

# Scott Prahl

## Education

California Institute of Technology	1982	B.S.	Applied Physics
University of Texas at Austin	1988	Ph.D.	Biomedical Engineering

## Professional Experience

1988 – 1989	<i>Research fellow</i> , Academic Medical Center, Amsterdam
1990 – 1991	<i>Research fellow</i> , Massachusetts General Hospital, Boston
1991 – 1993	<i>Instructor</i> , Harvard Medical School, Boston
1993 – 2006	<i>Assistant Professor</i> , Oregon Graduate Institute, Portland
1993 – 2011	<i>Senior Research Scientist</i> , Oregon Medical Laser Center, Portland
1993 – Present	<i>Research Assistant Professor</i> , Dermatology, OHSU, Portland
2006 – Present	<i>Research Assistant Professor</i> , Biomedical Engineering, OHSU, Portland
2011 – Present	<i>Visiting Professor</i> , Electrical & Computer Engineering, PSU, Portland
2012 – 2017	<i>Associate Professor</i> , Electrical Engineering & Renewable Energy, OIT, Portland
2017 – Present	<i>Professor</i> , Electrical Engineering & Renewable Energy, OIT, Portland

## Awards and Other Professional Activities

1995 – 2001	Editorial Board	Lasers in Surgery and Medicine
2001	Distinguished Teaching Award	Oregon Graduate Institute
2003 – 2007	Medical Imaging Study Section (ad hoc)	NIH SBIR/STTR
2007, 2009, 2010	Session chair	SPIE Photonics West
2009 – 2010	Ohio Biomedical Research	National Academy of Science
2009 – 2010	BISH (ad hoc)	NSF
2009 – 2017	External Advisory Board	Beckman Laser Institute
1995 – Present	Physics Chairman	Oregon Academy of Science
2012 – Present	Op-TEC Advisory Board Member	

**Refereed Papers**

- [1] P. A. Patel, J. W. Valvano, J. A. Pearce, S. A. Prahl, and C. R. Denham. A self-heated thermistor technique to measure effective thermal properties from the tissue surface. *J. Biomechanical Engineering*, 109:330–335, 1987.
- [2] S. L. Jacques, C. A. Alter, and S. A. Prahl. Angular dependence of HeNe laser light scattering by human dermis. *Lasers Life Sci.*, 1:309–333, 1987.
- [3] S. L. Jacques and S. A. Prahl. Modeling optical and thermal distributions in tissue during laser irradiation. *Lasers Surg. Med.*, 6:494–503, 1987.
- [4] G. Yoon, S. A. Prahl, and A. J. Welch. Accuracies of the diffusion approximation and its similarity relations for laser irradiated biological media. *Appl. Opt.*, 28:2250–2255, 1989.
- [5] M. Keijzer, S. L. Jacques, S. A. Prahl, and A. J. Welch. Light distributions in artery tissue: Monte Carlo simulations for finite-diameter laser beams. *Lasers Surg. Med.*, 9:148–154, 1989.
- [6] C. J. M. Moes, M. J. C. van Gemert, W. M. Star, J. P. A. Marijnissen, and S. A. Prahl. Measurements and calculations of the energy fluence rate in a scattering and absorbing phantom at 633 nm. *Appl. Opt.*, 28:2292–2296, 1989.
- [7] M. R. Prince, G. M. LaMuraglia, C. E. Seidlitz, S. A. Prahl, C. A. Athanasoulis, and R. Birngruber. Ball-tipped fibers for laser angioplasty with the pulsed-dye laser. *IEEE J. Quantum Electron.*, 26:2297–2304, 1990.
- [8] W. F. Cheong, S. A. Prahl, and A. J. Welch. A review of the optical properties of biological tissues. *IEEE J. Quantum Electron.*, 26:2166–2185, 1990.
- [9] E. L. Koschmieder and S. A. Prahl. Surface tension driven Bénard convection in small containers. *J. Fluid Mechanics*, 215:571–583, 1990.
- [10] H. J. van Staveren, C. J. M. Moes, J. van Marle, S. A. Prahl, and M. J. C. van Gemert. Light scattering in Intralipid-10% in the wavelength range of 400–1100 nm. *Appl. Opt.*, 31:4507–4514, 1991.
- [11] J. W. Pickering, C. J. M. Moes, H. J. C. M. Sterenborg, S. A. Prahl, and M. J. C. van Gemert. Two integrating sphere with an intervening scattering sample. *J. Opt. Soc. Am. A*, 9:621–631, 1992.
- [12] S. A. Prahl, I. A. Vitkin, U. Bruggemann, B. C. Wilson, and R. R. Anderson. Determination of optical properties of turbid media using pulsed photothermal radiometry. *Phys. Med. Biol.*, 37:1203–1217, 1992.
- [13] J. W. Pickering, S. A. Prahl, N. van Wieringen, J. F. Beek, H. J. C. M. Sterenborg, and M. J. C. van Gemert. Double-integrating-sphere system for measuring the optical properties of tissue. *Appl. Opt.*, 32:399–410, 1993.
- [14] S. A. Prahl, M. J. C. van Gemert, and A. J. Welch. Determining the optical properties of turbid media by using the adding-doubling method. *Appl. Opt.*, 32:559–568, 1993.
- [15] I. A. Vitkin, B. C. Wilson, R. R. Anderson, and S. A. Prahl. Pulsed photothermal radiometry in optically transparent media containing discrete optical absorbers. *Phys. Med. Biol.*, 39:1721–1744, 1994.

