

BIOGRAPHICAL SKETCH

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NAME Venugopalan, Vasan		POSITION TITLE Associate Professor of Chemical Engineering, Biomedical Engineering, and Surgery	
eRA COMMONS USER NAME vasannah			
EDUCATION/TRAINING (Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)			
INSTITUTION AND LOCATION	DEGREE (if applicable)	YEAR(s)	FIELD OF STUDY
University of California, Berkeley, CA	B.S.	1988	Mechanical Engineering
M.I.T., Cambridge, MA	S.M., Sc.D.	1990, 1994	Mechanical Engineering
Harvard Medical School, Boston, MA		1994-1995	Biomedical Optics
Princeton University, Princeton, NJ		1995-1996	Biophysics
University of California, Irvine, CA		1996-1998	Biomedical Optics

A. Positions and Honors**Positions and Employment**

- 7/05–present: Associate Professor, Departments of Chemical Engineering & Materials Science, Biomedical Engineering, and Surgery (Beckman Laser Institute), University of California, Irvine, Irvine, CA
- 7/00–6/05: Assistant Professor, Department of Biomedical Engineering, University of California, Irvine, Irvine, CA
- 7/99–6/05: Assistant Professor, Department of Chemical Engineering & Materials Science, University of California, Irvine, Irvine, CA
- 7/98–6/05: Assistant Professor, Department of Surgery (Beckman Laser Institute), University of California, Irvine, Irvine, CA

Professional Memberships

- 1993–present: Member, American Association for the Advancement of Science
- 1993–present: Member, The American Society of Mechanical Engineers
- 1996–present: Member, SPIE, The International Society for Optical Engineering
- 1997–present: Member, The Optical Society of America

Honors

- 1990: Sigma Xi Honor Society
- 1991, 1992: American Society for Laser Medicine and Surgery Research Fellowship
- 1996-1998: Whitaker Foundation Postdoctoral Fellow
- 2001: Chancellor's Award for Excellence in Fostering Undergraduate Research, University of California, Irvine

B. Peer-reviewed publications (in chronological order).

- Venugopalan, V**, N. S. Nishioka, B. B. Mikić. Effect of CO₂ pulse repetition rate on mass removal and thermal damage in biological tissue. *IEEE Trans. Biomed. Eng.* **38**(10):1049-1052, (1991).
- Ren, Q., **V. Venugopalan**, K. Schomacker, T. F. Deutsch, T. J. Flotte, C. A. Puliafito, and R. Birngruber. Mid-infrared laser ablation of the cornea: A comparative study and its application. *Lasers Surg. Med.*, **12**(3):274-281, (1992).

