

CURRICULUM VITAE

Christine Carlisle Helms, Ph.D.

Departments of Physics
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EDUCATION

- 2010 Doctor of Philosophy in Physics, Wake Forest University
Dissertation topic: Using Atomic Force Microscopy to discern the mechanical properties of native, variant and electrospun fibrin/fibrinogen fibers
Advisor: Martin Guthold
- 2005 Bachelors, Physics, University of Mary Washington

AREAS OF SPECIAL INTEREST

My general research interests are in the areas of biophysics, nanotechnology, hemostasis and translational research. Specific interests include:

- Production of electrospun fibers
- Polymer orientation and organization in nanofibers
- Mechanical properties and force detection by AFM
- Interaction of NO and NO metabolites with vascular components
- Mechanic properties of fibrin fibers

PROFESSIONAL EXPERIENCE

Research

- 2013 - present Assistant Professor, Physics Department, University of Richmond
- 2010 - 2013 Postdoctoral Research, Physics Department and Translational Science Center, Wake Forest University
- 2005 - 2010 Research Assistant - PhD Candidate, Physics Department, Wake Forest University
- 2004 - 2005 Undergraduate Honors Research, Physics Department, University of Mary Washington
- 2004 Research Experience for Undergraduates, Physics Department, Purdue University

Teaching, Tutoring & Coaching

- 2013 - present Assistant Professor, Physics Department, University of Richmond
Courses: Physics 131 General Physics with Calculus, Physics 132 General Physics with Calculus II, Physics 215 Computational Methods for Physics, Physics 221 Intermediate Lab, Special Topics: Biophysics
- 2007 - present Mentoring undergraduate research, (20+ students)
- 2010 - 2013 Assistant Varsity and JV Girls High School Basketball Coach
- 2009 - 2010 Project TEACH Volunteer - physics tutoring for high school students at risk of failing science
- 2005 - 2008 Teaching Assistant, Physics Department, Wake Forest University
General Physics Lab (Teaching and Grading) and General Physics Tutorial

Service

2018 – present Engineering Dual Degree Advisor
2017 – present Integrated Inclusive Science Committee member
2016 - present Student Co-curricular Academic Initiatives Committee (Chair – 2018)
2016 - 2018 Society for Redox Biology and Medicine Professional Development Committee: Co-Founder/Chair of Undergraduate Research Subcommittee
2014 - 2017 Undeclared Academic advisor
2015 - 2017 Richmond Scholars Science Committee
2017 Richmond Physics Olympics Organizer: physics competition for high school students
2015 Engineering Dual Degree advisor (~80 students)
2013 - present Referee for the journals and funding including: Journal of Biomedical Materials Research: Part A, JoVE, Nanomedicine: Nanotechnology, Biology, and Medicine
2014 - 2015 University of Richmond Physics MCAT review
2014 - 2015 Physics study abroad website in collaboration with International Educations
2006 - 2010 Graduate Student Association – Physics Department Representative, Co-Chair (2008-2009) Wake Forest University

AWARDS, HONORS & PROFESSIONAL MEMBERSHIPS

Awards

2013 Travel Award - From the Nitrite and Nitrate in Physiology, Pathophys, and Therapeutics to attend the annual meeting
2010 Outstanding PhD Student Award – Wake Forest University
2008 - 2010 Predoctoral Fellowship - American Heart Association Mid-Atlantic Affiliate
2009 Travel Award – From the Biophysical Society to attend the annual meeting
2009 Travel Award – From the NSF CMMI to attend the grantees conference
2007 - 2009 Travel Awards - Alumni Student Travel Fund Award, Wake Forest University
2008 Outstanding Teaching Assistant, Physics Department, Wake Forest University
2005 Physics Faculty Award, University of Mary Washington

