

## Celeste M. Nelson, Ph.D.

Chemical & Biological Engineering  
Princeton University  
303 Hoyt Laboratory  
25 William Street  
Princeton, NJ 08544

Office: 609.258.8851  
Fax: 609.258.1247  
E-mail: celesten@princeton.edu  
Web: cmngroup.princeton.edu  
Twitter/X: @celestemnelson

### Education and Training

- 2007            *Woods Hole Marine Biological Laboratory*  
Embryology Course
- 2003-07        *Lawrence Berkeley National Laboratory*  
Postdoctoral Fellow in the Life Sciences Division  
Mentor: Mina J. Bissell, Ph.D.
- 1998-03        *Johns Hopkins University School of Medicine*  
Ph.D. in Biomedical Engineering (with high distinction)  
Thesis advisor: Christopher S. Chen, M.D., Ph.D.
- 1994-98        *Massachusetts Institute of Technology*  
S.B. in Biology  
S.B. in Chemical Engineering  
Minor in Biomedical Engineering  
Research advisor: Douglas A. Lauffenburger, Ph.D.

### Professional Positions

#### *At Princeton University*

- 2020-present    Wilke Family Professor in Bioengineering  
Professor of Chemical & Biological Engineering  
Preceptor, Academy of Mentors, NJ Alliance for Clinical and Translational Research (ACTS)
- 2007-present    Associated Faculty, Department of Molecular Biology  
Member, Rutgers Cancer Institute of New Jersey, Breast Cancer Research and Cancer  
Metabolism and Growth Programs
- 2020            Pomeroy and Betty Perry Smith Professor of Chemical & Biological Engineering
- 2016-20        Professor
- 2012-16        Associate Professor
- 2007-12        Assistant Professor

#### *Outside of Princeton University*

- 2022-present    Packard Fellowships Advisory Panel
- 2021-present    HHMI Janelia 4D Cellular Physiology (4DCP) Advisory Board

### Membership in Professional Societies

AAAS	ASMB	SBE
AACR	APS	SDB
AIChE; Senior Member	BMES	TEMTIA
AIMBE; College of Fellows	BPS	
ASCB	NYAS	

## **Selected Honors, Awards, and Named Lectures**

2023	American Institute of Chemical Engineers (AIChE) Area 15d/e Life Sciences Plenary Award
2022	NIH Director's Pioneer Award
2022	Van C. Mow Lectureship, Columbia University
2019	Biomedical Engineering Society (BMES) Mid-Career Award
2017, 2018	Blavatnik National Award Finalist for Young Scientists in Life Sciences
2016	Howard Hughes Medical Institute (HHMI) Faculty Scholar
2016	American Institute for Medical & Biological Engineering (AIMBE) College of Fellows
2014	Thiele Lectureship, University of Notre Dame
2013	E. Llewellyn-Thomas Distinguished Lecture, University of Toronto
2012	Camille Dreyfus Teacher-Scholar Award
2011	Allan P. Colburn Award, American Institute of Chemical Engineers (AIChE)
2010	Technology Review TR35 Young Innovator
2010	Alfred P. Sloan Research Fellow in Molecular Biology
2009	E. Lawrence Keyes, Jr./Emerson Electric Co. Faculty Advancement Award
2008	David & Lucile Packard Fellow
2007	Burroughs Wellcome Fund Career Award at the Scientific Interface (BWF CASI)
2007	Lawrence Berkeley National Laboratory (LBNL) Outstanding Performance Award
2004-07	DOD Breast Cancer Research Program Postdoctoral Fellowship
1999-03	Whitaker Foundation Graduate Fellowship
1998	Phi Beta Kappa Graduate

## **Teaching Awards**

2021, 2024	Excellence in Teaching Award, Princeton Engineering Council (selected by the students)
2016	President's Award for Distinguished Teaching (Princeton University-wide award)
2014	Princeton School of Engineering and Applied Science (SEAS) Distinguished Teacher Award
2009-present	Princeton Engineering Commendation for Outstanding Teaching (10 times)

## **Service to Professional Societies**

2024	Student Paper Competition Review Committee, SB3C Meeting Track co-chair, Cellular and Molecular Bioengineering, BMES Annual Meeting Abstract reviewer, ISSCR 2024 Annual Meeting
2023	BMES Mid-Career Award Selection Committee Specialty review subcommittee, Biomechanics, AIMBE College of Fellows Co-chair, Minisymposium on Communal Cell, ASCB Annual Meeting Co-organizer Mid-Atlantic Society for Developmental Biology (MASDB) Meeting
2022	BMES Mid-Career Award Selection Committee
2020	Track co-chair, Cancer Technologies, BMES Annual meeting Specialty review subcommittee, Cell and Tissue Biomechanics, AIMBE College of Fellows
2019	Organizing committee, SBE's 8th ICBN Conference Specialty review subcommittee, Cell and Tissue Biomechanics, AIMBE College of Fellows
2018	ASCB Taskforce on Organoids (chaired by Ruth Lehmann) Specialty review subcommittee, Cell and Tissue Biomechanics, AIMBE College of Fellows
2016	Co-theme leader, Organs, Morphogenesis, and Development track, SB3C Faculty Committee Member, Student Affairs Committee, BMES
2015	Co-theme leader, Development and Morphogenesis track, SB3C Co-chair, Multicellular Interactions, Tissues, and Development, ASCB Annual Meeting Faculty Committee Member, Student Affairs Committee, BMES Co-organizer, Mid-Atlantic Society for Developmental Biology (MASDB) meeting
2014	Session chair, Integrating ECM and Cell Biomechanics, ASMB conference Faculty Committee Member, Student Affairs Committee, BMES