- [16] D. D. Royston, R. S. Poston, and S. A. Prahl. Optical properties of scattering and absorbing materials used in the development of optical phantoms at 1064 nm. *J. Biomedical Optics*, 1:110–116, 1996.
- [17] U. S. Sathyam, A. Shearin, E. A. Chastaney, and S. A. Prahl. Threshold and ablation efficiency studies of microsecond ablation of gelatin under water. *Lasers Surg. Med.*, 19:397–406, 1996.
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- [19] H. Shangguan, L. W. Casperson, and S. A. Prahl. Microsecond laser ablation of thrombus and gelatin under clear liquids: Contact vs non-contact. *IEEE J. Selected Topics Quantum Electron.*, 2:818–825, 1996.
- [20] U. S. Sathyam and S. A. Prahl. Limitations in measurement of subsurface temperatures using pulsed photothermal radiometry. *J. Biomed. Opt.*, 2:251–261, 1997.
- [21] E. N. La Joie, A. D. Barofsky, K. W. Gregory, and S. A. Prahl. Patch welding with a pulsed diode laser and indocyanine green. *Laser Med. Sci.*, 12:49–54, 1997.
- [22] H. Shangguan, L. W. Casperson, and S. A. Prahl. Pressure impulses during microsecond laser ablation. *Appl. Opt.*, 36:9034–9041, 1997.
- [23] H. Shangguan, L. W. Casperson, D. L. Paisley, and S. A. Prahl. Photographic studies of laser-induced bubble formation in absorbing liquids and on submerged targets: Implications for drug delivery with microsecond laser pulses. *Optical Engineering*, 37:2217–2226, 1998.
- [24] H. Shangguan, K. W. Gregory, L. W. Casperson, and S. A. Prahl. Enhanced laser thrombolysis with photomechanical drug delivery: an *In Vitro* study. *Lasers Surg. Med.*, 23:151–160, 1998.
- [25] J. A. Viator, S. L. Jacques, and S. A. Prahl. Depth profiling of absorbing soft materials using photoacoustic methods. *IEEE Journal of Selected Topics in Quantum Electronics*, 5:989–996, 1999.
- [26] J. A. Viator and S. A. Prahl. Laser thrombolysis using long pulse frequency-doubled Nd:YAG lasers. *Lasers in Surgery and Medicine*, 25:379–388, 1999.
- [27] T. P. Moffitt and S. A. Prahl. Sized-fiber reflectometry for measuring local optical properties. *IEEE JSTQE*, 7:952–958, 2001.
- [28] J. A. Viator, G. Au, G. Paltauf, S. L. Jacques, S. A. Prahl, H. Ren, Z. Chen, and J. Stuart Nelson. Clinical testing of a photoacoustic probe for port wine stain depth determination. *Lasers in Surgery and Medicine*, 30:141–148, 2002.
- [29] A. D. Janis, L. A. Buckley, A. N. Nyara, S. A. Prahl, and K. W. Gregory. A reconstituted in vitro clot model for evaluating laser thrombolysis. *J. Thrombosis and Thrombolysis*, 13:167–175, 2002.
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- [32] Ronald F. Wolf, Hua Xie, John Petty, Jeff S. Teach, and Scott A. Prahll. Argon ion beam hemostasis with albumin following liver resection. *Am. J. Surg.*, 183:584–587, 2002.
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- [34] Paulo R. Bargo, Scott A. Prahll, and Steven L. Jacques. Optical properties effects upon the collection efficiency of optical fibers in different probe configurations. *IEEE J. Selected Topics Quantum Electron.*, 9:314–321, 2003.
- [35] Jessica C. Ramella-Roman, Paulo R. Bargo, Scott A. Prahll, and Steven L. Jacques. Evaluation of spherical particle sizes with an asymmetric illumination microscope. *IEEE J. Selected Topics Quantum Electron.*, 9:301–306, 2003.
- [36] Yin-Chu Chen, Sean J. Kirkpatrick, and Scott A. Prahll. Measurement of changes in concentrations of biological solutions using a Rayleigh interferometer. In V. V. Tuchin, editor, *SPIE Saratov Fall Meeting 2002: Optical Technologies in Biophysics & Medicine IV*, volume 5068, pages 273–283, 2003.
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- [40] Jessica C. Ramella-Roman, Kenneth Lee, Scott A. Prahll, and Steven L. Jacques. Design, testing, and clinical studies of a handheld polarized light camera. *Journal of Biomedical Optics*, 9:1305–1310, 2004.
- [41] Zhen Ren, Anthony Funary, H. Xie, Kathryn A. Lagerquist, Allen Burke, Scott A. Prahll, and Kenton W. Gregory. Optimal dye concentration and irradiance for laser-assisted vascular anastomosis. *Journal of Clinical Laser Medicine & Surgery*, 22:81–86, 2004.
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- [43] P. R. Bargo, S. A. Prahll, T. T. Goodell, R. A. Slevin, G. Koval, G. Blair, and S. L. Jacques. In vivo determination of optical properties of normal and tumor tissue with white light reflectance and an empirical light transport model during endoscopy. *J. Biomedical Optics*, 10:034018–1–034018–15, 2005.
- [44] J. C. Ramella-Roman, S. A. Prahll, and S. L. Jacques. Three Monte Carlo programs of polarized light transport into scattering media: part I. *Optics Express*, 13:4420–4438, 2005.