Memberships

2017 – present Materials Research Society
2017 – present Virginia Academy of Science
2015 - present ALPha - Advanced laboratory Physics Association
2014 - present American Association of Physics Teachers (AAPT)
2014 – present International Fibrinogen Research Society
2013 - present American Physical Society (APS)
2012 - present American Heart Association
2011 - 2018 Society of Free Radical Biology and Medicine
2007 - 2017 Member: Biophysical Society
2002 - 2010 Member: Society of Physics Students

PUBLICATIONS, PRESENTATION, FUNDING (MAIDEN NAME C.R. CARLISLE)

Refereed Publications (* denotes University of Richmond Student)

1. C. Fryer*, M. Scharnagl*, **C.C. Helms**. “Electrostatic alignment of electrospun PEO fibers by the gap method increases individual fiber modulus in comparison to non-aligned fibers of similar diameter.” AIP Advances. 2018.8(6). doi:10.1063/1.5027812

2. **C.C. Helms**, M.T. Gladwin, D.B Kim-Shapiro. "Erythrocytes and Vascular Function: Oxygen and Nitric Oxide." *Frontiers in Physiology*. 2018.9:125. doi: 10.3389/fphys.2018.00125
3. W. Li, J. Sigley, S. Baker, **C.C. Helms**, M. Kinney, M. Pieters, P. Brubaker, R. Cubccioti, M. Guthold. "Non-uniform internal structure of fibrin fibers: Protein density and bond density strongly decrease with increasing diameter." *BioMed Research International*. 2017. doi: 10.1155/2017/6385628
4. **C.C. Helms**, S. Kapadia*, A.C. Gilmore*, Z. Lu*, S. Basu, D.B. Kim-Shapiro. "Exposure of fibrin and thrombin to nitric oxide donor ProliNONOate affects fibrin clot properties." *Blood Coagulation and Fibrinolysis*. 2017.28(5):356-364. doi: 10.1097/MBC
5. **C.C. Helms**, X. Liu, D.B Kim-Shapiro. "Recent insights into nitrite signaling processes in blood." *Biological Chemistry*. 2017.398(3):319-329
6. W. Li, J. Sigley, M. Pieters, **C.C. Helms**, C. Nagaswami, J. W. Weisel, M. Guthold. "Fibrin Fiber Stiffness Is Strongly Affected by Fiber Diameter, but not by Fibrinogen Glycation." *Biophysical Journal*. 2016.110(6):1400-1410.
7. C. Liu, N. Wajih, X. Liu, S. Basu, J. Janes, M. Marvel, C. Keggi, **C.C. Helms**, A.N. Lee, A.M. Belanger, D.I. Diz, P.J. Laurienti, D.L. Caudell, J. Wang, M.T. Gladwin, D.B. Kim-Shapiro. "Mechanisms of Human Erythrocytic Bioactivation of Nitrite." *Journal of Biological Chemistry*. 2015.290(2):1281-94.
8. M.J. Berry, N.W. Justus, J.I. Hauser, A.H. Case, **C.C. Helms**, S. Basu, Z. Rogers, M.T. Lewis, G.D. Miller. "Dietary nitrate supplementation improves exercise performance and decreases blood pressure in COPD patients." *Nitric Oxide*. 2014.48(1):22-30.
9. K. Kemper, D. Powell, **C.C. Helms**, D.B. Kim-Shapiro. "Loving-kindness meditation's effects on nitric oxide and perceived well-being: A pilot study in experienced and inexperienced meditators." *Explore: The Journal of Science and Healing*. 2014. 11:32-39.
10. D. Wang, I. Cortes-Puch, J. Sun, S.B. Solomon, T. Kanas, K. Remy, J. Feng, M. Alimchandani, M. Quezado, **C.C. Helms**, A. Perlegas, M.T. Gladwin, D.B. Kim-Shapiro, H. Klein, C. Natanson. "Transfusions of older stored blood worsens outcomes in canines depending on the presence and severity of pneumonia." *Transfusion*. 2014.54(7):1712-1724.
11. **C.C. Helms**, M. Marvel, W. Zhao, M. Stahle, R. Vest, G.J. Kato, J.S. Lee, G. Christ, M.T. Gladwin, R.R. Hantgan, D.B. Kim-Shapiro. "Mechanisms of hemolysis-associated platelet activation." *Journal of Thrombosis and Haemostasis*. 2013.11(12):2148-2154.
12. **C.C. Helms** and D. Kim-Shapiro. "Hemoglobin-mediated nitric oxide signaling." *Free Radic Biol Med*. 2013. 61:464-472
13. S.B. Solomon, D. Wang, J. Sun, T. Kanas, J. Feng, **C.C. Helms**, M.A. Solomon, M. Alimchandani, M. Quezado, M.T. Gladwin, D.B. Kim-Shapiro, H.G. Klein, C. Natanson. "Mortality increases after massive exchange transfusion with older stored blood in canines with experimental pneumonia." *Blood*. 2013. 121(9):1663-1672.
14. D. Wang, B. Piknova, S.B. Solomon, I. Cortes-Puch, S.J. Kern, J. Sun, T. Kanas, M.T. Gladwin, **C.C. Helms**, D.B. Kim-Shapiro, A.N. Schechter, C. Natanson. "In vivo reduction of cell-free methemoglobin to oxyhemoglobin results in vasoconstriction in canines." *Transfusion*. 2013. 53(12):3149-63
15. S.B. Solomon, L. Bellavia, D. Sweeney, B. Piknova, A. Perlegas, **C.C. Helms**, G.A. Ferreyra, S.B. King, N.J.H. Raat, S.J.Kern, J. Sun, L. Mcphail, A.N. Schechter, C. Natanson, M.T. Gladwin, D.B. Kim-Shapiro. "Angeli's Salt Counteracts the Vasoactive Effects of Elevated Plasma Hemoglobin." *Free Radic Biol Med*. 2012. 53(12):2229-2239
16. R.D. Averett, B. Menn, E.H. Lee, **C.C. Helms**, T. Baker, M. Guthold. "A modular fibrinogen model that captures the stress-strain behavior of fibrin fibers." *Biophysics Journal*. 2012. 103(7):1537-44.