Abstract Reviewer, BMES Annual Meeting  
 2013 Faculty Committee Member, Student Affairs Committee, BMES  
 2012 Co-chair, Bioengineering of regenerative medicine, Experimental Biology Annual Meeting  
 2011 Co-chair, Bioengineering and mechanobiology, ASCB Annual Meeting  
 2010 Co-chair, Plenary session on Tissue engineering microenvironment, AIChE Annual Meeting  
 Abstract Reviewer, BMES Annual Meeting  
 Abstract Reviewer, Annual Biomedical Research Conference for Minority Students  
 2010-present Faculty advisor for the Princeton student chapter of BMES  
 2009 Chair, plenary session on Disease mechanisms, AIChE Annual Meeting  
 2008 Abstract Reviewer, Annual Biomedical Research Conference for Minority Students  
 Poster Reviewer, Santa Cruz Developmental Biology Meeting

### **Editorial Services to Scholarly Publications**

*Editorial/advisory board memberships: Current Biology* (2022-present); *Biophysical Journal* (2016-20); *Journal of Cell Science* (2016-present); *Frontiers in Biomechanics* (2013-present)

*Guest editor/co-editor: Current Topics in Developmental Biology*, themed issue on mechanics in vertebrate development (2024; with Lance Davidson); *Philosophical Transactions of the Royal Society*, themed issue on tissue mechanics (2018; with Niamh Nowlan and Philippa Francis-West); *Current Opinion in Cell Biology*, section on “Cellular Architecture” (2018; with Franck Perez); *Seminars in Cell and Developmental Biology*, themed issue on tissue morphodynamics (2016); *Philosophical Transactions of the Royal Society*, themed issue on morphogenesis (2016; with Jeremy Green and Yanlan Mao); *Soft Matter*, themed issue on patterning for biology (2014; with Ulrich Schwarz and Pascal Silberzan); *Organogenesis*, special issue on mechanics in development (2012)

*Book editor: Tissue Morphogenesis volume II, Methods in Molecular Biology* series (2024); *Tissue Morphogenesis, Methods in Molecular Biology* series (2014)

### **Grant Review Service**

2014-17 Standing Member, Mentored Transition to Independence (MTI) study section, NHLBI

2007-present *Ad hoc referee for proposals submitted to:* NIH (NIBIB Special Emphasis Panels; NCI Tumor Progression & Metastasis Study Section; NHLBI Basic Research in Calcific Aortic Valve Disease Study Section; CSR Biophysical and Biomechanical Aspects of Embryonic Development Study Section; NCI Cancer Biology-2 Study Section; NCI Provocative Questions Study Section; Intercell; CSR Cell Biology Integrated Review Group); NSF; Netherlands Organisation for Scientific Research; HFSP (Research Grant Awards); HHMI (International Predoctoral Fellowships); AHA; ANR; Chan Zuckerberg Human Cell Atlas Initiative

### **Conference Organizing Service**

2024 Co-organizer (with Alex Hughes), NIDDK Workshop on Engineering Replacement Kidneys  
 2023 Co-organizer (with Andrej Kosmrlj and Jared Toettcher), PCTS workshop on biophysics of organoids  
 2020 Co-organizer (with Ned Wingreen and Daniel Cohen), PCTS workshop on collective cell migration  
 2019 Co-organizer (with Francois Nedelec, Ulrich Schwarz, Xavier Trepas, and Kinnert Keren), Symposium on “Physics of Cells and Tissues – Modelling meets Experiment”, EMBO/EMBL, Heidelberg, Germany  
 2018 Co-organizer (with Orion Weiner, Darren Gilmour, and Takashi Hiiragi), Symposium on “Tissue self-organization: challenging the systems”, EMBO/EMBL, Heidelberg, Germany  
 2018 Co-organizer (with Andrej Kosmrlj, Stas Shvartsman, and Lisa Manning), PCTS workshop on mechanics in morphogenesis  
 2018 International Organizing Committee (with Roger Kamm, Bob Nerem, and Rashid Bashir), 2<sup>nd</sup> Workshop on Integrated Cellular Systems  
 2017 Co-chair (with Niamh Nowlan and Philippa Francis-West), Royal Scientific Meeting on “Mechanics of Development”, Chicheley Hall, UK

- 2016 International Organizing Committee (with Roger Kamm, Bob Nerem, and Rashid Bashir), Workshop on Integrated Cellular Systems
- 2015 Co-organizer (with Stas Shvartsman), inaugural Bioengineering Day symposium

### **Recent STEM Outreach and Diversity-Related Service**

- 2024 Faculty participant, Keller Center Program in Institutional and Historical Racism
- 2022-23 IQ Biology Advisory Board, University of Colorado, Boulder
- 2023 Panel on Equitable and Inclusive Teaching, McGraw Center for Teaching and Learning
- 2023 Women's Leadership Panel, School of Engineering and Applied Science
- 2022 Panel on Inclusive Teaching, School of Engineering and Applied Science
- 2021 Council on Science and Technology (CST) Community of Practice Fellow

### **Selected Publications**

(out of 169 total; corresponding author)

(\*, \*\*, \*\*\*, and † denote those with  $\geq 25$ , 50, 100, and 250 citations, respectively)  
(Google scholar total citations = 21352; i10-index = 127; H-index = 63)

