u>	<u>Enrollment</u>	<u>SRTE</u>
FA 2018	BMB 401 section 002	General Biochemistry	76	4.57
FA 2017	BMB 401 section 001	General Biochemistry	129	4.64
SP 2015	MICRB 415	General Virology	41	4.94
SP 2014	BMMB 598	Critical Analysis of the Literature	11	6.33
SP 2013	PSU 016	First-Year Seminar	20	6.07
SP 2013	BMB 411	Survey of Biochemistry Literature	3	7.00
SP 2012	PSU 016	First-Year Seminar	18	6.31
SP 2011	PSU 016	First-Year Seminar	19	6.71
SP 2011	BMB 445W section 001	Laboratory in Molecular Genetics	30	6.00
SP 2011	BMB 445W section 002	Laboratory in Molecular Genetics	23	5.60
SP 2010	PSU 016	First-Year Seminar	17	6.64
SP 2010	BMB 411	Survey of Biochemistry Literature	10	6.71
SP 2008	PSU 016	First-Year Seminar	19	6.29
FA 2005	PSU 016	First-Year Seminar	20	5.86
FA 2004	PSU 016	First-Year Seminar	20	6.37
FA 2003	PSU 016	First-Year Seminar	18	6.59

FA 2002	BMB 435	Medical Virology	73	5.22
FA 2001	BMB 435	Medical Virology	63	5.25
FA 2000	BMB 435	Medical Virology	74	5.35
FA 1999	BMB 435	Medical Virology	59	4.39
SP 1998	BMB 411	Survey of Biochemistry Literature	11	5.13
FA 1998	BMB 435	Medical Virology	111	4.14

Postdoctoral Students (Name/Degree/Institution & Date Granted/Period of Training/Current Status)

Britney Johnson, Ph.D. (Washington University School of Medicine in St. Louis, 2018)

August 2018 – April 2019

Medical Science Liaison, GlaxoSmithKline, St. Louis, MO

Markus Kastner, Ph.D. (Institute of Biophysics, Johannes Kepler University, Linz, Austria, 2016)

August 2016 – May 2019

Postdoctoral Scholar, Materials Characterization Lab, Penn State University, State College, PA

Wu Liu, Ph.D. (Tsinghua University, Beijing, China, 2015)

July 2016 – July 2019

Postdoctoral Scholar, Micro & Nano Integrated Biosystem Laboratory, Carnegie Mellon University, Pittsburgh, PA

Shubeena Chib, Ph.D. (University of Arkansas for Medical Sciences, 2016)

July 2016 – December 2017

Intern, Technology Transfer and Business Development

Andrew Woodman, Ph.D. (University of Warwick, 2015)

August 2015 – October 2019

Scientist, Indigo Biosciences, State College, PA

Thomas McCrory, Ph.D. (Pennsylvania State University, 2012)

January 2013 – December 2013

Business Development Manager, LauchWorks Manufacturing Lab, Beverly, MA

Spencer Weeks, Ph.D. (University of Michigan, 2009)

March 2009 – December 2010

Quality Control Manager, Market Garden Brewery, Cleveland, OH

Maria Fernanda Lodeiro, Ph.D. (University of Buenos Aires, Argentina, 2007)

April 2007 – December 2012

Left workforce to raise her children.

Akira Uchida, Ph.D. (Gifu University, Gifu, Japan, 2003)

January 2007 - March 2013

Senior Research Fellow, Nanyang Technological University, Singapore

Qixin Wang, M.D., Ph.D. (Peking University, Beijing, China, 2001)

September 2003 – August 2007

Medical Advisor, Merck, Sharp and Dohme, Beijing, China

Michele Hargittai, Ph.D. (University of Minnesota, Minneapolis, MN)

November 2001 – August 2007

Associate Professor, Department of Chemistry, Saint Francis University, Loretto, PA

Miaoqing Shen, Ph.D. (The Pennsylvania State University, University Park, PA)

Thesis Title: Expanding the functional proteome of an RNA virus by host-mediated phosphorylation in intrinsically disordered domains of a viral protein

Current Position: Teacher, Westmont Hilltop High School, Johnstown, PA

Alex Lugo M.S.(Molecular Medicine)/August 2011

Thesis Title: Biochemical characterization of dengue non-structural protein 5 (NS5) and general acid derivatives

Current Position: QA Compliance Associate II, Sandoz (Novartis), Mechanicsburg, PA

