James F. Brennan III

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Education:

Massachusetts Institute of Technology **Cambridge, MA**
Ph.D. Physics & Electrical Engineering, September 1995. Specialized in biomedical optics.
Electrical Engineer degree, January 1991. Concentrated in continuum electromechanics.
S.M. Electrical Engineering, June 1989. Concentrated in electromagnetic field and wave theory.
S.B. Electrical Engineering and Computer Science, June 1987.

Harvard Medical School, Cambridge, MA Studied cardiovascular pathophysiology.

Experience:

Exponent, Inc **Menlo Park, CA**
Principal January 12 – present
Serve as a science and engineering technical consultant for hundreds of companies throughout the world that range from pre-revenue organizations to multi-national corporations. Provide guidance on proactive technical challenges involving development and compliance issues, as well as reactive concerns, such as regulatory recalls and litigation. Have supported, written reports, and given testimony as a technical expert in several litigation and intellectual property cases.

Assist various companies with mergers and acquisitions from a technology assessment standpoint. Typical projects have involved scouting a given technology space for potential acquisition targets, evaluating the intellectual property, and assisting in placing a monetary value on certain key targets. Often alternative product and technology development plans are established with costs and timelines, which are used to assist engagement discussions. Have also served as an intermediary to form a firewall between separate organizations engaged in technology licensing, and have been utilized to assist companies in making products in regulated arenas through activities such as establishing development programs, quality systems, and regulatory strategies. Regularly conduct technology scoping exercises by reaching into Exponent's technical expertise to help companies address multi-disciplinary challenges.

Projects included complex medical devices, which often involve hardware, software, optics, and control systems, some of which have been implantable or communicate wirelessly. Led projects involving radiation sources in medical devices, e.g. x-ray, ultrasound, lasers, and LEDs, for diagnostic, cosmetic, and surgical applications, assisted organizations with radiation sources in consumer devices, such as LIDAR, laser machining, and scanning remote sensors, and checked for compliance with various regulatory standards. Have also been involved in evaluating electrical shock incidents, fire investigations, monopolar and bipolar electrosurgical equipment (RF ablation), wearable technology, and smart & IR radiative clothing. Regularly assist companies to ensure product compatibility with MRI, electronic article surveillance (EAS) systems, and other possible electromagnetic environments.

Prescient Medical, Inc **Doylestown, PA**
Chief Science Officer July 06 – December 11
Member of executive team that managed $64M to develop products to prevent heart attacks, primarily by identifying and treating atherosclerotic plaques that are prone to rupture. Developed a transcutaneous coronary diagnostic system, worked to prioritize the company's next products, and built a development plan for the product platform. Created and maintained awareness and excitement for both the company and its technologies in the scientific & medical community and for potential partners through presentations, white papers, and publications. Collaborated in the design, monitoring and output of pre-clinical and clinical trials.

Specific accomplishments include the development of an optical catheter system that diagnosed coronary artery disease by utilizing Raman spectroscopy to identify and to quantify chemicals within artery walls. Chemical information was obtained in real-time to identify thin-capped fibroatheromas (TCFA - vulnerable atherosclerotic plaques) and other

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histopathology *in situ*. Marketing and product specifications were established by working closely with key opinion leaders, and then a development plan was implemented that entailed dividing the project into several major subunits, including a console with an optical engine, a fiber optic catheter, and software. The project plan was implemented by an extended team of >100 members, which consisted of a combination of internal staff, academic laboratories, consultants, and subcontractors, that were located throughout North America and Europe. Identified and acquired complementary technologies to the Raman catheter through licensing and technology transfer agreements to bolster product acceptance and designed a combination technology product. An IP strategy was established, which included protecting several 2nd-generation catheter designs that combined Raman spectroscopy technology with other cardiovascular diagnostic modalities, such as optical coherence tomography.

Raydiance, Inc **Orlando, FL**
V.P. of Research and Development October 04 – June 06
Built, led, and managed the entire product development team in a pre-revenue environment to build high-power fiber laser systems that addressed the medical and military laser micromachining markets, reporting directly to the CEO and COO.

Accomplishments played a large role in increasing the company valuation from $40M at Round B to $90M at Round C. Hired by investors at Round B financing to realize the company vision, i.e. to build compact ultrashort pulse lasers at ablation-level energies with flexible user interfaces that are ready for OEM incorporation. Assessed initial company technology, built technical capabilities and technical team, created and implemented a product roadmap, and established scalable business practices. Steered company away from flawed initial technical paths towards an approach involving optical fiber amplifier systems and implemented this new approach by hiring specialist to train and work with the internal team. Acquired expertise in high-power chirped-pulse fiber amplifier systems, solid-state optical amplifiers, and specialized fiber delivery systems. Was the technical lead for existing government programs and crafted new government proposals where the work mapped directly onto the company technical roadmap. Identified Bragg fiber technology as a potentially disruptive technology, implemented IP strategy to protect technology, and obtained funding for feasibility work at a university and for internalizing the technology. Established requirements needed to address certain markets for ultrashort pulse laser requirements for non-thermal ablation and thus drove guidelines for initial product and subsequent releases, and steered product development to completion, resulting in several recognitions and awards for the product and corporation, including the "Red Herring 100 North America" award and a finalist in the "Most Innovative Company" category in the 2008 American Business Awards.

Developed and implemented an IP strategy by working closely with a prominent San Jose legal firm that specializes in startup companies. Evaluated and organized prior patent filings, implemented a record-of-invention filing and evaluation process, trained a new patent liaison, educated technical team on IP and the patenting process, and aided the transition of the patent portfolio to a new legal firm. 50+ inventions filed internally by technical team in year 2005, which were triaged and converted to ~2 patents applications filed per month.

3M Company **Austin, TX**
Sr. Research Specialist August 96 – September 04
Built and established a laboratory to develop passive optical components that addressed the telecommunications and sensor industries, which became the cornerstone of the Optical Components business unit.