169. Banavar S.P., Fowler E.W., Nelson C.M. Biophysics of morphogenesis in the vertebrate lung, *Curr. Topics Dev. Biol.*, in press (2024).
166. Paramore S.V., Trenado Yuste C., Sharan R., Nelson C.M., Devenport D. Vangl-dependent mesenchymal thinning shapes the distal lung during murine sacculation, *Dev. Cell*, 59: 1302-1316 (2024).
165. Leggett S.E., Brennan M.C., Martinez S., Tien J., Nelson C.M. Relatively rare populations of invasive cells drive progression of heterogeneous tumors, *Cell. Mol. Bioeng.*, 17: 7-24 (2024).
163. Banavar S., Nelson C.M. Mechanical properties pattern the skin, *Science*, 382: 880 (2023).
162. Lemma B., Nelson C.M. Spatial patterning of energy metabolism during tissue morphogenesis, *Curr. Opin. Cell Biol.*, 85: 102235 (2023).
161. Farahani P.E., Yang X., Mesev E.V., Fomby K.A., Brumbaugh-Reed E.H., Bashor C.J., Nelson C.M., Toettcher J.E. pYtags enable spatiotemporal measurements of receptor tyrosine kinase signaling in living cells, *eLife*, 12: e82863 (2023).
159. Goodwin K., Lemma B., Zhang P., Boukind A., Nelson C.M. Plasticity in airway smooth muscle differentiation during mouse lung development, *Dev. Cell*, 58: 338-47 (2023).
158. Dance Y.W., Obenreder M.C., Seibel A.J., Meshulam T., Ogony J.W., Lahiri N., Pacheco-Spann L., Radisky D.C., Layne M.D., Farmer S.R., Nelson C.M., Tien J. Adipose cells induce escape from an engineered human breast microtumor independently of their obesity status, *Cell. Mol. Bioeng.*, 16: 23-39 (2023).
157. Paramore S.V., Goodwin K., Nelson C.M. How to build an epithelial tree, *Phys. Biol.*, 19: 061002 (2022).
156. Seibel A.J., Kelly O.M., Dance Y.W., Nelson C.M., Tien J. Role of lymphatic endothelium in vascular escape of engineered human breast microtumors, *Cell. Mol. Bioeng.*, 15: 553-569 (2022).
155. Goodwin K., Jaslove J.M., Tao H., Zhu M., Hopyan S., Nelson C.M. Patterning the embryonic pulmonary mesenchyme, *iScience*, 25: 103838 (2022).
154. Nelson C.M. Mechanical control of cell differentiation: insights from the early embryo, *Annu. Rev. Biomed. Eng.*, 24: 307-22 (2022).
153. Jaslove J.M., Goodwin K., Sundarakrishnan A., Spurlin J.W. III, Mao S., Kosmrlj A., Nelson C.M. Transmural pressure signals through retinoic acid to regulate lung branching, *Development*, 149: dev199726 (2022).
152. Farahani P.E., Nelson C.M. Revealing epithelial morphogenetic mechanisms through live imaging, *Curr. Opin. Genet. Dev.*, 72: 61-68 (2022).
149. Dance Y.W., Meshulam T., Seibel A.J., Obenreder M.C., Layne M.D., Nelson C.M., Tien J. Adipose stroma accelerates the invasion and escape of human breast cancer cells from an engineered microtumor, *Cell. Mol. Bioeng.*, 15: 15-29 (2022).
- 148\*. Farahani P.E., Lemke S.B., Dine E., Uribe G., Toettcher J.E., Nelson C.M. Substratum stiffness regulates

