

## CURRICULUM VITAE: Joe Y. Tien

Boston University  
Department of Biomedical Engineering  
44 Cummington Street  
Boston, MA 02215  
(617) 358-3055  
jtien@bu.edu

Born August 1, 1976, in Boston, MA

### Education and Training

- 2008-2009     *Princeton University, Department of Chemical Engineering*  
Visiting fellow (with Celeste M. Nelson)
- 1999-2001     *Johns Hopkins School of Medicine, Department of Biomedical Engineering*  
Postdoctoral fellow (with Christopher S. Chen)
- 1993-1999     *Harvard University*  
Ph.D., Physics (with George M. Whitesides)  
A.M., Physics (1995)
- 1990-1993     *University of California, Irvine*  
B.S., Physics, *summa cum laude* (with Gordon L. Shaw)  
B.S., Mathematics, *summa cum laude*

### Professional Positions

- 2002-present     *Boston University*  
Member, Program in Materials Science and Engineering (2008-present)  
Associate Professor of Biomedical Engineering (tenured) (2008-present)  
Member, Program in Molecular Biology, Cell Biology, and Biochemistry (2003-present)  
Assistant Professor of Biomedical Engineering (2002-2008)

### Honors and Awards

NIH/NIBIB Edward C. Nagy New Investigator Award (2006), Boston University Provost's Innovation Award (2002-2003), NIH/NHLBI National Research Service Award (2001-2002), Johns Hopkins University Distinguished Postdoctoral Fellow (1999-2001), NSF Fellow (1993-1996), Sigma Xi (1993), UC Irvine Herbert H. Chen Award (1992), Barry Goldwater Fellow (1991-1993), UC Irvine Campuswide Honors Program (1990-1993), UC Regents Scholar (1990-1993), National Merit Scholar (1990), Tandy Technology Scholar (1990)

### Research Focus

Vascularization of biomaterials; quantitative physiology of engineered tissues; biomaterials for microsurgical applications; lymphatics and interstitial transport

**Publications**

42. Leung, A.D., Wong, K.H.K. & Tien, J., Plasma expanders stabilize human microvessels in microfluidic scaffolds. *J. Biomed. Mater. Res. A*, in press.
41. Wong, K.H.K., Chan, J.M., Kamm, R.D. & Tien, J., Microfluidic models of vascular functions. *Annu. Rev. Biomed. Eng.*, in press.
40. Tien, J., Wong, K.H.K. & Truslow, J.G. Vascularization of microfluidic hydrogels. in *Microfluidic Cell Culture Systems* (eds. Bettinger, C.J., Borenstein, J.T. & Tao, S.L.), in press (Elsevier).
39. Truslow, J.G. & Tien, J., Perfusion systems that minimize vascular volume fraction in engineered tissues. *Biomicrofluidics* **2011**, *5*, 022201.
38. Price, G.M. & Tien, J. Methods for forming human microvascular tubes in vitro and measuring their macromolecular permeability. in *Biological Microarrays (Methods in Molecular Biology, vol. 671)* (eds. Khademhosseini, A., Suh, K.-Y. & Zourob, M.), pp. 281-293 (Humana Press, Totowa, NJ, 2011).
37. Price, G.M., Wong, K.H.K., Truslow, J.G., Leung, A.D., Acharya, C. & Tien, J., Effect of mechanical factors on the function of engineered human blood microvessels in microfluidic collagen gels. *Biomaterials* **2010**, *31*, 6182-6189.
36. Wong, K.H.K., Truslow, J.G. & Tien, J., The role of cyclic AMP in normalizing the function of engineered human blood microvessels in microfluidic collagen gels. *Biomaterials* **2010**, *31*, 4706-4714.
35. Truslow, J.G., Price, G.M. & Tien, J., Computational design of drainage systems for vascularized scaffolds. *Biomaterials* **2009**, *30*, 4435-4443.
34. Price, G.M. & Tien, J. Subtractive methods for forming microfluidic gels of extracellular matrix proteins. in *Microdevices in Biology and Engineering* (eds. Bhatia, S.N. & Nahmias, Y.), pp. 235-248 (Artech House, Boston, MA, 2009).
33. Price, G.M., Chu, K.K., Truslow, J.G., Tang-Schomer, M.D., Golden, A.P., Mertz, J. & Tien, J., Bonding of macromolecular hydrogels using perturbants. *J. Am. Chem. Soc.* **2008**, *130*, 6664-6665.
32. Price, G.M., Chrobak, K.M. & Tien, J., Effect of cyclic AMP on barrier function of human lymphatic microvascular tubes. *Microvasc. Res.* **2008**, *76*, 46-51.
31. Golden, A.P. & Tien, J., Fabrication of microfluidic hydrogels using molded gelatin as a sacrificial element. *Lab Chip* **2007**, *7*, 720-725.
30. Nelson, C.M. & Tien, J., Microstructured extracellular matrices in tissue engineering and development. *Curr. Opin. Biotechnol.* **2006**, *17*, 518-523.
29. Chrobak, K.M., Potter, D.R. & Tien, J., Formation of perfused, functional microvascular tubes in vitro. *Microvasc. Res.* **2006**, *71*, 185-196.
28. Tien, J., Golden, A.P. & Tang, M.D. Engineering of blood vessels. in *Microvascular Research: Biology and Pathology*, Vol. 2 (eds. Shepro, D. & D'Amore, P.A.), pp. 1087-1093 (Elsevier Academic Press, San Diego, CA, 2006).