17. J. Tejero, S. Basu, **C.C. Helms**, N. Hogg, S.B. King, D.B. Kim-Shapiro, M.T. Gladwin. "Low NO concentration dependence of the reductive nitrosylation reaction of hemoglobin". *Journal of Biological Chemistry*. 2012. 287(22):18262-74
18. G. Miller, A. Marsh, R.W. Dove, D. Beavers, T. Presley, **C.C. Helms**, E. Bechtold, S.B. King, D. Kim-Shapiro. "Plasma nitrate and nitrite are increased by a high nitrate supplement, but not by high nitrate foods in older adults." *Nutrition Research*. 2012. 32(3):160-8.
19. **C.C. Helms**, R. Ariëns, S. Uitte de Willige, K. Standeven, M. Guthold. "Alpha-alpha Cross-Links Increase Fibrin Fiber Elasticity and Stiffness." *Biophysical Journal*. 2012. 102(1):168-175.
20. S. Baker, J. Sigley, **C. Carlisle**, J. Stitzel, J. Berry, M. Guthold. "The mechanical properties of dry, electrospun fibrinogen fibers." *Materials Science and Engineering C*. 2011. 32: 215-221
21. J. Kim, H. Song, I. Park, **C. Carlisle**, K. Bonin, M. Guthold. "Denaturing of single electrospun fibrinogen fibers studied by deep ultraviolet fluorescence microscopy." *Microscopy Research and Technique*. 2011. 74(3): 219-224.
22. W. Liu, **C.R. Carlisle**, E.A. Sparks, M. Guthold. "The mechanical properties of single fibrin fibers." *Journal of Thrombosis and Haemostasis*. 2010. 8(5): 1030-1036 (**co-first author**)
23. **C.R. Carlisle**, E.A. Sparks, C. Der Loughiam, M. Guthold. "Strength and Failure of Fibrin Fiber Branch Points." *Journal of Thrombosis and Haemostasis*. 2010. 8(5): 1135-1138.
24. **C.R. Carlisle**, C. Coulais, M. Guthold. "The mechanical stress-strain properties of single electrospun collagen type I nanofibers." *Acta Biomaterialia*. 2010. 6(8): 2997-3003.
25. **C.R. Carlisle**, C. Coulais, M. Namboothiry, D. Carroll, R.R. Hantgan, M. Guthold. "The mechanical properties of individual, electrospun fibrinogen fibers." *Biomaterials*. 2009. 30(6): 1205-1213.

