

# **Curriculum Vitae**

**Ofer Levi**

## 1. General Information

### 1.1. Contact information

**Name :** Ofer Levi

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### 1.2. Current academic appointments

- **Associate Professor** (07/2014 – present)  
University of Toronto (Toronto, Ontario, Canada)  
Faculty of Engineering, faculty of Medicine  
Institute of Biomaterials and Biomedical Engineering  
The Edward S. Rogers Sr. Department of Electrical and Computer Engineering
- **Associate Member, School of Graduate Studies** (05/2007 – present)  
University of Toronto (Toronto, Ontario, Canada)

### 1.3. Education

<b>Post Doctoral Fellowship</b>	Applied Physics and Electrical Engineering Departments, Stanford University Advisors: Martin M. Fejer and James S. Harris	2000-2005
<b>Ph.D.</b>	Physics, The Hebrew University of Jerusalem, Israel Advisors: Dan Davidov and Aharon J. Agranat	1995-2000
<b>M. Sc. <i>Magna cum laude</i></b>	Applied Physics, The Hebrew University of Jerusalem, Israel , Advisor: Nissim Ben Yosef	1990-1992
<b>B. Sc. <i>Magna cum laude</i></b>	Applied Physics / Electro-Optics, Jerusalem College of Technology, Israel	1984-1988

## 1.4. Work and training experience

### **07/2014 – current: Associate Professor, University of Toronto, Institute of Biomaterials and Biomedical Engineering and the Edward S. Rogers Sr. Department of Electrical and Computer Engineering**

My main fields of interest include bio-photonics and semiconductor optical devices, and in particular, the development of miniature optical bio-sensors and biomedical imaging systems enabled by semiconductor optical devices and nano-structures. We seek to design, fabricate and use miniature optical imaging systems for portable micro-fluidics diagnosis systems and for *in vivo* applications such as optical brain imaging, and continuous monitoring of tissue kinetics. Our research direction is divided into two main categories:

- (i) Miniature bio-sensors for optical sensing inside Lab-on-a-Chip micro-fluidics chips
- (ii) Bio-sensors and optical imaging systems for portable imaging inside the body (*in vivo* imaging) for neural imaging, tissue imaging, and cancer studies applications.

### **07/2007 – current: Visiting Professor, Department of Electrical Engineering, Stanford University, Stanford, CA**

As a Visiting Professor, I interact with researchers and students at Stanford University that share mutual research interests in optical devices, optical imaging and biomedical applications. It does not include direct teaching requirement, but I am involved in mentoring PhD students in micro- and nano-fabrication of optical devices, biomedical optical imaging and sensing.

### **05/2007 – 06/2014: Assistant Professor, University of Toronto, Institute of Biomaterials and Biomedical Engineering and the Edward S. Rogers Sr. Department of Electrical and Computer Engineering**

### **12/2005 - 05/2007: Research Associate, Department of Electrical Engineering, Stanford University, Stanford, CA**

#### **Supervisor: Professor James S. Harris**

Fabricated and evaluated optical semiconductor-based integrated sensors that included VCSELs, PIN photodiodes, and micro-optics for fluorescence sensing applications, measured near-IR neural activity through oxygenation changes using Intrinsic Optical Signal Imaging (IOSI) in mice, and fabricated and evaluated index of refraction sensors, using Photonic Crystal Slab nano-structures.

### **02/2000 - 12/2005: Post Doctoral Fellow, Department of Applied Physics and Department of Electrical Engineering, Stanford University, Stanford, CA**

#### **Supervisor: Professor Martin M. Fejer, Professor James S. Harris,**

Designed and fabricated GaAs nano-structures and devices for Quasi-Phase-Matching (QPM) nonlinear optical wave mixing, applied these devices to create highly tunable mid-IR coherent light sources using difference frequency generation (DFG) and optical parametric oscillation (OPO) techniques for chemical and bio-sensing, participated in development and evaluation of near infrared optical semiconductor-based optical sensors and MEMS-based miniature spectrometers for Lab-on-a-Chip microfluidic chips.

**04/1995 - 02/2000: Research Assistant, Racah Institute of Physics, The Hebrew University of Jerusalem, Jerusalem, Israel**

**Supervisor: Professor Dan Davidov, Professor Aharon J. Agranat**

Studied at the Interdisciplinary Neural Computation Graduate Student program and at the Physics Department and conducted my thesis research at the Racah Institute of Physics. Fabricated and measured the optical properties of composite conjugated polymer layers and holographic optical devices for storage applications, fabricated and evaluated fast organic light emitting diodes (LED's) and quantum well structures in conjugated polymers.

**04/1995 - 02/2000: Consultant and Manager (part time), Spin Consulting and System Design, Netanya, Israel.**

Managed a small private consulting firm specializing in electro-optical engineering and system engineering services to mid-size and large companies in Israel; assisted companies in research, development and production support activities; contributed in various projects including biomedical diagnostics (developing an automated fluorescence microscope for clinical diagnostics), machine vision (developing fabric inspection and analysis imaging systems), optical communications (creating Metro free-space optical communication links), and semiconductor production support (developing transistor failure spectral analysis system, Intel R&D center, Haifa, IL)

**04/1993- 04/1995: Physicist and Electro-optical Engineer, Kodak Graphic Communications Group, Eastman Kodak Company (formerly Scitex Corp.), Herzlia, Israel.**

Participated in research and development activities and in production support for large format laser-based film and plate printers, pre-press color printers, and scanners optimized for full color production in the pre-press and press industry; designed, fabricated and evaluated imaging systems and fast scanning laser systems in the visible and the near infrared spectral regions for pre-press film and plate printers, simulated and optimized optical systems performance.

**09/1990 - 11/1992: Research Assistant, Department of Applied Physics, The Hebrew University of Jerusalem, Jerusalem, Israel**

**Supervisor: Professor Nissim ben Yosef**

Designed, built and evaluated diode-pumped solid state lasers, modeled the optical and thermal properties of Nd:YAG and Nd:YLF based diode-pumped laser cavities.

