

Kris Noel Dahl, PhD

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APPOINTMENT

Carnegie Mellon University, Pittsburgh, PA, January 2006 - Present
Assistant Professor, Departments of Biomedical Engineering and Chemical Engineering
Courtesy appointment in Materials Science and Engineering

EDUCATION

Johns Hopkins University School of Medicine, Baltimore, MD
Postdoctoral Fellowship, Department of Cell Biology, October 2004 – December 2005
“Biochemical and functional analysis of spectrin-repeat complexes at the nuclear envelope”
- Katherine L. Wilson, supervisor - NIH-NRSA fellowship supported
University of Pennsylvania, Philadelphia, PA
Ph.D. Department of Chemical and Biomolecular Engineering, December 2004
“From the red cell to the nucleus: mechanics and architecture of composite membrane systems”
- Dennis E. Discher, advisor - Whitaker fellowship supported
M.S. Department of Chemical Engineering, December 1999
Carnegie Mellon University, Pittsburgh, PA
B.S. Highest Honors, Chemical Engineering, May 1998

HONORS, DISTINCTIONS

Ruth L. Kirschstein National Research Service Award: NIH Post-doctoral research fellowship
Whitaker Fellowship: Graduate research fellowship for biotechnology research

OTHER PROFESSIONAL AND ACADEMIC EXPERIENCE

08/04 – 09/04 *Visiting Scientist*, Universität Leipzig, Leipzig, Germany
- in collaboration with Jochen Guck and Josef Käs
manipulation of isolated nuclei and nuclear envelopes by optical deformation using two
opposed, nonfocused, infrared laser beams
12/02 *Consultant*, LZA Technology, The Thornton-Thomasetti Group, Philadelphia, PA
engineering analysis of combustion, deflagration, detonation and blast for structural retro-
fitting of buildings against chemical fuel spills
01/00 - 08/00 *Researcher*, Health Care Division, Procter and Gamble, Cincinnati, OH
selective protein adhesion to hydroxyapatite surfaces and alterations in protein
composition with dentifrice additives
03/99 – 12/99 *Masters research*, University of Pennsylvania, Philadelphia, PA
- under the direction of Scott L. Diamond
non-viral gene transfer to *in vitro* endothelium using fusogenic peptides derived from the
hemagglutinin protein of influenza virus

PUBLICATIONS

10. Philip JT and **Dahl KN**(2008)
Nuclear mechanotransduction: response of the lamina to extracellular stress with implications in aging
Journal of Biomechanics 41(15):3164-70
9. Rohde GK, Ribeiro AJS, **Dahl KN**, Murphy RF (2008)
Deformation-based nuclear morphometry: Capturing nuclear shape variation in HeLa cells
Cytometry A; 73(4):341-50
8. Pajerowski JD, **Dahl KN**, Zhong FL, Sammak PJ, Discher DE (2007)
Physical plasticity of the nucleus in stem cell differentiation
Proceedings of the National Academy of Science USA; 104:15619-24
7. **Dahl KN**, Scaffidi P, Islam MF, Yodh AG, Wilson KL, Misteli T (2006)
Distinct structural and mechanical properties of the nuclear lamina in Hutchinson-Gilford progeria syndrome
Proceedings of the National Academy of Science USA; 103(27):10271-6
6. Subramanian S, Tsai R, Sen S, **Dahl KN**, Discher DE (2006)
Membrane mobility and clustering of Integrin Associated Protein (IAP, CD47)-Major differences between mouse and man and implications for signaling
Blood Cells, Molecules and Diseases; 36(3):364-72
5. **Dahl KN**, Engler AJ, Pajerowski JD and Discher DE (2005)
Power-law rheology of isolated nuclei with deformation mapping of nuclear sub- structures.
Biophysical Journal; 89: 2855-2864
4. **Dahl KN**, Kahn SM, Wilson KL and Discher DE (2004)
The nuclear envelope lamina network has elasticity and incompressibility suggestive of a molecular shock absorber.
Journal of Cell Science; 117:4779-4786 with Editor's Highlight and Research highlight in October 7, 2004 issue of *Nature*
3. **Dahl KN**, Parthasarathy R, Westhoff CM, Layton DM and Discher DE (2004)
Protein 4.2 is critical to the CD47-membrane skeleton attachment in the human red cell.
Blood 2004; 103:1131-1136
2. **Dahl KN**, Westhoff CM, and Discher DE (2003)
Fractional attachment of CD47 (IAP) to the erythrocyte cytoskeleton and visual co-localization with Rh protein complexes.
Blood; 101:1194-1199
1. Subramanian A, Ma H, **Dahl KN**, Zhu J and Diamond SL (2002)
Adenovirus or HA-2 fusogenic peptide-assisted lipofection increases cytoplasmic levels of plasmid in nondividing endothelium with little enhancement of transgene expression.
The Journal of Gene Medicine; 4: 75-83