3. Zweig, A. D., **V. Venugopalan**, and T. F. Deutsch. Stress transients generated by excimer-laser irradiation of polyimide. In *Laser Ablation in Materials Processing: Fundamentals and Application*, B. Braren, J. J. Dubowski, and D. P. Norton, editors, Materials Research Society, **285**:69-74, (1993).
4. Zweig, A. D., **V. Venugopalan**, and T. F. Deutsch. Stress generated in polyimide by excimer-laser irradiation. *J. Appl. Phys.*, **74**(6):4181-4189, (1993).
5. **Venugopalan, V.**, N. S. Nishioka, and B. B. Mikić. The effect of laser parameters on the zone of thermal injury produced by laser ablation of biological tissue. *ASME J. Biomech. Eng.*, **116**(1):62-70, (1994).
6. Dierickx, C. C., J. M. Casparian, **V. Venugopalan**, W. A. Farinelli, and R. R. Anderson. Thermal relaxation of port-wine stain vessels probed in vivo: the need for 1-10 millisecond laser pulse treatment. *J. Invest. Dermatol.*, **105**(5):709-714, (1995).
7. **Venugopalan, V.**, N. S. Nishioka, and B. B. Mikić. The thermodynamic response of soft biological tissues to pulsed ultraviolet-laser irradiation. *Biophys. J.*, **69**(4):1259-1271, (1995).
8. Doukas, A. G., D. J. McAuliffe, S. Lee, **V. Venugopalan**, and T. J. Flotte. Physical factors involved in stress-wave-induced cell injury: the effect of stress gradient. *Ultrasound Med. Biol.*, **21**(7):961-967, (1995).
9. Lewandrowski, K-U., **V. Venugopalan**, W. W. Tomford, K. T. Schomacker, N. A. Michaud, T. J. Flotte, H. J. Mankin, and T. F. Deutsch. Kinetics of cortical bone demineralization. *J. Biomed. Mat. Res.*, **31**(3):365-372, (1996).
10. **Venugopalan, V.**, N. S. Nishioka, and B. B. Mikić. Thermodynamic response of soft biological tissues to pulsed infrared laser irradiation. *Biophys. J.*, **70**(6): 2983-2996, (1996).
11. Tromberg, B. J., O. Coquoz, J. B. Fishkin, T. Pham, E. R. Anderson, J. Butler, M. Cahn, J. D. Gross, **V. Venugopalan**, and D. Pham. Non-invasive measurements of breast tissue optical properties using frequency-domain photon migration. *Philos. Trans. R. Soc. London Ser. B*, **352**:661-668, (1997).
12. Payne, B. P., N. S. Nishioka, B. B. Mikić, and **V. Venugopalan**. Comparison of pulsed CO₂ laser ablation at 10.6 μm and 9.5 μm . *Lasers Surg. Med.*, **23**(1):1-6, (1998).
13. **Venugopalan, V.**, J. S. You, and B. J. Tromberg. Radiative transport in the diffusion approximation: An extension for highly absorbing media and small source detector separations. *Phys. Rev. E*, **58**(2):2395-2407, (1998).
14. Yablon, A. D., N. S. Nishioka, B. B. Mikić, and **V. Venugopalan**. Measurement of tissue absorption coefficients by use of interferometric photothermal spectroscopy. *Appl. Opt.*, **38**(7):1259-1272, (1999)
15. Peavy, G. M., L. Reinisch, J. T. Payne, and **V. Venugopalan**. Comparison of cortical bone ablations by using infrared wavelengths 2.9 μm to 9.2 μm . *Lasers Surg. Med.*, **26**(5):421-434, (1999).
16. Berger, A. J., **V. Venugopalan**, A. J. Durkin, T. Pham, and B. J. Tromberg. Chemometric analysis of frequency-domain photon migration data: Quantitative measurements of optical properties and chromophore concentrations in multicomponent turbid media. *Appl. Opt.*, **39**(10):1659-1667, (2000).
17. Berns, M. W., Z. Wang, A. K. Dunn, V. P. Wallace, and **V. Venugopalan**. Gene inactivation by multiphoton-targeted photochemistry. *Proc. Natl. Acad. Sci. USA*, **97**(17):9504-9507, (2000).
18. Hayakawa, C. K., J. Spanier, F. Bevilacqua, A. K. Dunn, J. S. You, B. J. Tromberg and **V. Venugopalan**. Perturbation Monte Carlo methods to solve inverse photon migration problems in heterogeneous tissues. *Opt. Lett.*, **26**(17):1335-1337, (2001).
19. **Venugopalan, V.**, A. Guerra III, K. Nahen, and A. Vogel. On the role of laser-induced plasma formation in pulsed laser microsurgery and micromanipulation. *Phys. Rev. Lett.*, **88**(7):078103, (2002).
20. Vogel, A., and **V. Venugopalan**. Mechanisms of pulsed laser ablation of tissue. *Chem Rev.*, **103**(2):577-644, (2003).
21. Payne, B. P., **V. Venugopalan**, B. B. Mikić, N. S. Nishioka. Optoacoustic determination of optical attenuation depth using time-resolved interferometric detection. *J. Biomed. Opt.*, **8**(2):264-272, (2003).
22. Payne, B. P., **V. Venugopalan**, B. B. Mikić, N. S. Nishioka. Optoacoustic tomography using time-resolved interferometric detection of surface displacement. *J. Biomed. Opt.*, **8**(2):273-280, (2003).

23. Carp, S. A., S. A. Prael, and **V. Venugopalan**. Radiative transport in the delta-P₁ approximation: Accuracy of fluence rate and optical penetration depth predictions in turbid semi-infinite media. *J. Biomed. Opt.*, **9**(3):632–647, (2004).
24. Bevilacqua, F., J. S. You, C. K. Hayakawa, and **V. Venugopalan**. Sampling tissue volumes using frequency-domain photon migration. *Phys. Rev. E*, **69**(5):051908 (10 pages), (2004).
25. Hayakawa, C. K., B. Y. Hill, J. S. You, F. Bevilacqua, J. Spanier, and **V. Venugopalan**. Use of the -P₁ approximation for recovery of optical absorption, scattering and asymmetry coefficients in turbid media. *Appl. Opt.*, **41**(24):4677–4684, (2004).
26. Botvinick, E. L., **V. Venugopalan**, J. V. Shah, L. L. Liaw, D. W. Cleveland, and M. W. Berns. Controlled ablation of microtubules using a picosecond laser. *Biophys. J.*, **87**(12):4203–4212, (2004).
27. Carp, S. A., A. Guerra III, S. Q. Duque Jr., and **V. Venugopalan**. Optoacoustic imaging using interferometric measurement of surface displacement. *Appl. Phys. Lett.*, **85**(23):5772–5774, (2004).
28. Youn, J-I., G. M. Peavy, and **V. Venugopalan**. Free electron laser ablation of articular and fibrocartilage at 2.79, 2.9, 6.1, and 6.45 μm: Mass removal studies. *Lasers Surg. Med.*, **36**(3):202–209, (2005).
29. You, J. S., C. K. Hayakawa, and **V. Venugopalan**. Frequency-domain photon migration in the -P₁ approximation: Analysis of ballistic, transport, and diffuse regimes. *Phys. Rev. E*, **62**(2):021903 (13 pages), (2005).
30. Youn, J-I., P. Sweet, G. M. Peavy, and **V. Venugopalan**. Mid-IR laser ablation of articular and fibrocartilage: A wavelength dependent study of thermal injury and crater morphology. *Lasers Surg. Med.*, **38**(2):218–228, (2006).
31. Kim, A. D., C. K. Hayakawa, and **V. Venugopalan**. Estimating optical properties in layered tissues by use of the Born approximation of the radiative transport equation. *Opt. Lett.* **31**(8):1088–1090, (2006).
32. Rau, K. R., P. A. Quinto-Su, A. N. Hellman, and **V. Venugopalan**. Laser microbeam induced cell lysis: Time-resolved imaging and analysis of hydrodynamic effects. *Biophys. J.*, **91**(1):317–329, (2006).
33. Seo, I., J. S. You, C. K. Hayakawa, and **V. Venugopalan**. Perturbation and Monte Carlo methods for measurement of optical properties in a layered epithelial tissue model. *J. Biomed. Opt.*, **12**(1):014030 (15 pages), (2007).