- Erk signaling dynamics through receptor-level control, *Cell Reports*, 37: 110181 (2021).
147. Palmer M.A., Nerger B.A., Goodwin K., Sudhakar A., Lemke S.B., Ravindran P., Toettcher J.E., Kosmrlj A., Nelson C.M. Stress ball morphogenesis: how the lizard builds its lung, *Science Adv.*, 7: eabk0161 (2021).
- 145\*. Lemke S.B., Nelson C.M. Dynamic changes in epithelial cell packing during tissue morphogenesis, *Curr. Biol.*, 31: R1098-R1110 (2021).
144. Silver B.B., Zhang S.X., Rabie E.M., Nelson C.M. Substratum stiffness tunes membrane voltage in mammary epithelial cells, *J. Cell Sci.*, 134: jcs256313 (2021).
143. Nelson C.M. Mechanobiology: the mechanics of crypt morphogenesis, *Nat. Cell Biol.*, 23: 678-9 (2021).
- 141\*. Nerger B.A., Jaslove J.M., Elashal H., Mao S., Kosmrlj A., Link A.J., Nelson C.M. Local accumulation of extracellular matrix regulates global morphogenetic patterning in the developing mammary gland, *Curr. Biol.*, 31: 1903-17 (2021).
139. Rabie E., Zhang S.X., Kourouklis A., Kilinc A.N., Simi A.K., Radisky D.C., Tien J., Nelson C.M. Matrix degradation and proliferation are coupled to promote invasion and escape from an engineered human breast microtumor, *Integr. Biol.*, 13: 17-29 (2021).
- 137\*\*. Goodwin K., Nelson C.M. Mechanics of development, *Dev. Cell*, 20: 30934-5 (2021).
136. Goodwin K., Nelson C.M. Uncovering cellular networks in branching morphogenesis using single-cell transcriptomics, *Curr. Topics Dev. Biol.*, 143: 239-80 (2021).
135. Tien J., Dance Y.W., Ghani U., Siebel A.J., Nelson C.M. Interstitial hypertension suppresses escape of human breast tumor cells via convection of interstitial fluid, *Cell. Mol. Bioeng.*, 14: 147-59 (2021).
- 134\*. Tien J., Ghani U., Dance Y.W., Seibel A.J., Karakan M.C., Ekinici K.L., Nelson C.M. Matrix pore size governs escape of human breast cancer cells from a microtumor to an empty cavity, *iScience*, 23: 101673 (2020).
- 132\*. Anlas A.A., Nelson C.M. Soft microenvironments induce chemoresistance by increasing autophagy downstream of integrin-linked kinase, *Cancer Res.*, 80: 4103-13 (2020).
- 131\*. Silver B.B., Wolf A.E., Lee J., Pang M.-F., Nelson C.M. Epithelial tissue geometry directs emergence of bioelectric field and pattern of proliferation, *Mol. Biol. Cell*, 31: 1691-1702 (2020).
- 129\*. Nerger B.A., Brun P.-T., Nelson C.M. Marangoni flows drive the alignment of fibrillar cell-laden hydrogels, *Science Adv.*, 6: eazz7748 (2020).
- 128\*\*. Goodwin K., Nelson C.M. Branching morphogenesis, *Development*, 147: dev184499 (2020).
127. Nerger B.A., Nelson C.M. Engineered extracellular matrices: emerging strategies for decoupling structural and molecular signals that regulate epithelial branching morphogenesis, *Curr. Opin. Biomed. Eng.*, 13: 103-12 (2020).
- 126\*\*. Goodwin K., Mao S., Guyomar T., Miller E., Radisky D.C., Kosmrlj A., Nelson C.M. Smooth muscle differentiation shapes domain branches during mouse lung development, *Development*, 146: dev182188 (2019).
- 125\*\*. Spurlin J.W., Siedlik M.J., Nerger B.A., Pang M.F., Jayaraman S., Zhang R., Nelson C.M. Mesenchymal proteases and tissue fluidity remodel the extracellular matrix during airway epithelial branching in the embryonic avian lung, *Development*, 146: dev175257 (2019).
- 124\*\*. Nerger B.A., Brun P.-T., Nelson C.M. Microextrusion printing cell-laden networks of type I collagen with patterned anisotropy and geometry, *Soft Matter*, 15: 5728-38 (2019).
120. Nelson C.M. Epithelial packing: Even the best of friends must part, *Curr. Biol.*, 28: R1190-R1211 (2018).
- 119\*. Jaslove J.M., Nelson C.M. Smooth muscle: a stiff sculptor of epithelial shapes, *Phil. Trans. R. Soc. B*, 373: 20170318 (2018).
- 115\*. Han S., Pang M.F., Nelson C.M. Substratum stiffness tunes proliferation downstream of Wnt3a in part by regulating integrin-linked kinase and frizzled-1, *J. Cell Sci.*, 131, jcs210476 (2018).
- 114\*. Simi A.K., Anlas A.A., Stallings-Mann M., Zhang S., Hsia T., Cichon M., Radisky D.C., Nelson C.M. A soft microenvironment protects from failure of midbody abscission and multinucleation downstream of the EMT-promoting transcription factor Snail, *Cancer Res.*, 78: 2277-89 (2018).
- 111\*\*\*. Nelson C.M., Gleghorn J.P., Pang M.F., Jaslove J., Goodwin K., Varner V.D., Miller E., Radisky D.C., Stone H.A. Microfluidic chest cavities reveal that transmural pressure controls the rate of lung

