

Curriculum Vitae

March 22, 2021

Kandice R. Levental, Ph.D.

PRESENT TITLE: Research Associate Professor of Molecular Physiology and Biological Physics
and Center for Membrane and Cell Physiology
University of Virginia

ADDRESS: 1340 Jefferson Park Ave
Pinn Hall 4010
Charlottesville, VA 22903

BIRTHDATE: January 20, 1981

CITIZENSHIP: USA

UNDERGRADUATE EDUCATION:

B.S. Chemical Engineering, 2003; The University of Texas at Austin

GRADUATE EDUCATION:

Ph.D in Bioengineering, 2008; University of Pennsylvania, Philadelphia, PA
(Advisor: Valerie Weaver)

POSTGRADUATE TRAINING:

Postdoctoral Fellowship, Laboratory of Carsten Werner, 2008-2012
Max Bergmann Center of Biomaterials Dresden / Leibniz Institute of Polymer Research
Dresden; Dresden, Germany

ACADEMIC APPOINTMENTS:

Research Associate Professor, 2020-Current
Molecular Physiology and Biological Physics
Center for Membrane and Cell Physiology
University of Virginia
Charlottesville, VA

Research Assistant Professor, 2012-2020
Department of Integrative Biology and Pharmacology
The University of Texas Medical School at Houston
Houston, TX

Director of Center for Advanced Microscopy, 2014-2019
Department of Integrative Biology and Pharmacology
The University of Texas Medical School at Houston
Houston, TX

PROFESSIONAL ORGANIZATIONS:

Biophysical Society: 2013-2014, 2017-present
Biomedical Engineering Society: 2004-2008, 2014-2015
American Society of Cell Biology: 2004-2008, 2014-present
American Institute of Chemical Engineers: 2000-2003

HONORS AND AWARDS:

2018 Visiting Scholar, Friedrich-Alexander University (Erlangen, Germany)
2017 Collaborative Research International Symposium "New Horizons in Membrane Transport and Communication" Poster Prize
2005 (*graduate*) NSF Graduate Research Fellowship Honorable Mention
2004-2006 (*graduate*) NIH Institute for Medicine and Engineering Cardiovascular Bioengineering Training Grant
2002-2003 (*undergraduate*) College Scholar
2002-2003 (*undergraduate*) Dean's List – University of Texas College of Engineering
1999-2003 (*undergraduate*) University Honors
2002 (*undergraduate*) National Collegiate Engineering Award

EDITORIAL SERVICE (Ad hoc reviewer):

Acta Biomaterialia
Biochimica et Biophysica Acta (BBA) - Biomembranes
Biophysical Journal
Biotechnology and Bioengineering
Cancer Research
Experimental Gerontology
Frontiers Cell and Developmental Biology
Journal of Visualized Experiments (JoVE)
Nature Communications
Proceedings of the National Academy of Sciences

SERVICE ON GRANT REVIEW PANELS, STUDY SECTIONS, COMMITTEES:

2017 Vienna Science and Technology Fund (WWTF): Life Sciences - Chemical Biology (ad hoc mail review)

SERVICE ON MEDICAL SCHOOL COMMITTEES:

2014, 2017 Dean's Post-doctoral Award Judge (UTH)
2014-2016 Interviewer for Medical School applicants (UTH)

SERVICE TO THE COMMUNITY:

2015-2018 Sponsor for Rice University undergraduate (Allison Skinkle) for independent research course (BIOC 310)
2019 Chair of Biophysical Society 63rd Annual Meeting Platform Session

SPONSORSHIP OF SUMMER RESEARCH STUDENTS AND UNDERGRADUATES:

2014-2015 Emily Stockenbojer (Rice University)
2015-2016 Allison Skinkle (Rice University)

SPONSORSHIP OF CANDIDATES FOR POST-GRADUATE DEGREES:

2010-2015 Mirko Nowak (PhD student, Technical University of Dresden; Dresden, Germany)

TEACHING RESPONSIBILITIES:

2019-2020	Current Methods in Biochemistry and Cell Biology 2 lectures (2 hours) – Microscopy, Cellular Applications of Fluorescence
2019	Postdoctoral Certificate Program Course: Study of Shared Resources 1 lecture (1 hour) – Advanced Microscopy
2020	Fluorescence and Electron Microscopy: Imaging Cells and Molecules 1 laboratory (4 hours) – Super-Resolution Fluorescence Microscopy

CURRENT GRANT SUPPORT

P.I.: Ilya Levental, Ph.D., Co-Investigator: Kandice Levental
NIH / NIGMS (1R01GM114282)

“Biochemical, biophysical, and functional differentiation of mesenchymal stem cell membranes”
\$1,482,250 (\$962,500 direct costs) 2015-2020