- [45] J. C. Ramella-Roman, S. A. Prael, and S. L. Jacques. Three Monte Carlo programs of polarized light transport into scattering media: part II. *Optics Express*, 13:10392–10405, 2005.
- [46] Yin-Chu Chen, Jack L. Ferracane, and Scott A. Prael. A pilot study of a simple photon migration model for predicting depth of cure in dental composite. *Dental Materials*, 21:1075–1086, 2005.
- [47] Yin-Chu Chen, Zheming Wang, Mingdi Yan, and Scott A. Prael. Fluorescence anisotropy study of molecularly imprinted polymers. *Luminescence*, 21:7–14, 2006.
- [48] Theodore Moffitt, Yin-Chu Chen, and Scott A. Prael. Preparation and characterization of polyurethane optical phantoms. *Journal of Biomedical Optics*, 11:041103, 2006.
- [49] Yin-Chu Chen, Jack L. Ferracane, and Scott A. Prael. Quantum yield of conversion of the photoinitiator camphorquinone. *Dental Materials*, pages 655–664, 2007.
- [50] Luis F. J. Schneider, Carmem S. C. Pfeifer, Simonides Consani, Scott A. Prael, and Jack L. Ferracane. Influence of photoinitiator type on the rate of polymerization, degree of conversion, hardness and yellowing of dental resin composites. *Dental Materials*, 24:1169–1177, 2008.
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- [53] Amanda Dayton, Laurel Soot, Ronald Wolf, Christina Gougoutas-Fox, and Scott A. Prael. Light guided lumpectomy: Device. *J. Biomed. Opt.*, 15(6):061706, 2010.
- [54] Genevieve R. Mueller, Paul D. Hansen, Ronald F. Wolf, Ken W. Gregory, and Scott A. Prael. Hemostasis after liver resection improves after single application of albumin and argon beam coagulation. *J Gastrointest Surg*, 14(11):1764–1769, 2010.
- [55] Amanda Dayton, Laurel Soot, Ronald Wolf, Christina Gougoutas-Fox, and Scott A. Prael. Light guided lumpectomy: First clinical experience. *J. Biophotonics*, 4:752–758, 2011.
- [56] Jessica C. Ramella-Roman, Amritha Nayak, and Scott A. Prael. A spectroscopic sensitive polarimeter for biomedical applications. *J. of Biomedical Optics*, 16:047001, 2011.
- [57] Donald D. Duncan, David G. Fischer, Amanda Dayton, and Scott A. Prael. Quantitative Carré differential interference contrast microscopy to assess phase and amplitude. *J. Opt. Soc. Am. A*, 28:1297–1306, 2011.
- [58] Luis Felipe J. Schneider, Larissa Maria A. Cavalcante, Scott A. Prael, Carmem S. Pfeifer, and Jack L. Ferracane. Curing efficiency of dental resin composites formulated with camphorquinone or trimethylbenzoyl-diphenyl-phosphine oxide. *Dental Materials*, 28:392–397, 2012.
- [59] Reid McCargar, Hua Xie, Kirk Price, and Scott A. Prael. In vitro mechanical assessments of laser-welded vascular anastomoses using water as the chromophore and dissolvable extruded albumin stents. *Lasers in Surgery and Medicine*, 44:330–338, 2012.