- development, *Development*, 144: 4328-35 (2017).
- 110\*\*\*. Piotrowski-Daspt A.S., Nerger B.A., Wolf A.E., Sundaresan S., Nelson C.M. Dynamics of tissue-induced alignment of fibrous extracellular matrix, *Biophys. J.*, 113: 702-13 (2017).
109. Siedlik M.J., Manivannan S., Kevrekidis I.G., Nelson C.M. Cell division induces and switches coherent angular motion within bounded cellular collectives, *Biophys. J.*, 112: 2419-27 (2017).
107. Nelson C.M. From static to animated: measuring mechanical forces in tissues, *J. Cell Biol.*, 216: 29-30 (2017).
- 103\*. Varner V.D., Nelson C.M. Computational models of airway branching morphogenesis, *Semin. Cell Dev. Biol.*, 67: 170-76 (2017).
- 102\*\*\*. Pang M.F., Siedlik M.J., Han S., Stallings-Mann M., Radisky D.C., Nelson C.M. Tissue stiffness and hypoxia modulate the integrin-linked kinase ILK to control breast cancer stem-like cells, *Cancer Res.*, 76: 1-11 (2016).
- 99\*\*\*. Piotrowski-Daspt A.S., Tien J., Nelson C.M. Interstitial fluid pressure regulates collective invasion in engineered human breast tumors via Snail, vimentin, and E-cadherin, *Integr. Biol.*, 8: 319-331 (2016).
- 96\*\*\*. Nelson C.M. On buckling morphogenesis, *J. Biomech. Eng.*, 138: 021005 (2016).
- 94†. Pang M.F., Georgoudaki A.M., Lambu L., Johansson J., Tabor V., Hagikura K., Jin Y., Jansson M., Alexander J.S., Nelson C.M., Jakobsson L., Betsholtz C., Sund M., Karlsson M.C., Fuxe J. TGFβ1-induced EMT promotes targeted migration of breast cancer cells through the lymphatic system by activation of CCR7/CCL21-mediated chemotaxis, *Oncogene*, 35: 748-760 (2016).
- 93\*\*\*. Kim H.Y., Pang M.F., Varner V.D., Kojima L., Miller E., Radisky D.C., Nelson C.M. Localized smooth muscle differentiation is essential for epithelial bifurcation during branching morphogenesis of the mammalian lung, *Dev. Cell*, 34: 719-26 (2015).
- 92\*\*\*. Varner V.D., Gleghorn J.P., Miller E., Radisky D.C., Nelson C.M. Mechanically patterning the embryonic airway epithelium, *Proc. Natl. Acad. Sci. USA*, 112: 9230-35 (2015).
- 91\*\*\*. Gjorevski N., Piotrowski A.S., Varner V.D., Nelson C.M. Dynamic tensile forces drive collective cell migration through three-dimensional extracellular matrices, *Sci. Rep.*, 5: 11458 (2015).
- 86\*. Boghaert E., Radisky D.C., Nelson C.M. Lattice-based model of ductal carcinoma in situ suggests rules for breast cancer progression to an invasive state, *PLOS Comp. Biol.*, 10: e1003997 (2014).
- 84\*\*\*. Varner V.D., Nelson C.M. Cellular and physical mechanisms of branching morphogenesis, *Development*, 141: 2750-59 (2014).
- 82\*\*. Jakus Z., Gleghorn J.P., Enis D., Sen A., Chia S., Liu X., Rawnsley D., Yang Y., Hess P., Zou Z., Yang J., Guttentag S., Nelson C.M., Kahn M.L. Lymphatic vascular function is required perinatally for lung inflation at birth, *J. Exp. Med.*, 211: 815-26 (2014).
80. Varner V.D., Nelson C.M. Toward the directed self-assembly of engineered tissues. *Annu. Rev. Chem. Biomol. Eng.*, 5: 507-26 (2014).
79. Tien J., Nelson C.M. Microstructured extracellular matrices in tissue engineering and development, an update, *Ann. Biomed. Eng.*, 42: 1413-23 (2014).
75. Nelson C.M. Forces in epithelial origami, *Dev. Cell*, 26: 554-56 (2013).
- 73\*\*\*. Kim H.Y., Varner V.D., Nelson C.M. Apical constriction initiates new bud formation during monopodial branching of the embryonic chicken lung, *Development*, 140: 3146-55 (2013).
- 72\*. Zhu W., Nelson C.M. PI3K regulates branch initiation and extension of cultured mammary epithelia via Akt and Rac1 respectively, *Dev. Biol.*, 379: 235-45 (2013).
- 68\*\*\*. Chen Q.K., Lee K., Radisky D.C., Nelson C.M. Extracellular matrix proteins regulate epithelial-mesenchymal transition in mammary epithelial cells, *Differentiation*, 86: 126-32 (2013).
- 67\*\*\*. Mori H., Lo A.T., Ghajar C.M., Inman J.L., Alcaraz J., Chen C.S., Nelson C.M., Zhang H., Mott J.D., Bascom J.L., Seiki M., Bissell M.J. Transmembrane/cytoplasmic, rather than catalytic, domains of Mmp14 signal to MAPK activation and mammary branching morphogenesis via binding to integrin β1. *Development*, 140: 343-52 (2013).
- 66\*\*. Boghaert E., Gleghorn J.P., Lee K., Gjorevski N., Radisky D.C., Nelson C.M. Host epithelial geometry regulates breast cancer cell invasiveness. *Proc. Natl. Acad. Sci. USA*, 109: 19362-67 (2012).
65. Nelson C.M. Symmetry breaking during morphogenesis in the embryo and in engineered tissues. *AICHE J.*, 58: 3608-13 (2012).