Hyung Suk Oh Ph.D./December 2009

Thesis Title: Insight into poliovirus genome replication and encapsidation revealed from molecular characterization of 3B-3C cleavage site mutants

Current Position: Research Associate, Harvard Medical School, Boston, MA

Jungwook Hwang Ph.D.(Molecular Medicine)/August 2008

Thesis Title: Biological and biochemical studies of HCV NS5A protein: functions in genome replication and antagonism of the innate immune response

Current Position: Associate Professor, Hanyang University, Seoul, South Korea

Jason Graci Ph.D./August 2007

Thesis Title: Evaluation of nucleoside analogs with ambiguous hydrogen-bonding capacity as antiviral lethal mutagens

Current Position: Principal Scientist, PTC Therapeutics, South Plainfield, NJ

Victoria (Korneeva) Korboukh Ph.D./August 2007

Thesis Title: Poliovirus RNA-dependent RNA polymerase (in)fidelity: mechanisms, consequences and applications

Current Position: Senior Scientist, Astra Zeneca, Boston, MA

Uzodinma Uche M.S.(Chemistry)/May 2007

Thesis Title: Analysis of poliovirus RNA-dependent RNA polymerase (3Dpol)

Current Position: PhD student, University of Pittsburgh School of Medicine, Pittsburgh, PA

Harsh Pathak Ph.D./May 2006

Thesis Title: Towards a unified model for initiation of the first step of picornavirus genome replication

Current Position: Research Assistant Professor, University of Kansas School of Medicine, Kansas City, KS

Jamie Arnold Ph.D.(Chemistry)/December 2003

Thesis Title: Kinetic and thermodynamic analysis of poliovirus RNA-dependent RNA polymerase catalyzed nucleotide incorporation

Current Position: Research Associate Professor, University of North Carolina School of Medicine, Chapel Hill, NC

David Gohara Ph.D./December 2001

Thesis Title: Structural, Biochemical and biological analysis of the poliovirus RNA-dependent RNA polymerase (3D^{pol})

Current Position: Director of Research Computing, Edward A. Doisy Department of Biochemistry and Molecular Biology, St. Louis University School of Medicine, St. Louis, MO

Undergraduate Students

(More than 75 undergraduate students mentored in the laboratory; only those completing an honors thesis are indicated below.)

Gwen Oliver, 2020

Thesis Title: Biophysical and Biochemical Characterization of the Transcription of Mitochondrial DNA

Andrew C. Gilmore, 2013

Thesis Title: Purification and characterization of human leucine-rich pentatricopeptide repeat containing protein (LRPPRC) expressed in Escherichia coli

Nitin Kumar, 2011

Thesis Title: Mechanism and specificity of mammalian mitochondrial transcription factors a binding to the light-strand promoter of human mitochondrial DNA

Corinne N. Thompson, 2009

Thesis Title: Investigation of the antiviral activity of 5-methyl-indole ribonucleoside and the genetic basis for resistance

Zachary J. Reitman, 2006

Thesis Title: Scanning of the poliovirus protease, 3Cpro by an acidic to alanine mutagenesis strategy

Rebecca L. Morgan, 2005

Thesis Title: The development of a cell-based assay to screen for viral mutagens

Vijay Babu, 2004

Thesis Title: RNA-dependent RNA polymerase activity associated with calicivirus precursor proteins

Jason Huhn, 2001

Thesis Title: Proteinase-polymerase precursor as the active form of feline calicivirus RNA-dependent RNA polymerase

Jayaram Srinivasan, 2001

Thesis Title: Lipofection in mammalian cells to study poliovirus replicon kinetics

David Maag, 2000

Thesis Title: The broad-spectrum antiviral ribonucleoside ribavirin, is a RNA virus mutagen

7. Grants

Active

Sponsor: National Institutes of Health; NIAID; R37 AI053531

Title: "Picornavirus Genome Replication"

Duration: 07/01/03-01/31/28 (MERIT Award)

Current Year Total Costs: \$449,205

Role (Effort) PI (3.0 months)

Sponsor: National Institutes of Health; NIAID; R01 AI045818

Title: "RNA-Dependent RNA Polymerase"

Duration: 07/01/99-04/30/22

Current Year Total Costs: \$311,837

Role (Effort) PI (3.0 months)

(Renewal application for 7/1/21 – 6/30/26 received an impact score of 20, 4th percentile.)