27. Tang, M.D., Golden, A.P. & Tien, J., Fabrication of collagen gels that contain patterned, micrometer-scale cavities. *Adv. Mater.* **2004**, *16*, 1345-1348.
26. Gray, D.S., Tien, J. & Chen, C.S., High conductivity elastomeric electronics. *Adv. Mater.* **2004**, *16*, 393-397.
25. Chen, C.S., Tan, J.L. & Tien, J., Mechanotransduction at cell-matrix and cell-cell contacts. *Annu. Rev. Biomed. Eng.* **2004**, *6*, 275-302.
24. Tang, M.D., Golden, A.P. & Tien, J., Molding of three-dimensional microstructures of gels. *J. Am. Chem. Soc.* **2003**, *125*, 12988-12989.
23. Gray, D.S., Tien, J. & Chen, C.S., Repositioning of cells by mechanotaxis on surfaces with micropatterned Young's modulus. *J. Biomed. Mater. Res.* **2003**, *66A*, 605-614.
22. Tan, J.L., Tien, J., Pirone, D.M., Gray, D.S., Bhadriraju, K. & Chen, C.S., Cells lying on a bed of microneedles: an approach to isolate mechanical force. *Proc. Natl. Acad. Sci. USA* **2003**, *100*, 1484-1489.
21. Clark, T.D., Ferigno, R., Tien, J., Paul, K.E. & Whitesides, G.M., Template-directed self-assembly of 10- $\mu$ m-sized hexagonal plates. *J. Am. Chem. Soc.* **2002**, *124*, 5419-5426.
20. Tien, J., Nelson, C.M. & Chen, C.S., Fabrication of aligned microstructures with a single elastomeric stamp. *Proc. Natl. Acad. Sci. USA* **2002**, *99*, 1758-1762.
19. Tien, J. & Chen, C.S., Patterning the cellular microenvironment. *IEEE Eng. Med. Biol.* **2002**, *21*, 95-98.
18. Tan, J.L., Tien, J. & Chen, C.S., Microcontact printing of proteins on mixed self-assembled monolayers. *Langmuir* **2002**, *18*, 519-523.
17. Tien, J. & Chen, C.S. Microarrays of cells. in *Methods of Tissue Engineering* (eds. Atala, A. & Lanza, R.), pp. 113-120 (Academic Press, San Diego, CA, 2001).
16. Bowden, N., Tien, J., Huck, W.T.S. & Whitesides, G.M. Mesoscale self-assembly: the assembly of micron- and millimeter-sized objects using capillary forces. in *Supramolecular Organization and Materials Design* (eds. Jones, W. & Rao, C.N.R.), pp. 103-145 (Cambridge University Press, New York, NY, 2001).
15. Clark, T.D., Tien, J., Duffy, D.C., Paul, K.E. & Whitesides, G.M., Self-assembly of 10- $\mu$ m-sized objects into ordered three-dimensional arrays. *J. Am. Chem. Soc.* **2001**, *123*, 7677-7682.
14. Gracias, D.H., Tien, J., Breen, T.L., Hsu, C. & Whitesides, G.M., Forming electrical networks in three dimensions by self-assembly. *Science* **2000**, *289*, 1170-1172.
13. Dike, L.E., Chen, C.S., Mrksich, M., Tien, J., Whitesides, G.M. & Ingber, D.E., Geometric control of switching between growth, apoptosis, and differentiation during angiogenesis using micropatterned substrates. *In Vitro Cell. Dev. Biol. Anim.* **1999**, *35*, 441-448.
12. Deng, T., Tien, J., Xu, B. & Whitesides, G.M., Using patterns in microfiche as photomasks in 10- $\mu$ m-scale microfabrication. *Langmuir* **1999**, *15*, 6575-6581.
11. Breen, T.L., Tien, J., Oliver, S.R.J., Hadzic, T. & Whitesides, G.M., Design and self-assembly of open, regular, 3D mesostructures. *Science* **1999**, *284*, 948-951.