**07/1988- 10/1991: Project Leader, Army Research and Development Department, Israel Defense Forces, Israel**

Participated in an Army technical team, focusing on developing and evaluating performance for Electro-optics devices and systems, for army use; developed specifications and optical system architecture and field-tested long-range optical imaging systems; evaluated imaging optics and image sensor modules performance in the visible, near infrared and mid infrared spectral regions; directed the integration of GPS and range finding modules with optical imaging systems.

## 1.5. Awards, honors and scholarships

Award	Name	Organization	Year
Distinction	Finalist Team patent award, Bio-design patent competition.	Stanford University	2003
Distinction	Intel Prize, for outstanding Ph.D. work	Intel Corporation, Israel	1999
Research Award	Interdisciplinary Neural Computation Graduate Fellowship	The Hebrew University of Jerusalem	1993
Distinction	M. Sc. in applied Physics, <i>Magna cum laude</i>	The Hebrew University of Jerusalem	1992
Distinction	B.Sc. in Applied Physics/Electro-optics, <i>Magna cum laude</i>	Jerusalem College of Technology	1988

## 2. Scholarly work

### 2.1. Research Interests

My main fields of interest include bio-photonics and semiconductor optical devices, and in particular, the development of miniature optical bio-sensors and biomedical imaging systems enabled by semiconductor optical devices and nano-structures. We seek to design, fabricate and use miniature optical imaging systems for portable micro-fluidics diagnosis systems and for *in vivo* applications such as optical brain imaging, and continuous monitoring of tissue kinetics. Our research direction is divided into two main categories:

- (i) *Miniature bio-sensors for optical sensing inside Lab-on-a-Chip micro-fluidics chips*
- (ii) *Bio-sensors and optical imaging systems for portable imaging inside the body (in vivo imaging) for neural imaging, tissue imaging, and cancer studies applications.*

My group uses a multifaceted interdisciplinary approach that include activities in (1) device and optical system modeling; (2) fabrication and optimization of custom optical sensor devices; (3) optoelectronic characterization of the device and the system performance, and (4) application to bio-medical diagnostics, *in vivo* imaging, and study of bio-molecular interactions.

## 2.2. Publications

### 2.2.1. Journal papers

*Published: My trainees are underlined*

- 29. I. Sigal, R. Gad, A. M. Caravaca, Y. Atchia, D. B. Conkey, R. Piestun, and **O. Levi**, "Laser Speckle Contrast Imaging with Extended Depth of Field for *in-vivo* Tissue Imaging", Biomed. Opt. Express, **5(1)**, pp. 123-135 (2014).
- 28. C. Nicholaou, W. T. Lau, R. Gad, H. Akhavan, R. Schilling, and **O. Levi**, "Enhanced Detection Limit by Dark Mode Perturbation in 2D Photonic Crystal Slab Refractive Index Sensors", Optics Express, **21(25)**, pp. 31698-31712 (2013)

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27. **O. Levi**, “VCSEL-Based Imaging System Monitors Brain Activity”, Invited feature article, *Biophotonics Magazine*, Oct. 2013 issue, pp. 28-31 (2013)
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26. **S. Dufour**, **Y. Atchia**, **R. Gad**, **D. Ringuette**, **I. Sigal**, and **O. Levi** , “Laser speckle contrast imaging as an intrinsic method to monitor blood brain barrier integrity “,*Biomed. Opt. Express* **4(10)**, pp. 1856-1875 (2013).
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25. **T. D. O'Sullivan**, **R. T. Heitz**, **N. Parashurama**, **D. B. Barkin**, **B. A. Wooley**, **S. S. Gambhir**, **J. S. Harris**, and **O. Levi**, "Real-time, continuous, fluorescence sensing in a freely-moving subject with an implanted hybrid VCSEL/CMOS biosensor," *Biomed. Opt. Express* **4(8)**, pp. 1332-1341 (2013).
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24. **Y. Atchia**, **H. Levy**, **S. Dufour**, and **O. Levi**, “Rapid Multi Exposure in-vivo Brain Imaging System using VCSELs as a Light Source”, *Applied Optics*, **52(7)** pp. C64-C71 (2013)
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23. **N. Parashurama**, **T. D. O'Sullivan**, **A. De La Zerda**, **P. El Kalassi**, **S. Cho**, **H. Liu**, **R. Teed**, **H. Levy**, **J. Rosenberg**, **Z. Cheng**, **O. Levi**, **J. S. Harris**, and **S. S. Gambhir** “Continuous sensing of tumor-targeted molecular probes with a Vertical Cavity Surface Emitting Laser based biosensor”, *J. Biomed. Opt.* **17(11)**, pp. 117004 (2012)
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22. **H. Levy**, **D. Ringuette**, and **O. Levi**, “Rapid monitoring of cerebral ischemia dynamics using laser-based optical imaging of blood oxygenation and flow” *Biomed. Opt. Express* **3(4)**, pp. 777-791 (2012).
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21. **E. A. Munro**, **H. Levy**, **D. Ringuette**, **T. D. O'Sullivan**, and **O. Levi**, "Multi-modality optical neural imaging using coherence control of VCSELs," *Opt. Express* **19**, pp. 10747-10761 (2011).
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20. **M. El Beheiry**, **V. Liu** , **S. Fan** and **O. Levi**, “Sensitivity enhancement in photonic crystal slab bio-sensors”, *Optics Express* **18(12)**, pp. 22702-22714 (2010)
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19. **T. D. O'Sullivan**, **E. A. Munro**, **N. Parashurama**, **A. De la Zerda**, **C. Conca**, **S. S. Gambhir**, **J. S. Harris**, and **O. Levi** , “Implantable semiconductor biosensor for continuous in vivo sensing of far-red fluorescent molecules”, *Optics Express* **18(12)**, pp. 12513-12525 (2010)
- 
18. **O. Levi**, **T. T. Lee**, **M. M. Lee**, **S. J. Smith**, and **James S. Harris**, “Integrated Semiconductor Optical Sensors for Cellular and Neural Imaging”, *Appl. Optics*, **46(10)**, pp. 1881-1889 (2007).
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17. **S. E. Bisson**, **T. J. Kulp**, **O. Levi**, **J. S. Harris** and **M.M. Fejer**, “Long-wave IR chemical sensing based on difference frequency generation in orientation-patterned GaAs”, *Appl. Phys. B - Lasers and Optics*, **85 (2-3)**, pp. 199-206 (2006).
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16. **E. Thrush**, **O. Levi**, **L. J. Cook**, **J. Deich**, **A. Kurtz**, **S. J. Smith**, **W. E. Moerner** and **J. S. Harris Jr.**, “Monolithically integrated semiconductor fluorescence sensor for microfluidic applications”, *Sens. Actuators B: Chemical*, **105**, pp. 393-399 (2005).
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15. **K. L. Vodopyanov**, **O. Levi**, **P. S. Kuo**, **T. J. Pinguet**, **J. S. Harris**, **M. M. Fejer**, **B. Gerard**, **L. Becouarn**, and **E. Lallier**, “Optical parametric oscillation in quasi-phase-matched GaAs”, *Opt. Lett.* **29**, pp. 1912-1914 (2004).
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14. **X. Yu**, **P. S. Kuo**, **K. Ma**, **O. Levi**, **M. M. Fejer**, and **James S. Harris, Jr.**” Single-phase growth studies of GaP on Si by solid-source molecular beam epitaxy”, *J. Vac. Sci. Technol. B*, **22(3)**, pp. 1450-1454, (2004).
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13. **E. Thrush**, **O. Levi**, **W. Ha**, **G. Carey**, **L. J. Cook**, **J. Deich**, **S. J. Smith**, **W. E. Moerner**, and **J. S. Harris**, “Integrated Semiconductor Vertical-Cavity Surface-Emitting Lasers and PIN Photodetectors for Bio-Medical Fluorescence Sensing”, *IEEE J. Quant. Electronics*, **40(5)**,
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- pp. 491-498 (2004).
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12. T. Skauli, P. S. Kuo, K. L. Vodopyanov, T. J. Pinguet, **O. Levi**, L.A. Eyres, J. S. Harris, M. M. Fejer, B. Gerard, L. Becouarn, E. Lallier, "Improved dispersion relations for GaAs and applications to nonlinear optics", *J. Appl. Phys.* **94**(10), pp. 6447-6455, (2003).