- [60] Scott A. Prah, Amanda Dayton, Kyle Juedes, Erik J. Sánchez, Rafael López Páez, and Donald D. Duncan. Experimental validation of phase using Nomarski microscopy with an extended Fried algorithm. *J. Opt. Soc. Am. A*, 29:2104–2109, 2012.

**Patents**

- [1] R. R. Anderson, N. Bhatta, S. Prahl, and P. J. Dwyer. Laser illuminator. *United States Patent. No. 5,527,308*, 1996.
- [2] L. A. Buckley, S. A. Prahl, and S. L. Jacques. Method and apparatus for determination of psoralen concentrations in biological tissues. *United States Patent. No. 5,522,868*, 1996.
- [3] S. A. Prahl and S. L. Jacques. Multiple diameter fiber optic device and process of using the same. *United States Patent. No. 6,014,204*, 1998.
- [4] Scott Prahl and Amanda Dayton. Optical wire illuminator. *United States Provisional Patent Application*, 2009.
- [5] Y. Wadia and S. A. Prahl. Biocompatible denatured albumin lamina. *United States Patent. No. RE 43,134*, 2012.

**Supervised Theses**

- [1] Amanda Dayton. *Light-Guided Lumpectomy: Visual and Frequency Domain Localization of Breast Lesions*. PhD thesis, Oregon Health & Science University, 2013.
- [2] Theodore Paul Moffitt. *Light Transport in Polymers for Optical Sensing and Photopolymerization*. PhD thesis, Oregon Health & Science University, 2005.
- [3] Yin-Chu Chen. *Light Transport in Polymers for Optical Sensing and Photopolymerization*. PhD thesis, Oregon Health & Science University, 2005.
- [4] J. A. Viator. *Characterization of photoacoustic sources in tissue using time domain measurements*. PhD thesis, Oregon Graduate Institute of Science and Technology, 2001.
- [5] H. Shangguan. *Local Drug Delivery with Microsecond Laser Pulses: In vitro Studies*. PhD thesis, Portland State University, 1996.
- [6] K. S. Kumar. Spectroscopy of indocyanine green photodegradation. Master's thesis, Oregon Graduate Institute of Science and Technology, 1996.
- [7] U. S. Sathyam. *Laser Thrombolysis: Basic Ablation Studies*. PhD thesis, Oregon Graduate Institute of Science and Technology, 1996.
- [8] S. D. Pearson. Mechanical strength studies of steady-state thermal and pulsed laser tissue welding. Master's thesis, Oregon Graduate Institute of Science and Technology, 1996.
- [9] S. D. Robinson. Measurement of 8-methoxypsoralen concentration using fluorescence. Master's thesis, Oregon Graduate Institute of Science and Technology, 1995.
- [10] E. N. La Joie. Tissue welding: Studies of pulsed diode laser interaction with ICG stained porcine aorta and elastin-based biomaterial. Master's thesis, Oregon Graduate Institute of Science and Technology, 1995.
- [11] S. A. Prahl. *Light Transport in Tissue*. PhD thesis, University of Texas at Austin, 1988.



