

Curriculum vitae

April 2005

Personal details

Name: **Robert S. Marks**
Date and place of birth: February 17, 1961; Denver, Colorado, USA
Date of immigration: February 26, 1995
Military service: Volontaire du Service National de la Coopération (1985-6)
Work contact details: Department of Biotechnology Engineering, Ben-Gurion University of the Negev, Beer-Sheva, Israel
Office: 972-(0)8-6477182; Fax: 972-(0)8-6472857
Email: rsmarks@bgumail.bgu.ac.il
Web site (Department): <http://www.bgu.ac.il/BioTech>

Higher Education

PhD 1987-1992; Chemical Immunology, The Weizmann Institute of Science
MA 1984-1987; Physiology and Cell Biology, University of California, Santa Barbara
BA 1980-1984; Biology, University of California, Santa Barbara, USA

Professional & Scientific Employment History

Invited Professor Jan-Feb 2005; École Normale Supérieure, Cachan, France
Tenure Oct 2004 onwards (Present rank) Department of Biotechnology Engineering, BGU
Senior Lecturer Oct 2003 – Sept 31, 2004; Department of Biotechnology Engineering, BGU
Invited Professor Jul-Aug 2003; Université Joseph Fourier, Grenoble, France
Lecturer Oct 1999 – Sept 2003; Department of Biotechnology Engineering, BGU
Research Associate May 1, 1995-September 30, 1999, Institute for Applied Biosciences, BGU
Post-doctorate Oct 1992-Nov 1994; University of Cambridge, Cambridge, England
Teaching Assistant Spring 1985-7; University of California, Santa Barbara, USA

Professional Activities

Academic committees

Graduate Program Committee (2002; onwards)
Advanced Laboratories Committee (2002; onwards)
Departmental Seminars (1996, 2000-2002)
Institute and Department Days (2000-2003)

Affiliations

Center for Optronics, BGU (2003-)
National Institute for Biotechnology in the Negev, BGU (2004-)
Institute for Applied Biosciences, BGU (1995-2004)

Professional activities outside the academia

Founder, Chairman of the Board

BioSensing Technologies Ltd, Israel (1997-2002)
Biopixel Ltd, Israel (1998-2002)

Editor

Applied Biochemistry and Biotechnology; 89 (2-3) 105-253 (2000)
Talanta; 55 (5) 879-1038 (2002)
Applied Journal of Toxicology 24 (5) 313-408 (2004)

Conferences and Workshops Organized

- 1997 Chairman. **Bio/Chemical Analytical Sensors**. Israel. December 10.
- 1998 Co-Chairman. **The First France-Israel Workshop on Biosensors and Biochips**. Israel: October 27-28.
- 2000 Chairman. **Biosensors and Molecular approaches to water quality monitoring**. Israel. October 22.
- 2000 Co-chairman. **The second France-Israel Workshop on Biosensors, Biochips and Nanobiotechnology**.. Autrans. France. December 11-16.
- 2002 Co-chairman. **EILATox-Oregon**. Corvallis, Oregon, USA. September 8-14.
- 2002 Chairman. **Bi-National France-Israeli Symposium on Enabling nano- and Micro-Technologies in Biotechnology**. Israel. Octobre 31.
- 2003 Chairman. **Biotechnology Engineering at BGU**. Israel. June 8.
- 2003 Co-Chairman. **The 3rd France-Israel Workshop on Biosensors, Biochips and Nanobiotechnology**. Israel. November 30-December 4.
- 2004 Co-chairman. **EILATox-Pecs**. Pecs, Hungary. August 29-September 4.
- 2004 Co-chairman. **International Workshop on Biodefense to Biological Threats**. Israel. December 1-2.
- 2004 Co-chairman. **UK-Israel Workshop on NanoBioTechnology**. Israel. December 19-20.

Invited activities at Conferences and Workshops

- 1998 Roundtable discussion. Synergy between high-Tech and Biological sciences in Biosensors, Biochips and Nanobiotechnology. (BIRD, BSF).
- 2000 Panelist. Seminar of the strategic research project in bio-microelectronics & bio-optics; The Weizmann Institute of Science, Rehovot, Israel; June 25
- 2001 Scientific committee. 10th International Symposium on Toxicity Assessment, ISTA10; Quebec City, Canada; Aug 26-31, 2001
- 2002 Panelist. NATO Advanced Research Workshop, Nanostructured materials and coatings for biomedical and sensor applications. Kiev, Ukraine; August 7
- 2002 Session coordinator. Annual Israel Society for Microbiology, HUJ.

