

# DARIA MONAENKOVA

161 Sistine Hall, Clemson University,  
Clemson, SC, 29634

Phone: (864)633-7956  
E-mail: [dmonaen@g.clemson.edu](mailto:dmonaen@g.clemson.edu)

## RESEARCH INTERESTS:

Modeling and experimental analysis of elasto - capillary, - wetting, and kinetic effects manifested through interactions of liquids with porous materials. Role of these effects in biomechanics of insect feeding.

## EDUCATION:

**PhD.**, Materials Science and Engineering, Clemson University, SC  
*GPA: 4.00/4.00*

*Anticipated graduation: May 2012*

**B.S./M.S.**, Physics, Russian State University of Aviation Technology named  
after K.E.Tsiolkovskii (MATI) and Institute for Problems in Mechanics, RAS,  
Moscow, Russia

*June 2007*

*GPA: 5.00/5.00, Summa Cum Laude*

## WORK EXPERIENCE

**Graduate Research Assistant**, School of Materials Science and Engineering, Clemson University *Jan 2008 – Present*

### Projects

- Study of the mechanisms of butterflies feeding: capillary driven food intake and Plateau instability in curved food canals;
- Research on the correlation between structural morphology of the butterfly proboscis and its functionality;
- Conduction of the X-Ray phase contrast imaging experiments in Argonne National Laboratory to reveal the mechanisms of liquid flow through micron sized liquid probes and butterfly proboscis;
- Study of elasto-capillary and elasto-wetting effects in flexible porous materials;
- Experimental and theoretical analyses of the wicking phenomena in nanofibrous and nanoporous membranes.
- Development of the experimental protocol for the characterization of buckling phenomena in fiber assemblies interacting with liquids (Euler Elastica theory augmented with Laplace theory of capillarity);
- Critical analysis of fluid uptake by short capillaries to classify the applicability of Bosanquet and Lucas-Washburn theories;
- Analysis of the spreading kinetics of low surface tension liquids over nanoporous surfaces under different deposition conditions;
- Mathematical modeling of rotation of magnetically driven nano-wires for the analysis of nanorheology of carrying fluids;
- Technical assistance on the analyses of solid-/liquid interactions for industrial projects. Development of experimental protocols and engineering software.

## INTERNSHIPS

Institute for Problems in Mechanics of the Russian Academy of Sciences, Moscow, Russia  
*Study of a cohesive model for fatigue failure of polymers. Modeling on ANSYS 8.1.*

*Sept – Oct 2007*

Institute for Problems in Mechanics of the Russian Academy of Sciences, Moscow, Russia  
*Database development based on observations of rough endoprosthesis surfaces.*

*July - August 2005*

## EXPERIMENTAL SKILLS

**Scientific Imaging Techniques:** Optical Microscopy, Polarization Microscopy, Fluorescent Microscopy, Scanning Electron Microscopy, High Speed Imaging Systems such as MotionProX3, DALSA.

*I am an active user of Argonne Photon Source, where I am doing the Synchrotron X-Ray phase contrast imaging (Argonne National Laboratory, Chicago, IL).*

**Characterization techniques:**

**Liquid properties:** Dynamic Surface Analyzer (Kruss, Germany), DU-III Ultra Rheometer (Brookfield), Microdrop Dispenser (Germany), Laboratory Refractometer.

**Structure analysis of porous materials:** Capillary Flow Porometer CFP-1100-AEXS (PMI, Ithaca, NY).

**Surface Analysis:** Alpha-Step IQ surface profiler, ZYGO Profilometer, AFM.

**Analytical methods in polymer chemistry:** IR, ATR, FT-IR, Raman, TGA, DSC, DTA, TMA, GPC.

**Mechanical properties:** Full mechanical characterization of natural and man-made fibers (tensile, compression and bending properties); familiar with Instron 5582 and 1152 Tensile Tester; Kawabata Single Filament Compression Tester KES-G (KatoTech, Japan).