P.I.: Ilya Levental, Ph.D., Co-Investigator: Kandice Levental
Volkswagenstiftung (93091)

“Design principles of living membranes”
375,000 EUR 2017-2022

P.I.: Ed Lyman, Ph.D., Co-Investigator: Kandice Levental
NIH / NIGMS (1R01GM120351-01A1)

“Effects of lipidomic diversity on GPCR activity”
\$2,000,000 (Levental portion = \$350,000 direct costs; \$70,000 annual) 2017-2022

PI: Ilya Levental, Ph.D., Co-Investigator: Kandice Levental
Human Frontiers Science Program (RGP0059/2019)

“Regulation of membrane receptor function in the brain by lipid composition and dietary inputs”
\$300,000 (all direct costs / \$100,000 annual) 2020-2023

P.I.: Ilya Levental, Ph.D., Co-Investigator: Kandice Levental
NIH / NIGMS (1R35GM134949-01)

“The functional organization of mammalian membranes”
\$3,700,000 (\$2,400,000 direct costs) 2020-2025

PUBLICATIONS (h-index = 25; total citations > 7700; all statistics from Google Scholar)

A. Refereed Original Articles in Journals (in chronological order)

1. Christman KL, Fang Q, Yee MS, **Johnson KR**, Sievers RE, Lee RJ. Enhanced neovasculature formation in ischemic myocardium following delivery of pleiotrophin plasmid in a biopolymer. *Biomaterials*. 26(10):1139-44, April 2005.
2. Paszek MJ, Zahir N, **Johnson KR**, Lakins JN, Rozenberg GI, Gefen A, Reinhart-King CA, Margulies SS, Dembo M, Boettiger D, Hammer DA, Weaver VM. Tensional homeostasis and the malignant phenotype. *Cancer Cell*. 8(3):241-54, September 2005.
3. **Levental KR**, Yu H, Kass L, Lakins JN, Egeblad M, Ertler JT, Fong SF, Csiszar K, Giaccia A, Weninger W, Yamauchi M, Gasser DL, Weaver VM. Matrix crosslinking forces tumor progression by enhancing integrin signaling. *Cell*. 139(5):891-906, November 2009.

4. Tsurkan MV, **Levental KR**, Freudenberg U, Werner C. Enzymatically degradable heparin-polyethylene glycol gels with controlled mechanical properties. *Chemical Communications*. 46(7):1141-1143, February 2010.
5. Zieris A, Prokoph S, Welzel PB, Grimmer M, **Levental KR**, Panyanuwat W, Freudenberg U, Werner C. Analytical approaches to uptake and release of hydrogel-associated FGF-2. *Journal of Materials Science: Materials in Medicine*. 21(3):915-923, March 2010.
6. Levental I*, **Levental KR***, Klein EA, Assoian R, Miller RT, Wells RG, Janmey PA. A simple indentation technique for measuring micron-scale tissue stiffness heterogeneity. *Journal of Physics - Condensed Matter*. 22(19):194120, May 2010.
7. Tsurkan MV, Chwalek K, **Levental KR**, Freudenberg U, Werner C. Modular StarPEG-Heparin Gels with Bifunctional Peptide Linkers. *Macromolecular Rapid Communications*. 31(17):1529-1533, September 2010.
8. Zieris A, Prokoph S, **Levental KR**, Welzel PB, Grimmer M, Freudenberg U, Werner C. FGF-2 and VEGF functionalization of starPEG-heparin hydrogels to modulate biomolecular and physical cues of angiogenesis. *Biomaterials*. 31(31):7985-7994, November 2010.
9. Zieris A, Chwalek K, Prokoph S, **Levental KR**, Welzel PB, Freudenberg U, Werner C. Dual independent delivery of pro-angiogenic growth factors from starPEG-heparin hydrogels. *Journal of Controlled Release*. 156(1):28-36, November 2011.
10. Chwalek K, **Levental KR**, Tsurkan MV, Zieris A, Freudenberg U, Werner C. Two-tier hydrogel degradation to boost endothelial cell morphogenesis. *Biomaterials*. 32(36):9649-9657, December 2011.
11. Freudenberg U, Sommer J-U, **Levental KR**, Welzel PB, Zieris A, Chwalek K, Schneider K, Prokoph S, Prewitz M, Dockhorn R, Werner C. Using Mean field theory to guide biofunctional materials design. *Advanced Functional Materials*. 22(7):1391-1398, April 2012.
12. Prokoph S, Chavakis EM, **Levental KR**, Zieris A, Freudenberg U, Dimmeler S, Werner C. Sustained delivery of SDF-1alpha from heparin-based hydrogels to attract circulating pro-angiogenic cells. *Biomaterials*. 33(19):4792-4800, June 2012.
13. Tsurkan MV, Chwalek K, Prokoph S, Zieris A, **Levental KR***, Freudenberg U*, Werner C. Defined polymer-peptide conjugates to form cell-instructive starPEG-heparin matrices in situ. *Advanced Materials*. 25(18):2606-2610, May 2013. *co-corresponding authors
14. Mouw JK, Yui Y, Damiano L, Bainer RO, Lakins JN, Acerbi I, Ou G, Wijekoon AC, **Levental KR**, Gilbert PM, Chen Y-Y, Weaver VM. Tissue mechanics modulate microRNA-dependent PTEN expression to regulate malignant progression. *Nature Medicine*. 20(4):360-7, April 2014.
15. Diaz-Rohrer BB, **Levental KR**, Simons K, Levental I. Membrane raft association is a determinant of plasma membrane localization. *Proceedings of the National Academy of Sciences USA*. 111(23): 8500-5. June 2014.
16. Diaz-Rohrer BB, **Levental KR**, Levental I. Rafting through traffic: Membrane domains in cellular logistics. *Biochim Biophys Acta*. 1838(12): 3003-3013, December 2014.

