Curriculum Vitaé

Zunlong Ke

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Education

2012-2018 Ph.D., Structural Biology
Thesis topic: Structure and assembly of enveloped virus
Advisors: Prof. Elizabeth R. Wright and Prof. Stephen C. Harvey
Georgia Institute of Technology, Atlanta, Georgia

2008-2012 B.S., Biology
College of Life Sciences
Wuhan University, Wuhan, Hubei, China

Research Experience

06/2013-Present PhD Graduate Student, Department of Pediatrics, Emory University
Advisor: Dr. Elizabeth R. Wright

Project 1: Structural studies of respiratory syncytial virus (RSV) from infected cells

- Cryo-ET sample preparation of RSV-infected cells and tilt series data collection using direct electron detector DE-20 on JEOL JEM-2200FS
- Tomographic reconstruction, segmentation, and quantitative analysis of structural proteins
- Subtomogram averaging of RSV structural proteins, including F glycoprotein in pre- and post-fusion conformational states
- Software: IMOD, Amira, PEET, EMAN2, UCSF Chimera
- Figure preparation, writing, editing, and revising
- Manuscripts: one published in ***Nature Communications***; one in revision for ***Viruses***

Project 2: Structural studies of measles virus (MeV) from infected cells

- Cryo-ET sample preparation of MeV-infected cells and tilt series data collection
- Subtomogram averaging of structural proteins, including F glycoprotein, matrix lattice, glycoprotein-matrix complex, and the helical RNP
- Figure preparation, writing, editing, and revising
- Published in ***Nature Communications***

Project 3: Cryo-correlative light and electron microscopy (cryo-CLEM)

- Prepared frozen-hydrated virus-infected cells using Cryoplunge 3 (CP3) system
- Performed cryo-CLEM data acquisition using Leica cryo-CLEM system
- Figure preparation, writing, editing, and revising
- Published in ***Nature Protocols***

Project 4: Single particle analysis of RSV glycoproteins

- Prepared frozen-hydrated samples using Vitrobot Mark III system
- Data processing using single particle workflow, including EMAN2 and Relion

01/2013-06/2013 PhD Rotation Student, School of Biology, Georgia Institute of Technology
Advisor: Dr. Stephen C. Harvey

- Prediction and visualization of RNA secondary structure using the GTfold and jViz program
- Localized catalytic domain of tyrosyl-tRNA synthetase using the VMD program

03/2011-06/2012 State Key Laboratory of Virology, Wuhan University, Wuhan, China

Advisors: Dr. Jianguo Wu and Dr. Yingle Liu

- Isolated 2 strains of Enterovirus 71 and focused on RACE DNA amplification technology
- Detected, isolated, sequenced, and gene typed virus samples
- Performed phylogenetic analysis of specific viruses
- Established a network system platform for querying, analyzing, predicting, and taking emergency measures towards infectious diseases in central China

Honors and Fellowships

05/2015 Ruska Award in Biological Sciences, Southeastern Microscopy Society, Decatur, GA
05/2015 Best Electron Micrograph Award, Southeastern Microscopy Society, Decatur, GA
06/2012 Excellent Graduate, Wuhan University
09/2011 National Encouragement Scholarship, Wuhan University
09/2010 Presidential Scholarships for excellent students, Wuhan University

Professional Workshops and Training

06/2017 IMOD/PEET Workshop for Cryo-Tomography of Biological Specimens, Rocky Mountain Laboratories. Hamilton, MT
07/2016 Electron Cryotomography Image Processing Using RELION, Columbus, OH
10/2015 NCMI Workshop on Single Particle, Structural Variability and Modeling, Houston, TX

Professional and Community Service

04/2017 Judge, Georgia Tech Undergraduate Research Spring Symposium, Atlanta, GA
07/2016 Volunteer, Microscopy and Microanalysis Conference, Columbus, OH
05/2016 Rider, 14th AIDS Vaccine 200 (Charity Bike Ride), Atlanta, GA
03/2016 Volunteer, 2016 Publix Georgia Marathon & Half Marathon, Atlanta, GA
10/2015 Volunteer, Atlanta Streets Alive, Atlanta, GA
04/2015 Judge, Georgia Tech Undergraduate Research Spring Symposium, Atlanta, GA
08/2014 Volunteer, Microscopy and Microanalysis Conference, Hartford, CT
10/2013 Volunteer, Project Live Love, Atlanta, GA