Began in a staff laboratory and studied several issues related to fiber Bragg grating fabrication to improve their quality and to increase production yields, such as hydrogen diffusion in silica, fiber fixturing, fiber photosensitivity, ultraviolet-induced optical loss, and optical and mechanical lifetime issues. Invented a direct-write technology for producing fiber gratings of arbitrary reflectivity profiles and lengths and utilized the method to make chromatic dispersion compensators for use in long-haul communications systems. Devised and executed an intellectual property strategy for protecting the technology, which became a platform technology, including process, device, and application patent filings. Brought the technology into a business unit and developed products around it. Led technical team of >50 scientist and engineers on a multimillion dollar development effort to bring product into manufacturing and through Telcordia testing. Interacted with hundreds of customers throughout N. America, Europe, and SE Asia (Japan, China, & Singapore) to discern their needs and directed internal laboratory efforts to address technical gaps. One

product won the *2002 Photonics Circle of Excellence* award from *Photonics Spectra* for one of the 25 most technically innovative products of the year and was also nominated by *Fiberoptic Product News* for the 2001 technology award.

Specific technical accomplishments include designing and building systems to make multimeter length fiber gratings, which involved custom low rotational-velocity rotary induction motors and control systems, ultra-precision machined components (10 microinch), exacting air-bearing translation stages and controls, interferometers, and software control. Construction of these manufacturing systems spawned several other inventions, such as function generators capable of an unlimited number of <10 μHz steps, fabrication methods of co-propagating mode fiber couplers, and fiber handling devices. Other technical accomplishments included building hydrogenation system capable of 30,000 p.s.i. pressures, understanding the optical properties of fibers exposed to extreme environments, and establishing a 10 Gbit/s optical telecommunication test system.

Principal investigator on a DARPA subcontract that employed chirped pulse amplification and semiconductor optical amplifiers to produce high-peak-power femtosecond-duration light pulses for laser micromachining and concurrently led efforts within 3M to make products utilizing this technology, including market and IP assessment. Other general responsibilities included identifying and evaluating new technology, serving as a laser safety officer, assessing the capabilities of potential acquisitions, and acting as a university liaison and initiating collaborations.

Academisch Ziekenhuis **Leiden, The Netherlands**
Erasmus Universiteit **Rotterdam, The Netherlands**
Independent consultant March 96 – August 96
Provided technical consulting for development of Raman spectroscopy systems for human tissue studies. Conceived and started a research plan for Leiden University that led to several articles and a Ph.D. thesis for one student.

G. R. Harrison Spectroscopy Laboratory, M.I.T. **Cambridge, MA**
Postdoctoral scientist August 95 – March 96
Research assistant January 91 – August 95
Conceived and developed signal processing algorithms to extract quantitative biochemical information about human tissue with near infrared Raman spectroscopy. Invented an optical fiber probe that uses a compound parabolic concentrator to increase significantly light collection. Designed and built electro-optical instrumentation for Raman and laser-induced fluorescence spectroscopy, including photodiode arrays, CCD systems and PdSi focal plane arrays. Used Raman scattering and laser-induced fluorescence to diagnose various pathologies, including various cancers and atherosclerosis. Conducted research independently and gained general experience with optics, nonimaging optics, laser systems, turbid media, probabilistic systems, light-matter interactions, and biomedical engineering.

M.I.T. Continuum Electromechanics Laboratory **Cambridge, MA**
Teaching assistant September 90 - December 90
Research assistant January 90 - September 90
Investigated momentum transfer mechanisms in electro-rheological fluids. Conceived, designed, and implemented unique couette viscometer to simultaneously measure normal and tangential stresses within ER fluids.

Head teaching assistant September 89 - December 89
Assisted Prof. Hermann A. Haus in teaching class entitled "Electromagnetic Fields and Energy". Managed teaching assistants and conducted interactive mini-lectures weekly. Acted as substitute lecturer.

Lincoln Laboratory **Lexington, MA**
Radar analyst May 89 - September 89
Proposed and implemented various methods for determining material makeup of exo-atmospheric objects through analysis of microwave radar returns.

M.I.T. High Voltage Research Laboratory **Cambridge, MA**
Research assistant May 87 - May89
Discovered unusual optical phenomena associated with molten polymers. Investigated charge migration in polyethylene under high voltage stressed situations by utilizing Kerr elecro-optical measurement techniques.

Undergraduate Research Assistant May 86 - May 87

Automated Kerr electro-optical field mapping measurements with an image digitizer installed in an IBM PC. Contributed to the understanding of electric charge movement in polymethylmethacrylate.

Lexicon, Inc. **Cambridge , MA**
Junior engineer May 85 - August 85

Softbridge Microsystems, Inc. **Cambridge, MA**
Software engineer December 84 - February 85

Professional:
Have held memberships in various professional organizations, such as OSA, SPIE, & IEEE. Committee member for OSA's 2007 conference on *Optical Fiber Communications*. Committee member for OSA's *Bragg Gratings, Photosensitivity, and Poling* topical conference for 1999, 2001, & 2003. Regular reviewer for *IEEE Photonics Technology Letters*, as well as several other journals. Research work highlighted in various trade journals, such as *The Economist* (10 August 1996, p. 64), *Analytical Chemistry News and Features* (1 June 1997, pp. 336-7 A), *FiberSystems International* (Apr/May 2000, p. 15), *Lightwave* (July 2000, p.140-1), *Laser Focus World* (April 2000, p. 109), *Photonics Spectra* (May 2001, p. 34), *Photonics Spectra* (January 2003, p. 83) and *Photonics Spectra* (March 2003, p.100). Invited speaker to several universities, such as M.I.T., U of Texas at Austin, Texas A & M, and University of Rochester, NY.