- 2002 Breakout session chair. Workshop on advanced technologies in real-time monitoring for drinking water security, USA
- 2004 Animator. DNA and protein chips, Nano2Life, Autrans, France.
- 2004 Animator. Cell-and-tissue-on-a-chip, Nano2Life, Sestra, Italy.

Courses taught

Biomedical and biotechnological ethics; 2005
 Activities of Metabolites in Biotechnology; 2003-2004
 Nanobiotechnology A: 2004; 2005
 Nanobiotechnology B: 2004
 Biosensors-nanobiotechnology Laboratory; 2003-2005
 Bioelectronics; 2002
 Biochemistry for Biotechnology; 2001
 Biochemistry Laboratory; 2002-2005
 Medical Mycology; 1998-2001
 Microchip Array Technology; 1998-1999
 Nanobiotechnology; Graduate, 1997-2003
 Biosensors; Graduate Program; 1995-2002
 Business in Biotechnology, 2002

Research Dissertation Students

Graduated PhD students

Polyak, Boris (2004) Biotechnology Engineering; BGU
Ionescu, Rodica (2004) Biotechnology Engineering; BGU

Graduated MSc students

Rudoy, Hila (2001) Environmental Engineering; BGU
Polyak, Boris (2002) Biotechnology Engineering; BGU
Kahanovitz, Lindy (2002) Environmental Engineering; BGU
Freifeld, Zeev (2004) Biotechnology Engineering; BGU
Green, Tal (2004) Biotechnology Engineering; BGU
Fine, Tamir (2005) Biotechnology Engineering; BGU

Doctoral theses in Progress

Aburabia, Khalil Biotechnology Engineering; BGU
Konry, Taly Biotechnology Engineering; BGU
Herrman, Sebastien Biotechnology Engineering; BGU

Masters theses in Progress

Leshem, Boaz Biotechnology Engineering; BGU
Illouz, Michal Biotechnology Engineering; BGU
Meir, Anat Biomedical Engineering; BGU
Mor, Amit Biotechnology Engineering, BGU
Hershkovits, Zeev Biotechnology Engineering, BGU

Awards, Citations, Honors, Fellowships

- 1980 Mention Bien, Baccalauréat D, Janson de Sailly, Paris, France
- 1983 Karyn Kupcinet International Science School; The Weizmann Institute of Science, Rehovot, Israel.
- 1983-4 President's Undergraduate Fellowship; University of California, Santa Barbara, USA
- 1984 Certificate of Recognition for participation in the Senior Honors Program, University of California Santa Barbara, USA
- 1987 The Edwin & Jean Corle Memorial Book Collection Contest. First Graduate Prize. Library. University of California, Santa Barbara, USA
- 1987-92 Feinberg Graduate School Fellowship The Weizmann Institute of Science, Rehovot, Israel.
- 1995-7 Keren Shapira Ministry of Absorption, Israel.
- 2000 Arc-en-ciel/Keshet travel award. Israel Ministry of Science and the Arts and the Ministère des Affaires Étrangères; Electrochemical fabrication of microbiosensors and biochips. 4 bi-national trips
- 2002-4 Arc-en-ciel/Keshet travel award; Israel Ministry of Science and the Arts and the Ministère des Affaires Étrangères, Indium-tin-oxide-coated optical fiber tips for electropolymerization of photosensitive films, 8 bi-national trips
- 2003 Israel Ministry of Science and British Council; Survey delegation in the field of nanobiotechnology for biosensors and biochips, Team of 6 Israeli scientists to UK

Scientific Publications

- **Edited Books**

- 2005 Cullen, D., Lowe, C., R.S. **Marks** (coordinator), H.H. Weetall and I. Karube. Handbook of Biosensors and Biochips. John Wiley & Sons Ltd Publishers. In progress.