10. Lahiri, J., Isaacs, L., Tien, J. & Whitesides, G.M., A strategy for the generation of surfaces presenting ligands for studies of binding based on an active ester as a common reactive intermediate. *Anal. Chem.* **1999**, *71*, 777-790.
9. Tien, J., Breen, T.L. & Whitesides, G.M., Crystallization of millimeter-scale objects with use of capillary forces. *J. Am. Chem. Soc.* **1998**, *120*, 12670-12671.
8. Huck, W.T.S., Tien, J. & Whitesides, G.M., Three-dimensional mesoscale self-assembly. *J. Am. Chem. Soc.* **1998**, *120*, 8267-8268.
7. Marzolin, C., Terfort, A., Tien, J. & Whitesides, G.M., Patterning of a polysiloxane precursor to silicate glasses by microcontact printing. *Thin Solid Films* **1998**, *315*, 9-12.
6. Tien, J., Xia, Y. & Whitesides, G.M. Microcontact printing of SAMs. in *Self-Assembled Monolayers of Thiols*, Vol. 24 (ed. Ulman, A.), pp. 227-250 (Academic Press, San Diego, CA, 1998).
5. Xia, Y., Venkateswaran, N., Qin, D., Tien, J. & Whitesides, G.M., Use of electroless silver as the substrate in microcontact printing of alkanethiols and its application in microfabrication. *Langmuir* **1998**, *14*, 363-371.
4. Mrksich, M., Dike, L.E., Tien, J., Ingber, D.E. & Whitesides, G.M., Using microcontact printing to pattern the attachment of mammalian cells to self-assembled monolayers of alkanethiolates on transparent films of gold and silver. *Exp. Cell Res.* **1997**, *235*, 305-313.
3. Tien, J., Terfort, A. & Whitesides, G.M., Microfabrication through electrostatic self-assembly. *Langmuir* **1997**, *13*, 5349-5355.
2. Xia, Y., Tien, J., Qin, D. & Whitesides, G.M., Non-photolithographic methods for fabrication of elastomeric stamps for use in microcontact printing. *Langmuir* **1996**, *12*, 4033-4038.
1. Shaw, G.L. & Tien, J., Energy levels of quark atoms. *Phys. Rev. D* **1993**, *47*, 5075-5078.