Sponsor: National Institutes of Health; NIAID; R21 AI49312
Title: "Contribution of IL-32 Gene Expression to Viral Persistence"
Duration: 07/01/20-08/31/2022
Current Year Total Costs: \$242,427
Role (Effort) PI (1.0 month)

Sponsor: National Institutes of Health; NIAID; R01 AI161841
Title: "Coronavirus Genome Replication"
Duration: 03/15/21-02/28/2026
Current Year Total Costs: \$677,301
Role (Effort) PI (3.0 months)

Pending

Sponsor: National Institutes of Health; NIAID; R21 AI160616
Title: "Ribonucleotide Analogs for Treatment of SARS CoV-2 Infection"
Duration: 04/01/21-03/31/2023
Requested Total Costs: \$427,625
Role (Effort) PI (0.6 month)
(Impact score of 23)

Expired

Years	Amount	Agency	Project
2017-2017	\$34,566	Atea	POLRMT utilization of nucleotide analogues in vitro (Test Tubes)
2016-2017	\$66,470	Abbvie	POLRMT utilization of nucleotide analogues in vitro (Test Tubes)
2016-2016	\$10,000	BWF	Single-Molecule Studies of a Viral RNA-dependent RNA Polymerase (Travel Award)
2015-2018	\$1,050,000	HFSP	Stabilizing RNA Virus Vaccine Strains by Elucidating Triggers and Mechanisms of Recombination
2015-2020	\$1,445,194	NIAID/NIH	Single-Cell Virology
2013	\$123,207	BMS	Human Mitochondrial RNA Polymerase with BMS (Cells and Test Tubes)
2012-2015	\$408,770	NIAID/NIH	Forms of HCV NS5A In Vivo
2012-2013	\$24,635	BioCryst	Human Mitochondrial RNA Polymerase with BioCryst (Test Tubes)
2009-2014	\$1,697,304	NIAID/NIH	Mechanisms of RNA Binding and Remodeling Proteins
2009-2010	\$162,594	NCR/NIH	Phosphorimager Replacement
2007-2008	\$500,000	NCR/NIH	Macromolecular X-Ray Crystallography Instrument **Major User
2006-2007	\$64,000	J&J	Influenza Virus RNA-dependent RNA Polymerase
2003-2009	\$706,367	NIAID/NIH	HCV NS3: Biological, Biochemical and Structural Analysis **Co-PI
2003-2009	\$3,114,949	NIAID/NIH	Lethal Mutagenesis as an Antiviral Strategy

2003-2007	\$500,000	AHA	Strategies to Treat Persistent Coxsackievirus Heart Infections
2003-2004	\$5,300	Micrologix	Mechanisms of RNA Virus Multiplication and Pathogenesis
2003-2004	\$34,500	Ribopharm	Mechanisms of RNA Virus Multiplication and Pathogenesis
2002-2018	\$6,172,330	NIAID/NIH	Picornavirus Genome Replication
2002-2004	\$150,000	US-Israel BARD	Characterization of Bee Viruses and an Investigation of Their Mode of Spread
2001-2003	\$59,566	ICN Pharm.	Lethal Mutagens for Treatment of RNA Virus Infection
1999-2015	\$3,773,600	NIAID/NIH	RNA-Dependent RNA Polymerase Mechanism
1999-2004	\$453,945	NIDDK/NIH	Mechanism of Hepacivirus Replicase Assembly
1999-2001	\$55,158	Schering-Plough	Nucleoside Analogs as Inhibitors of the Viral RdRp
1997-2002	\$679,825	NCI/NIH	Mechanistic Studies of AICAR Transformylase