- **Chapter in collective volumes – Conference Proceedings etc...**

3. Perié, K., V. Stokhnin, R.S. **Marks** and J.-P. Lellouche (2001) Electro-polymerizable bipyrrrole-biotin: a new derivative for the immobilization of ligands onto electrode surfaces. Novel Approaches in Biosensors and Rapid Diagnostic Assays. 43rd OHOLO Conference, Eilat, October 10-14, 1999. Z. Liron, A. Bomberg and M. Fisher (eds). Kluwer Academic/Plenum Publishers, New York. Pp. 225-233.
2. **Marks**, R.S., Z.M. Hale, M.M. Levine, C.R. Lowe and F.P. Payne (1994) Single-mode tapered optical fiber loop immunosensor. II. Assay of cholera antitoxin. SPIE. 2131: 495-503.
1. Hale, Z.M., R.S. **Marks**, C.R. Lowe and F.P. Payne (1994) Single-mode tapered optical fiber loop immunosensor. II. Characterisation with model analytes. SPIE. 2131: 484-494.

- **Peer-reviewed articles and letters in scientific journals**

36. Konry, T. and R.S. **Marks** (2005) Physico-Chemical studies of an ITO-coated fiber-optic biosensor. *Thin Solid Films*. Accepted.
35. Ionescu, R.E., R.S. **Marks** and L. Gheber (2005) Manufacturing of nano-channels with controlled dimensions using protease nanolithography. *Nanoletters*. Accepted.
34. Konry, T., A. Novoa, Y. Shemer-Avni, N. Hanuka, S. Cosnier, A. Lepellec and R.S. **Marks** (2005) Optical immunosensor based on a poly(pyrrole-benzophenone) film for the detection of antibodies to viral antigen. *Analytical Chemistry*. 77 (6) 1771-1779.
33. Pancrazio, J.J., P.N. McFadden, S. Belkin and R.S. **Marks** (2004) EILATox-Oregon biomonitoring workshop: summary and observations. *Journal for Applied Toxicology*. 24: 317-321.
32. Herrmann, S. B. Leshem, S. Landes, B. Rager-Zisman and R.S. **Marks** (2004) Chemiluminescent optical fiber immunosensor for the detection of anti-West Nile virus IgG. *Talanta*. 66: 6-14.
31. Ionescu, R., C. Gontran, S. Cosnier, L. Gheber, R.S. **Marks** (2004) Construction of amperometric immunosensors based on the electrogeneration of a permeable biotinylated polypyrrole film. *Analytical Chemistry*. 76: 6808-6813.
30. Ionescu, R., C. Gondran, S. Cosnier, L. Gheber and R.S. **Marks** (2004) Comparison between the performances of amperometric immunosensors for cholera antitoxin based on three enzyme markers. *Talanta*. 66: 15-20.
29. Leshem, B., G. Sarfati, A. Novoa, I. Breslav and R.S. **Marks** (2004) Photochemical attachment of biomolecules onto fiber-optics for construction of a chemiluminescence immunosensor. *Luminescence*. 19: 69-77.
28. Polyak, B., S. Geresh and R.S. **Marks** (2004) Synthesis and characterization of a biotin-alginate conjugate and its application in a biosensor construction. *Biomacromolecules*. 5: 389-396.
27. Cosnier, S., C. Mousty, J. de Melo, A. Lepellec, A. Novea, B. Polyak and R.S. **Marks** (2004) Organic phase PPO biosensors prepared by multiplayer deposition of enzyme and alginate through avidin-biotin interactions. *Electroanalysis*. 16 (24) 2022-2029.
26. Pedahzur, R., B. Polyak, R.S. **Marks** and S. Belkin (2004) Water toxicity detection by a panel of stress responsive luminescent bacteria. *Journal of Applied Toxicology*. 24: 343-348.
25. Hakkila, K., T. Green, P. Leskinen, A. Ivask, R. S. **Marks** and M. Virta (2004) Detection of bioavailable heavy metals in EILATox-Oregon samples using whole-cell Luminescent bacterial sensors in suspension or immobilized onto fiber-optic tips. *Journal of Applied Toxicology*. 24: 333-342.
24. Shani Sekler, M., Y. Levi, B. Polyak, A. Novoa, PSM Dunlop, JA Byrne and RS **Marks** (2004) Monitoring genotoxicity during the photocatalytic degradation of *p*-nitrophenol. *Journal of Applied Toxicology*. 24: 395-400.
23. Ionescu, R., R. S. **Marks** and L. Gheber (2003) Nanolithography Using Protease Etching of Protein Surfaces. *Nano Letters*. 3 (12) 1639-1642.
22. Cosnier, S., A. Le Pellec, R.S. **Marks**, K. Perie and J.-P. Lellouche (2003) A permselective biotinylated polycarbazole film for the fabrication of amperometric enzyme electrodes. *Electrochemistry Communications*. 5: 973-977.

