

Philipp M. Niethammer

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Curriculum Vitae

PERSONAL STATEMENT

I am an experimental biologist with a background in biochemistry, cell biology, and advanced imaging techniques. For my PhD and postdoc, I trained with Eric Karsenti, Philippe Bastiaens (EMBL Heidelberg, Germany), and Tim Mitchison (Harvard Medical School, Boston, USA), using frogs and zebrafish as experimental systems. My general biological interest is to understand the biochemical and biophysical basis of morphogenesis in cells, tissues, and organisms. I am interested in the question of how biochemical signaling circuits generate and process spatiotemporal information to spatially guide morphogenetic events and how this warrants the specificity of a morphogenetic response. One of my primary research directions, past and future, has been the development of new probes and microscopy-based methods to image these circuits inside living cells, tissues, and organisms. This approach was exemplified by my development of novel optical probes for microtubule regulation during my PhD and the first implementation of a genetically encoded H₂O₂ sensor in a vertebrate animal during my postdoc. My PhD and postdoctoral training in the Department of Cell Biology and Biophysics at EMBL Heidelberg and the Department of Systems Biology at Harvard Medical School have minted me with a physical perspective on biological problems. In my lab, I have further developed quantitative intravital imaging approaches to decipher the early regulation of inflammation and healing after tissue damage in zebrafish. This led to our recent discovery that cell swelling, a generic cellular stress response to hypotonicity and metabolic perturbation, acts as physiological key trigger of wound detection in zebrafish.

EDUCATION

European Molecular Biology Laboratory & Hamburg University, Germany Ph.D., Cell Biology and Biophysics	2004
Hamburg University, Germany Diploma, Neurobiology	2000

POSITIONS AND APPOINTMENTS

Cell Biology Program (Sloan Kettering Institute) New York, NY, USA Associate Member, MSKCC Associate Professor, BCMB Weill Cornell Graduate School Associate Professor, Gerstner Sloan Kettering Graduate School of Biomedical Sciences	Nov 2016-present
Cell Biology Program (Sloan Kettering Institute) New York, NY, USA Assistant Member, MSKCC Assistant Professor, BCMB Weill Cornell Graduate School Assistant Professor, Gerstner Sloan Kettering Graduate School of Biomedical Sciences	Jan 2011-2016
Systems Biology (Harvard Medical School) Boston, MA, USA Postdoctoral Fellow in the Laboratory of Dr. Timothy Mitchison	Feb 2006-Jan 2011

Cell Biology and Biophysics (European Molecular Biology Laboratory)
Heidelberg, Germany
Ph.D. student in the Laboratories of Dr. Eric Karsenti and Dr. Philippe Bastiaens
Jun 2001-Feb 2006

Center for Molecular Neurobiology
Hamburg, Germany
Diploma student in the Laboratory of Dr. Melitta Schachner
Jan 2000-Jun 2001

OTHER RESEARCH EXPERIENCE

Research Visit (Biocurrents Research Center)
Woods Hole, MA, USA
Visiting Scientist in the group of Dr. Peter Smith
Aug 2009

MBL Physiology Course (Marine Biology Laboratory)
Woods Hole, MA, USA
Participant
Jun-Jul 2004

HONORS AND FELLOWSHIPS

Louise and Allston Boyer Young Investigator Award
American Asthma Foundation Scholar
Louis V. Gerstner Young Investigators Fund Award
Dorsett L. Spurgeon Distinguished Research Award
AAAS Excellence in Science program
2018
2014
2012
2009
2008-2010

Human Frontiers Science Program Long Term Fellowship
European Molecular Biology Organization Long Term Fellowship
Boehringer Ingelheim Foundation Travel Fellowship
GlaxoSmithKline Travel Fellowship
Surdna Foundation Fellowship
Magna cum laude, Ph.D. thesis
European Molecular Biology Laboratory Fellowship
2007-2010
2006
2004
2004
2004
2004
2001-2006

OTHER ACTIVITIES: SEMINAR SPEAKER

Selected from Abstract:

Gordon Conference, 'Gradient Sensing and Directed Cell Migration', 2009, Galveston
EMBO Conference, 'Morphogenesis and Dynamics of Multicellular Systems', 2009, Heidelberg
6th Strategic Conference for Zebrafish Investigators, 2015, Pacific Grove