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  11. E. Thrush, **O. Levi**, W. Ha, K. Wang, S. J. Smith, and J. S. Harris Jr. "Integrated Bio-Fluorescence Sensor", *J. Chrom. A*, **1013**, pp. 103-110 (2003).

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  10. X. Yu, L. Scaccabarozzi, **O. Levi**, T. J. Pinguet, M. M. Fejer, and J. S. Harris Jr. "Template design and fabrication for low loss orientation-patterned nonlinear AlGaAs waveguides pumped at 1.55  $\mu\text{m}$ ", *J. Crystal Growth*, **251**, pp. 794-799 (2003).

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  9. **O. Levi**, T. J. Pinguet, T. Skauli, L. A. Eyres, K. R. Parameswaran, J. S. Harris Jr., M. M. Fejer, T. J. Kulp, S. E. Bisson, B. Gerard, E. Lallier, and L. Becouarn, "Difference-frequency generation of 8- $\mu\text{m}$  radiation in orientation-patterned GaAs crystal", *Opt. Lett.* **27**, pp. 2091-2093 (2002).

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  8. T. J. Kulp, S. E. Bisson, R. P. Bambha, T. A. Reichardt, U. B. Goers, K. W. Aniolek, D. A. V. Kliner, B. A. Richman, K. M. Armstrong, R. Sommers, R. Schmitt, P. E. Powers, **O. Levi**, T. J. Pinguet, M. M. Fejer, J. P. Koplou, L. Goldberg, T. G. Mcrae, "The application of quasi-phase-matched parametric light sources to practical infrared chemical sensing systems", *Appl. Phys. B - Lasers and Optics*, **75**, pp. 317-327 (2002).

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  7. T. Skauli, K. L. Vodopyanov, T. J. Pinguet, A. Schober, **O. Levi**, L.A. Eyres, M. M. Fejer, J. S. Harris, B. Gerard, L. Becouarn, and E. Lallier, "Measurement of nonlinear coefficient of orientation-patterned GaAs and demonstration of highly efficient second harmonic generation", *Opt. Lett.* **27**, pp. 628-630 (2002).

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  6. A. Donval, D. Josse, G. Kranzelbinder, R. Hierle, E. Toussaere, J. Zyss, G. Perpelitsa, **O. Levi**, D. Davidov, I. Bar-Nahum, R. Neumann, "Photo-luminescence in a conjugated polymer/glass composite film", *Synth. Metals* **124** (1) pp. 59-61 (2001).

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  5. **O. Levi**, A. V. Yakimov, H. Nassar, D. Davidov, S. Pfeiffer, and H. H. Horhold, "Polymer and cathode emission studies of polymer-based light-emitting diodes under strong electrical pulse excitation", *J. Appl. Phys.* **88**, pp. 2548-2552 (2000).

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  4. **O. Levi**, G. Perpelitsa, D. Davidov, S. Shalom, I. Benjamin R. Neumann, A. J. Agranat, and Y. Avny, "A photo-oxidation mechanism for patterning and hologram formation in conjugated polymer/glass composites", *J. Appl. Phys.* **88**, pp. 1236-1243 (2000).

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  3. **O. Levi**, S. Shalom, I. Benjamin, G. Perpelitsa, A. J. Agranat, R. Neumann, Y. Avny, and D. Davidov, "Conjugated Polymeric Composites for Holographic Storage", *Synth. Metals* **102**, pp. 1178-81 (1999).