17. Freudenberg U, Zieris A, Chwalek K, Tsurkan MV, Maitz MF, Atallah P, **Levental KR**, Eming SA, Werner C. Heparin desulfation modulates VEGF release and angiogenesis in diabetic wounds. *J Control Release*. 220(PtA): 79-88, December 2015.
18. **Levental KR**, Lorent JH, Lin X, Skinkle AD, Surma MA, Stockenbojer EA, Gorfe AA, Levental I. Polyunsaturated Lipids Regulate Membrane Domain Stability by Tuning Membrane Order. *Biophys J*. 110(8):1800-10, April 2016.
19. Tulodziecka K, Diaz-Rohrer BB, Farley MM, Chan RB, Di Paolo G, **Levental KR**, Waxham MN, Levental I. Remodeling of the postsynaptic plasma membrane during neural development. *Mol Biol Cell*. 27(22):3480-3489, August 2016.
20. Lin X, Lorent JH, Skinkle AD, **Levental KR**, Waxham MN, Gorfe AA, Levental I. Domain Stability in Biomimetic Membranes Driven by Lipid Polyunsaturation. *J Phys Chem B* 120(46):11930-11941, November 2016.
21. Nowak M, Freudenberg U, Tsurkan MV, Werner C, **Levental KR**. Modular GAG-matrices to promote mammary epithelial morphogenesis in vitro. *Biomaterials* 112:20-30, January 2017.
22. He J, Zhang F, Tay LWR, Boroda S, Nian W, **Levental KR**, Levental I, Harris TE, Chang JT, Du G. Lipin-1 regulation of phospholipid synthesis maintains endoplasmic reticulum homeostasis and is critical for triple-negative breast cancer cell survival. *FASEB J* 31(7):2893-2904, July 2017.
23. Cornell CE, McCarthy NLC, **Levental KR**, Levental I, Brooks NJ, Keller SL. n-Alcohol Length Governs Shift in Lo-Ld Mixing Temperatures in Synthetic and Cell-Derived Membranes. *Biophys J* 119;113(6):1200-1211, August 2017.
24. Lorent JH, Diaz-Rohrer B, Lin X, Spring K, Gorfe AA, **Levental KR**, Levental I. Structural determinants and functional consequences of protein affinity for membrane rafts. *Nat Commun* 31;8(1):1219, October 2017.
25. **Levental KR**, Surma MA, Skinkle AD, Lorent JH, Zhou Y, Klose C, Chang JT, Hancock JF, Levental I. ω -3 polyunsaturated fatty acids direct differentiation of the membrane phenotype in mesenchymal stem cells to potentiate osteogenesis. *Science Advances*, Nov 8;3(11):eaao1193, November 2017.
26. van der Hoeven D, Cho KJ, Zhou Y, Ma X, Chen W, Naji A, Montufar-Solis D, Zuo Y, Kovar SE, **Levental KR**, Frost JA, van der Hoeven R, Hancock JF. Sphingomyelin metabolism is a regulator of KRAS function. *Mol Cell Biol*, November 2017.
27. Cornell CE, Skinkle AD, He S, Levental I, **Levental KR**, Keller SL. Tuning Length Scales of Small Domains in Cell-Derived Membranes and Synthetic Model Membranes. *Biophys J*. Aug 21;115(4):690-701, August 2018.
28. Torres-Adorno AM, Vitrac H, Qi Y, Tan L, **Levental KR**, Fan YY, Yang P, Chapkin RS, Eckhardt BL, Ueno NT. Eicosapentaenoic acid in combination with EPHA2 inhibition shows efficacy in preclinical models of triple-negative breast cancer by disrupting cellular cholesterol efflux. *Oncogene*, 38(12):2135-2150, March 2019.
29. Skinkle AD, **Levental KR**, Levental I. Cell-derived plasma membrane vesicles are permeable to hydrophilic macromolecules. *Biophys J*, <https://doi.org/10.1016/j.bpj.2019.12.040>, 2020.