## COMPUTER SKILLS

**Active user of:** Wolfram Mathematica, MatLab R2008a, Scientific Workplace 5.5

**Image processing and analysis:** Adobe Photoshop, ImageJ

**Video Processing and analysis:** VirtualDub, Vegas Pro 8.0

**Programming languages:** Pascal, Basic, C++

**Engineering simulation software:** Ansys 8.1, Abaqus 6.10

## PEER REVIEWED PUBLICATIONS

### Papers

**D. Monaenkova**, T. Andrukh, K. Kornev, Bernoulli catenary and elasto-capillary and -wetting effects in fibrous Materials (Under review)

**D. Monaenkova**, M. S. Lehnert, T. Andrukh, C. E. Beard, B. Rubin, A. Tokarev, W. Lee, P. H. Adler, and K.G. Kornev, Butterfly proboscis: combining a drinking straw with a nanosponge facilitated diversification of feeding habits, *Journal of the Royal Society. Interface*, 2011, DOI:10.1098/rsif.2011.0392 (*Unsolicited coverage by ScienceNews*)

C. Tsai, P. Mikes, T. Andrukh, E. White, **D. Monaenkova**, O. Bortovyy, R. Bortovyy, B. Rubin, D. Lukas, I. Luzinov, J. R. Owens and K. G. Kornev, "Nanoporous artificial proboscis for probing minute amount of liquids", *Nanoscale*, 2011, DOI: 10.1039/c1nr10773a 0392 (*Unsolicited coverage by Chemistry World*)

**D. Monaenkova** and Kornev K.G., Elastocapillarity: Stress transfer through fibrous probes in wicking experiments. *Journal of Colloid and Interface Science* 348, (1), 240-249, 2010

### Proceedings

T. Andrukh, **D. Monaenkova**, C. Tsai, K. G. Kornev, Wettability and absorbency of nanofiber-based probes, *Proceeding of the 24th Annual Technical Conference of the American Society for Composites (ASC)*, Delaware, 2009

K. Kornev, **D. Monaenkova**, T. Andrukh, Absorption-induced Deformations of Nanofiber Yarns and Nanofibrous Webs, in: J. Su, L.-P. Wang, Y. Furuya, S. Troler-McKinstry, J. Leng, (Eds.), *Materials and Devices for Smart Systems III* (Mater.Res. Soc. Symp. Proc. Volume 1129, Warrendale, PA, 2009), Paper #1129-V05-05, 2009

**D. Monaenkova**, K.G. Kornev, X. Ren and Y. Dzenis, Adsorption-Induced Deformations in Nanofibrous Materials: Freely Suspended Yarns and Webs, *POROMECHANICS IV*, DEStech Publications, Inc., PA, USA, 2009 (Proceedings of The Fourth Biot Conference on Poromechanics)

K. G. Kornev, **D.Monaenkova**, T.Andruk, V.Sa, C.Yore, C.Klipowics, K. Edmond, Butterfly Proboscis. A Biomicrofluidic System. *Proceedings of 2008 AIChE Annual Meeting*: Philadelphia, PA, November 16-21, 2008

## INVITED TALKS

Physics of butterflies feeding, **Bio-seminar of Clemson University, SC**

*November 2011*

Elasto-capillary effects in fibrous materials, **Milliken Research Center in Spartanburg, SC.**

*March 2009*

## SELECTED AWARDS

**Johnson & Johnson award**, Student paper competition, the Fiber Society's Fall 2011 Annual Meeting and Technical Conference, October 11–13, 2011, Charleston, South Carolina, USA.

**NSF travel grant** to attend 2011 NSF CMMI Engineering Research and Innovation Conference, January 4-7, 2011, Atlanta, Georgia

**Professional Enrichment Grant** from the Graduate Student Government Grants Committee to attend The Fiber Society 2010 Fall Conference, Oct. 20-22, 2010, Snowbird, Utah

**The Graduate Student Research Award**, College of Engineering & Science, Clemson University, 2009

**Sigma Xi Grant-in-Aid of Research** to cover the expenses of experiments in Argonne National Laboratory, IL, 2010.

**Professional Enrichment Grant** from the Graduate Student Government Grants Committee to attend , 62<sup>nd</sup> Annual Meeting of the American Physical Society's Division of Fluid Dynamics (DFD), Minneapolis, Minnesota, 2009.