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  2. **O. Levi**, G. Perpelitsa, D. Davidov, A. J. Agranat, I. Benjamin, S. Shalom, R. Neumann, and Y. Avny, "Holographic storage in conjugated-polymers composites", *Phys. Rev. B* **57** (20), pp. R12647-12650, (1998).

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  1. E. Z. Faraggi, Y. Sorek, **O. Levi**, Y. Avny, D. Davidov, R. Neumann, and R. Reisfeld, "New Conjugated Polymer/Sol-Gel Glass Composites: Luminescence and Optical Waveguides", *Adv. Mater.*, **8**, pp. 833-837 (1996).
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## 2.2.2. Conference proceedings

*Published: My trainees are underlined*

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65. S. Dufour, P. Bazzigaluppi, **O. Levi** and P. L. Carlen, “Extracellular and intracellular K<sup>+</sup> accumulation and buffering during focal cortical epilepsy: a spatiotemporal study *in vivo*”, submitted to the American Epilepsy Society (AES) 68<sup>th</sup> annual meeting, Seattle, WA (Dec. 2014) ID: 2034575
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64. R. Gad, C. Nicholaou, S. Ahmadi, and **O. Levi**, “Guided Resonance Manipulation and Degeneracy Removal by Elliptical Nano-Holes in Photonic Crystal Slabs”, Proc. of the Conference of Lasers and Electro-Optics (**CLEO 2014**), San Jose, CA, paper STu2H.6, (June 2014) (oral)
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63. S. Dufour, D. Ringuette, S. Stern, M. Pettigrew, M. Wu, **O. Levi**, T. A. Valiante, and P. L. Carlen, “*In vivo* imaging of neocortical intracellular K<sup>+</sup> fluctuations during seizures”, *Neuroscience 2013 Abstracts*, Society for Neuroscience 2013 (online), paper 626.17/N2, San Diego, CA, (Nov. 2013) (poster)
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62. M. Chang, S. Dufour, J. Dian, **O. Levi**, P. L. Carlen and T. A. Valiante, “Optogenetic control of interneuronal synchrony can generate seizure-like events (sles) in multiple models of epilepsy”, *Neuroscience 2013 Abstracts*, Society for Neuroscience 2013 (online) paper 627.24 / P1-DP4, San Diego, CA, (Nov. 2013) (poster)
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61. Y. Atchia, I. Sigal, S. Dufour, R. Gad, and **O. Levi**, “In-vivo depth evaluation in brain imaging by coherence length tuning of VCSELs ”, Imaging Systems and Applications (**IS**), OSA Technical Digest (CD), paper ITh2D.4, Arlington, VA, (June 2013). (oral)
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60. H. Akhavan, W. T. Lau, C. Nicholaou, R. Schilling, R. Gad, and **O. Levi**, “A New Scheme for Improvement of Index of Refraction Detection Limit in 2D Photonic Crystals”, Proc. of the Conference of Lasers and Electro-Optics (**CLEO 2013**), San Jose, CA, paper CTh3J.8, (June 2013) (oral)
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59. I. Sigal, Y. Atchia, R. Gad, A. M. Caravaca, D. Conkey, R. Piestun, and **O. Levi**, “Laser Speckle Contrast Imaging with Extended Depth of Field for Brain Imaging Applications”, Proc. of the Conference of Lasers and Electro-Optics (**CLEO 2013**), San Jose, CA, paper CTu2M.5, (June 2013) (oral)
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58. Y. Atchia, R. Gad, S. Dufour, D. Ringuette, I. Sigal, and **O. Levi**, “Multimodal portable optical neural imaging with VCSELs”, Advances in Optics for Biotechnology, Medicine and Surgery XIII, Lake Tahoe, CA (June 2013) (poster)
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57. M. Chang, S. Dufour, J. Dian, **O. Levi**, P. Carlen, T. Valiante, “Optogenetics approach to investigate the role of interneurons in seizure propagation in an in vitro and in vivo model of epilepsy”, 7<sup>th</sup> Annual meeting of the Canadian Association for Neuroscience (**CAN 2013**), (online), paper 3-B-18, Toronto, CA, (May 2013) (poster)
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56. S. Dufour, Y. Atchia, R. Gad, P. L. Carlen, and **O. Levi**, ” Laser Speckle Contrast Imaging during Blood Brain Barrier opening”, 7<sup>th</sup> Annual meeting of the Canadian Association for Neuroscience (**CAN 2013**), (online), paper 2-G-197, Toronto, CA, (May 2013) (poster)
- 
55. S. Dufour, Y. Atchia, P. Carlen, and **O. Levi**, “Multimodal Optical Brain Imaging for in vivo Epilepsy Studies”, 2013 European Conferences on Biomedical Optics meeting (**ECBO 2013**), Munich, Germany, paper ES3A.2 (May 2013) (oral)
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54. Y. Atchia, R. Gad, S. Dufour, H. Levy, and **O. Levi**, “CMOS camera based imaging of brain hemodynamic”, (**FiO 2012**), Rochester, NY, paper Fth4C (October 2012) (oral)
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53. S. Dufour, Y. Atchia, H. Levy, D. Ringuette, and **O. Levi**, “Laser contrast speckle imaging to monitor blood brain barrier integrity”, (**FiO 2012**), Rochester, NY, paper Fth6C (October 2012) (oral)
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52. Y. Atchia, H. Levy, and **O. Levi**, “Deviations in Long Exposure Laser Speckle Contrast Imaging: Accounting for Static Scatterers”, Imaging Systems and Applications (**IS**), OSA Technical Digest (CD), paper JW4A.3, (June 2012) (oral)
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51. R. Schilling, D. Aydin, and **O. Levi**, “Self-Referenced Photonic Crystal Biosensors for in situ Binding Studies”, *Proc. of the Conference of Lasers and Electro-Optics (CLEO 2012)*, San Jose, CA, paper JTh2A.11, (May 2012). (poster)
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50. Y. Atchia, H. Levy, S. Dufour, and **O. Levi**,” Speckle contrast at deviations from best focus in microfluidic and in vivo”, Biomedical Optics conference (**BIOMED 2012**) paper BTu3A.49, Optical Society of America (OSA), Miami, FL (April 2012)(poster)
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49. R. Schilling, D. Aydin, H. Akhavan, M. El Beheiry, and **O. Levi**, "Crossed-polarization Analysis of Guided Modes in Photonic Crystal Slab Biosensors," in **Optical Sensors**, Toronto, ON, OSA Technical Digest (CD), paper SWB2, (June 2011) (oral)
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48. D. Ringuette, H. Levy, and **O. Levi**, “Simultaneous Oxygenation and Flow using current modulation of VCSELs during Ischemia”, *Proc. of the Conf. of Lasers and Electro-Optics (CLEO 2011)*, Baltimore, MD, paper CTuF3, (May 2011) (oral)
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47. H. Levy, D. Ringuette, and **O. Levi**,” Multi-exposure speckle contrast imaging using current pulsed VCSELs” , *Proc. of the Conference of Lasers and Electro-Optics (CLEO 2011)*, Baltimore, MD, paper JWA98 (May 2011). (poster)
- 
46. H. Akhavan, M. El-Beheiry, R. Schilling, D. Aydin and **O. Levi**, “Evaluation of High Quality Factor Photonic Crystal Slabs for Biosensing”, *Proc. of the Conference of Lasers and Electro-Optics (CLEO 2011)*, Baltimore, MD, paper JWA105 (May 2011). (poster)