Invited Speaker:

Gordon Conference, 'Nox Family NADPH Oxidases', 2010, Les Diablerets, Switzerland – invitation declined
Gordon Conference, 'Phagocytes', 2011, Davidson College, Davidson
Gordon Conference, 'Tissue Repair & Regeneration', keynote lecture, 2011, Colby-Sawyer College, New London
Gordon Conference, 'Nox Family NADPH Oxidases', 2012, Waterville Valley
ASCB local meeting, 'Diverse Roles of the Cytoskeleton in Fundamental Cellular Processes', 2013, Weill Cornell Medical College
ASIP Meeting at Experimental Biology, 2014, San Diego
Guest Seminar, Department of Orthopaedics, Thomas Jefferson University, 2014, Philadelphia
Guest Seminar, Department of Cell & Developmental Biology, Weill Cornell Medical College, 2015, New York

Jacques Monod Research Conference, 'Building, repairing and evolving biological tissues', 2015, Roscoff, France
Cell Symposium, 'Cell Death and Immunity', co-chair of 'Resolution & healing' section, 2015, Berkeley
ASCB, Subgroup C, 'Cellular and Molecular Mechanobiology', 2015, San Diego
American Asthma Foundation, Annual Meeting, 2016, San Francisco
Guest Seminar, Department of Cell and Developmental Biology, University of Illinois (Urbana-Champaign), 2016, Champaign
ASCB, Subgroup M, 'Emerging Roles of ROS-Related Redox Signaling in Cell Biology', 2016, San Francisco
Guest Seminar, Department of Cell and Molecular Biology, Vanderbilt University, 2017, Nashville
Guest Seminar, Department of Biological Sciences, Purdue University, 2017, Lafayette
American Asthma Foundation, Annual Meeting, 2017, San Francisco
Guest Seminar, Institute of Biochemistry and Molecular Biology, Ulm University, 2017, Ulm, Germany
Gordon Conference, 'Tissue Repair & Regeneration', 2017, Colby-Sawyer College, New London
Zebrafish Disease Model Conference, ZDM10, 2017, San Diego
ASCB/EMBO, co-chair of Mini-symposium 'Multicellular Interactions, Tissues and Organs', 2017, Philadelphia
Symposium 'Models of Regeneration', CRTD Dresden/TU Dresden, 2018, Dresden, Germany
Guest Seminar, BGH/Harvard Medical School, 2018, Boston
Symposium 'Mitosis and Cell Organization Symposium', Systems Biology/Harvard Medical School, 2018, Boston
EMBO Workshop 'The molecular and cellular basis of regeneration and tissue repair', keynote lecture, 2018, Malta
Guest Seminar, Kennedy Institute/Oxford University, 2018, Oxford
MDI Symposium, 'Repair and Regeneration of Renal Tissue', 2018, Bar Harbor
Guest Seminar, Duke University, 2018, Durham
Guest Seminar, University of Oslo, 2018, Oslo

OTHER ACTIVITIES: SOCIETY MEMBERSHIPS

German Cell Biology Society (DGZB), Regular Membership
American Association for the Advancement of Science (AAAS), 2008-2010, Sponsored Membership

OTHER ACTIVITIES: TEACHING

Gerstner Sloan Kettering Graduate School of Biomedical Sciences:

- "Cell Migration and Chemotaxis" (Lecture); 2012, 2013, 2014, 2015, 2016, 2017, 2018
- "Cytoskeletal Architecture" (Lecture); 2015, 2016, 2017, 2018

BCMB Weill Cornell Graduate School:

- "Actin and Actin-based Motility"; (Lecture); 2012, 2013, 2014, 2015, 2016, 2017, 2018
- "Establishment and Maintenance of Epithelial Polarity"; (Focus group course); 2013-2014

Tri Institutional MD/PhD Program:

- "Regulation of wound detection in animals" (Lecture), 2013, 2016, 2017, 2018

OTHER ACTIVITIES: COMMITTEES

Thesis Defense Committee, First Opponent, Wojciech Pieka, University of Oslo, 2018
Thesis Defense Committee, Member, Shefali Krishna, GSK, 2017
Thesis Defense Committee, Chair, Yun-Yu Tseng, BCMB, 2016
Thesis Defense Committee, Chair, Sung Eun (Monica) Kim, BCMB, 2016
Student Advisory Committee, Member, Yasemin Kaygusuz, GSK
Student Advisory Committee, Member, Michelle Riegman, GSK
Student Advisory Committee, Member, Ellen Horste, GSK