Member of ANSI Z136.3 Standard Subcommittee (SSC-3), "Safe Use of Lasers in Health Care."

Member of ANSI Z136.9 Standard Subcommittee (SSC-9), "Safe Use of Lasers in Manufacturing Environments."

Member of ANSI Z136 Technical Subcommittee 1 (TSC1), "Biological Effects and Medical Surveillance."

Patents:

US #8,189,971 - Vaissié L & Brennan JF, "Dispersion Compensation in a chirped pulse amplification system," May 29, 2012.

US #8,150,271 – Brennan JF, Vaissié L, & Mielke M, "Active tuning of temporal dispersion in an ultrashort pulse laser system," April 3, 2012.

US #7,952,719 – Brennan JF, "Optical catheter configurations combining Raman spectroscopy with optical fiber-based low coherence reflectometry," May 31, 2011.

US #7,952,706 – Ling J, Mitchell JN, Sullivan ME, Brennan JF, Heistand MR, Nazemi J, & Fraker W, "Multi-channel fiber optic spectroscopy systems employing integrated optics modules," May 31, 2011.

US #7,835,646 – Vaissié L & Brennan JF, "High-order Bragg fiber dispersion correction," November 16, 2010.

US #7,822,347 – Brennan JF, Vaissié L, & Mielke M, "Active tuning of temporal dispersion in an ultrashort pulse laser system," October 26, 2010.

US #7,787,175 – Brennan JF, Vaissié L, Mielke M, & Yilmaz T "Pulse selecting in a chirped pulse amplification system," August 31, 2010.

US #7,593,441 – Brennan JF, Vaissié L, & Mielke M, "Bragg fibers in systems for the generation of high peak power light," September 22, 2009.

US #7,496,255 – Cronk BJ, MacDougall TW, David MM, Gates BJ, & Brennan JF, "Radiation-transmissive films on glass articles," February 24, 2009.

US #7,466,892 – LaBrake DL, Gates BJ, Cronk BJ, David MM, Nelson BK, Miller MN, & Brennan JF, "Optical and optoelectronic articles," December 16, 2008.

US #7,436,866 – Vaissié L & Brennan JF, "Combination optical isolator and pulse compressor," October 14, 2008.

US #7,433,558 – Booth TJ, Yilmaz IT, Brennan JF, "Methods for optical isolation in high power fiber-optic systems," October 7, 2008.

US #7,349,452 – Brennan JF, Vaissié L, Mielke M, "Bragg fibers in systems for the generation of high peak power light," March 25, 2008.

US #7,308,171 – Booth TJ, Yilmaz IT, & Brennan JF, "Method and apparatus for optical isolation in high power fiber-optic systems," December 11, 2007.

US #7,245,419 – Brennan JF & Booth TJ, "Wavelength-stabilized pump diodes for pumping gain media in an ultrashort pulsed laser system," July 17, 2007.

US # 7,139,116 – Vaissié L & Brennan JF, "Post amplification optical isolator," November 21, 2006.

US # 7,106,939 – LaBrake DL, Gates BJ, Cronk BJ, David MM, Nelson BK, Miller MN, & Brennan JF, "Optical and optoelectronic articles," September 12, 2006.

US # 6,901,188 – Brennan JF, "Dispersion compensation modules with fiber Bragg gratings," May 31, 2005.

US # 6,857,293 – Carpenter JB, Stedman JP, Bylander JR, Wiegand G, Stacey NA, Gatica AW, Elder DE, & Brennan JF, "Apparatus for selective photosensitization of optical fiber," February 22, 2005.

US # 6,834,134 – Brennan JF, Chou PC, Lee HLT, Ram RJ, Haus HA, Ippen EP, "Method and apparatus for generating frequency modulated pulses," December 21, 2004.

US # 6,823,110 – Battiato JM & Brennan JF, "Method to stabilize and adjust the optical path length of waveguide devices," November 23, 2004.

US # 6,795,636 – Cronk BJ, MacDougall TW, David MM, Gates BJ, Nelson BK, & Brennan JF, "Radiation-transmissive films on glass articles," September 21, 2004.

US # 6,781,698 – Fan X, Brennan JF, Matthews MR, Sinha PG, & Porque JC, "Quality review method for optical components using a fast system performance characterization," August 24, 2004.

US # 6,763,686 – Carpenter J, Stedman J, Bylander J, Wiegand G, Stacy N, Gatica T, Elder D, Brennan JF, & Cronk B, "Method for selective photosensitization of optical fiber," July 20, 2004.

US # 6,741,773 – Brennan JF, Hernandez E, Valenti J, Sinha P, Matthews M, Elder D, Beauchesne G, & Byrd C, "Wide- bandwidth chirped fiber Bragg gratings with low delay ripple amplitude," May 25, 2004.

US # 6,728,444 – Brennan JF & LaBrake DL, "Fabrication of chirped fiber Bragg gratings of any desired bandwidth using frequency modulation," April 27, 2004.

US # 6,668,126 – Brennan JF & Knox GJ, "Temperature stabilized optical fiber package." December 23, 2003.

US # 6,577,792 – Brennan JF, Hernandez E, Valenti J, Sinha P, Matthews M, Elder D, Beauchesne G, & Byrd C, "Wide- bandwidth chirped fiber Bragg gratings with low delay ripple amplitude," June 10, 2003.

US # 6,404,956 – Brennan JF & LaBrake DL, "Long-length continuous phase Bragg reflectors in optical media," June 11, 2002.

US # 6,311,524 – Brennan JF, Sloan DA, Fahey MT, & Novack JC, "Accelerated method for increasing the photosensitivity of a glassy material," November 6, 2001.

US # 6,195,484 – Brennan JF, LaBrake DL, Chou PC, Haus HA, "Method and apparatus for arbitrary spectral shaping of an optical pulse," February 27, 2001.