Teaching Experience

08/2012 - 08/2013 Graduate Teaching Assistant, Georgia Institute of Technology

Mentor Experience

09/2015 – 05/2017 SURE program, Emory University
Mentee: Fredrick Leon, undergraduate, Emory University
06/2017 – 08/2017 SURE program, Emory University
Mentees: Somnath Ganapa (The College of New Jersey, undergraduate), Dylan Price-Wittenauer (Emory University, undergraduate)
09/2017 – 05/2018 Undergraduate Research program, Emory University
Mentee: Mengtian Jin Emory University, undergraduate

Publications (Peer-Reviewed)

1. **Z. Ke***, J. D. Strauss*, C. M. Hampton, M. A. Brindley, R. S. Dillard, F. Leon, K. M. Lamb, R. K. Plemper, and E. R. Wright. **2018.** "Promotion of Virus Assembly and Organization by the Measles Virus Matrix Protein." ***Co-first author.** *Nature Communications*. Apr 30; 9:1736. doi:10.1038/s41467-018-04058-2
   Highlighted by Emory News
   Highlighted by Georgia Tech News
   Highlighted by EurekAlert!

2. C. M. Hampton*, J. D. Strauss*, **Z. Ke***, R. S. Dillard*, J. E. Hammonds, E. Alonas, T. M. Desai, M. Marin, R. E. Storms, F. Leon, G. B. Melikyan, P. J. Santangelo, P. W. Spearman, and E. R. Wright. **2017.** "Correlated Fluorescence Microscopy and Cryo-electron Tomography of Virus-infected or Transfected Mammalian Cells". *Nature Protocols*. Jan;12(1):150-167. doi: 10.1038/nprot.2016.168. ***Co-first author.**

Highlighted by Emory News
Highlighted by Phys.org
Highlighted by Health Canal
Highlighted by Counsel & Health

3. C. K. Ellison, J. Kan, R. S. Dillard, D. T. Kysela, A. Ducret, C. Berne, C. M. Hampton, **Z. Ke**, E. R. Wright, N. Biais, A. B. Dalia, and Y. V. Brun. **2017.** "Obstruction of pilus retraction stimulates bacterial surface sensing." *Science*. 358(6362):535-538. doi: 10.1126/science.aan5706

4. Y. Jang, W. T. Choi, W. T. Heller, **Z. Ke**, E. R. Wright, and J. A. Champion. **2017.** "Engineering Globular Protein Vesicles through Tunable Self-Assembly of Recombinant Fusion Proteins." *Small.* 2017 Jul 27. doi: 10.1002/smll.201700399.

5. K. F. Mittendorf*****, J. T. Marinko*****, C. M. Hampton, **Z. Ke**, A. Hadziselimovic, J. P. Schlebach, C. L. Law, J. Li, E. R. Wright, C. R. Sanders, and M. D. Ohi. **2017.** "Peripheral Myelin Protein 22 Alters Membrane Architecture." *Science Advances.* 3(7): e1700220.

6. C. C. Stobart*****, C. A. Rostad*****, **Z. Ke**, R. S. Dillard, H. Yi, A. L. Hotard, J. Meng, R. J. Pickles, K. Sakamoto, S. Lee, M. G. Currier, S. M. Moin, B. S. Graham, M. S. Boukhvalovas, B. E. Gilbert, J. C. G. Blanco, P. A. Piedra, E. R. Wright, and M. L. Moore. **2016.** "A Live-Attenuated RSV Vaccine with Increased Incorporation of Pre-Fusion F Exhibits Enhanced Thermal Stability and Immunogenicity." *Nature Communications*. Dec 21; 7:13916.
   Highlighted by Emory News
   Highlighted by EurekAlert!

7. A. J. Mitchell, W. D. Gray, M. Schroeder, H. Yi, J. V. Taylor, R. S. Dillard, **Z. Ke**, E. R. Wright, D. Stephens, J. D. Roback, and C. D. Searles. **2016.** "Pleomorphic Structures in Human Blood Are Red Blood Cell-Derived Microparticles, Not Bacteria." *PLoS ONE.* 11 (10): e0163582. doi:10.1371/journal. pone.0163582.

8. H. Yi*****, J. D. Strauss*****, **Z. Ke**, E. Alonas, R. S. Dillard, C. M. Hampton, K. M. Lamb, J. E. Hammonds, P. J. Santangelo, P. W. Spearman, and E. R. Wright. **2015.** "Native Immunogold Labeling of Cell Surface Proteins and Viral Glycoproteins for Cryo-Electron Microscopy and Cryo-Electron Tomography Applications." *Journal of Histochemistry & Cytochemistry*. 63(10): 780-792.