8. Professional Service

To discipline

2021 – 2025	Member, Editorial Committee, <i>Annual Review of Virology</i>
2020 – 2022	Associate Editor, <i>Science Advances</i>
2020 – 2025	Member, Board of Scientific Counselors, Vaccine Research Center, NIAID, NIH
2020	Member, Review Panel, HHMI 2021 Investigator Competition
2019 – 2022	President-elect, President, Past-President American Society for Virology
2019 – 2024	Associate Editor, Journal of Biological Chemistry (ASBMB)
2018 – present	Member, Editorial Board, <i>JoVE Biochemistry</i>
7/1/2017-1/01/2019	Member, Editorial Board, <i>J. Biol. Chem.</i>
2017	Member, Panel for review of the Biological Chemistry Graduate Program, UT Southwestern Graduate School of Biomedical Sciences, Dallas, TX
7/1/2016 – 8/31/2019	Member, Molecular Genetics B Study Section, Center for Scientific Review, NIH
8/2015 – 7/2017	Member, Editorial Board, <i>Mitochondrion</i>
2015	Discussion Leader, Transcription and Translation, Viruses & Cells Gordon Conference, Girona, Spain
10/2014 – 11/2015	Organizer, Fifth Annual Translational Research In Mitochondria, Aging and Disease (TRiMAD) 2015, State College, PA
8/8/2014 – 6/14/2018	Member, National Science Advisory Board for Biosecurity, Office of the Director, National Institutes of Health
2014 – 2015	Advisor, Graduate Student Public Affairs Committee (GSPAC), American Society for Biochemistry and Molecular Biology
2014 – present	Member, Advisory Committee, Research Center for Emerging Viral Infections, Chang Gung University, Taoyuan, Taiwan
2013	Chair, Workshop on Virus-Host Interactions: Positive Strand RNA Viruses (III), American Society for Virology 32 nd Annual Meeting, University Park, PA
2013	Co-chair, Virology workshop: RNA – so much more than genome
2012 – 2015	2013 Meeting of the Society for General Microbiology, Manchester, UK
	Member (elected), Public Affairs Advisory Committee, American Society for Biochemistry and Molecular Biology

2012 – 2014	Thematic Organizer, Mitochondria & Metabolism, American Society for Biochemistry and Molecular Biology Annual Meeting (2014) San Diego, CA
2012	Chair, Workshop on Antivirals and Therapeutic Interferons (I), American Society for Virology 31 st Annual Meeting, Madison, WI
2012	Co-chair, Session on: Eradication and antiviral strategies: Antivirals, European Study Group on the Molecular Biology of Picornaviruses, St. Raphael, France
2012	Member, Panel for review of the Biological Chemistry Graduate Program and Chemistry Training Track, UT Southwestern Graduate School of Biomedical Sciences, Dallas, TX
2012	Member, Special Emphasis Panel (ZAI1 UKS-M (M2) 1), DEA/NIAID/NIH
2012	Member, Site Visit Review Team, Laboratory of Emerging Pathogens, Center for Biologies Evaluation and Research, US FDA
2011 – 2012	Member, Nominations Committee, American Society for Virology
2011	Member and Co-chair, Special Emphasis Panel, Cell Biology IRG, Center for Scientific Review, NIH
2011	Discussion Leader, Virus Nanomachines: Structure and Catalysis, Viruses & Cells Gordon Conference, Lucca (Barga), Italy
2011 – 2012	Past Chair, Minority Affairs Committee American Society for Biochemistry and Molecular Biology
2011 – 2012	Guest Editor, Special issue: The Regulation of Mitochondrial Gene Expression, BBA – Gene Regulatory Mechanisms
7/1/10 – 6/30/11	Councilor for Division T (RNA viruses), American Society for Microbiology
2009 – 2011	Co-organizer, Viral Genome Replication Meeting (sponsored by ASM), February 2011, Banff, Alberta, Canada
2009 – 2011	Thematic Organizer, Obesity, American Society for Biochemistry and Molecular Biology Annual Meeting (2011), Washington, DC
2009	Member, 2012 Keystone Symposia Biochemistry/Structural Biology Study Group
2009	Chair, Workshop on Hepatitis Viruses, American Society for Virology 28 th Annual Meeting, Vancouver, BC, Canada
2009-2013	Member, Editorial Board, <i>Viruses</i>
2014-2018	
7/15/09-7/16/12	
2009-2019	
11/18/08 – 6/30/13	Member, Board of Scientific Counselors, National Institute of Diabetes and Digestive and Kidney Diseases, NIH
7/1/09 – 6/30/10	Chair, Division T (RNA Viruses) of the American Society for Microbiology
2009	Chair, Session on HIV: Activation and Antagonism of Host Defense, American Society for Biochemistry and Molecular Biology Annual Meeting New Orleans, LA
7/1/09 – 6/30/10	Chair-Elect, Division T (RNA Viruses) of the American Society for Microbiology
11/18/08 – 6/30/13	Member, Board of Scientific Counselors, National Institute of Diabetes and Digestive and Kidney Diseases, NIH
2008 – 2011	Chair, Minority Affairs Committee, American Society for Biochemistry and Molecular Biology
2008 – 2011	Member (<i>ex officio</i> , non-voting), Council, American Society for Biochemistry and Molecular Biology
2008	Chair, Workshop on RNA Virus Replication & Gene Expression II, American Society for Virology 27 th Annual Meeting, Ithaca, NY