## Book Chapters

- [1] S. A. Prahl. Pulsed photothermal radiometry of inhomogeneous tissue. In A. Mandelis and P. Hess, editors, *Progress in Photothermal and Photoacoustic Science and Technology Series: Life and Earth Sciences*, volume 3, pages 516–438. SPIE Optical Engineering Press, 1997.
- [2] S. A. Prahl. The adding-doubling method. In A. J. Welch and M. J. C. van Gemert, editors, *Optical-Thermal Response of Laser Irradiated Tissue*, chapter 5, pages 101–129. Plenum Press, 1995.
- [3] S. A. Prahl. The diffusion approximation in three dimensions. In A. J. Welch and M. J. C. van Gemert, editors, *Optical-Thermal Response of Laser Irradiated Tissue*, chapter 7, pages 207–231. Plenum Press, 1995.
- [4] M. J. C. van Gemert, S. A. Prahl, and A. J. Welch. Lichtausbreitung und Streuung in trüben Medien. In G. Müller and H. P. Berlien, editors, *Angewandte Lasermedizin: Lehr- und Handbuch für Praxis und Klinik*, chapter II–3.1.2, pages 1–10. ecomed verlagsgesellschaft mbH, München, 1989.

**Conference Proceedings**

- [1] P. A. Patel, J. W. Valvano, S. A. Prahl, and C. R. Denham. A self-heated thermistor technique to measure blood flow from the tissue surface. In *ASME Winter Annual Meeting*, volume HTD 61, pages 11–16, Anaheim, CA, 1986.
- [2] P. A. Patel, J. W. Valvano, and S. A. Prahl. Perfusion measurement by a surface thermal probe. In *IEEE/Ninth Annual Conference of the Engineering in Medicine and Biology Society*, pages 28–29, Boston, MA, 1987. IEEE.
- [3] J. W. Valvano, S. A. Prahl, J. C. Chan, and J. A. Pearce. Thermal camera imaging to measure tissue blood flow. In *Sixth Southern Biomedical Engineering Conference*, Dallas, TX, 1987 abstract only.
- [4] J. C. Chan, J. W. Valvano, J. A. Pearce, L. J. Hayes, and S. A. Prahl. Thermal camera imaging to measure perfusion from the tissue surface. In J. W. Clark, P. I. Horner, A. R. Smith, and K. Strum, editors, *Phys. Med. Biol.*, volume 33, page 408, San Antonio, TX, 1988 abstract only.
- [5] G. L. LeCarpentier, S. Rastegar, A. J. Welch, S. A. Prahl, and H. Hussein. Comparative analysis of laser ablation of plaque using direct laser irradiation and a metal contact probe. In J. W. Clark, P. I. Horner, A. R. Smith, and K. Strum, editors, *Phys. Med. Biol.*, volume 33, page 17, San Antonio, TX, 1988 abstract only.
- [6] S. A. Prahl, W. F. Cheong, G. Yoon, and A. J. Welch. Optical properties of human aorta during low power argon laser irradiation. In *SPIE Proceedings of Laser Interaction with Tissue*, volume 908, pages 29–33, 1988.
- [7] S. A. Prahl, M. Keijzer, S. L. Jacques, and A. J. Welch. A Monte Carlo model of light propagation in tissue. In G. J. Müller and D. H. Sliney, editors, *SPIE Proceedings of Dosimetry of Laser Radiation in Medicine and Biology*, volume IS 5, pages 102–111, 1989.
- [8] S. L. Jacques, L. Buckley, S. Prahl, and K. Gregory. Quantifying psoralen in tissues by fluorescence: Dosimetry for psoralen administration followed by ultraviolet A irradiation (Puva) to block restenosis. In G. S. Abela, editor, *SPIE Proceedings of Diagnostic and Therapeutic Cardiovascular Interventions IV*, volume 2130, pages 82–88, 1994.
- [9] E. N. La Joie, A. D. Barofsky, K. W. Gregory, and S. A. Prahl. Welding artificial biomaterial with a pulsed diode laser and indocyanine green. In R. R. Anderson, editor, *SPIE Proceedings of Lasers in Surgery: Advanced Characterization, Therapeutics, and Systems V*, volume 2395, pages 508–516, 1995.
- [10] H. Shangquan, L. W. Casperson, A. Shearin, K. W. Gregory, and S. A. Prahl. Photoacoustic drug delivery: The effect of laser parameters on spatial distribution of delivered drug. In S. L. Jacques, editor, *SPIE Proceedings of Laser-Tissue Interaction VI*, volume 2391, pages 394–402, 1995.
- [11] U. S. Sathyam, A. Shearin, and S. A. Prahl. The effect of spotsize, pulse energy, and repetition rate on microsecond ablation of gelatin under water. In S. L. Jacques, editor, *SPIE Proceedings of Laser-Tissue Interaction VI*, volume 2391, pages 336–344, 1995.