21. Taha, Hesham, R.S. **Marks**, L.A. Gheber, I. Rousso, J. Newman, C. Sukenik and A. Lewis (2003) Protein printing with an atomic force sensing nanofountainpen. Applied Physics Letters. 83 (5) 1041-1043.
20. Konry, T., A. Novoa, S. Cosnier and R.S. **Marks** (2003) Development of an 'electrode' immunosensor: Indium-tin-oxide-coated optical fiber tips conjugated with an electropolymerized thin film with conjugated cholera toxin B subunit. Analytical Chemistry. 75: 2633-2639.
19. **Marks**, R.S., A. Novoa, D. Thomassey and S. Cosnier (2002) An innovative strategy for immobilization of receptor proteins on to an optical fiber by use of poly(pyrrole-biotin). Analytical and Bioanalytical Chemistry. 374: 1056-1063.
18. Kleiner, O., J. Ramesh, M. Huleihel, B. Cohen, K. Kantarovich, C. Levi, B. Polyak, R.S. **Marks**, J. Mordehai, Z. Cohen and S. Mordehai (2002) A comparative study of gallstones from children and adults using FT-IR spectroscopy and fluorescence microscopy. BMC Gastroenterology. 2: 3-14
17. **Marks**, R.S., A. Novoa, T. Konry, R. Kraiss and S. Cosnier (2002) Indium tin oxide-coated optical fiber tips for affinity electro-polymerization. Materials Science and Engineering C. 21 (1-2) 189-194.
16. Cosnier, S.A., A. Novoa, C. Mousty and R.S. **Marks** (2002) Biotinylated alginate immobilization matrix in the construction of an amperometric biosensor: application for the determination of glucose. Analytica Chimica Acta. 453: 71-79
15. Mousty, C., A. Lelpelec, S. Cosnier, A. Novoa and R.S. **Marks** (2001) Fabrication of organic phase biosensors based on multilayered polyphenol oxidase protected by an alginate coating. Electrochemistry Communications. 3: 727-732
14. Premkumar, J.R., O. Lev, R.S. **Marks**, B. Polyak, R. Rosen and S. Belkin (2001) Antibody-based immobilization of bioluminescent bacterial sensor cells. Talanta. 55:1029-1038.
13. Cosnier, S., S. Szunerits, R.S. **Marks**, A. Novoa, L. Puech, E. Perez and I. Rico-Lattes (2001) A comparative physical study of two different hydrophilic synthetic latex matrices for the construction of a glucose sensor. Talanta. 55: 889-897.
12. Cosnier, S., S. Szunerits, R.S. **Marks**, J.-P. Lellouche and K. Perié (2001) Mediated electrochemical detection of catechol by tyrosinase-based poly(dicarbazole) electrodes. Journal of Biochemical and Biophysical Methods. 50: 65-77.
11. Cosnier, S., S. Szunerits, R.S. **Marks**, A. Novoa, L. Puech, E. Perez and I. Rico-Lattes (2000) A rapid and easy procedure of biosensor fabrication by micro-encapsulation of enzyme in hydrophilic synthetic latex films. Applications to the amperometric determination of glucose. Electrochemistry Communications. 2 (12) 851-855.
10. Cosnier, S., D. Folgea, S. Szunerits and R.S. **Marks** (2000) Poly(dicarbazole-N-hydroxysuccinimide) film: a new polymer for the reagentless grafting of enzymes and redox mediators. Electrochemistry Communications. 2 (12) 827-831.
9. Polyak, B., E. Bassis, A. Novodvoretz, S. Belkin and R.S. **Marks** (2000) Bioluminescent whole-cell optical fiber sensor to genotoxicants: system optimization. Sensors and Actuators. B 3656: 1-9.