US # 6,035,083 – Brennan JF & LaBrake DL, "Method for writing arbitrary index perturbations in a waveguiding structure," March 7, 2000.

US # 5,912,999 – Brennan JF, LaBrake DL, Beauchesne GA, & Pepin RP, "Method for fabrication of in-line optical waveguide index grating of any length", June 15, 1999.

US # 5,615,673 - Berger A, Brennan JF, Dasari RR, Feld MS, Itzkan I, Tanaka K, and Wang Y, "Apparatus and methods of Raman spectroscopy for analysis of blood gases and analytes", April 1, 1997.

Several additional patents filed and pending.

Book Chapters:

Nazemi JH, Marple E, Sangiorgi G, and Brennan JF, "Evaluation of plaque composition with intracoronary Raman spectroscopy," in *Coronary Artery Stenosis – Imaging, structure and physiology*, eds. Escaned J and Serruys PW, (PCR Publishing) ISBN: 978-2-913628-56-4 (2010), Chapter 19, pp. 263-272.

Brennan JF, "Broadband fiber Bragg gratings for dispersion management," Chapt. 9 in *Fiber-based dispersion compensation*, ed. S Ramachandran (Springer Verlag) ISBN: 978-0-387-40347-2 (2007).

Römer TJ, Brennan JF, and Buschman HPJ, "Raman spectroscopy of atherosclerosis: towards real-time in vivo histochemistry and pathology," Chapt. 3 in *Advanced Imaging in Coronary Artery Disease – PET, SPECT, MRI, IVUS, EBCT*, eds. Van der Wall EE, Blanksma PK, Niemeyer MG, Vaalburg W, and Crijns HJGM (Kluwer Academic Publishers, Dordrecht, 1998), pp. 29-53, ISBN 0-7923-5083-9.

Römer TJ, Brennan JF, Tuinenburg J, van Duinen SG, van der Laarse A, Bruschke AVG, and Puppels GJ, in *Spectroscopy of Biological Molecules: Modern Trends*, eds. Carmona P, et al. HJGM (Kluwer Academic Publishers, Dordrecht, 1997).

Römer TJ and Brennan JF, "Raman-spectroscopy during catheterization: a means of viewing plaque composition," Chapt. 11 in *Vascular Medicine – from Endothelium to Myocardium*, eds. Van der Wall EE, Cats VM & Baan J (Kluwer Academic Publishers, Dordrecht, 1997), pp. 175-196, ISBN 0-7923-4740-4.

Journal articles:

Anderson DM, Fessler JR, Pooley MA, Seidel S, Hamblin MR, Beckham HW, & Brennan JF, "Infrared radiative properties and thermal modeling of ceramic-embedded textile fabrics," *Biomedical Optics Express*, in press.

Pooley MA, Anderson DM, Beckham HW, & Brennan JF, "Engineered emissivity of textile fabrics by the inclusion of ceramic particles," *Optics Express*, **24**(10), 5 May 2016, pp. 10556-10564.

Nazemi JH & Brennan JF, "Lipid concentrations in human coronary artery determined with high wavenumber Raman shifted light," *Virtual Journal of Biological Physics Research*, May 15, 2009.

Nazemi JH & Brennan JF, "Lipid concentrations in human coronary artery determined with high wavenumber Raman shifted light," *Journal of Biomedical Optics*, Vol. 14(3), May/June 2009, 034009.

Brennan JF, Nazemi J, Motz J, & Ramcharitar S, "The vPredict Optical Catheter System: Intravascular Raman spectroscopy," Eurointervention, 2008; 3:635-638.

Brennan JF, "Broadband fiber Bragg gratings for dispersion management," *Journal of Optical Fiber Commun. Rep*., **2** (5), 397-434 (December 2005) DOI: 10.1007/s10297-005-0055-z.

Wang D, Matthews M, & Brennan JF, "Polarization mode dispersion in chirped fiber Bragg gratings", *Optics Express*, **12** (23), 15 November 2004, pp. 5741-5753.

Fan X & Brennan JF, "Performance effect in optical-communication systems caused by phase ripples of dispersive components," *Applied Optics*, **43** (26), pp. 5033-5036 (September 2004).

Brennan JF, Bungarden PM, Fisher CE, & Jennings RM, "Packaging to reduce thermal gradients along the length of long fiber gratings," *Photonics Technology Letters*, **16** (1), January 2004, 156-8.

Brennan JF, Matthews MR, Dower WV, Treadwell DJ, Wang W, Porque J, & Fan X, "Dispersion correction with a robust fiber grating over the full C-band at 10 Gb/s rates with <0.3 dB power penalties," *Photonics Technology Letters*, **15** (12), December 2003, pp. 1722-1724.

Koch BJ & Brennan JF, "Dispersion compensation in an optical communications system with an electro-absorption modulated laser and a fiber grating," *Photonics Technology Letters*, **15** (11), November 2003, pp. 1633-1635.

Chou PC, Haus HA, & Brennan JF, "Reconfigurable time-domain spectral shaping of an optical pulse stretched by a fiber Bragg grating," *Optics Letters* **25** (8) (15 April 2000), pp. 524-6.

Brennan JF, Sloan DA & LaBrake DL, "The behavior of silica optical fibers exposed to very high-pressure hydrogen environments," *OSA Trends in Optics and Photonics series*, "*WDM components"*, ed. DA Nolan, **XXIX**, pp. 286-91.

Römer TJ, Brennan JF, Puppels GJ, Zwinderman AH, van Duinen SG, van der Laarse A, van der Steen AFW, Bom NA, , & Bruschke AVG, "Intravascular ultrasound combined with Raman spectroscopy to localize and quantify cholesterol and calcium salts in atherosclerotic coronary arteries", *Atheriosclerosis, Thrombosis and Vascular Biology* (2000), **20**, pp.478-483.

