Matthew K. Daddysman, Ph.D.

Institute for Biophysical Dynamics, University of Chicago, Chicago, IL 60637

EDUCATIONAL & PROFESSIONAL HISTORY

University of Chicago, Chicago, IL — 2013 – Present
Institute for Biophysical Dynamics
Postdoctoral Scholar, Yen Fellowship
Advisor: Dr. Norbert Scherer, Professor of Chemistry

University of North Carolina, Chapel Hill, NC — 2009 – 2013
Ph.D. in Physical Chemistry
December 15, 2013
Advisor: Dr. Chris Fecko, Assistant Professor of Chemistry

Alderson Broaddus University, Philippi, WV — 2005 – 2009
B.S. in Chemistry & Biology, *Summa cum Laude*
Minor: International Studies
May 9, 2009
Research Advisor: Dr. Yi Charlie Chen, Associate Professor of Biology

PUBLICATIONS

- **Daddysman MK***, Renn MH*, Hutchison AL, Huynh T, Tamarina N, Dinner AR, Philipson LH and Scherer NF (**2017**) "Dimensionality of growth is the major contributor to differential expression in the transcriptome of clonal mouse insulinoma cells.", *in preparation*
- Banerjee S, Lo K, **Daddysman MK**, Selewa A, Kuntz T, Dinner AR and Scherer NF (**2017**) "Biphasic growth dynamics control cell division in *Caulobacter crescentus*.", Nat Microbiol, 2:17116, doi: 10.1038/nmicrobiol.2017.116
- Huynh T*, **Daddysman MK***, Bao Y, Selewa A, Kuznetsov A, Philipson LH and Scherer NF (**2017**) "Correlative imaging across microscopy platforms using the fast and accurate relocation of microscopic experimental regions (FARMER) method.", Rev Sci Instrum, 88(5):053702, doi: 10.1063/1.4982818
- **Daddysman MK**, Tycon MA and Fecko CJ (**2014**) "Photoinduced damage resulting from fluorescence imaging of live cells.", Methods Mol Bio, 1148, 1-17, doi: 10.1007/978-1-4939-0470-9_1
- Tycon MA, **Daddysman MK** and Fecko CJ (**2014**) "RNA polymerase II subunits exhibit a broad distribution of macromolecular assembly states in the interchromatin space of cell nuclei", J Phys Chem B, 118:2, 423-433, doi: 10.1021/jp4082933
- **Daddysman MK** and Fecko CJ (**2013**) "Revisiting point FRAP to quantitatively characterize anomalous diffusion in live cells", J Phys Chem B, 117:5, 1241-1251, doi: 10.1021/jp310348s
- **Daddysman MK** and Fecko CJ (**2011**) "DNA multiphoton absorption generates localized damage for studying repair dynamics in live cells", Biophys J, 101:9, 2294-2303, doi: 10.1016/j.bpj.2011.09.031

- Luo H, **Daddysman MK,** Rankin GO, Jiang BH and Chen YC (**2010**) "Kaempferol enhances cisplatin's effect on ovarian cancer cells through promoting apoptosis caused by down regulation of cMyc", Cancer Cell Int, 10:16, doi: 10.1186/1475-2867-10-16
- Luo H, Rankin GO, Liu L, **Daddysman MK,** Jiang BH and Chen YC (**2009**) "Kaempferol inhibits angiogenesis and VEGF expression through both HIF dependent and independent pathways in human ovarian cancer cells", Nutr Cancer, 61:4, 554 – 563, doi: 10.1080/01635580802666281

*Equal contribution

TECHNICAL SKILLS

- Maintains a Yokogawa W1 spinning disk confocal microscope
  - Trains group members on the equipment
  - Manages web based schedule calendar
  - Maintains performance and alignment of the microscope
- Microscopy techniques: Laser scanning (two-photon & confocal), spinning disk confocal, multifocal, interferometric super-resolution, live-cell imaging
- Microscopy software: ImageJ, Micromanager, Slidebook, Huygens
- Programming languages: Matlab, R, Labview, C, C++
- Statistical analysis using R & SPSS
- Biomedical techniques: Immunostaining, PCR, Western blot, cell transfection, tissue culture
- Microsoft Office: Word, Excel, Powerpoint