**Total number of citations:** 3476

**Hirsch index:** 23

## **Seminars and Papers Presented**

### ***I. Invited Seminars***

37. “Physical principles that govern vascularization of scaffolds”  
Brigham & Women's Hospital, Department of Pathology, Vascular Research Division (Boston, MA, 2012)
36. “Functional vascularization of microfluidic scaffolds”  
New Jersey Institute of Technology, Department of Biomedical Engineering (Newark, NJ; 2011)
35. “Scaffolds and mechanics as mediators of angiogenesis”  
13<sup>th</sup> Annual Boston Angiogenesis Meeting (Cambridge, MA; 2011)
34. “Functional vascularization of microfluidic scaffolds”  
33<sup>rd</sup> Annual International Conference of the Engineering in Medicine and Biology Society (Boston, MA; 2011)
33. “Engineering functional human microvessels in vitro”  
Gordon Research Conference on Signal Transduction by Engineered Extracellular Matrices (Biddeford, ME; 2010)
32. “Engineering functional human microvessels in vitro”  
Rensselaer Polytechnic Institute, Department of Biomedical Engineering (Troy, NY; 2010)
31. “Engineering functional human microvessels in vitro”  
Princeton University, Department of Chemical Engineering (Princeton, NJ; 2009)
30. “Engineering functional human microvessels in vitro”  
Harvard University, School of Engineering and Applied Sciences (Cambridge, MA; 2009)
29. “Vascularization of microfluidic type I collagen gels”  
Tissue Engineering and Regenerative Medicine International Society 2008 Annual Conference (San Diego, CA; 2008)
28. “Engineering functional human microvessels in vitro”  
University at Buffalo, Department of Chemical and Biological Engineering (Buffalo, NY; 2008)
27. “Microfluidic gels for microvascular tissue engineering”  
Center for Integration of Medicine and Innovative Technology (CIMIT) Summer Education Series (Boston, MA; 2008)
26. “Microfluidic gels for microvascular tissue engineering”  
Rutgers University, Department of Chemistry and Chemical Biology (New Brunswick, NJ; 2008)
25. “Engineering functional human microvessels in vitro”  
University of Virginia, Department of Biomedical Engineering (Charlottesville, VA; 2008)
24. “Engineering functional human microvessels in vitro”  
University of California, Irvine, Department of Biomedical Engineering (Irvine, CA; 2008)

23. "Engineering functional human microvessels in vitro"  
City College of New York, Department of Biomedical Engineering (New York, NY; 2008)
22. "Engineering functional human microvessels in vitro"  
Harvard Medical School and Massachusetts General Hospital, Center for Engineering in Medicine (Boston, MA; 2008)
21. "Engineering functional human microvessels in vitro"  
Rutgers University, Department of Biomedical Engineering (New Brunswick, NJ; 2008)
20. "Microstructured gels for microvascular tissue engineering"  
University of Massachusetts, Lowell, Center for Nanomanufacturing Research (Lowell, MA; 2008)
19. "Engineering functional microvessels in vitro"  
Biomedical Engineering Society 2007 Annual Meeting, Session on "Vascular Tissue Engineering" (Los Angeles, CA; 2007)
18. "Experiences of young investigators at the interface of life and physical sciences" (Nagy Awardees Panel)  
National Institutes of Health/National Institute of Biomedical Imaging and Bioengineering 5<sup>th</sup> Anniversary Symposium (Bethesda, MD; 2007)
17. "Microstructured gels for microvascular tissue engineering"  
University of Washington, Center for Nanotechnology (Seattle, WA; 2007)
16. "Engineering functional microvessels in vitro"  
Experimental Biology 2007 Annual Meeting, Symposium on "Engineering Vascular Cell Function using Nanoscale Cues" (Washington, DC; 2007)
15. "Engineering functional microvessels in vitro"  
Yale University School of Medicine, Program in Vascular Biology and Transplantation (New Haven, CT; 2007)
14. "Engineering functional microvessels in vitro"  
University of Virginia, Department of Biomedical Engineering (Charlottesville, VA; 2007)
13. "Engineering functional microvessels in vitro"  
University of Pennsylvania, Department of Bioengineering (Philadelphia, PA; 2006)
12. "Microstructured gels for microvascular tissue engineering"  
Roger Williams Medical Center, Department of Dermatology & Skin Surgery (Providence, RI; 2006)
11. "Engineering functional microvessels in vitro"  
28<sup>th</sup> Annual International Conference of the Engineering in Medicine and Biology Society (New York, NY; 2006)
10. "Engineering functional microvessels in vitro"  
Gordon Research Conference on Endothelial Cell Phenotypes in Health and Disease (Biddeford, ME; 2006)