2008	Chair, Session F: Genome replication and gene expression – 1, European Study Group on the Molecular Biology of Picornaviruses, Barcelona, Spain
2008	Co-Chair, Session on Integrating Discovery and Application, American Society for Biochemistry and Molecular Biology Annual Meeting Washington, DC
2008	Convener, ASBMB Award Ceremony for Exemplary Contributions to Education American Society for Biochemistry and Molecular Biology Annual Meeting, San Diego, CA
7/1/07 – 6/30/13	Member, ASBMB Today Editorial Advisory Board
2007	Member, Training and Career Opportunities Subcommittee, FASEB
2007	Chair, Workshop on Innate Immunity (II) – New Twists on Virus-Host Interactions, American Society for Virology 26 th Annual Meeting Corvallis, OR
2007	Chair, Session on Functional Analysis of Virus Proteins, Eighth International Symposium on Positive-strand RNA Viruses, Washington, DC
2007	Chair, Session on Infectious Diseases in Minority Populations: Hepatitis C, American Society for Biochemistry and Molecular Biology Annual Meeting, Washington, DC
2007	Convener, ASBMB Award Ceremony for Exemplary Contributions to Education American Society for Biochemistry and Molecular Biology Annual Meeting, Washington, DC
2006	Convener, ASBMB Award Ceremony for Exemplary Contributions to Education, American Society for Biochemistry and Molecular Biology Annual Meeting, San Francisco, CA
2006	Thrust Area Manager, Mitigation and Treatment Thrust Area, BioTech Master-Class Workshop, Defense Threat Reduction Agency Fort Belvoir, VA
2006	Member, Special Emphasis Panel Technical Evaluation Group: Partnerships for Hepatitis C Vaccine Development
2005	Invited Participant, NRC Workshop: Role of an Antiviral Compound in the Global Poliovirus Eradication Initiative
2005	Chair, Session on: Cis-acting RNA elements and trans-acting factors, European Study Group on the Molecular Biology of Picornaviruses Lunteren, The Netherlands
2005 – 6/30/2009	Member, Molecular Genetics A Study Section, Center for Scientific Review, NIH
2005	Member, Special Emphasis Panel Technical Evaluation Group: Centers for Hepatitis C Research
2004	Chair, Workshop on Antivirals and Interferons (I), American Society for Virology 23 rd Annual Meeting, Montreal, Quebec, Canada
2004 – 2008	Member (appointed), Minority Affairs Committee, American Society for Biochemistry and Molecular Biology
2004 – 2010	Member (appointed), Education and Professional Development Committee, American Society for Biochemistry and Molecular Biology
2004	Member, Special Emphasis Panel Technical Evaluation Group: Biodefense and Emerging Infectious Disease Research Opportunities, NIAID/NIH
1/1/2004-12/31/2018	Member, Editorial Board, <i>J. Virol.</i>
2003	Member (<i>ad hoc</i>), Virology Study Section, Center for Scientific Review, NIH
2003	Member, Special Emphasis Panel Technical Evaluation Group: Regional Biocontainment Laboratories, DMID/NIAID/NIH
2003	Member, Special Emphasis Panel Technical Evaluation Group: National Biocontainment Laboratories, DMID/NIAID/NIH

2002 - 2005	Chair, Local Organizing Committee, 2005 Annual Meeting of the American Society for Virology
2002	<i>Ad hoc</i> reviewer for Louisiana Board of Regents (grants)
2002	Member, Special Emphasis Panel Technical Evaluation Group: Impact of Microbial Interactions on Infectious Diseases, DMID/NIAID/NIH
2002	Member, Membership Task Force, American Society for Biochemistry and Molecular Biology
2002 - 2003	<i>Ad hoc</i> reviewer for Ohio Cancer Research Associates (grants)
2002	Member, Special Emphasis Panel Technical Evaluation Group: Drug Development for Opportunistic Infections-Hepatitis C, DAIDS/NIAID/NIH
2001 - present	<i>Ad hoc</i> reviewer for National Science Foundation (grants)
2001 - 2005	Member, International and Cooperative Projects Study Section, Center for Scientific Review, National Institutes of Health
2001	Co-Organizer, Penn State's 20 th Summer Symposium in Molecular Biology "Emerging Viral Disease", June 13-16.
2000	Member (<i>ad hoc</i>), International and Cooperative Projects Study Section, Center for Scientific Review, National Institutes of Health
1999	Chair, Workshop on Caliciviruses and Astroviruses (I), American Society for Virology 19 th Annual Meeting, Fort Collins, CO
1999	Organizer, Symposium on " <i>Understanding Biological Pathways: A Biophysical Perspective</i> " held on May 28, 1999 at Pennsylvania State University and sponsored by the Eberly College of Science, Bristol-Myers Squibb and SmithKline Beecham
1998 - 2012	Member, Congressional Liaison Committee, Joint Steering Committee for Public Policy (aka Coalition for the Life Sciences)