RESEARCH EXPERIENCE

University of Chicago, Institute for Biophysical Dynamics
Principle Investigator: Dr. Norbert Scherer, Professor of Chemistry
Collaborators: Dr. Louis Philipson, Professor of Medicine; Dr. Aaron Dinner, Professor of Chemistry
Yen Postdoctoral Research Fellowship
Biophysics of diabetes investigated using live cell fluorescence microscopy
December 2013 – Present

Research Summary: My research involves understanding the origins of type 2 diabetes at a cellular level. Previous research indicates that defects occur in insulin trafficking and exocytosis in pancreatic beta cells leading to diabetes. To further understand the origins of the disease, I use live cell confocal microscopy to image the trafficking of insulin granules. I apply tracking software to obtain trajectories of motion of granules over time. These trajectories are used to model the cell's behavior under different conditions or stresses. Additionally, I am working on developing new fluorescent microscope technologies to track cellular structures in 3-D. These new technologies would continue current work in the group tracking the motion for trafficking and secreting of insulin granules to further understand the cellular origins of diabetes**.**

University of North Carolina at Chapel Hill
Principle Investigator: Dr. Chris Fecko, Assistant Professor of Chemistry
Live cell fluorescence microscopy methods for studying nuclear protein dynamics
December 2009 – December 2013

Research Summary: My research focused on using multiphoton fluorescence microscopy techniques to interrogate DNA-protein interactions in live cells. I developed and characterized a method for creating two-photon photolesions on DNA in live cells as localized binding sites for DNA repair enzymes. My research used the specialized polytene cells of the *Drosophila melanogaster* larva salivary glands. In these cells, I demonstrated the recruitment of the enzyme topoisomerase I tagged with GFP to the site of DNA damage. Furthermore, I developed a live cell fluorescence recovery after photobleaching method and model to quantitatively measure diffusion and binding of proteins. The model takes into account fluorophore photophysics to more accurately determine protein diffusion rates and the nature of diffusion in disordered systems such as cells. I found that the primary source of anomalous diffusive behavior in cell nuclei for GFP is the dense chromatin network. Finally, I investigated how large protein complexes diffuse in live cells and the quantitative behavior of topoisomerase I recruitment to sites of DNA damage.

Alderson Broaddus University and WV-INBRE
Principle Investigator: Dr. Yi Charlie Chen, Associate Professor of Biology
Ovarian & prostate cancer suppression by VEGF inhibition with flavonoids
May 2007 – August 2007; January 2008 – August 2008
Research Summary: My research studied ovarian and prostate cancer cell lines that were resistant to cisplatin, the cancer drug commonly used to treat these cancers. Our group focused on flavonoids, a class of antioxidant phytochemicals, thought to be one of the active chemical agents responsible for the link between diets high in fruit and vegetable consumption and the reduced risk of cancer. We looked at two possible methods for the use of flavonoids. First, we measured the flavonoids' suppression of cancer cell proliferation and angiogenesis, the growth of new blood vessels to support the developing tumor. Secondly, we looked at the interaction of flavonoids with cisplatin to enhance the effectiveness of cisplatin in inducing apoptosis in cell lines mostly resistant to cisplatin. We found that a particular flavonoid, kaempferol, limited angiogenesis in ovarian cancer cells and enhanced cisplatin's effectiveness in producing apoptosis.

CONFERENCE PRESENTATIONS

- **Daddysman MK**, Selewa A, Huang X, Huynh T, Jureller J, Ferrier NJ, Hereld M and Scherer NF "Towards 3-D snapshot volumetric imaging: Novel methods of microscopy and image reconstruction to achieve 3-D volumes with single snapshot exposures." Talk presented at Fall 2016 National Meeting of the American Chemical Society, Philadelphia, PA
- **Daddysman MK**, Renn MH, Hutchison AL, Huynh T, Tamarina N, Dinner AR, Philipson LH and Scherer NF "Insulin secretion from clonal MIN6 sublines depends on the dimensionality of culturing." Poster presented at the 2016 American Diabetes Association Scientific Sessions, New Orleans, LA
- **Daddysman MK** and Fecko CJ "Quantifying the contributions of obstructions and protein-protein interactions to anomalous diffusion in cell nuclei." Poster presented at Spring 2013 National Meeting of the American Chemical Society, New Orleans, LA