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45. H. Levy, D. Ringuette, E. Munro, and **O. Levi** "Multimodal Optical Neural Imaging utilising Coherence Control in VCSELs", **Frontiers in Neurophotonics Conference**, Biophotonics world, Quebec City, QC. (September 2010) (poster)
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44. M. El Beheiry and **O. Levi**, "Enhanced sensitivity in optofluidic photonic crystal slab biosensors", *Proc. of the Conference of Lasers and Electro-Optics (CLEO 2010)*, San Jose, CA, (May 2010) (poster)
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43. D. A. A. Ringuette, H. Levy, E. A. Munro, X. Jin, and **O. Levi**,” Simultaneous Speckle Contrast and Functional Brain Tissue Imaging System”, Biomedical Optics conference (**BIOMED 2010**), paper BTuD51, Optical Society of America (OSA), Miami, FL (April 2010) (poster)
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42. M. El Beheiry, V. Liu, S. Fan, and **O. Levi**,” Suspended photonic crystal slabs for biosensing”, SPIE Photonics West 2010 conference, paper 75530R, San Jose, CA (January 2010) (poster)
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41. T. D. O’Sullivan, E. A. Munro, J. S. Harris and **O. Levi**, “Fabrication of an integrated 670nm VCSEL-based sensor for miniaturized fluorescence sensing”, SPIE Photonics West 2010 conference, paper 76150D, San Jose, CA (January 2010)
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40. N. Parashurama, T. D. O'Sullivan, A. De La Zerda, E. A. Munro, **O. Levi**, J. S. Harris, and S. S. Gambhir, "Continuous molecular monitoring of near infrared fluorophore in the tumors of living subjects using a microfabricated, implantable biosensor", paper 1113, **WMIC**, 2009 World Molecular Imaging Congress, Montreal, CANADA (September 2009)
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39. T. D. O'Sullivan, E. A. Munro, C. Conca, N. Parashurama, A. De la Zerda, S. S. Gambhir, J. S. Harris, and **O. Levi**, "Near-Infrared in vivo Fluorescence Sensor with Integrated Dielectric Emission Filter," *Proc. of the Conference of Lasers and Electro-Optics (CLEO 2009)*, Baltimore, MD, paper JWA49, (May 2009).
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38. T. D. O'Sullivan, E. A. Munro, A. de la Zerda, N. Parashurama, R. Teed, **O. Levi**, S. S. Gambhir, and J. S. Harris, "Implantable optical biosensor for in vivo molecular imaging", Proceedings of the SPIE -The International Society for Optical Engineering **7173**, Optical Fibers and Sensors for Medical Diagnostics and Treatment Applications IX, San Jose, CA, 7173-09 (January 2009).
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37. T. D. O'Sullivan, E. A. Munro, **O. Levi**, and J. S. Harris, "GaAs-based Integrated Fluorescence Bio-Sensors: Progress towards high Rejection of laser excitation light", IEEE-LEOS International Nano-Optoelectronics Workshop, **i-NOW 2008**, pp.179-180, Tokyo, Japan (August 2008) (poster)
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36. E. A. Munro, R. M. Henkelman, and **O. Levi**, "Optical mice - translating MRI images to 3D optical simulation for optical biomedical rodent studies", Proc. of Photonics North 2008 conference pp. 90, Montreal, Canada, (June 2008) (poster)
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35. T. D. O'Sullivan, A. Wechselberger, **O. Levi**, and J. S. Harris, "Compact Semiconductor Bioluminescence Bio-sensors," in **Frontiers in Optics**, OSA Technical digest (Optical Society of America), September 2007, San Jose, CA, paper JMD5 (2007)
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34. **O. Levi**, M. M. Lee, J. Zhang, V. Lousse, S. R. J. Brueck, S. Fan, and J. S. Harris, "Optical Characterization and Sensitivity Evaluation of Guided-Resonances in Photonic Crystal Slabs for Biosensing Applications", Conference on Lasers and Electro-Optics (**CLEO 2007**), May 2007, Baltimore, MD, paper CWK3 (2007)
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33. **O. Levi**, M. M. Lee, J. Zhang, V. Lousse, S. R. J. Brueck, S. Fan, and J. S. Harris, "Sensitivity analysis of a photonic crystal structure for index-of-refraction sensing", Proceedings of the SPIE-The International Society for Optical Engineering **6447**, Nanoscale Imaging, Spectroscopy, Sensing, and Actuation for Biomedical Applications IV, San Jose, CA, paper 6447-25 (2007)
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32. S. E. Bisson, T. J. Kulp, **O. Levi**, J. Harris, and M. M. Fejer, "Long-Wavelength Infrared Chemical Sensing", **Invited paper**, Conference on Lasers and Electro-Optics (**CLEO 2006**), May 2006, Long Beach, CA, paper CWA4 (2006).
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31. **O. Levi**, W. Suh, M. M. Lee, J. Zhang, S. R. J. Brueck, S. Fan, and J. S. Harris, "Guided-Resonance in Photonic Crystal Slabs for Biosensing Applications", Conference on Lasers and Electro-Optics (**CLEO 2006**), May 2006, Long Beach, CA, paper CTuK.
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30. **O. Levi**, T. T. Lee, M. M. Lee, and J. S. Harris, "Integrated Semiconductor Bio-Sensors for In Vivo Cellular and Neural Imaging", OSA Biomedical Optics Topical Meeting (**BIOMED 2006**), March 2006, Fort Lauderdale, Florida, paper WF8 (2006)
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24. E. P. Thrush, **O. Levi**, L. J. Cook, J. Deich, S. J. Smith, W. E. Moerner, J. S. Harris, Jr., "Integrated semiconductor bio-fluorescence sensor integrated on micro-fluidic platform" Conference on Lasers and Electro-Optics (**CLEO 2004**) San Francisco, CA, p. CThI3 (2004)
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23. S. E. Bisson, T. J. Kulp, **O. Levi**, M. M. Fejer, and James S. Harris Jr., "Long-wave infrared chemical sensing based on difference frequency generation in orientation-patterned GaAs", Conf. on Lasers and Electro-Optics (**CLEO 2004**) San Francisco, CA, paper CMN1 (2004).
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20. E. Thrush, **O. Levi**, L. J. Cook, W. Ha, J. Deich, S. J. Smith, W. E. Moerner, and James Harris Jr. "Laser background characterization in a monolithically integrated bio-fluorescence sensor", Proceedings of the SPIE-The International Society for Optical Engineering **5318**, Advanced Biomedical and Clinical Diagnostics Systems, San Jose, CA, pp. 59-66 (2004).
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19. E. Thrush, **O. Levi**, W. Ha, J. S. Harris Jr., and S. J. Smith, "Integrated semiconductor fluorescence sensor for portable bio-medical diagnostics", Conference on Lasers and Electro-Optics (**CLEO 2003**), Baltimore, MD, 2003, OSA Technical Digest (Optical Society of America), Washington DC, paper CTuU1, pp. 824-826 (2003).
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  12. K. L. Vodopyanov, T. Skauli, T. J. Pinguet, A. Schober, **O. Levi**, L. A. Eyres, M. M. Fejer, J. S. Harris, B. Gerard, L. Becouarn, and E. Lallier, "Highly efficient SHG in all-epitaxial quasi-phase-matched GaAs", in TOPS **73**, Conference on Lasers and Electro-Optics (**CLEO 2002**), OSA Technical Digest (Optical Society of America), Washington DC, pp. 419 (2002).