Römer TJ, Brennan JF, Puppels GJ, van der Laarse A, Princen H, Buschman R, Jukema JW, Havekes LM & Bruschke AVG, "Raman spectroscopy provides chemical mappings of athersoclerotic plaques in APOE*3 Leiden transgenic mice", submitted.

Römer TJ, Brennan JF, Bakker-Schut TC, Wolthuis R, van den Hoogen RCM, Jemeis JJ, van der Laarse A, Bruschke AVG, & Puppels G, "Raman spectroscopy for quantifying cholesterol in intact coronary artery wall," *Atherosclerosis* (November 1998), **141** (1), pp. 117-124.

Salenius JP, Brennan JF, Miller A, Wang Y, Aretz T, Sacks B, Dasari RR & Feld MS, "Biochemical composition of human peripheral arteries examined with near infrared Raman spectroscopy", *J. Vascular Surgery*, (April 1998), **27** (4), pp. 710-19.

Römer TJ, Brennan JF, Fitzmaurice M, Feldstein ML, Deinum G, Myles JL, Kramer JR, Lees RS & Feld MS, "Histopathology of human coronary artery atherosclerosis by quantifying its chemical composition with Raman spectroscopy", *Circulation*, **97** (9) (March 1998), pp. 878-885.

Brennan JF, Römer TJ, Lees RS, Tercyak AM, Kramer JR & Feld MS, "Determination of human coronary artery composition by Raman spectroscopy", *Circulation*, **96** (1) (1997), pp. 99-105.

Brennan JF, Wang Y, Dasari RR & Feld MS, "Near infrared Raman spectrometer systems for human tissue studies", *Appl. Spectros*., **51** (2) (1997), pp. 201-08.

Brennan JF, Beattie ME, Wang Y, Cantella MJ, Tsaur BY, Dasari RR & Feld MS, "PdSi focal plane array detectors for short-wave infrared Raman spectroscopy of biological tissue: a feasibility study", *Appl. Optics*, **35** (28), 1 Oct. 1996, pp. 5736-5739.

Tanaka K, Pacheco MTT, Brennan JF, Itzkan I, Berger AJ, Dasari RR & Feld MS, "Compound parabolic concentrator probe for efficient light collection in spectroscopy of biological tissue", *Appl. Optics*, **35** (4), 1 February 1996, pp. 758-763.

Cothren RM, Sivak MV, van Dam J, Petras RE, Fitzmaurice M, Crawford JM, Wu J, Brennan JF, Rava RP, Manoharan R, & Feld MS, "Detection of dysplasia at colonoscopy using laser-induced fluorescence: a blinded study", *Gastrointestinal Endoscopy*, **44** (2), August 1996, pp. 168-176.

Brennan JF, Zonios GI, Wang TD, Rava RR, Hayes GB, Dasari RR & Feld MS. "Portable laser spectrofluorimeter for *in vivo* human tissue fluorescence studies", *Appl. Spectros.*, **47** (12), (1993), pp. 2081-2086.

Hikita, Zahn, Wright, Cooke, & Brennan, "Kerr Electro-optic Field Mapping Measurements in Electron-beam Irradiated Polymethylmethacrylate", *IEEE Elect. Insul*., **23** (5), (1988) p. 861-880.

Zahn, Hikita, Wright, Cooke, & Brennan, "Kerr Electro-optic Field Mapping Measurements in Electron-beam Irradiated Polymethylmethacrylate", *IEEE Elect. Insul.*, **22** (2), (1987) p.181-185.

Conferences:

Fei E, Piper J, Lau E, & Brennan JF, "Optical hazards posed by high-intensity LED flashlights," International Laser Safety Conference, Atlanta, GA (2017), in press.

Nazemi J, Marple E, Brennan JF, Sangiorgi G, and Mauriello A, "Contour mappings of the chemical composition within human coronary artery measured with an intravascular Raman spectroscopy system," in SPIE symposium on Biomedical Optics (BiOS) 2010, San Fransisco, CA (2010), Paper #7548D-104.

Nazemi J, Brennan JF, Sangiorgi G, and Mauriello A, "Chemical Maps of Human Coronary Artery Measured with a Raman Spectroscopy Catheter System Designed for Percutaneous Clinical Use," in Transcatheter Cardiovascular Theraputics 2009, San Francisco, CA (2009) Paper #09-A-1416-CRF.

Brennan JF (invited), "Raman Spectroscopy," 7th International Vulnerable Plaque Meeting, Vouliagmeni, Greece, 21-23 June 2009.

Nazemi J, Brennan JF, Sangiorgi G, Mauriello A, and Kutys R, "A label-free optical biosensor for *in vivo* disease classification of coronary artery wall," in CRT 2009 (Cardiovascular Research Technologies), Washington, DC (2009).

Nazemi J and Brennan JF, "A Robust Chemometric Model for Determining the Chemical Composition of Human Coronary Artery with Raman Spectroscopy," in Fall Meeting of the Materials Research Society, Symposium AA: Materials for Optical Sensors in Biomedical Applications, Boston, MA (2008), Paper #517487.

Nazemi J & Brennan JF, "Discrimination between cholesterol and cholesterol esters in coronary artery tissue with Raman spectroscopy," Transcatheter Cardiovascular Therapeutics 2008, Washington, D.C., 12-17 October 2008, Paper TCT-640.

Brennan JF (invited), "Raman Spectroscopy," 6th International Vulnerable Plaque Meeting, Vouliagmeni, Greece, 22-24 June 2008.

Nazemi J and Brennan JF, "Rapid Lipid Identification and Quantification in Coronary Artery Tissue via an Optical Fiber Probe with Raman Spectroscopy," in Cardiovascular Revascularization Therapies, Washington, DC (2008), Paper #08-A-186-CRT.

Nazemi J & Brennan JF, "Biochemical assay of human artery tissue via a single optical fiber with high waveneumber Raman shifted light," SPIE symposium on Biomedical Optics (BiOS) 2008, San Jose, CA, 19-24 January 2008, Paper 6842D-80.