- **Daddysman MK** and Fecko CJ "Quantifying the contribution of obstructions to anomalous diffusion in cell nuclei." Poster presented at 2013 National Meeting of the Biophysical Society, Philadelphia, PA
- **Daddysman MK** and Fecko CJ "Toward quantitative measurements of DNA repair protein recruitment dynamics in live cells." Poster presented at 2012 Southeast Regional Meeting of the American Chemical Society, Raleigh, NC
- **Daddysman MK** and Fecko CJ "Multiphoton magic in the nucleus: from localized DNA damage to quantitative FRAP." Talk presented at 2012 UNC Microscopy and Users Group, Chapel Hill, NC
- **Daddysman MK,** Juliano N, Jiang BH, Luo H and Chen YC "Kaempferol inhibits expression of VEGF in PC-3 prostate cancer cells." Poster presented at 2009 STAR Symposium, Charleston, WV
- **Daddysman MK**, King SM, Jiang BH, Luo H and Chen YC "Flavonoids and vitamin E sensitize the anticancer effect of cisplatin in the OVCAR-3 cell line." Poster presented at 2007 STAR Symposium, Morgantown, WV; and 2008 Undergraduate Research Day at the Capital, Charleston, WV

TEACHING EXPERIENCE

University of Chicago

- Mentorship
  - Research mentor for 3 undergraduates, Mattie Renn, Nicole Luk, & Theresa Haunold
  - Mattie Renn completed an honors thesis on her project

University of North Carolina at Chapel Hill

- Physical Chemistry Computational Lab (Chem 481L) Instructor
  - Instructor of record in Fall 2013
    - Prepared course materials and exams
    - Conducted weekly lectures to introduce lab assignments
    - Graded lab reports and assigned final grades
    - Supervised 2 teaching assistants
  - 40 senior students
  - Teaching assistant in same course - Fall 2011 & Spring 2012
    - Received the 2012 Albert R. Ledoux Teaching Award for this TA assignment
- Physical Chemistry Experimental Lab (Chem 482L) Teaching Assistant
  - 36 senior students in Spring 2010
- General Chemistry Lab (Chem 101L) Teaching Assistant
  - 48 mostly freshmen students in Fall 2009
- Mentorship
  - Research mentor for 1 undergraduate, Catherine Dial, over 1 year
  - Tutor for 18 undergraduates in several chemistry courses: General, Physical, Analytical, and Organic

Alderson Broaddus University

- Organic Chemistry Lab Instructor
  - Experimental and instrumentation survey lab for 2 health science majors

- Prepared and designed experiments, graded lab reports, and wrote lab exams
- Summer 2009

HONORS, AWARDS, AND ACTIVITES

University of Chicago	
Yen Postdoctoral Fellowship	2014
University of North Carolina	
UNC Chemistry Albert R. Ledoux Teaching Award	2012
Alderson Broaddus University	
Outstanding Senior Award	2009
Outstanding Natural Science Senior	2009
Outstanding Senior Male on Campus Resident	2009
Member of Silver Key – Academic Honor Society	2008
Outstanding Junior Chemistry Major Award presented by the Northern West Virginia Section of the American Chemical Society	2008
Appalachian College Association STEM/NSF Scholarship	2008 – 2009
Honor Program	2005 – 2009
Dean's List – 8 semesters	2005 – 2009
International Study at Alderson Broaddus	
Belize: Rain Forest and Coral Reef Ecology – 3 weeks	2009
Salzburg, Austria: European History and Culture – 3 months	2007
Alderson Broaddus Student Government	
Student Government President	2008 – 2009
Student Government Senator	2006 – 2008
Other	
Valedictorian Philip Barbour High School Class of 2005 – Philippi, WV	2005
Philip Barbour High School Band – Volunteer Instructor	2005 – 2017