- 64\*\*. Tien J., Truslow J.G., Nelson C.M. Modulation of invasive phenotype by interstitial pressure-driven convection in aggregates of human breast cancer cells. *PLOS ONE*, 7: e45191 (2012).
- 63\*\*\*. Lee K., Chen Q.K., Lui C., Cichon M.A., Radisky D.C., Nelson C.M. Matrix compliance regulates Rac1b localization, NADPH oxidase assembly, and epithelial-mesenchymal transition. *Mol. Biol. Cell*, 23: 4097-108 (2012).
- 61\*\*\*. Gjorevski N., Nelson C.M. Mapping of mechanical strains and stresses around quiescent engineered three-dimensional epithelial tissues. *Biophys. J.*, 103: 152-62 (2012).
- 59\*. Gleghorn J.P., Kwak J., Pavlovich A.L., Nelson C.M. Inhibitory morphogens and monopodial branching of the embryonic chicken lung. *Dev. Dyn.*, 241: 852-62 (2012).
- 57\*\*. Chung J.W., Lee K., Neikirk C., Nelson C.M., Priestley R.D. Photoresponsive coumarin-stabilized polymeric nanoparticles as a detectable drug carrier. *Small*, 8: 1693-1700 (2012).
- 56\*\*\*. Nelson C.M., Gleghorn J.P. Sculpting organs: Mechanical regulation of tissue development. *Annu. Rev. Biomed. Eng.*, 14: 139-54 (2012).
- 54\*. Lui C., Lee K., Nelson C.M. Matrix compliance and RhoA direct the differentiation of mammary progenitor cells. *Biomech. Modeling Mechanobiol.*, 11: 1241-49 (2012).
- 49\*\*\*. Lee K., Nelson C.M. New insights into the regulation of epithelial-mesenchymal transition and tissue fibrosis. *Int. Rev. Cell Mol. Biol.*, 294: 169-219 (2012).
- 48†. Gjorevski N., Nelson C.M. Integrated morphodynamic signalling of the mammary gland. *Nat. Rev. Mol. Cell Biol.*, 12: 581-93 (2011).
- 47\*\*. Lee K., Gjorevski N., Boghaert E., Radisky D.C., Nelson C.M. Snail1, Snail2, and E47 promote mammary epithelial branching morphogenesis. *EMBO J.*, 30: 2662-74 (2011).
- 46\*. Pavlovich A.L., Boghaert E., Nelson C.M. Mammary branch initiation and extension are inhibited by separate pathways downstream of TGF $\beta$  in culture. *Exp. Cell Res.*, 317: 1872-84 (2011).
- 43\*\*\*. Gjorevski N., Nelson C.M. Endogenous patterns of mechanical stress are required for branching morphogenesis. *Integr. Biol.*, 2: 424-34 (2010).
- 42\*. Pavlovich A.L., Manivannan S., Nelson C.M. Adipose stroma induces branching morphogenesis of engineered epithelial tubules. *Tissue Eng. Part A*, 16: 3719-26 (2010).
- 39†. Liu Z., Tan J.L., Cohen D.M., Yang M.T., Sniadecki N.J., Ruiz S.A., Nelson C.M., Chen C.S. Mechanical tugging forces regulate the size of cell-cell junctions. *Proc. Natl. Acad. Sci. USA*, 107: 9944-49 (2010).
- 38\*\*\*. Raghavan S., Nelson C.M., Baranski J.D., Lim E., Chen C.S. Geometrically controlled endothelial tubulogenesis in micropatterned gels. *Tissue Eng. Part A*, 16: 2255-63 (2010).
- 36†. Gomez E.W., Chen Q.K., Gjorevski N., Nelson C.M. Tissue geometry patterns epithelial-mesenchymal transition via intercellular mechanotransduction. *J. Cell. Biochem.*, 110: 44-51 (2010).
- 35\*\*\*. Mori H., Gjorevski N., Inman J.L., Bissell M.J., Nelson C.M. Self-organization of engineered epithelial tubules by differential cellular motility. *Proc. Natl. Acad. Sci. USA*, 106: 14890-95 (2009).
- 33\*. Chen C.S., Nelson C.M., Khauv D., Bennett S., Radisky E.S., Hirai Y., Bissell M.J., Radisky D.C. Homology with vesicle fusion mediator syntaxin-1a predicts determinants of epimorphin/syntaxin-2 function in mammary epithelial morphogenesis. *J. Biol. Chem.*, 284: 6877-84 (2009).
- 32\*\*\*. Nelson C.M. Geometric control of tissue morphogenesis. *Biochim. Biophys. Acta.*, 1793: 903-10 (2009).
- 27\*\*\*. Nelson C.M., Khauv D., Bissell M.J., Radisky D.C. Change in cell shape is required for matrix metalloproteinase-induced epithelial-mesenchymal transition of mammary epithelial cells. *J. Cell. Biochem.*, 105: 25-33 (2008).
26. Nelson C.M., Inman J.L., Bissell M.J. Three-dimensional lithographically-defined organotypic tissue arrays for quantitative analysis of morphogenesis and neoplastic progression. *Nature Protoc.*, 3: 674-8 (2008).
- 21†. Nelson C.M., VanDuijn M.M., Inman J.L., Fletcher D.A., Bissell M.J. Tissue geometry determines sites of branching morphogenesis in organotypic cultures, *Science*, 314: 298-300 (2006).
- 20\*\*\*. Nelson C.M., Tien J. Microstructured extracellular matrices in tissue engineering and development. *Curr. Opin. Biotech.*, 17: 518-23 (2006).
- 18†. Nelson C.M., Bissell M.J. Of extracellular matrix, scaffolds, and signaling: Tissue architecture regulates development, homeostasis, and cancer. *Annu. Rev. Cell Dev. Biol.*, 22: 287-309 (2006).

- 17\*. Kenny P.A., Nelson C.M., Bissell M.J. The ecology of tumors. *The Scientist*, April 2006: 30-37 (2006).
- 14†. Nelson C.M., Jean R.P., Tan J.L., Liu W.F., Sniadecki N.J., Spector A.A., Chen C.S. Emergent patterns of growth controlled by multicellular form and mechanics, *Proc. Natl. Acad. Sci. USA*, 102: 11594-99 (2005).
- 13†. Radisky D.C., Levy D.D., Littlepage L.E., Liu H., Nelson C.M., Fata J.E., Leake D., Godden E.L., Albertson D.G., Nieto M.A., Werb Z., Bissell M.J. Rac1b and reactive oxygen species mediate MMP3-induced EMT and genomic instability, *Nature*, 436: 123-7 (2005).
- 12†. Nelson C.M., Bissell M.J. Modeling dynamic reciprocity: Engineering three-dimensional culture models of breast architecture, function, and neoplastic transformation. *Semin. Cancer Biol.*, 15: 342-52 (2005).
- 9\*\*\*. Nelson C.M., Pirone D.M., Tan J.L., Chen C.S. Vascular endothelial-cadherin regulates cytoskeletal tension, cell spreading, and focal adhesions by stimulating RhoA. *Mol. Biol. Cell*, 15: 2943-53 (2004).
- 8†. McBeath R., Pirone D.M., Nelson C.M., Bhadriraju K., Chen C.S. Cell shape, cytoskeletal tension, and RhoA regulate stem cell lineage commitment. *Dev. Cell*, 6: 483-95 (2004).
- 7\*\*\*. Nelson C.M., Chen C.S. VE-cadherin simultaneously stimulates and inhibits cell proliferation by altering cytoskeletal structure and tension. *J. Cell Sci.*, 116: 3571-81 (2003).
- 5\*\*\*. Nelson C.M., Raghavan S., Tan J.L., Chen C.S. Degradation of micropatterned surfaces by cell-dependent and -independent processes. *Langmuir*, 19: 1493-9 (2003).
- 3†. Nelson C.M., Chen C.S. Cell-cell signaling by direct contact increases cell proliferation via a PI3K-dependent signal. *FEBS Letters*, 514: 238-42 (2002).
- 2\*\*\*. Tien J., Nelson C.M., Chen C.S. Fabrication of aligned microstructures with a single elastomeric stamp. *Proc. Natl. Acad. Sci. USA*, 99: 1758-62 (2002).
- 1\*\*\*. Asthagiri A.R., Nelson C.M., Horwitz A.F., Lauffenburger D.A. Quantitative relationship among integrin-ligand binding, adhesion, and signaling via focal adhesion kinase and extracellular-signal regulated kinase 2. *J. Biol. Chem.*, 274: 27119-27 (1999).