Motz JT, Nazemi J, Waxman S, Houser SL, Gardecki JA, Chau AH, Bouma BE, Brennan JF, & Tearney GJ, "Intracoronary Raman diagnostics in a human-to-porcine xenograft model," Transcatheter Cardiovascular Therapeutics 2007, Washington, D.C., 20-25 October 2007, Paper TCT-334.

Brennan JF (invited), "Intravascular spectroscopy," 4th Symposium on the Burden of Atherothrombotic Disease: Diagnosis and Therapy, New York, NY, 9-10 June 2007.

Motz JT, Puppels GJ, Waxman S, Bakker Schut TC, Marple E, Green N, Nazemi J, Chau AH, Gardecki JA, Brennan III JF, and Tearney GJ. *Percutaneous Intracoronary Raman Spectroscopy*. Cardiovascular Revascularization Therapies, Washington, D.C., Paper 813, 7-9 March 2007.

Vaissié L, Kim K, Brennan JF, Mielke MM, Stadler A, Yilmaz T, Saunders T, Goldman D, and Cumbo MJ, "Autonomous, flexible and reliable ultra-short pulse laser at 1552.5 nm," *SPIE Photonics West* (2007).

Brennan JF (presider), "Grating Properies III", *OSA, Bragg Gratings, Photosensitivity, and Poling '03* (September 2003), Monterey, CA, TuD.

Fan X, LaBrake, & Brennan JF, "Chirped fiber grating characterization with phase ripples," *OSA, Optical Fiber Communication 2003* (March 2003), Atlanta, GA, FC2, pp 638-40

Brennan JF, (invited) "Dispersion management with long-length fiber Bragg gratings," *OSA, Optical Fiber Communication 2003* (March 2003), Atlanta, GA, FC1, pp 637-8.

Wang D, Matthews M, & Brennan JF, "PMD measurement of dispersion compensation gratings and its effect on system penalty estimation," *OSA, Optical Fiber Communication 2003* (March 2003), Atlanta, GA, WC3, pp 313-4.

Viswanathan NK & Brennan JF, "Indication of re-circulating catalyst in photosensitive reactions with H_2-saturated silica fibers," *OSA, Optical Fiber Communication 2002* (March 2002), Anaheim, CA, TuQ1, pp. 107-8.

Brennan JF, Matthews MR, and Sinha PG, "The modulation transfer- function of chirped fiber Bragg gratings," *OSA, Bragg Gratings, Photosensitivity, and Poling in Glass Waveguides* (July 2001), Stressa, Italy, BThC21.

Brennan JF, Hernandez E, Valenti JA, Sinha PG, Matthews MR, Elder DE, Beauchesne GA, & Byrd CH, "Dispersion and dispersion-slope correction with a fiber Bragg grating over the full C-band," *OSA, Optical Fiber Communication 2001* (March 2001), Anaheim, CA, PD12.

David MM, Brennan JF, Cronk B, Gates B, Nelson B, Jorgenson C, LaBrake DL, Paolucci D, Byrd C & Valenti J, "Diamond-like film encapsulated fibers for long-length fiber grating production," *IEEE-LEOS Workshop on Fibres and Optical Passive Components,* (June 8-9, 2000), Pavia, Italy, pp. 63-68.

David MM, Brennan JF, Cronk B, Gates B, Nelson B, Jorgenson C, LaBrake DL, Paolucci D, Byrd C & Valenti J, "Diamond-like film encapsulated fibers for long-length fiber grating production," *OSA, Optical Fiber Communication 2000* (March 2000), Baltimore, MD, PD1.

Brennan JF & LaBrake DL, "Realization of >10-m-long chirped fiber Bragg gratings," *OSA, Bragg Gratings, Photosensitivity, and Poling '99* (September 1999), Stuart, FL, ThD2, pp. 35-37. Also in *OSA Trends in Optics and Photonics series*, ed. Tingye Li, Volume 33, pp. 128-30.

Brennan JF & LaBrake DL, "Fabrication of long-period fiber gratings with arbitrary refractive index profiles and lengths," *OSA, Bragg Gratings, Photosensitivity, and Poling '99* (September 1999), Stuart, FL, ThE13, pp. 84-86.

LaBrake DL, Sloan DA & Brennan JF, "Optical losses due to grating fabrication processes in germanosilicate optical fibers", *OSA, Bragg Gratings, Photosensitivity, and Poling '99* (September 1999), Stuart, FL, ThE29, pp. 130-132.

Brennan JF, Sloan DA, LaBrake DL & May M, "Photosensitivity and UV-induced optical loss of silica optical fibers exposed to very-high pressure hydrogen environments," *SPIE, Optical Devices for Fiber Communication* (20-21 September 1999, Boston, MA) ed. MJF Digonnet, **3847**, pp. 42-47.

Brennan JF, Sloan DA, Dent J & LaBrake DL, "The behavior of silica optical fibers exposed to very high-pressure hydrogen environments," *OSA, Optical Fiber Communication '99* (February 1999), San Diego, CA, **THD4**, pp. 59-61.

Römer TJ, Brennan JF, Puppels GJ, van Duinen SG, van der Laarse A & Bruschke AVG, "Raman spectroscopy assisted to localize and quantify cholesterol and calcium salts in coronary arteries," Eur. Soc. Cardiology meeting, *Eur. Heart Suppl* (1998), **19**, pp. 620.

Römer TJ, Buschman HPJ, Puppels GJ, Brennan JF, van der Laarse A, Jukema JW, Havekes LM & Bruschke AVG, "Raman spectroscopy provides chemical mappings of atherosclerotic plaques in APOE*3 Leiden trangenic mice", 47th Ann. Meet. of Amer. College of Cardiology, Atlanta, *JACC* (1998).