9. “Microvascular tissue engineering”  
Louisiana Tech University, Biomedical Engineering Program (Shreveport, LA; 2006)
8. “Microvascular tissue engineering”  
Center for Integration of Medicine and Innovative Technology (CIMIT) Forum (Boston, MA; 2006)
7. “3D gels for microvascular tissue engineering”  
University of Windsor, Department of Chemistry (Windsor, ON; 2006)
6. “In vitro synthesis of a microvascular network”  
National Institutes of Health/National Institute of Biomedical Imaging and Bioengineering Grantees Meeting (Bethesda, MD; 2005)
5. Boston University Medical Center, Pulmonary Section (Boston, MA; 2004)
4. Boston University Medical Center, Rheumatology Section (Boston, MA; 2004)
3. “In vitro synthesis of a microvascular network”  
National Institutes of Health/National Institute of Biomedical Imaging and Bioengineering Grantees Meeting (Bethesda, MD; 2004)
2. Harvard Medical School and Massachusetts General Hospital, Center for Engineering in Medicine (Boston, MA; 2002)
1. Boston University, Department of Chemistry (Boston, MA; 2002)

## ***II. Presentations and Abstracts***

23. “Polymers stabilize engineered human microvessels in vitro” [poster]  
Biomedical Engineering Society 2011 Annual Meeting (Hartford, CT; 2011)
22. “Drainage of vascularized microfluidic fibrin scaffolds” [poster; presented by K.H.K. Wong]  
Biomedical Engineering Society 2011 Annual Meeting (Hartford, CT; 2011)
21. “A microfluidic device to control interstitial pressures within engineered tumors” [poster]  
Biomedical Engineering Society 2011 Annual Meeting (Hartford, CT; 2011)
20. “Computational design of perfusion systems for engineered tissues” [talk]  
Biomedical Engineering Society 2011 Annual Meeting (Hartford, CT; 2011)
19. “Effect of interstitial pressure on epithelial invasion from human mammary ducts” [poster]  
Department of Defense Breast Cancer Research Program, Era of Hope 2011 Conference (Orlando, FL; 2011)
18. “Dextran stabilizes engineered human microvessels in vitro” [poster; presented by A.D. Leung]  
Biomedical Engineering Society 2010 Annual Meeting (Austin, TX; 2010)
17. “Normalization of microvascular physiology by cyclic AMP in engineered human blood

- microvessels” [poster; presented by K.H.K. Wong]  
Biomedical Engineering Society 2010 Annual Meeting (Austin, TX; 2010)
16. “Engineering functional human microvessels in vitro” [poster]  
Biomedical Engineering Society 2010 Annual Meeting (Austin, TX; 2010)
  15. “Cyclic AMP normalizes the physiology of engineered human blood microvessels in microfluidic collagen gels” [poster; presented by K.H.K. Wong]  
Gordon Research Conference on Signal Transduction by Engineered Extracellular Matrices (Biddeford, ME; 2010)
  14. “Effect of the mechanical microenvironment on the physiology of engineered human microvascular tubes” [poster; presented by G.M. Price]  
Biomedical Engineering Society 2009 Annual Meeting (Pittsburgh, PA; 2009)
  13. “Cyclic AMP restores microvascular functions of engineered human blood microvessels” [poster; presented by K.H.K. Wong]  
Biomedical Engineering Society 2009 Annual Meeting (Pittsburgh, PA; 2009)
  12. “Design of drainage systems for vascularized scaffolds” [poster]  
Biomedical Engineering Society 2009 Annual Meeting (Pittsburgh, PA; 2009)
  11. “Vascular designs that maintain transmural pressure” [poster; presented by J.G. Truslow]  
Biomedical Engineering Society 2008 Annual Meeting (St. Louis, MO; 2008)
  10. “Effect of cyclic AMP on the physiology of engineered human lymphatic microvascular tubes” [poster; presented by G.M. Price]  
Biomedical Engineering Society 2008 Annual Meeting (St. Louis, MO; 2008)
  9. “Microfluidic hydrogels for microvascular tissue engineering” [poster]  
Biomedical Engineering Society 2008 Annual Meeting (St. Louis, MO; 2008)
  8. “Effect of cyclic AMP on the barrier function of engineered human lymphatic microvascular tubes” [poster; presented by G.M. Price]  
Gordon Research Conference on Endothelial Cell Phenotypes in Health and Disease (Biddeford, ME; 2008)
  7. “Barrier function of engineered microvessels in vitro” [poster]  
8<sup>th</sup> World Congress for Microcirculation (Milwaukee, WI; 2007)
  6. “Effect of microenvironment on engineered microvessels” [poster; presented by G.M. Price]  
Biomedical Engineering Society 2006 Annual Meeting (Chicago, IL; 2006)
  5. “Engineering functional microvascular tissue in vitro” [talk; presented by K.M. Chrobak]  
Biomedical Engineering Society 2006 Annual Meeting (Chicago, IL; 2006)
  4. “Using fluorescent micro-particle image velocimetry to interrogate the surface glycocalyx on cultured endothelial cells in collagen microchannels” [poster; presented by E.R. Damiano]  
Experimental Biology 2006 Meeting (San Francisco, CA; 2006)
  3. “In vitro synthesis of a microvascular network” [talk]