REVIEWS AND BOOK CHAPTERS

2. **Dahl KN**, Ribeiro AJS, Lammerding J (2008)
Nuclear shape, mechanics, and mechanotransduction.
Circulation Research;102(11):1307-18. Review
1. Lammerding J, **Dahl KN**, Discher DE, Kamm RD (2007)
Nuclear mechanics and methods
Methods in Cell Biology 2007; 83: 269-94

MANUSCRIPTS IN REVISION, SUBMITTED AND IN PREPARATION

1. Zhong Z, Chang SA, Wilson KL, Dahl KN
The spectrin-like domains of nesprin-1 α are mechanically over-stabilized by the evolutionarily

PAST STUDENTS

Graduate Students:

Julia T. Philip – Masters Student, Chemical Engineering, graduated 12/07

MS thesis: Nuclei Respond to Extracellular Shear Stress by Upregulating and Reorganizing Lamins

Chao-Kuei “Eric” Wang – Masters Student, Chemical Engineering, graduated 12/06

MS thesis: Actin polymerization *in vitro* and the Effects of Single Wall Carbon Nanotubes

Undergraduate Students:

Matthew Woodling – Undergraduate, Chemical Engineering and Biomedical Engineering

Alice Peiyang Wang – Undergraduate, Chemical Engineering and Biomedical Engineering

Sunhoo Kim - Undergraduate, Chemical Engineering and Biomedical Engineering

Andy SiWei Chang – Undergraduate, Chemical Engineering

Alexandra German - Undergraduate, Mechanical Engineering and Biomedical Engineering

Nicholas Wren - Undergraduate, Chemical Engineering and Biomedical Engineering

Nikunja Kolluri - Undergraduate, Chemical Engineering and Biomedical Engineering

Sarah Brothers - Summer REU undergraduate, Youngstown State

INVITED SEMINARS AND ORAL PRESENTATIONS

5. “Biophysical Characterizations of Structural Proteins in the Nucleus: Lamins and Spectrins”
Invited departmental seminar at **University of Paris-Diderot Department of Physics**, Paris, France, December 2008
4. “Biophysical Characterizations of Structural Proteins in the Nucleus: Lamins and Spectrins”
Invited departmental seminar at **University of Pittsburgh Molecular Biophysics and Structural Biology**, Pittsburgh, October 2008
3. “Nuclear structure changes in Hutchinson-Gilford progeria syndrome” **Physical and Chemical Aspects of Molecular Biology: An International Workshop on Current Problems in Complex Fluids**, Puebla, Mexico January 2007
2. “Organization and Mechanics of Structural Proteins in the Cell Nucleus” **University of Maryland Baltimore County, Department of Mechanical Engineering** April 7, 2006
1. “Measuring surface mobility of CD47, RhAG, and Rh in normal and deficient human red cells using biophysical techniques” - Invited Educational Presentation **American Association of Blood Banks**, Seattle, WA, October 2005

CONTRIBUTED ORAL PRESENTATIONS

9. Ribeiro AJS, Finol EA, **Dahl KN**
“Rheology of adult stem cells and modeling of flow induced deformation”
American Institute of Chemical Engineers, Philadelphia, PA, November 2008
8. Zhong ZZ, Chang SA, Wilson KL, **Dahl KN**
“The mechanical role of spectrin-repeat proteins at the nuclear envelope”
Biomedical Engineering Society, St. Louis, MO, October 2008
7. **Dahl KN**, Avila-Rencoret, Islam MF
“Carbon nanotube bundling of actin *in vitro* and *in vivo* and reduction in cell proliferation”
Society of Biorheology, State College, PA, July 2008
6. Ribeiro AJS, Larenas CR, Guzman AG, Finol EA, **Dahl KN**
“Mechanical Measurements of Adult Stem Cells and Modeling of Flow-Induced Deformation”