Oral Presentations

1. Virginia Soft Matter Workshop, September 2017. "The mechanical properties of nanofibers by AFM."
2. Nitric Oxide Gordon Research Conference, February 2017. "In vitro effect of fibrin modification due to nitric oxide exposure."
3. Virginia Commonwealth University physics colloquia, February 2017. "Fibrin Fiber Formation and Mechanics."
4. Society for Redox Biology and Medicine, Professional Development Seminar, November 2016. "Teaching while running and effective research lab."
5. James Madison University physics seminar, October 2016. "The Mechanical Properties of Fibrin."
6. XXIVth International Fibrinogen Workshop, June 2016. "The Exposure of fibrin clots to nitric oxide donor during polymerization alters clot properties."
7. Science Museum of Virginia, April 2016. "The Physics of NASCAR."
8. Wake Forest University physics colloquium, Feb. 2015. "Structural and Mechanical Properties of Fibrin Exposed to Nitric Oxide"
9. University of Richmond biology department seminar, Nov. 2014. "Structural and Mechanical Properties of Fibrin Exposed to Nitric Oxide"
10. 80th Annual Southeastern Section of the American Physical Society Conference. Nov. 2013 "Mechanical Property measurements of Single Nanofibers"
11. Fifth International Meeting on the Role of Nitrite and Nitrate in Physiology, Pathophysiology, and Therapeutics. May 2013. "Platelet Activation in the Presence of NO₂, NO and hemoglobin."
12. Winston Salem State University, Biophysics Course, September 2012. "My biophysics experience."
13. Graduate Student Research Day, Wake Forest University, April 2009. "Nanoscale research with an atomic force microscope."

14. Carolina Biophysics Society, November 2008. "The stress-strain behavior of crosslinked and noncrosslinked fibrin fibers."
15. Nanomedicine Workshop, April 2008. "The stress-strain behavior of natural fibrin fibers and electrospun fibrinogen and electrospun collagen fibers."

Selected Conference Abstracts (* denotes University of Richmond student)

1. M. Guthold, **C.C. Helms**, S.R. Baker, J. Sigley, E. Voyles, S. Banerjee, J. Sharpe, Z. Zhang, J. Diaz-Silveira, K. Bonin. "The mechanical properties of electrospun fibrinogen, blended fibrinogen:PCL, and fibrinogen:collagen nanofibers." IFRS: XXVth International Fibrinogen Workshop. June 2018.
2. **C.C. Helms**, C. Fryer*, B. D'Oleo*, M. Scharnagl*. "Properties of individual electrospun fibers aligned using parallel plate collectors." Materials Research Society Spring Meeting. April 2018.
3. C. Fryer*, **C.C. Helms**. "The effect of parallel plate alignment on the mechanical properties of electrospun PEO." Material Research Society Spring Meeting. April 2017.
4. A. Gilmore*, **C.C. Helms** "Nitric oxide affects fibrin clots through peroxynitrite formation." Virginia Academy of Science Research Showcase at the Capitol. January 2017.
5. A. Gilmore*, S. Hyman*, D. Pacella*, **C.C. Helms**. "ProliNONOate alters fibrin clot formation through peroxynitrite formation and protein oxidation." Society for Redox Biology and Medicine. November 2016.
6. **C.C. Helms**, Z. Lu*. "The Radius and Extensibility of fibrinogen 1 and fibrinogen 2 fibers." IFRS: XXIVth International Fibrinogen Workshop. June 2016.
7. K. McGiboney*, T. Thanos*, **C.C. Helms**. "Alignment and Diameter of Electrospun PEO fibers." Biophysical Society. February 2016.
8. A. Gilmore*, Z. Lu*, S. Kapadia*, **C.C. Helms**. "The effect of ProliNONOate on fibrin clot polymerization." Society of Free Radical Biology and Medicine. November 2015.
9. S. Kapadia*, M. Mepyans*, A. Achey*, T. Becker*, **C. C. Helms**. "Permeability of Fibrin Clots Exposed to Nitric Oxide During Polymerization." Nitric Oxide - Nitrite/Nitrate Conference. June 2014.
10. C. Liu, X. Liu, N. Wajih, J. Janes, S. Basu, M. Marvel, **C. C. Helms**, D. Diz, P. Laurienti, D. Caudell, J. Wang, M. T. Gladwin, D. B. Kim-Shapiro. "Hemoglobin is the Primary Erythrocytic Nitrite Reductase." Nitric Oxide - Nitrite/Nitrate Conference. June 2014.