Römer TJ, Buschman HPJ, Puppels GJ, Brennan JF, van der Laarse A, Jukema JW, Havekes LM & Bruschke AVG, "Raman spectroscopic mapping of atherosclerotic plaques in APOE*3 Leiden transgenic mice", in *Cardiologie* (1997) **10**, p. 484.

Römer TJ, Brennan JF, Tuinenburg J, van Duinen SG, Bom NA, van der Laarse A, Puppels GJ & Bruschke AVG, "Intravascular ultrasound combined with Raman spectroscopy to localize and quantify cholesterol and calcium salts in atherosclerotic coronary arteries," Ann. Meet. Amer. Heart Assoc., Orlando FL, (November 1997), in *Circulation* supplement, (1997), **96**, p. 193.

Römer TJ, Brennan JF, Puppels GJ, van der Laarse A, Princen H, Buschman R, Jukema JW, Havekes LM & Bruschke AVG, "Raman spectroscopy provides chemical mappings of atherosclerotic plaques in APOE*3 Leiden trangenic mice", Ann. Meet. European Atherosclerosis Society, Brugge, Belgium (1997), in *Atherosclerosis* 1997, **130** supplement, S36.

Puppels GJ, Wolthuis R, Bruining, Römer TJ, Brennan JF, van der Laarse A & Bruschke AVG, "Comparison of IVUS data to Raman spectroscopy", invited talk at XVth Conf. On Raman spectroscopy, Pittsburg, PA (1996).

Fitzmaurice M, Römer TJ, Brennan JF, Feldstein ML, Kramer JR and Feld MS, "In situ diagnosis of coronary artery atherosclerosis using near infrared Raman spectroscopy", *Annual meeting of U. S. and Canadian Acad. Pathology*, Washington, D.C., March 27, 1996, abstract in *Modern Pathology* (1996), **9**, p. 29A.

Wang Y, Brennan JF, Römer TJ, Manoharan R, Salenius JP, Orenstein-Cardona J, Dasari RR, and Feld MS, "Molecular & morphological analysis of human tissue by near infrared Raman spectroscopy", *Am. S. Photobiol. XXIII*, SAM-C4, Washington, D.C., June 17-22, 1995, abstract in *Photochemistry and Photobiology*, **61** supplement, May 1995, p. 5S.

Brennan JF, Römer TJ, Fitzmaurice M, Dasari RR, Kramer JR & Feld MS, "Histochemical analysis of human coronary artery using near infrared Raman spectroscopy", *S. Cardiac Angio. & Interv. XVIII*, Orlando, FL, May 16-20, 1995, abstract in *Cath. & Cardiovasc. Diag.*, **35** (1), (May 1995) p. 87.

Römer TJ, Brennan JF, Wang Y, Tercyak AM, Lees RS, Kramer JR, Dasari RR & Feld MS, "Coronary artery atherosclerosis: histochemical analysis using near infrared Raman spectroscopy", *Ohio Acad. Sci. CIV*, Columbus, OH, April 28-30, 1995, abstract in *Ohio J. Sci*., (April 1995) **95** (2), p. A-16.

Fitzmaurice M, Brennan JF, Römer TJ, Wang Y, Lees RS, Dasari RR, Kramer JR & Feld MS, "Coronary artery atherosclerosis: biochemical analysis using near infrared Raman spectroscopy", *Int. Acad. Pathology*, Toronto, March, 1995, in *Modern Pathology* , **8** (1): 32A (abstract).

Fitzmaurice M, Brennan JF, Römer TJ, Wang Y, Lees RS, Dasari RR, Kramer JR & Feld MS, "Coronary artery atherosclerosis - biochemical analysis using near infrared Raman spectroscopy", *Laboratory Investigation*, **72** (1) (Jan 1995).

Brennan JF, Römer TJ, Tercyak AM, Wang Y, Fitzmaurice M, Lees RS Dasari RR, Kramer JR & Feld MS, "In situ histochemical analysis of human coronary artery by Raman spectroscopy compared with biochemical assay", *SPIE Adv. Fluoresc. Sensing Tech*. (San Jose, CA, 4-10 Feb. 1995), ed. Lakowicz JR, **2388**, 105-109.

Kramer JR, Brennan JF, Römer TJ, Wang Y, Dasari RR & Feld MS, "Spectral diagnosis of human coronary artery: A clinical system for real time analysis", *SPIE Lasers in Surgery: Adv. Characteriz., Therapeutics & Systems V* (San Jose, CA, 4-10 1995), Johnson DE, Abela GS & Shapshay SM, eds., **2395**, 376-382.

Feld MS, Manoharan R, Salenius J, Orenstein-Cardona J, Römer TJ, Brennan JF, Dasari RR & Wang Y, "Detection and characterization of human tissue lesions with near infrared Raman spectroscopy", *SPIE Adv. Fluoresc. Sensing Tech*. (San Jose, CA, 4-10 1995), ed. Lakowicz JR, **2388**, 99-104.

Brennan JF, Römer TJ, Wang Y, Fitzmaurice M, Lees RS, Kramer JR & Feld MS, "Histochemical analysis of human coronary artery using near infrared Raman spectroscopy", *EOS/SPIE Optical Biopsy & Fluoresc. Spectros. & Imag*. (Lille, France, 9-10 Sept. 1994), ed. Katzir A, **2324**, 98.

R. Manoharan, et. al., "Raman spectroscopy for cancer detection: instrument development and tissue diagnosis", *EOS/SPIE Biomedical Optoelect. Devices & Systems II* (Lille, France, 6-8 Sept. 1994), ed. Katzir A, **2328**, 128.

Cothren, et. al., "A Prospective Study of the Diagnosis of Dysplasia at Colonoscopy using Laser-Induced Fluorescence", *ASLMS*, Toronto, Canada, April 8-10, 1994, in *Lasers Surg. & Med.* (abstract).