Biomedical Engineering Society 2005 Annual Meeting (Baltimore, MD; 2005)

2. “Methods for the fabrication of microstructured gels” [poster; presented by M.D. Tang]  
Biomedical Engineering Society 2004 Annual Meeting (Philadelphia, PA; 2004)
1. “Use of microfabrication and self-assembly in tissue engineering” [abstract]  
Whitaker Foundation Biomedical Engineering Research Conference (La Jolla, CA; 2004)

**Research Trainees*****I. Postdoctoral***

|                                 |   |
|---------------------------------|---|
| James Truslow<br>(2011-present) | Research area: Computational modeling of vascularized scaffolds |
| Chitragada Acharya<br>(2010)    | Research area: Physiology of engineered lymphatic vessels       |

***II. Post-baccalaureate***

|                                   |  |
|-----------------------------------|--|
| Alexander Leung<br>(2011-present) | M.D. (expected)  |
| Kelvin Chan<br>(2011-present)     | M.S., biomedical engineering (expected, 2012)  |
| Keith Wong<br>(2007-present)      | Ph.D., biomedical engineering (expected, 2012)   |
| James Truslow<br>(2006-2011)      | Ph.D., biomedical engineering (2011)<br>Thesis: "Design and analysis of engineered microvasculature via computational methods"<br>M.S., biomedical engineering (2008)<br>Thesis: "Drainage systems that maintain transmural pressure in engineered microvascular tissue" |
| Gavielle Price<br>(2004-2009)     | Ph.D., biomedical engineering (2010)<br>Thesis: "Mechanical and chemical control of barrier in engineered microvessels"  |
| Andrew Golden<br>(2002-2008)      | Ph.D., biomedical engineering (2008)<br>Thesis: "Microfluidic hydrogels for microvascular tissue engineering"  |
| Kenneth Chrobak<br>(2003-2007)    | Ph.D., biomedical engineering (2007)<br>Thesis: "Formation of perfused microvessels in vitro, and their use as models of barrier function"   |
| Min Tang<br>(2002-2005)           | Ph.D., biomedical engineering (2006)<br>Thesis: "In vitro engineering of a microvascular network"  |

***III. Undergraduate***

Rebecca Thompson (2012-present)  
 Aimal Khankhel (2011-present)  
 Jason Pui (2011-present)  
 Alexander Leung (2009-2011)  
 Stephanie Steichen (2008)  
 Kim Waller (2007-2008)

Russell Condie (2006; University of Utah)  
Hillary Eggert (2004; Carthage College)  
Caitlyn McCullough (2003; RPI)  
Wajd Al-Holou (2002; University of Detroit Mercy)  
Brandon Markway (2002; University of Missouri, Columbia)