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  11. E. Thrush, **O. Levi**, K Wang, J. S. Harris and S. J. Smith, "Integrated Semiconductor Fluorescence Detection System for Biochip and Biomedical Applications", IEEE-EMBS Special Topic Conference on Microtechnologies in Medicine and Biology, Madison, Wisconsin, pp.374-379 (2002).

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  10. S. E. Bisson, T. J. Kulp, R. Bambha, K. Armstrong, **O. Levi**, T. J. Pinguet, L. A. Eyres, M. M. Fejer, J. S. Harris Jr., "Long-wave IR chemical sensing based on difference frequency generation in orientation patterned GaAs" Proceedings of the SPIE-The International Society for Optical Engineering **4634**, Methods for Ultrasensitive Detection II , pp. 78-82 (2002).

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  9. E. P. Thrush, **O. Levi**, K. Wang, J. S. Harris Jr., and S. J. Smith, "Integrated semiconductor fluorescent detection system for biochip and biomedical applications", Proceedings of the SPIE-The International Society for Optical Engineering **4626**, Biomedical Nanotechnology Architectures and Applications, San Jose, CA pp. 289-297, (2002).

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  8. T. J. Pinguet, L. Scaccabarozzi, **O. Levi**, T. Skauli, L. A. Eyres, M. M. Fejer, J.S. Harris," Second Harmonic Generation in Orientation-Patterned AlGaAs Waveguides Pumped at 1.55  $\mu\text{m}$ ", The 14<sup>th</sup> Annual Meeting of the IEEE Lasers & Electro-Optics Society (**LEOS 2001**), San Diego, CA pp. 376-377 (2001).

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  7. T. Skauli, K. Vodopyanov, T. J. Pinguet, **O. Levi**, L.A. Eyres, M. M. Fejer, J. S. Harris, V. Gerard, L. Becouarn, E. Lallier, "Second harmonic generation in thick orientation-patterned GaAs" Optical Society of America annual meeting 2001, Long beach, CA (2001).

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  6. **O. Levi**, T. Skauli, T. J. Pinguet, L. A. Eyres, L. Scaccabarozzi, M. M. Fejer, J. S. Harris Jr., T. J. Kulp, S. Bisson, B. Gerard, L. Becouarn, E. Lallier, "Mid-infrared generation by difference-frequency mixing in orientation-patterned GaAs", in TOPS Vol. **56**, Conference on Lasers and Electro-Optics (**CLEO 2001**), OSA Technical Digest (Optical Society of
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America), Washington DC, pp. 675-676 (2001) *Post deadline paper.*

5. T. J. Pinguet, **O. Levi**, T. Skauli, L. A. Eyres, L. Scaccabarozzi, M. M. Fejer, J. S. Harris, T. J. Kulp, S. Bisson, B. Gerard, L. Becouarn, E. Lallier, "Characterization of 0.5 mm thick films of orientation-patterned GaAs for nonlinear optical applications" in TOPS Vol. **56**, Conference on Lasers and Electro-Optics (**CLEO 2001**), OSA Technical Digest (Optical Society of America), Washington DC, pp. 138 (2001).