University of Richmond Symposia Abstracts

1. Z. Lu* "Mechanical Properties of Fibrin Fibers." Poster presentation Arts and Science Symposia. 2018
2. D. Pacella* "Imaging Techniques of Butterfly Wings." Poster presentation Arts and Science Symposia. 2018
3. M. Scharnagl*, B. D'Oleo* "Properties of Electrospun Polyethylene Oxide (PEO)." Poster presentation Arts and Science Symposia. 2018
4. T. Thanos* "Properties and Computational Model of Electrospun fibers." Poster presentation Arts and Science Symposia. 2017
5. C. Fryer* "Effects of electric field alignment on the mechanical properties of electrospun nanofibers." poster presentation HHMI symposia. 2016
6. S. Hyman* "The effect of varying substrates and nitric oxide exposure on blood clot coagulation and aggregation." poster presentation HHMI symposia. 2016
7. Z. Lu* "Mechanical properties of gamma' fibrin fibers." poster presentation at Arts and Science Symposia. 2016
8. K. McGiboney*, T. Thanos* "Variances in aligned and unaligned electrospun fibers and coaxial fibers." poster presentation Arts and Sciences symposia. 2016

9. M. Mepyans* "The Effect of Nitric Oxide on Fibrin Clot Permeability", poster presentation at HHMI symposia. 2014.
10. D. Pacella*, A. Gilmore*, M. Murvin* "Clotting time, diameter and permeability of fibrin clots exposed to S-Nitrosogluththione." Poster presentation at Arts and Sciences Symposia. 2015.
11. A. Gilmore*, J. Lu*, D. Pacella*, S. Kapadia* "The effect of nitric oxide of fibrin fiber properties." Poster presentation at Arts and Science Symposia. 2015
12. S. Kapadia* "Confocal Microscopy and Permeability of Fibrin Clots Exposed to Nitric Oxide During Polymerization", Poster presentation at HHMI Symposia. 2014.
13. T. Chapuis* "IGOR Pro Programming for the AFM", poster presentation at Arts and Science Symposia and HHMI Symposium. 2014/2015.
14. A. Achey* "The effect of fibrin concentration and Nitric Oxide on Clot Permeability", oral presentation at Arts and Science Symposium. 2014
15. T. Becker*, A. Achey* "The effect of Thrombin Concentration and NO Activity on Clot Permeability", poster presentation at Arts and Science Symposium. 2014.
16. S. Kapadia* "Confocal Microscopy of Fibrin Clot Properties", poster presentation at Arts and Science Symposium. 2014.
17. T. Chapuis* "Atomic Force Microscopy", poster presentation at Arts and Science Symposium. 2014.

AWARDS AND FUNDING

1. **C.C. Helms**, "Properties of aligned electrospun nanofibers." Jeffress Trust Awards Program in Interdisciplinary Research. \$100,000 (funded July 2016)