C. Research Support

Ongoing Research Support

2006-12 Venugopalan (PI) 07/01/06 – 06/30/08

University of California Biotechnology Research and Education Program

Development of a Laser Microbeam/Microscope Platform for Rapid Single Cell Bioanalytics

This grant supports the development an experimental platform to provide a broad spectrum of laser-based cellular micromanipulation capabilities (injection, poration, lysis) for single cell analytics.

Role: Co-Principal Investigator

R01 EB-004436 Allbritton (PI) 08/01/04 – 05/30/08

NIH/NIBIB

An Automated Platform for Kinase Assays on Patient Cells

This grant supports the design, building, and testing of an analytical platform for the performance of single-cell kinase assays on primary patient cells. State-of-the-art microfabrication technology will be employed to engineer a microfluidic system that integrates electronics and photonics for the performance of microanalytical chemical separation. The microfluidic system will be coupled to a meso-scale incubator for sample preparation. The components of the hybrid system will be designed and optimized individually for their given function, and then integrated into a multifunctional platform.

Role: Co-Principal Investigator

P41 RR-01192 Tromberg (PI) 05/01/03 – 04/30/08
NIH/NCRR

A Laser Microbeam Biotechnology Resource

The Laser Microbeam and Medical Program (LAMMP) is a NIH Biomedical Technology Resource Center dedicated to the use of lasers and optics in biology and medicine. LAMMP provides both Microbeam and Microscopy Technologies for optical manipulation and functional imaging of living cells and tissues and Medical Translational Technologies for monitoring, treating, and imaging pre-clinical animal models and humans.

Role: Co-Principal Investigator

R01 EB00345 Venugopalan (PI) 07/01/01 – 06/30/06
NIH/NIBIB

Photon Migration for Measurement of Small Tissue Volumes

This project aims to develop non-invasive optical technologies for the real-time quantitative measurement of optical and physiological properties of small tissue volumes (~2-50 mm³) of arbitrary single scattering albedo.

Role: Principal Investigator

Completed Research Support

P20 GM066051-01 Lander (PI) 07/01/02 – 06/30/05
NIH/NIGMS

“Transport and Complexity in Biological Systems”

This planning grant proposal seeks funds to support a 3-year period of expansion of research interactions and development of the necessary research, teaching and administrative infrastructure to become a Center of Excellence in Complex Biological Systems Research.

Role: Investigator

R01 RR14892 Berns (PI) 09/30/99 – 08/31/04
NIH/NCRR

Integrated Platform for Chemical Analysis of Live Cells

The goal of the project is to develop an integrated micro-electro-mechanical-optical system to enable the biochemical analysis of live cells. This will be achieved through the miniaturization and integration of microfluidic control, laser-microirradiation, capillary electrophoresis, and confocal-fluorescence detection.

Role: Co-Principal Investigator

P20 CA086182 Nalcioglu (PI) 03/01/00 – 02/28/03
NIH/NCI

Center for In-vivo Molecular Functional Onco-Imaging

The goals of the project are to: (a) integrate magnetic resonance and optical imaging equipment and techniques; (b) understand underlying biological mechanisms by analyzing factors contributing to image signal intensities; (c) develop imaging agents to label various molecular markers associated with angiogenesis; (d) utilize above methods to assess therapeutic efficacy; and (e) develop imaging techniques/therapeutic agents to monitor therapy.

Role: Investigator

P41 RR-01192 Tromberg (PI) 04/01/98 – 03/31/03
NIH/NCRR

A Laser Microbeam Resource

This grant provides funding for a P41 Biotechnology Resource. The function of the resource is to promote vigorous activity in technological research/development, collaborative/service research and training/dissemination. The technology development is organized around three core research programs that span three fundamental regimes of light-tissue interaction: (a) High-Intensity interactions; (b) Coherent Interactions; and (c) Diffuse Interactions.

Role: Co-Principal Investigator