**One of three finalists in the Fiber Society's Student Paper Competition**, the Fiber Society's Fall 2009 Annual Meeting and Technical Conference, October 28–30, 2009, Athens, Georgia.

**NSF travel grant** to attend 2009 NSF Engineering Research and Innovation Conference, June 22-25, 2009, Honolulu, Hawaii.

**1st place in "Science as Art 2009" competition**, Clemson University, Entry Category: Non-interactive Media, work title "Mimicking the Nature: Fiber based microprobe", D. Monaenkova, M. Chyasnachyus, T. Andruk

**2nd place in "Science as Art 2009" competition**, Clemson University, Entry Category: Non-interactive Media, work title "Giving birth to droplet by popping up water filled balloon", D. Monaenkova, M. Chyasnachyus, T.Andruk, A. Tokarev

**Professional Enrichment Grant** from the Graduate Student Government Grants Committee to attend AIChE Annual Meeting Symposium in, Philadelphia, PA, November 16-21, 2008.

**The best student of the department award**, Department of the aerospace technology, Russian State University of Aviation Technology named after K.E.Tsiolkovskii (MATI). Scholarship of the Board of Academics, Scholarship of the Mayor of Moscow, Gagarin' Scholarship.

## COURSES COMPLETED

**Applied Mathematics** (Introduction to continuum mechanics, dimensional analysis, scaling and simplification; asymptotic methods such as steepest descent, stationary phase & WKB theory, boundary layer theory, multiple-scale analysis, and ray theory applied to diffusion)

**Surface Phenomena in Fiber Science** (Introduction to surface phenomena focusing on fiber science: thermodynamics of surfaces, physics of adhesion, wetting, and finishing emphasizing specific features associated with interactions of liquids and chemicals with fibers and fibrous materials)

**Physical Chemistry** (Selected problems of molecular spectroscopy, irreversible thermodynamics, and statistical mechanics of polymers)

**Kinetics of Materials I** (Diffusion of atoms and defects in solids)

**Kinetics of Materials II** (Motion of dislocations and interfaces)

**Fiber Physics I** (Introduction to fiber science, melt spinning, introduction to mechanical, thermodynamic, and electrical properties of fibers, experimental methods in fiber science, basics of X-Ray analysis)

**Fiber Physics II** (Statistical physics of polymers, thermodynamic and mechanical properties of fibers & fiber-based materials, polymer rheology, nanofiber formation)

**Polymer Science II** (Structure of polymers and their properties, polymers solutions and melts, polymer surfaces and interfaces)

**Analytical methods in textile polymers** (Basics and instrumentations: TGA, DSC, DTA, TMA, IR, ATR, FT-IR, NMR, GPC)

## **TEACHING EXPERIENCE**

Mentor, Clemson University Research Experience for Undergraduates	<i>Sep 2009 - Present</i>
Mentor, Research Experience for Undergraduates (REU) 2011, I See Science	<i>May 2011– July 2011</i>
TA volunteer for Mechanical Properties of Materials class	<i>Jan 2011 – May 2011</i>
Supervising students from the SC Governor School of Science & Mathematics	<i>June– July 2008, 2009, 2010</i>

## **LEADERSHIP EXPERIENCE**

Clemson Russian Speaking Society, President	<i>August 2011 – Present</i>
Clemson chapter of The Material Research Society, Treasurer	<i>May 2010 – Present</i>
Senator, Graduate Student Government	<i>Fall 2011 – Spring 2012</i>
Reviewer, Professional Enrichment Grants Committee	<i>Spring 2011, Fall 2011</i>
Clemson Russian Speaking Society, Vice-president	<i>November 2010 – August 2011</i>
International Student Programs Student Advisory Board Member	<i>August 2010 – August 2011</i>

## **MEMBERSHIPS AND AFFILIATIONS**

Sigma-Xi (The Scientific Research Society),  
The Material Research Society,  
The Fiber Society,  
American Physical Society