- [12] S. A. Prahl. Charts for rapid estimation of spatial and temporal distribution of temperature following laser irradiation. In S. L. Jacques, editor, *SPIE Proceedings of Laser-Tissue Interaction VI*, volume 2391, pages 499–511, 1995.
- [13] H. Shangguan, L. W. Casperson, A. Shearin, and S. A. Prahl. Investigation of cavitation bubble dynamics using particle image velocimetry: Implications for photoacoustic drug delivery. In R. R. Anderson and A. Katzir, editors, *SPIE Proceedings of Lasers in Surgery: Advanced Characterization, Therapeutics, and Systems VI*, volume 2671, pages 104–115, 1996.
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- [15] E. J. Chapyak, R. P. Godwin, S. A. Prahl, and H. Shangguan. Comparison of numerical simulations and laboratory studies of laser thrombolysis. In R. R. Anderson, K. E. Bartels, L. S. Bass, K. W. Gregory, D. M. Harris, H. Lui, R. S. Malek, G. J. Mueller, M. M. Pankratov, A. P. Perlmutter, H. Reidenbach, L. P. Tate, and G. M. Watson, editors, *SPIE Proceedings of Lasers in Surgery: Advanced Characterization, Therapeutics, and Systems VII*, volume 2970, pages 28–34, 1997.
- [16] H. Shangguan, L. W. Casperson, A. Shearin, D. L. Paisley, and S. A. Prahl. Effects of material properties on laser-induced bubble formation in absorbing liquids and on submerged targets. In D. L. Paisley and A. M. Frank, editors, *Proceedings of the 22nd International Congress on High-Speed Photography and Photonics*, volume 2869, pages 783–791, 1997.
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- [18] H. Shangguan, L. W. Casperson, K. W. Gregory, and S. A. Prahl. Penetration of fluorescent particles in gelatin during laser thrombolysis. In R. R. Anderson, K. E. Bartels, L. S. Bass, K. W. Gregory, D. M. Harris, H. Lui, R. S. Malek, G. J. Mueller, M. M. Pankratov, A. P. Perlmutter, H. Reidenbach, L. P. Tate, and G. M. Watson, editors, *SPIE Proceedings of Diagnostic and Therapeutic Cardiovascular Interventions VII*, volume 2970, pages 10–18, 1997.
- [19] S. A. Prahl and S. D. Pearson. Rate process models for thermal laser welding. In S. L. Jacques, editor, *SPIE Proceedings of Laser-Tissue Interaction VIII*, volume 2975, pages 245–252, 1997.
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- [23] M.-A. Descalle, S. L. Jacques, S. A. Prahl, T. L. Laing, and W. R. Martin. Measurements of ligament and cartilage optical properties at 351 nm, 365 nm, and in the visible range (440 to 800 nm). In Guy P. Delacretaz, Lars O. Svaasand, Rudolf W. Steiner, Roberto Pini, and Guilhem Godlewski, editors, *SPIE Proceedings of Laser-Tissue Interaction, Tissue Optics, and Laser Welding III*, volume 3195, pages 280–286, 1998.
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- [25] S. A. Prahl and S. L. Jacques. Sized-fiber array spectroscopy. In S. L. Jacques, editor, *SPIE Proceedings of Laser-Tissue Interaction IX*, volume 3254, pages 348–352, 1998.
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