To University of North Carolina at Chapel Hill

2021	Chair, Biochemistry and Biophysics Chair Search Committee
2021	Co-director, Infectious Disease Research Cluster, NIH FIRST grant application
2020 – present	Member, School of Medicine Research Leadership Committee

To Pennsylvania State University

2018 – 2019	Member, Lithography Committee, Nanofabrication Lab, Material Research Institute
2018 – 2019	Member, BMB Faculty Search Committee
2018 – 2019	Member, BMB Promotion and Tenure Committee
2017 – 2019	Member, Faculty Advisory Committee, Center of Excellence in Industrial Biotechnology
2017 – 2018	Member, Search Committee, Director of the Huck Institutes of the Life Sciences
2016 – 2019	Chair, Institutional Review Entity, Office of Research Protections
2016 – 2019	Member, Advisory Committee, Genomics Core Facility
2015 – 2016	Co-chair, Search Committee, BSL3 Virologist, BMB/Huck
2014 – 2015	Member, Search Committee, BSL3 Pathogens, Huck/ECoS/AgSci
2014 – 2015	Member, Search Committee, Dean of Eberly College of Science, PSU
2014	Member, Strategic Planning Advisory Committee, ECoS
2013 – 2014	Member, Search Committee, Director of Forensics Program, ECoS
2013 – 2014	Member, Life Sciences Instrumentation Group, Huck Institutes of the Life Sciences
2013 – 2015	Member, BMB Promotion and Tenure Committee

2012 – 2013	Member, Search Committee, Director of the Penn State Hershey Cancer Institute
2011 – 2012	Co-chair, BMB Faculty Search Committee: Molecular Virology and Prokaryotic Systems Biology
2011 – 2012	Member, BMB Post Tenure Review Committee
2011 – 2012	Junior Faculty Mentoring Committee (<i>ex officio</i>)
2010 – 2015	Member, President's Award Committee for Excellence in Academic Integration (Chair, 2013-2014 and 2014-2015)
2010 – 2019	Member, Advisory Committee, Shared Fermentation Facility
2010 – 2015	Member, University Immediate Tenure Review Committee (Chair, 2011-2012 and 2013-2014)
2010 – 2012	Co-chair, Graduate Affairs Committee
2010 – 2019	Member, BMB Department Head Executive Committee
2009 – 2012	Member, University Selection Committee for Faculty Scholar Medal (Chair, 2011 and 2012)
2009	Eberly College of Science Distinguished Professorship Screening Committee
2009 – 2013	BMMB Graduate Student Recruiting Committee
2008 – 2015	Head, Advisory Committee, Electron Microscopy Facility, Huck Institute of the Life Sciences
2008 – 2010	University Promotion and Tenure Review Committee
1/1/2008 – 12/31/13	Member, Institutional Biosafety Committee
2007 – 2008	Huck Institute of the Life Sciences Promotion and Tenure Committee
2007 – 2008	Eberly College of Science Faculty Scholar Medal Nominating Committee
2007 – 2008	Search Committee for ECoS Directors of Outreach (K-14 & Professional Development)
2007	Modular BL3 Building and Design Committee
2007 – present	Conferences Advisory Committee, Outreach, Conferences and Institutes
2006 – present	Head then Member, Advisory Committee, X-ray Crystallography Facility, Huck Institute of the Life Sciences
2005 – 2007	BMB Promotion and Tenure Committee
2005 – 2006	Eberly College of Science Summer Outreach Program for grades 4-8
2004 – 2006	Dean's Committee on "Vision"
2004 - 2005	Faculty Search Committee: Gene Regulation
2003 - 2004	Search Committee for Head of Department of Chemistry
7/1/2003 – 6/30/07	ECoS Representative, University Faculty Senate
2003 – 2019	Honors Student Advisory Committee
2003 – 2007	Endowed Positions Search Committee
2002 - 2004	Faculty and Staff Achievement Awards Committee
2002 - 2003	Faculty Search Committee: Structural Biology
2002 - 2019	Honors Advisor
2002 - 2007	BMB Climate and Diversity Committee
2001 - 2002	Chair, Subcommittee for Junior Faculty Affairs, Climate Committee
2000	Post-tenure Faculty Review Committee
1999 - 2002	Dean's Committee on "Climate"
1999 - 2000	Faculty Search Committee: Host-Microbe Interactions
1999 - 2000	Chair, Selection Committee, Marker Lectures in Genetic Engineering
1998 & 1999	Judge, Graduate Student Research Exhibition
1998 - 1999	Selection Committee, Marker Lectures in Genetic Engineering
1998 & 1999	Admissions Committee, Summer Undergraduate Research Program, Life Sciences Consortium