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4. T. J. Pinguet, L. A. Eyres, C. B. Ebert, **O. Levi**, M. M. Fejer, and J. S. Harris Jr., "Epitaxial orientation-patterning of AlGaAs films for nonlinear optical devices", Proc. of the IEEE 27<sup>th</sup> International Symposium on Compound Semiconductors, Monterey, CA, pp. 229-232 (2000).

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3. **O. Levi**, A. J. Agranat, G. Perepelitsa, S. Shalom, R. Neumann, Y. Avny and D. Davidov, "Oxygen-dependent hologram writing and fixing in conjugated polymers storage media", Proceedings of the SPIE-The International Society for Optical Engineering **3082**, Advanced Optical Data Storage: Materials, Systems, and Interfaces, Denver, CO, pp. 100-110 (1999)

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2. **O. Levi**, J. M. Poplawski, M. Tarabia, E. Ehrenfreund, and D. Davidov, "Electroabsorption spectroscopy of self-assembled (PPV/SPS) films: size dependent blue shift", Proceedings of the SPIE-The International Society for Optical Engineering **3145**, Optical Probes of Conjugated Polymers, San Diego, CA, pp. 444-452, (1997).

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1. **O. Levi**, I. Benjamin, R. Neumann, Y. Avny, A. J. Agranat, and D. Davidov, "Highly Photorefractive Sol-Gel/Polymer Composite", Proceedings of the 1997 OSA Topical Meeting on Photorefractive Materials and Devices (**PR 97**), Chiba, Japan, pp. 86-89, (1997).

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### 2.3. Patents and invention disclosures

E. P. Thrush, **O. Levi**, S. J. Smith, and J. S. Harris, "Excitable Target Marker Detection", *USPTO patent 7,604,981 (awarded October 2009) (P)*

**O. Levi**, E. P. Thrush, S. J. Smith, K. V. Shenoy, and James S. Harris, "Implantable Sensing Arrangement and Approach", *USPTO patent 8,306,607 (awarded June 2012) (P)*

E. A. Munro **O. Levi**, "System and method for Optical Imaging with Vertical Cavity Surface Emitting Lasers", *USPTO patent application # 13/357,070 (January 2012) – applied*

### 2.4. Invited presentations

- **S. Dufour**, **O. Levi**, P. Carlen, "In Vivo Electrophysiology and Neurophotonics to Study Epilepsy", Gloor Symposium, Eastern Association of Electroencephalographers meeting, Bromont, QC (Feb. 15, 2014)

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- **Levi, O.** "Multimodal optical neural imaging system incorporating laser speckle contrast imaging", Biomedical Applications of Light Scattering IX, SPIE Photonics West 2014, San Francisco, CA (Feb. 2, 2014)

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- **Levi, O.** "Multimodal Optical Neural imaging using VCSELs", Imaging Systems and Applications (IS), The Optical Society of America (OSA), Arlington, VA, (June 27, 2013)

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- **S. Dufour**, M. Chang, J. Dian, **O. Levi**, P. L. Carlen and T. A. Valiante, "Optogenetics to interrogate the role of interneurons in an acute in vivo epilepsy model", XII Workshop on Neurobiology of Epilepsy (WONOE 2013), International League Against Epilepsy (ILAE), Laurentian, QC (June 19, 2013)

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- **Levi, O.** "Evaluating tissue oxygenation and perfusion using optical imaging techniques", Beyond Borders: Lyon Sachs Symposium on Biomaterials and Tissue Engineering, Technion, Israel Institute of Technology, Haifa, Israel (May 7, 2013)
- 
- **Levi, O.** "Portable Biomedical Optical Sensing and Imaging", Optics and Electronics Seminar, Department of Applied Physics, Stanford University, Stanford, CA (April 29, 2013)
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- **Levi, O.** "Multimodal Portable Optical Neural Imaging", Optics and Photonics Seminar Series, Department of Biomedical Engineering, Duke University, Durham, NC (April 10, 2013)
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- **Levi, O.** "Multimodal optical neural imaging with VCSEL light sources", Techniques in Biophotonic Imaging Webinar series, Photonics Media (online, > 650 attendees) (March 21, 2013)
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- **Levi, O.** "Multimodal Portable Optical Neural Imaging", Laser Microbeam and medical Program (LAMMP) seminars, Beckman Laser Institute, U. C. Irvine, Irvine, CA (February 11, 2013)
- 
- **Levi O.** "Multimodal optical neural imaging monitoring blood oxygenation and flow", 1<sup>st</sup> International Biophotonics Meeting in Israel, Bruce Tromberg and Israel Gannot, Chairs, Tel Aviv, Israel , Organized by SPIE. (December 9, 2012)
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- **Levi O.** "Integrated sensors and nanostructures for bio-sensing and biomedical imaging", Tel Aviv University, Tel Aviv, Israel (July 10, 2011).
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- **Levi, O.** "Integrated sensors and nanostructures for bio-sensing and biomedical imaging", The University of Southern California, Los Angeles, CA (February 24, 2011).
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- **Levi, O.** "Integrated optical sensors for portable biomedical sensing and imaging", The Technion, Israel Institute of Technology, Haifa, Israel (December 6, 2010).
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- **Levi, O.** "Integrated sensors and nanostructures for bio-sensing and biomedical imaging", The Hebrew University of Jerusalem, Jerusalem, Israel (December 8, 2010).
- 
- **Levi, O.** "Integrated sensors and nanostructures for bio-sensing and biomedical imaging", Waterloo Institute of Nanotechnology, University of Waterloo, Waterloo, ON, (March 22, 2010).
- 
- **Levi, O.** "Optical imaging systems for portable brain imaging in rodents", Invited talk, Computational Optical Sensing and Imaging (COSI) Program, University of Colorado at Boulder, Boulder, CO, (April 26, 2010)
- 
- **Levi, O.** "Integrated optical semiconductor bio-sensors and bio-imaging systems for cellular and neural imaging" Princess Margaret Hospital, Biophotonics Div., Toronto, ON, (February 16, 2007)
- 
- **Levi, O.** "Optical neural imaging", Neuroscience program, Physiology Department, University of Toronto, Toronto, ON, (March 12, 2007)
- 
- **Levi, O.,** "Integrated Semiconductor Bio-Sensors: Cellular and Neural Sensing", The 16th Annual Meeting of IEEE Lasers & Electro-Optics Society (LEOS 2003), Tucson, AZ ( Oct. 27, 2003)
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- **Levi, O.,** Shalom, S; Benjamin, I; Perepelitsa, G; Agranat, AJ; Neumann, R; Avny, Y; Davidov, D , "Conjugated polymeric composites for holographic storage", International Conference on Science and Technology of Synthetic Metals (ICSM 98), Montpellier, France (July 12-18, 1998)
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## 2.5. Professional associations activities