16th International Conference on Mechanics in Medicine and Biology, Pittsburgh, PA July, 2008

5. **Dahl KN**, Wilson KL, Discher DE
“Measurements of the nuclear lamina network’s mechanical properties suggest its role as a molecular shock absorber”
American Society of Cell Biology, Washington, DC, December 2004
4. **Dahl KN**, Engler AE, Discher DE
“Mechanical properties of isolated nuclei and nuclear components”
American Institute of Chemical Engineers, Austin, TX, November 2004
3. **Dahl KN**, Wilson KL and Discher DE
“Nuclear envelope properties and physical interactions with nucleoplasm”
Biomedical Engineering Society, Philadelphia, PA, October 2004
2. **Dahl KN**, Wilson KL and Discher DE
“Mechanical properties of isolated nuclear envelopes”
Society of Histochemistry, Prague, Czeck Republic, September 2004
1. **Dahl KN**, Photos PJ, Parthasarathy R, Subramanian S and Discher DE
“Molecular basis of biocompatibility: cellular engineering analysis”
American Institute of Chemical Engineers, San Francisco, CA, November 2003

SELECTED POSTERS PRESENTATIONS

10. **Ribeiro AJS**, Alexander S, Friedl P, Dahl KN
“Micropipette Aspiration Study Of The Mechanical Properties Of Nuclei From Invasive Cancer Cells”
Biomedical Engineering Society, Los Angeles, CA, September 2007
9. **Ribeiro AJS**, Rohde GK, Sammak PJ, Yue J, **Dahl KN**
“Time-Dependent Morphological Dynamics of the Cell Nucleus During Lamin A/C Knockdown”
Engineering in Cell Biology II, Boston, MA August 2007
8. **Dahl KN**, Scaffidi P, Islam MF, Yodh AG, Wilson KL and Misteli T
“Distinct structure, organization and mechanics of the nuclear lamina network in the premature aging disease Hutchinson-Gilford Progeria Syndrome”
Biophysical Society, Baltimore, MD, February 2007
7. **Dahl KN** and Discher DE
“Mechanical Properties of Isolated Nuclei and Contributions of Subnuclear Structures”
Biophysical Society, Baltimore, MD, February 2004
6. **Dahl KN**, Parthasarathy R, Westhoff CM and Discher DE
“Mechanical Properties of Biological Membranes: from Red Cell to Nucleus”
USNCB Frontiers in Biomechanics, Nashville, TN, October 2003
5. **Dahl KN**, Westhoff CM and Discher DE
“Fractional Attachment of CD47 (IAP) to the Erythrocyte Cytoskeleton and Association with Integral and Periphery Membrane Proteins”
Gordon Research Conference - Red Cells, Barga, Italy, May 2003
4. **Dahl KN**, Kahn SM and Discher DE
“Micromechanical Properties of the Nuclear Envelope, Nucleoplasm and Nuclear Structure”
Symposium on the Eukaryotic Nucleus - NICHD, Berkeley Springs, WV, March 2003
3. **Dahl KN**, Hoffman BD, Kahn SM, Crocker JC and Discher DE
“Physical Properties of Nuclear Envelopes and Contributions of Specific Nuclear Components”
American Society of Cell Biology, San Francisco, CA, December 2002
2. **Dahl KN**, Parthasarathy R, Westhoff CM and Discher DE
“Membrane Protein Responses to Disruption of F-actin and Deletion of Protein 4.2 in

Erythrocyte Membranes”

American Society of Hematology, Philadelphia, PA December 2002

1. **Dahl KN** and Discher DE

“Micromechanical Properties of Isolated Nuclei and Nuclear Components”

Dynamic Organization of Nuclear Function, Cold Spring Harbor, NY, September 2002

PROFESSIONAL MEMBERSHIPS

American Association Advancement Science, American Institute of Chemical Engineers, American Society for Cell Biology, Bio-Medical Engineering Society, Biophysical Society

REVIEW ACTIVITIES

Journal of Biomechanics, American Journal of Hematology, Journal of Cell Biology,
Journal of Biomechanical Engineering, Biophysical Journal