9. G. Kiss, X. Chen, M. A. Brindley, P. Campbell, C. L. Afonso, **Z. Ke**, J. M. Holl, R. C. Guerrero-Ferreira, L. A. Byrd-Leotis, J. Steel, D. A. Steinhauer, R. K. Plemper, D. F. Kelly, P. W. Spearman, and E. R. Wright. **2014.** "Capturing Enveloped Viruses on Affinity Grids for Downstream Cryo-Electron Microscopy Applications." *Microscopy and Microanalysis*. 20: 164-174.

10. **Z. Ke**, R. S. Dillard, T. Chirkova, F. Leon, C. S. Stobart, C. M. Hampton, J. D. Strauss, D. Rajan, C. Rostad, J. V. Taylor, H. Yi, R. Shah, M. Jin, T. V. Hartert, R. S. Peebles, B. S. Graham, L. J. Anderson, M. L. Moore, and E. R. Wright. "The Morphology and Assembly of Respiratory Syncytial Virus Revealed by Cryo-Electron Tomography." **Manuscript in revision for *Viruses*.**
    Special Issue: Advances in Structural Virology via Cryo-EM
    Guest Editor: Prof. Elizabeth R. Wright (Advisor)

11. R. S. Dillard, C. M. Hampton, J. D. Strauss, **Z. Ke**, D. Altomara, R. C. Guerrero-Ferreira, G. Kiss, and E. R. Wright. "Biological Applications from the Cutting Edge of Cryo-Electron Microscopy." **Manuscript in revision with *Microscopy and Microanalysis.***

Manuscripts in Preparation

1. R. S. Dillard*****, R. C. Guerrero-Ferreira*****, **Z. Ke**, P. D. Aldridge, and E. R. Wright. "Structural Specificity of Bacteriophage ΦCbK Head Filament to the *Caulobacter crescentus* Flagellum." Manuscript in preparation.

Conference Papers and Abstracts

1. **Z. Ke**, R. S. Dillard, C. M. Hampton, R. E. Storms, J. D. Strauss, and E. R. Wright. **2016.** "Native-State Structural Analysis of Respiratory Syncytial Virus." *Microscopy and Microanalysis.* 22 (S3): 1116-1117.

2. J. D. Strauss, **Z. Ke**, R. K. Plemper, and E. R. Wright. **2016.** "Cryo-Electron Tomography Provides Insight into the Native Architecture of the Measles Virus Assembly Site." *Microscopy and Microanalysis*. 22 (S3): 1136-1137.

3. E. R. Wright, J. D. Strauss, **Z. Ke**, C. M. Hampton, F. Leon, M. Brindley, and R. K. Plemper. **2017.** "The Near-to-Native Architecture of Measles Virus Assembly Sites and Isolated Measles Virus Particles." *Microscopy and Microanalysis*. 22 (S1): 1228-1229.

Conference Presentations

1. **Z. Ke**, J. D. Strauss, C. M. Hampton, M. A. Brindley, R. S. Dillard, F. Leon, K. M. Lamb, R. K. Plemper, and E. R. Wright. **2017.** "The Measles Virus Matrix Protein Regulates Organization of Virus Assembly as Revealed by Cryo-Electron Tomography." IMOD/PEET Workshop for Cryo-Tomography of Biological Specimens. Rocky Mountain Laboratories/NIH, Hamilton, MT. June 2017. (Poster).

2. **Z. Ke**, et al., and E. R. Wright. "Native-State Cryo-ET Structural Analysis of Respiratory Syncytial Virus." School of Biology Recruitment, Georgia Institute of Technology. Atlanta, GA. February 2017. (Poster).

3. **Z. Ke**, et al., and E. R. Wright. "Native-State Structural Analysis of Respiratory Syncytial Virus." School of Biology for the 2016 Scientific Retreat, Georgia Institute of Technology. Helen, GA. August 2016. (Talk).

4. **Z. Ke**, et al., and E. R. Wright. "Native-State Structural Analysis of Respiratory Syncytial Virus." Microscopy and Microanalysis Conference. Columbus, OH. July 2016. (Talk).

5. **Z. Ke**, et al., and E. R. Wright. "Native-State Structural Analysis of Respiratory Syncytial Virus." 14th Southeastern Regional Virology Conference. Atlanta, GA. April 2016. (Talk).

6. **Z. Ke**, et al., and E. R. Wright. "Respiratory Syncytial Virus Assembly and Budding Visualized by Cryo-Electron Tomography." Southeastern Microscopy Society Conference. Decatur, GA. May 2015. (Talk).

7. **Z. Ke**, et al., and E. R. Wright. "Human Respiratory Syncytial Virus Assembly and Budding Visualized by Cryo-Electron Tomography." 7th International Electron Tomography Conference. Cancun, Mexico. November 2014. (Poster).

References

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