- *Associate Editor*, Biomedical Optics Express journal (2012 Impact Factor: 3.176, #7/80 in Optics), The Optical Society of America (06/2013 - current)
- *Chair*, Optical Biosensors technical group, The Optical Society of America (01/2011–12/2013)
- *Organizing Committee*, Imaging Systems and Applications (IS), The Optical Society of America (OSA), Seattle, WA, July 13-17, 2014
- *Program committee, Session chair*, Optical Materials, Fabrication and Characterization, Conference on Lasers and Electro-Optics (CLEO 2014), The Optical Society of America (OSA), San Jose, CA, June 08-13, 2014
- *Co-chair*, Biosensors and Biomedical Optics sessions, Photonics North 2014 Conference, SPIE, Montreal, QC, May 28-30, 2014.
- *Program Committee*, Photoptics 2014, 2<sup>nd</sup> International conference on Photonics, Optics, and Laser Technology, Lisbon, Portugal, January 7-9, 2014
- *Session chair*, Microcavity Optofluidic Sensors, Conference on Lasers and Electro-Optics (CLEO 2013), The Optical Society of America (OSA), San Jose, CA, June 10-14, 2013
- *Organizing Committee*, Imaging Systems and Applications (IS), The Optical Society of America (OSA), Arlington, VA, June 23-27, 2013
- *Organizing Committee*, Imaging Systems and Applications (IS), The Optical Society of America (OSA), Monterey, CA, June 24-28, 2012
- *Session chair*, Optical Sensors (Sensors), The Optical Society of America (OSA), Toronto, Canada, June 12-16, 2011
- *Course instructor*, The International Society for Optical Engineering (SPIE), Biophotonics short courses (2002-2014).

## 2.6. Professional associations memberships

(2001 – current) The International Society for Optical Engineering (SPIE)

(2003 – current) The Optical Society of America (OSA)

(2003- current) Institute of Electrical and Electronics Engineers, Photonics Society (IEEE)

(2006-2007) Materials Research Society (MRS)

## 2.7. Departmental/ Faculty/ University activities

- *Executive committee*, Collaborative Program In Neuroscience (CPIN) (2013-2014)
- *Co-chair*, Engineering Science Biomedical Systems undergraduate track (2013-2014)
- *Member*, IBBME curriculum committee (2014)
- *IBBME representative*, Faculty of Engineering Council, University of Toronto (2008- 2013)
- *Poster judge*, IBBME Scientific Day, University of Toronto, (2009, 2013)
- *Presenter*, ECE graduate studies research presentation – Photonics group (2008 - 2013)
- *Presenter*, IBBME graduate studies research presentation (2008-2013)
- *Member*, IBBME Faculty Search committee on Rehabilitation Engineering (2008).

- *Advisory Committee*, Stanford University Post Doctoral Fellows Advisory Committee (**SUPD-PAC**) (2002-2005).
- *Co-chair*, Stanford Medical School Postdoctoral Medical Benefits Committee (2004).
- *Member*, Stanford Provost Advisory Committee for postdoctoral affairs (2003).
- *Workshop co-organizer*, Stanford Photonics Research Center Biophotonics workshop (2003).
- *Team Mentor*, Entrepreneurship class, Stanford Graduate School of Business (2004).
- *Team Mentor*, Introduction to Medicine class, Stanford Medical School (2003 – 2004)

## 2.8. Reviewer activities

### Member of Review panel:

- Ontario Graduate Scholarship (**OGS**), Ministry of Training Colleges and Universities (2008-09)
- MITACS Elevate post doctoral fellowship review committee, sub-committee chair (2010)

### *Ad hoc* scientific reviewer:

- Nano Letters, J. Neurophotonics, Optics Letters, Optics Express, Biomedical Optics Express, J. Biomedical Optics, Applied Optics, Applied Physics Letters, IEEE Photonics Technology Letters, IEEE Photonics J., IEEE J. Quantum Electronics, IEEE J. Selected Topics in Quantum Electronics, IEEE Sensors, IEEE Transactions on Biomedical Engineering, Sensors and Actuators B, J. Biophotonics,

## 3. Teaching

### 3.1. Courses

I taught the following courses since I joined the University of Toronto:

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- BME1450 Bioengineering Science, Winter 2008, Fall 2008, Fall 2009 – class coordinator and co-instructor (Graduate course, mandatory, IBBME)
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- ECE1475 Biophotonics, Fall 2008, Winter 2010, Fall 2010, Fall 2011, Fall 2012, Winter 2014, (graduate course, ECE and IBBME)
- 
- ECE335 Introduction to Electronic Devices, Fall 2009, Fall 2010, Fall 2012, (undergraduate class, ECE)
- 
- BME595 Biomedical Imaging, Winter 2011, Winter 2012, Winter 2013, Winter 2014 as Course coordinator (undergraduate class, IBBME)
-