1998 - 2002 Graduate Candidacy Exam Committee

To Industry

2016 – 2018	Consultant (contracted) Atea Pharmaceuticals, Inc., Boston, MA
2015 – 2019	Consultant (contracted) Latham & Watkins LLP, Washington, DC
2015 – 2019	Consultant (contracted) Abbvie, North Chicago, IL
2014 – 2016	Consultant (contracted) Finnegan, Henderson, Farabow, Garrett & Dunner LLP, Washington, DC
2013	Consultant (contracted) PTC Therapeutics, South Plainfield, NJ
2013	Consultant (contracted) Alios Biopharma, San Francisco, CA
2012	Consultant (contracted) BioCryst Pharmaceuticals, Inc., Birmingham, AL
2012 – 2013	Consultant (contracted) Bristol-Myers Squibb Company, Princeton, NJ
2010	Consultant (contracted) Merck Frosst, Montreal, Quebec, Canada
2010	Consultant (contracted) GlaxoSmithKline LLC, Research Triangle Park, NC
2009, 2011, 2013	Consultant (contracted) Gilead Sciences, Inc., Foster City, CA
2009	Consultant (contracted) Roche Palo Alto LLC, Palo Alto, CA
2008	Consultant (contracted) Merck Research Laboratories, West Point, PA
2008	Consultant (contracted) InterMune, Brisbane, CA
2007	Consultant (ad hoc), XTL Biopharmaceuticals Ltd., Valley Cottage, NY
2006 – 2008	Consultant (ad hoc), Genelabs Technologies, Inc., Redwood City, CA
2005	Consultant, Pfizer Global Research and Development, La Jolla, CA
2004 – 2006	Consultant (ad hoc) Valeant Pharmaceuticals International (formerly Ribapharm), Costa Mesa, CA
2003 – 2006	Consultant (contracted) Migenix (formerly Micrologix Biotech, Inc.), Vancouver, British Columbia, Canada
2003 – 2004	Consultant (contracted) Akros Pharma, Inc. Princeton, NJ
2003	Consultant (ad hoc) for Ribapharm, Inc., Costa Mesa, CA
2001 – 2003	Consultant (contracted) for Discovery Research, ICN Pharmaceuticals, Costa Mesa, CA
2000	Consultant (contracted) for Biochem Pharma, Inc., Laval, Quebec, Canada
2000	Consultant (contracted) for Antiviral Therapy, Schering-Plough Research Institute, Kenilworth, NJ

9. Research Statement

Viral infection poses a never-ending threat to human health. It is nearly impossible to predict the next viral outbreak of concern because of the ever-evolving nature of viruses and the potential for new human pathogens to originate in non-human members of the animal kingdom. Readiness for a viral epidemic of unknown etiology requires broad-spectrum, antiviral therapeutics and universal strategies for viral attenuation, for example strategies based on attenuating changes to the activity of a conserved viral enzyme. Our laboratory has had a longstanding interest in discovering fundamental biological knowledge relevant to the treatment and/or prevention of viral infection.

The era of biology on the single-cell level is well underway, and we have become a standard-bearer for “single-cell virology.” Currently, most studies emphasize the between-cell variability of populations in terms of gene expression. Even those studies with viral infection as the focus emphasize end-point differences in yield of virus or viral nucleic acid. No doubt there is much to

learn from these studies. However, there is also much to be learned by evaluating viral infection dynamics on the single-cell level.

We have developed a microfluidics-based, cell-culturing, imaging, and data-analysis platform that enables high-throughput, kinetic analysis of single, isolated cells infected with a viral population harboring fluorescent reporters. We have observed unprecedented between-cell variation in the onset, speed, and yield of replication, as well as variation in lysis, both if and when lysis occurs. Our studies demonstrate that analysis of viral infection dynamics on the single-cell level yields knowledge about virus-host interactions and the response of the host to viral infection eluded by population methods.