30. Levental I, **Levental KR**, Heberle FA. Lipid Rafts: Controversies Resolved, Mysteries Remain. *Trends in Cell Biology*, <https://doi.org/10.1016/j.tcb.2020.01.009>, 2020.
31. Lorent JH, **Levental KR**, Ganesan L, Rivera-Longsworth G, Sezgin E, Doktorova M, Lyman E, Levental I. Plasma membranes are asymmetric in lipid unsaturation, packing, and protein shape. *Nat Chem Biol*, doi: 10.1038/s41589-020-0529-6, 2020.
32. **Levental KR***, Malmberg E, Symons J, Fan YY, Chapkin RS, Ernst R, Levental I*. Lipidomic and biophysical homeostasis of mammalian membranes counteracts dietary lipid perturbations to maintain cellular fitness. *Nat Commun*, doi: 10.1038/s41467-020-15203-1, 2020.
*Co-corresponding authors
33. Symons JL, Cho KJ, Chang JT, Du G, Waxham MN, Hancock JF, Levental I, **Levental KR**. Lipidomic atlas of mammalian cell membranes reveals hierarchical variation induced by culture conditions, subcellular membranes, and cell lineages. *Soft Matter*, May 26. doi: 10.1039/d0sm00404a, 2020.
34. Castello-Serrano I, Lorent JH, Ippolito R, **Levental KR**, Levental I. Myelin-Associated MAL and PLP Are Unusual Among Multi-Pass Transmembrane Proteins in Preferring Ordered Membrane Domains. *J Phys Chem B*, May 21. doi: 10.1021/acs.jpcc.0c03028, 2020.

B. Book Chapters

1. **Levental KR**, Leight JL, Weaver VM. Demystifying three-dimensional force and tissue morphogenesis. Wang Y-L and Discher D.E. (Eds.) Methods in Cell Biology: Cell Mechanics. 83: 547-583. New York: Academic Press, 2007.
2. **Levental KR**, Levental I. Isolation of giant plasma membrane vesicles for evaluation of plasma membrane structure and protein partitioning. Methods in Membrane Biology. 1232: 65-77. New York: Springer Publishing, 2015.
3. **Levental KR**, Levental I. Giant plasma membrane vesicles: models for understanding membrane organization. Currents Topics in Membranes: Lipid Domains. 75: 25-57, New York: Academic Press, 2015.

C. Other Professional Communications

1. Angioscaff: 1st annual Project Meeting, Lausanne, Switzerland. December 2008.
2. Angioscaff: 2nd annual Project Meeting, Zurich, Switzerland. December 2009.
3. Tissue Engineering and Regenerative Medicine International Society (TERMIS) European Chapter Meeting, Galway, Ireland. June 2010.
4. TOPEA Congress for Young Scientists, Barcelona, Spain. June 2010.
5. Angioscaff: 4th annual Project Meeting, Lausanne, Switzerland. February 2012.
6. American Society of Cell Biology Annual Meeting, San Diego, CA December 2015.
7. Invited Speaker, James T. Willerson M.D. Cardiovascular Seminar, Houston, TX. May 2016.
8. Poster Presentation, Biomembrane Days, Berlin, Germany. September 2016.
9. Invited Speaker, Max Bergman Center of Biomaterials Dresden, Dresden, Germany September 2016.
10. Poster Presentation, New Horizons in Membrane Transport and Communication Conference, Frankfurt, Germany. October 2017.

11. Poster Presentation, American Society of Cell Biology Annual Meeting, Philadelphia, PA. December 2017.
12. Poster Presentation, Biophysical Society Annual Meeting, San Francisco, CA. February 2018.
13. Invited Speaker, Friedrich-Alexander-University of Erlangen-Nuremberg, Erlangen, Germany July 2018.
14. Poster Presentation, International Workshop on Biological Membranes, Helsinki, Finland, August 2018.
15. Invited Speaker, Saenz-Tang-Nadler-Honigmann Joint Group Retreat, Lwowek Slaski, Poland, August 2018
16. Platform Presentation, American Society of Cell Biology Annual Meeting, San Diego, CA December 2018.
17. Platform Presentation, Biophysical Society Annual Meeting, Baltimore, MD March 2019.
18. Platform Presentation, 16th International Membrane Research Forum, Okinawa, Japan March 2019.
19. Poster Presentation, Gordon Research Conference on Membrane Biology, Andover, NH July 2019.
20. Poster Presentation, Biomembrane Days, Berlin, Germany. December 2019.
21. Invited Speaker, Online Journal Club, Erdinc Sezgin, www.youtube.com, April 2020.