Cothren R, Brennan JF, Rava RP, Feld MS & Kramer JR, "Autofluorescence imaging of coronary atheroma as a guidance for laser angiosurgery", *ASLMS XII*, Orlando, FL, May 17-19, 1992 (abstract).

Brennan JF, & Zahn M, "Preliminary Kerr electro-optic field mapping measurements in melted polyethylene", *3rd Int. Conf. Conduction & Breakdown in Solid Dielectrics*, July 1989, 555-559.

Hikita, Cooke, Zahn, Wright, & Brennan, "Electric Field and Charge Profiles of Electron Beam Irradiated PMMA until Breakdown using Kerr Electro-optic Measurements", *Conf. Electr. Insul. Dielec. Phen*., 300-306, Oct. 1987.

Hikita, Zahn, Cooke, Wright, & Brennan, "Kerr Electro-optic Field and Charge Mapping Measurements in Electron Beam Irradiated Polymethylmethacrylate in Air and Vacuum", *6th IEEE Pulsed Power Conference*, Arlington, VA, pp. 653-656, June 1987.

Zahn M, Brennan JF, Carreras R, Cooke CM, Hikita M, Masui M, Reyes H, Rhoads K, Shepard S, Sun G, Wang TD & Wright KA, "Kerr Electro-optic Field and Space Charge Mapping Measurements in High Voltage Stressed Gas, Liquid, and Solid Dielectrics", *IEEE Industry Appl. Soc. Conf*., **86CH2272-3**, pp. 1260-1265, 1986.

Trade journal & newsletter articles:

D'Andrade, Kuehn CM, & Brennan JF, "Software recognized as a key subsystem in electrosurgery systems by FDA," Exponent Medical Device Bulletin, Vol. 6, 2016.

D'Andrade, Kuehn CM, & Brennan JF, "Software recognized as a key subsystem in electrosurgery systems by FDA," Exponent Electrical Engineering & Computer Science Newsletter, Vol. 5, 2016.

Brennan JF, "The Physiological Effects of 60 Hz Electric Shocks," *Georgia Defense Lawyer*, Winter 2013, published by the Georgia Defense Lawyer's Association (GDLA), pp. 16 & 47.

Brennan JF, "Biospectroscopy/Cardiology: High-wavenumber Raman reveals composition and location of intracoronary plaques," *BioOptics World*, November 2010, **3**(6).

Brennan JF, "Dispersion compensation gratings for the C-band," *Photonics Spectra*, June 2001, p.159-165.

Brennan JF, "Fiber gratings: vendors braced for the ramp-up," *FiberSystems International*, April 2001, pp. 53-6.

David MM & Brennan JF, "Diamond-like film-encapsulated fibers enable long –length grating production," *Lightwave*, July 2000, pp. 58-64.

Brennan JF, "Breakthrough in long-length fiber Bragg gratings ushers in a new era for the application of fiber gratings technology," *Lightwave*, March 2000, pp. 106- 113.

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Thomas Mahoney vs. Emerson Electric Co.; Emersub XCI, Inc. and Paksense, Inc, Case No. CV01-18-15435, in the District Court of the Fourth Judicial District of the State of Idaho, in and for the County of Ada. Deposition on January 6th, 2023. Retained by Defendant, Emerson Electric Co.

Cisco Systems, Inc vs. Wilson Chung, James He, Jedd Williams, Tom Puorro, and Plantronics, Inc. dba Poly, Case C.A. No. 4:19-cv-07562-PJH, in the United States District Court, Northern District of California. Deposition on October 26th, 2022. Retained by Defendant, Plantronics, Inc. dba Poly.

Ronald Janzen vs. Hal Martin, D.O., Osso Healthcare Network; TPG Hospital, L.L.C., d/b/a/ Northwest Surgical Hospital; The Physicians' Group, L.L.C.; and Healthcare Partners Investments, L.L.C., Case CJ-2016-4425, in the District Court of Oklahoma County, State of Oklahoma. Deposition on September 1st, 2022. Retained by Defendant, Hal Martin, D.O.

Orthopediatrics Corp., Orthex, LLC, and Vilex, LLC, vs. Wishbone Medical, Inc., and Nick A. Deeter, Case No. 3:20 – CV – 00929, in the United States District Court of Indiana, South Bend Division. Deposition March 28, 2022. Retained by Plaintiff, Orthopediatrics Corp.

Kelley Cotton vs. Osama Ahmed, M.D., NSC Consultants, PA, Gerardo Zavala, M.D., PA., Methodist Healthcare System of San Antonio, Ltd., L.L.P. d/b/a Methodist Hospital, and Monteris Medical Corporation, Case No. 2019CI16776, in the District Court of Bexar County, 73rd Judicial District. Deposition March 9th, 2022. Retained by Defendant Monteris Medical Corporation.

Lamont Jennings, Individually and as Personal Representative of The Estate of Ashley Jennings, and Langston Jennings v. American Medical Response AKA AMR and Medevac Midamerica, Inc. AKA AMR, Case No. 18CV0555, in the District Court of Johnson County, Kansas Division No. 15. Deposition June 29, 2020. Retained by the Defendant American Medical Response AKA AMR and Medevac Midamerica, Inc. AKA AMR.

Elicia Cutsinger, v. Gyrus ACMI, Inc., Gyrus ACMI, LP, Olympus Corporation of the Americas, and Olympus America, Inc., Case No. 4:18-CV-00004, United States District Court for the Eastern District of Missouri, St. Louis Division. Deposition January 9, 2019. Retained by Defendant, Olympus Corporation

Quanergy Systems, Inc., v. Velodyne Lidar, Inc., Case No. IPR 2018-00255, United States Patent and Trademark Office, Patent Trial and Appeal Board. Deposition January 4, 2019. Retained by Petitioner, Quanergy Systems, Inc.