Tri-Institutional MD PhD admissions/screening committee, 2015, 2016, 2017, 2018
GSK SURP Program admissions/screening committee, 2016, 2018
SKI provocative question discussion group, 2018
SKI website refresh committee, 2018

OTHER ACTIVITIES: JOURNAL PEER REVIEWER

Science Signaling, Developmental Cell, Cell Stem Cell, Cell Reports, Journal of Experimental Medicine, Journal of Investigative Dermatology, Cellular Microbiology, DNA and Cell Biology, Disease Models & Mechanisms, BMC Biology, Development, PLoS Genetics, Journal of Cell Biology, Biophysical Journal, Scientific Reports, Seminars in Immunology, Cellular and Molecular Bioengineering, Nature Communications, Cell, Nature, Immunity, Biology Open.

OTHER ACTIVITIES: GRANT REVIEWER

Organizations: Wellcome Trust UK, Lister Institute, Human Frontiers Science Program

OTHER ACTIVITIES: SCIENCE OUTREACH

2017 Major Trends in Modern Cancer Research Seminar Series, MSKCC, Speaker
<https://www.youtube.com/watch?v=tdNYyQCpszK>

BIBLIOGRAPHY: PUBLISHED AND IN PRESS

Huang C, Niethammer P. Tissue Damage Signaling Is a Prerequisite for Protective Neutrophil Recruitment to Microbial Infection in Zebrafish. *Immunity*. 2018 May 15;48(5):1006-1013.e6. PMID: 29768163. **Highlighted by Preview.**

Jelcic M, Enyedi B, Xavier JB, Niethammer P. Image-Based Measurement of H₂O₂ Reaction-Diffusion in Wounded Zebrafish Larvae. *Biophys J*. 2017 May 9;112(9):2011-2018. PMID: 28494970

Enyedi B, Jelcic M, Niethammer P. The Cell Nucleus Serves as a Mechanotransducer of Tissue Damage-Induced Inflammation. *Cell*. 2016; 165(5):1160–1170. PMID: 27203112 **highlighted in Leading Edge, Previews. Editor's choice: Science & Science Signaling, F1000 recommendation**

Gault WJ, Enyedi B, Niethammer P. Osmotic surveillance mediates rapid wound closure through nucleotide release. *J Cell Biol*. 2014 Dec 22;207(6):767–82. PMID: 25533845 **F1000 recommendation, highlighted in JCB Biosights**

Enyedi B, Kala S, Nikolich-Zugich T, Niethammer P. Tissue damage detection by osmotic surveillance. *Nat Cell Biol*. 2013 Sep 11;15(9):1123–30. PMID: 23934216

Kueh HY, Niethammer P, Mitchison TJ. Maintenance of mitochondrial oxygen homeostasis by cosubstrate compensation. *Biophys J*. 2013 Mar 19;104(6):1338–48. PMID: 23528093

Niethammer P, Grabher C, Look AT, Mitchison TJ. A tissue-scale gradient of hydrogen peroxide mediates rapid wound detection in zebrafish. *Nature*. 2009 Jun 18;459(7249):996–9. PMID: 19494811 **F1000 recommendation & widely covered by international popular press**

Niethammer P, Kueh HY, Mitchison TJ. Spatial patterning of metabolism by mitochondria, oxygen, and energy sinks in a model cytoplasm. *Curr Biol*. 2008 Apr 22;18(8):586–91. PMID: 18406136

Niethammer P, Kronja I, Kandels-Lewis S, Rybina S, Bastiaens P, Karsenti E. Discrete states of a protein interaction network govern interphase and mitotic microtubule dynamics. *PLoS Biol*. 2007 Feb;5(2): e29. PMID: 17227146

Niethammer P, Bastiaens P, Karsenti E. Stathmin-tubulin interaction gradients in motile and mitotic cells. *Science*. 2004 Mar 19;303(5665):1862–6. PMID: 15031504 **F1000 recommendation**

Niethammer P, Delling M, Sytnyk V, Dityatev A, Fukami K, Schachner M. Cosignaling of NCAM via lipid rafts and the FGF receptor is required for neuritogenesis. *J Cell Biol*. 2002 Apr 29;157(3):521–32. PMID: 11980923

BIBLIOGRAPHY: SUBMITTED AND UNDER REVIEW

Stoddard M, Huang C, Enyedi B, Niethammer P. Live imaging of leukocyte recruitment in a zebrafish model of chemical liver injury. Stage: Revision

Jelcic M, Enyedi B, Niethammer P. Quantitative imaging of endogenous and exogenous H₂O₂ gradients in live zebrafish larvae. Methods in Molecular Biology. Stage: Under review.