### **Invited Presentations (selected Keynote, Plenary, and Named talks, out of 219 total presentations)**

210. A trip to the zoo: lessons for tissue engineers. Area 15d/e Plenary award talk, American Institute of Chemical Engineers (AIChE) Annual Meeting, Orlando, FL, 2023.
193. Uncovering the mechanical forces that sculpt tissue form. Van C. Mow Lecture, Department of Biomedical Engineering, Columbia University, 2022.
189. What can transcriptomics teach us about mechanobiology? Plenary speaker, World Congress on Biomechanics, Taipei, Taiwan, 2022.
164. Mechanical forces and epithelial folding. Plenary speaker, Summer Biomechanics, Bioengineering, and Biotransport Conference (SB3C), Virtual Meeting, 2021.
162. Uncoupling tissue morphogenesis and differentiation. Distinguished speaker, Stem Cells in Regenerative Medicine (SCiRM) 5th Stem Cell Virtual Symposium, SUNY Buffalo, 2021.
158. Lessons in tissue engineering from evolution. Distinguished Lecture in Biomedical Engineering, Worcester Polytechnic Institute, 2021.
149. Lessons from evolution: how to build a lung. Keynote talk, Cell biology, development, and stem cells program virtual retreat, University of Colorado, Anschutz Medical Campus, 2020.
144. Mechanical regulation of airway morphogenesis. Distinguished lecture, Cell and Developmental Biology seminar series, National Heart, Lung and Blood Institute, NIH, 2020.
141. Mechanics, morphogenesis, and tissue origami, Mid-Career Award Lecture, BMES Annual Meeting, Philadelphia, PA, 2019.
136. Mechanical forces and epithelial morphogenesis. Keynote Session, Developmental Biology Gordon Research Conference, Mt. Holyoke College, MA, 2019.
129. Mechanics, midbodies, and EMT. Keynote Session, Physical Science of Cancer Gordon Research Conference, Galveston, TX, 2019.
124. Mechanical forces in epithelial morphogenesis. Presidential Keynote Symposium, Society for Developmental Biology (SDB) Annual Meeting, Portland, OR, 2018.
120. Establishing complex tissue architecture by integrating mechanical and chemical cues. Keynote, Mammary Gland Biology Gordon Research Conference, Tuscany Il Ciocco, Italy, 2018.



119. Keynote, Young Women's Conference on STEM, Princeton Plasma Physics Laboratory, 2018.
113. Building tissue complexity: lessons from the tree of life. EBICS Distinguished Lecture, GA Tech, 2017.
112. Engineering tissues: inspiration from evolution. Keynote Speaker, Annual McNulty Seminar, Saint Joseph's University, Philadelphia, PA, 2017.
109. The revolution in bioengineering IdeasLab. Annual Meeting of the New Champions, World Economic Forum, Dalian, China, 2017.
98. Interstitial fluid pressure, matrix compliance, and tumor phenotype. Plenary talk, AACR Special Conference on Engineering and Physical Sciences in Oncology, Boston, MA, 2016.
85. Physical forces and development of the lung. Plenary speaker, 41st Northeast Bioengineering Conference (NEBEC), Rensselaer Polytechnic Institute, 2015.
63. Role of biomechanics in tissue growth. Presidential Symposium (Opening Keynote Session), International Congress of Developmental Biology, Cancun, Mexico, 2013.
60. Epithelial origami: Folding native and engineered tissues. 2013 E. Llewellyn-Thomas Distinguished Lecture, University of Toronto, 2013.
59. Microscale tissues: Tissue engineering meets developmental biology, Keynote presentation, 7th International Conference on Microtechnologies and Biology, Marina del Rey, CA, 2013.

### Selected University Service

2022-present	Executive Committee, Princeton Writing Program
2021-present	Chair, Chemical & Biological Engineering Awards Committee
2020-present	Institutional Biosafety Committee (IBC)
2016-17	Co-chair, Faculty retreat on the future of bioengineering
2016-17	Chair, Bioengineering working group
2014-present	Director, Undergraduate Certificate Program in Engineering Biology (bioengineering minor)
2014-17	Director of Graduate Studies, Chemical & Biological Engineering
2013-present	Director, Graduate Certificate Program in Bioengineering
2007-17	Chemical & Biological Engineering Graduate Affairs/Admissions Committee (Chair, 2014-17)

### Courses Taught

*Instructor:* Fundamentals of Bioengineering (4 times, ave. rating 4.5/5); Quantitative Physiology (4 times, ave. rating 4.3/5); Physical Basis of Human Disease (6 times, ave. rating 4.5/5); Mass, Momentum, and Energy Transport (4 times, ave. rating 4.6/5); Chemical Reaction Engineering (3 times, ave. rating 4.1/5)