A selection of our contributions to science are presented below.

- 1988-1992 Among the earliest to identify residues of the retroviral protease required for substrate specificity. These studies provided an early indication of residues of HIV protease that would change to confer resistance to protease inhibitors used in the clinic and enabled the development of second- and third-generation inhibitors. (Graduate Student)

- 1993 Co-discovered the late assembly domain of retroviruses. This discovery established a new paradigm for how enveloped viruses complete the process of membrane envelopment, opening a field that continues to thrive and uncover new aspects of mammalian cell biology even today. (Postdoctoral Scholar)

- 1994-1997 Identified a complex of HIV reverse transcriptase and HIV nucleocapsid protein required for template switching (recombination). In addition, used dihydrofolate reductase from *E. coli* to make one of the earliest connections between remote-site dynamics of an enzyme and active-site conformational dynamics required for efficient catalysis. These now seminal studies established an inextricable connection between structure, dynamics, and function of proteins and enzymes. (Postdoctoral Fellow)

- 1997-2002 Developed robust expression and purification systems to produce proteins in *E. coli* without a methionine as the first amino acid. Established a quantitative biochemical assay to study a viral RNA-dependent RNA polymerase (RdRp). Used this assay to discover the RdRp as a target for ribavirin, which was a component of the combination used as standard of care for treatment of HCV infection. The finding that the target of ribavirin was a viral factor challenged the longstanding view that the target was a host factor. (Assistant Professor)

- 2002-2005 Co-discovered RdRp incorporation fidelity as a determinant of viral pathogenesis and virulence. Contributed to the development of lethal mutagenesis as an antiviral strategy. Elucidated the first comprehensive kinetic mechanism and structure-function-dynamics relationships for an RdRp. Developed the first robust purification protocol for *authentic* NS5A protein from HCV, enabling structural characterization of this protein that is now a critical component to cocktails used to cure HCV infection. Discovered the first biochemical activity of HCV NS5A protein. (Associate Professor)

- 2005-2015 Discovered the first amino acid of nucleic acid polymerases that contributes directly to the chemistry of nucleotidyl transfer. Used this knowledge to invent a

polymerase mechanism-based strategy for viral attenuation and vaccine development, an invention for which a patent was successfully prosecuted. Contributed to the discovery of a lipid as a critical host factor for viral multiplication and have now discovered the viral protein responsible for its induction. Discovered the mitochondrial RNA polymerase as the off target for antiviral ribonucleosides, enabling development of HCV RdRp inhibitors currently used in the combination therapies to cure HCV infection. (Professor)

2015-present Demonstrated the power of performing single-cell analysis of viral infections using poliovirus as a model system. Our studies reveal the stochastic behavior of viral infection dynamics, even in a cell-culture dish where it is easy to assume synchrony of infection. We predict that single-cell analysis of viral infections is an advance that will be as impactful to 21st-century virology as the one-step-growth and plaque assays have been to 20th-century virology.

10. Teaching Statement

I have more than 20 years of experience teaching undergraduate, graduate, and postdoctoral students in the classroom and/or my research laboratory. In the classroom, I have taught a range of courses from the more physical, chemical, and quantitative like general biochemistry to the more biological and conceptual like general virology. In all cases, it has been my observation that learning happens most effectively and efficiently when students have a genuine curiosity for the subject matter being taught. It is therefore imperative to frame a course around a timely, compelling problem. For general biochemistry, the theme is the need for new therapeutics and the process of drug discovery, characterization, and development. The pace at which knowledge in the life sciences is growing has far outstripped the capacity of any individual to master a subject area by learning all the facts. Instead, it is important to empower students to use the compendium of knowledge by introducing students to the most important questions of the day for the discipline and providing them with a paradigm to discover solutions to these and other problems on a case-by-case basis. I achieve this goal using current primary literature and facilitated group discussions. Given the diversity of learning styles: visual, aural, verbal, physical, logical, social, and solitary, it is imperative to integrate many different styles into in-class and out-of-class activities and to assess daily students' mastery of learning objectives. How I translate these guiding principles into actions in the classroom can be evaluated by reading the accompanying syllabi for general-biochemistry and general-virology courses that I have taught over the past few years (available upon request). My methods have been successful, at least for the upper half of the class, based on student ratings of teaching effectiveness and corresponding comments (available upon request).