BIBLIOGRAPHY: REVIEWS AND COMMENTARIES

Niethammer P. Multicellular interactions: regeneration and mechanisms of disease. Mol Biol Cell. 2018 Mar 15;29(6):690.

Niethammer P. Wound redox gradients revisited. Semin Cell Dev Biol. 2018 Aug; 80:13-16. PMID: 28751250

Enyedi B, Niethammer P. Nuclear membrane stretch and its role in mechanotransduction. Nucleus. 2017 Mar 4;8(2):156-161. PMID: 28112995

Niethammer P. Neutrophil mechanotransduction: A GEF to sense fluid shear stress. J Cell Biol. 2016 Oct 10;215(1):13-14.

Huang C, Niethammer P. Illuminating Phagocyte Biology: The View from Zebrafish. Dev Cell. 2016 Jul 25;38(2):133. PMID: 27459065

Niethammer P. The early wound signals. Curr Opin Genet Dev. 2016; Jun 4;40:17-22. PMID: 27266971

Enyedi B, Niethammer P. A Case for the Nuclear Membrane as a Mechanotransducer. Cell Mol Bioeng.; 2016; 9(2), 247-251. PMID: 27453760

Jelcic M, Niethammer P. Do not scratch that mole! Trends Immunol. 2015 Sep;36(9):503–4. PMID: 26254146

Enyedi B, Niethammer P. Mechanisms of epithelial wound detection. Trends Cell Biol. 2015 Jul;25(7):398–407. PMID: 25813429

Niethammer P. Healed by our inner fish? Oncotarget. 2015 Jun 30;6(18):15732–3. PMID: 26119150

Niethammer P. Stress heals. Dev Cell. 2014 Oct 13;31(1):5–6. PMID: 25313958

Enyedi B, Niethammer P. H₂O₂: a chemoattractant? Methods Enzymol. 2013;528:237–55. PMID: 23849869

Bastiaens P, Caudron M, Niethammer P, Karsenti E. Gradients in the self-organization of the mitotic spindle. Trends Cell Biol. Elsevier; 2006 Mar;16(3):125–34. PMID: 16478663

FUNDING LIST

Active Support:

A. Research Grants:

NIH/NIGMS R01GM099970

Niethammer (PI)

9/1/12 – 8/31/21 (~\$200K/year)

Regulation of wound detection in animal tissues

NIH/NIGMS R01GM127356 Niethammer (PI) 4/1/2018-3/31/2023 (~\$200K/year)
Biomechanical control of inflammation by the nuclear membrane

NIH/NIAID R21 Niethammer(PI) 7/1/2018-6/30/2020 (\$125K/year)
Probing the physiological function of oxo-eicosanoid signaling by intravital imaging in a zebrafish infection model

B. Fellowships:

Tow Fellowship King Lam Hui (Postdoc) 8/1/2018-7/31/2021 (\$53K/year)
Investigating Redox Regulation of Inflammation Initiation by Biosensor Imaging

PERSONNEL LIST

Current:

Mark Jelcic, GSK graduate student, 7-1-2014 – to date
King Lam Hui, postdoc, 10-17-2016 – to date
Anushka Katikaneni, technician, 9-4-2018-to date
Zhouyang Shen, GSK graduate student, 9-1-2018-to date

Past:

Balazs Enyedi, MDPH.D. Postdoc. November 2011 – April 2016
William Gault, PhD. Postdoc August 2011 – March 2015
Cong Huang (BCMB program), graduate student, 10-3-2013 – 5-31-2018
Micheline Stoddard (Tri-Institutional MD PhD program), graduate student, 9-23-2014 – 11-20-2017
Gary Gerlach, Postdoc, 6-1-2015 – 5-31-2018