*Co-instructor:* Quantitative Principles in Cell and Molecular Biology (5 times, ave. rating 3.9/5)

### Trainees Mentored

*Postdoctoral fellows (current position indicated)*

Esther W. Gomez (2008-10)	Associate Professor, Chemical and Biomolecular Engineering, Penn State
KangAe Lee (2009-12)	Current position unknown
Hye Young Kim (2011-13)	Young Scientist Fellow, KAIST
Wenting Zhu (2011-13)	Adjunct Faculty, Biology, The College of New Jersey
Jason P. Gleghorn (2010-14)	Associate Professor, Biomedical Engineering, University of Delaware
Victor D. Varner (2012-15)	Associate Professor, Bioengineering, University of Texas, Dallas
Adam Navis (2014-15)	Senior Manager, Taconic Biosciences
Mei-Fong Pang (2013-18)	Scientist, Insmad, Inc.
James W. Spurlin (2015-20)	Project Manager, Avance Biosciences
Andreas Kourouklis (2017-19)	Project Leader, ETH Zurich, Switzerland
A. Sundararishnan (2018-20)	Assistant professor, Biomedical Engineering, Univ. of Wisconsin, Eau Claire
Nihan Kilinc (2018-21)	Postdoctoral fellow, Griffith Laboratory, MIT
Sandra B. Lemke (2019-21)	Zeiss Microscopy
Susan E. Leggett (2019-22)	Assistant Professor, Bioengineering, University of Illinois, Urbana-Champaign
Maryam Kohram (2021-now)	CPBF Postdoctoral fellow

Bezia Lemma (2021-now)	NSF Postdoctoral fellow (with Andrej Kosmrlj)
C. Trenado Yuste (2021-now)	Damon Runyon Postdoctoral fellow (with Sujit Datta and Ned Wingreen)
Samhita Banavar (2022-now)	LSRF Postdoctoral fellow
Eric Fowler (2022-now)	Postdoctoral associate
Pengfei Zhang (2022-now)	PBI2 Postdoctoral fellow (with Michelle Chan)
Aaron Griffing (2022-now)	NSF Postdoctoral fellow (with Ricardo Mallarino)
Chan Jin Park (2023-now)	Postdoctoral associate
Bridget Waas (2023-now)	Postdoctoral associate
Kim Dao (2024-now)	Postdoctoral associate

*Ph.D. students (current position indicated)*

Nikolce Gjorevski (2008-12)	Group Leader, Organoid Engineering, Roche Institute for Translational BioE
Qike K. Chen (2008-13)	Associate Vice President, Fortitude Re
Sriram Manivannan (2009-13)	Vice President, Product Development, Vorbeck Materials
Eline Boghaert (2009-14)	Associate Chair and Lecturer, Chemical Engineering, University of Waterloo,
A. Piotrowski (2012-16)	Assistant Professor, Biomedical Engineering, University of Michigan
Michael Siedlik (2013-18)	Senior Scientist, InfiniFluidics
Allison Simi (2013-18)	Medical Science Liaison, Janssen Oncology Medical Affairs
Siyang Han (2014-19)	Senior Manager, BeiGene
Alişya Anlaş (2015-20)	Postdoctoral fellow, Discher Laboratory, University of Pennsylvania
Brian Silver (2016-20)	Postdoctoral fellow, Tokar Laboratory, NIH
Bryan Nerger (2016-21)	Postdoctoral fellow, Mooney Laboratory, Harvard University
Jacob Jaslove (2016-21)	Resident, Medicine, NYU
Michael Palmer (2017-21)	Postdoctoral fellow, Gillis Laboratory, Marine Biological Laboratory
Emann Rabie (2018-21)	Resident, Interventional Radiology, University of Pennsylvania
Katharine Goodwin (2017-22)	Postdoctoral fellow, McDole Laboratory, MRC-LMB
Sarah Paramore (2018-22)	Postdoctoral fellow, Prince Laboratory, University of Chicago
Payam Farahani (2018-23)	Scientist, InduPro
Molly Brennan (2019-23)	Scientist, Oddity Labs
E. Navarro Salazar (2021-now)	Ph.D. student, chemical engineering
Niles Huang (2023-now)	Ph.D. student, quantitative and computational biology

*Plus:* 57 senior thesis students, 21 rotation students, 35 non-thesis undergraduate researchers, 19 high school students, 32 Ph.D. thesis committees as non-advisor

**Current Research Support**

<i>National Institutes of Health</i>	R01 HD099030 (PI: Nelson)	08/15/2019 – 06/30/2025
Mechanical forces and the regulation of airway progenitor cells		\$1,690,995
<i>National Science Foundation</i>	2134935 (PI: Nelson)	12/01/2021 – 11/30/2025
RECODE: Using light and mechanics to monitor and control the differentiation of lung alveolar organoids		\$1,500,000
<i>Princeton Ludwig Branch</i>	TBD (PI: Nelson)	07/31/2021 – 12/31/2024
Bespoke microfluidic systems to test the effects of diet on tumor cell behavior		\$300,000
<i>National Institutes of Health</i>	R01 HL164861 (PI: Nelson)	01/01/2022 – 12/31/2025
Interplay between mechanical forces and retinoic acid in lung development		\$2,161,018
<i>National Institutes of Health</i>	DP1 HD111539 (PI: Nelson)	09/16/2022 – 08/31/2027
Mechanical clocks during fetal development		\$5,670,000