8. Périe, K., R.S. **Marks**, S. Szunerits, S. Cosnier and J.-P. Lellouche (2000) Novel electro-oxidizable chiral N-substituted dicarbazoles and resulting electroactive films for covalent attachment of proteins. Tetrahedron Letters. 41: 3725-3729.
7. Cosnier, S., R.S. **Marks**, J.-P. Lellouche, K. Perié, D. Folgea and S. Szunerits (2000) Electrogenerated poly(chiral dicarbazole) films for the reagentless grafting of enzymes. Electroanalysis. 12 (14) 1107-1112.
6. Polyak, B., E. Bassis, A. Novodvoretz, S. Belkin and R.S. **Marks** (2000) Optical fiber bioluminescent whole-cell microbial biosensors to genotoxicants. Water Science and Technology. 42 (1-2) 305-311.
<http://iwaponline.com/wst/04202/wst042010305.htm>
5. **Marks**, R.S., A. Margalit, A. Bychenko, E. Bassis, N. Porat and R. Dagan (2000) Development of a chemiluminescent optical fiber immunosensor to detect *Streptococcus pneumoniae* anti-polysaccharide antibodies. Applied Biochemistry and Biotechnology. 89 (2-3) 117-126.
4. Strashnikov, N., V. Papper, P. Parkhomyuk, G.I. Likhtenstein, V. Ratner and R.S. **Marks** (1999) Local medium effects in the photochemical behavior of substituted stilbenes immobilized on quartz surfaces. Journal of Photochemistry and Photobiology A: Chemistry. 122: 133-142.
3. **Marks**, R.S., E. Basis, A. Bychenko and M.M. Levine (1997) Chemiluminescent optical fiber immunosensor for detecting cholera antitoxin. Optical Engineering. 36 (12) 3258-3264.
2. Hale, Z.M., F.P. Payne, R.S. **Marks**, M.M. Levine, C.R. Lowe (1996) The single mode tapered optical fibre loop immunosensor. Biosensors and Bioelectronics. 11: 137-148.
1. **Marks**, R.S. (1991) Dermatophytoses in art. Journal of Medical and Veterinary Mycology. 29 (1) 1-8.

Un-refereed professional articles and publications

- **Scientific journal**

1. **Marks**, R.S., A. Novodvoretz, B. Polyak and S. Belkin (2001) Bacterial biosensors for environmental analysis. G.I.T. Laboratory. 3: 122-123.
2. **Marks**, R.S. (2004) Preface. Journal for Applied Toxicology. 24: 313-314

- **Non-scientific journal**

1. **Marks**, R.S. (1999) Les Biopuces. France Culture. 7 (Mar-Apr) 4-5.
2. **Marks**, R.S. (2003) Le diagnostique à travers le temps. Daguessh. 47, 11.

- **Book reviews**

1. **Marks**, R.S. (1991) Synthetic polypeptides as antigens. Van Regenmortel et al. (ed) Elsevier. Molecular Immunology 28 (1988) 195.
2. **Marks**, R.S. (1989) Molecular mimicry: cross-reactivity between microbes and host proteins as a cause of auto-immunity. Osborne (ed) Springer Verlag. Molecular Immunology 28 (1991) 563.

3. **Marks, R.S.** (1989) Diagnosis and therapy of systemic fungal infections. Holmberg (ed). Raven Press. Molecular Immunology. 28 (1991) 919.

Lectures and Presentations at Invited Meetings and Seminars

- **Invited Conference Lectures**

1. **Marks, R.S.** and M. Sela. Dermatophytoses in Fine Art. MEDAX 88. Jerusalem, Israel. May 18, 1988.
2. **Marks, R.S.** Mycoses in Art. International Conference on Medicine for the Performing Arts. ICMIPA '89.
3. **Marks, R.S.**, E. Bassis and A. Bychenko. Immunosensors and Military Applications. Eighth Annual Joint IDF-US Army Conference on Infectious Diseases and Vaccines of Military Importance. Mitzpeh Rachel. Israel. November 4-5, 1996.
4. **Marks, R.S.** Optical Immunosensors. The Biotechnology Committee Biotechnology year 2000. The Weizmann Institute of Science. Rehovot, Israel. November 27, 1996.
5. **Marks, R.S.** Development and Engineering of optical and acoustic immunosensor devices. The 6th Jerusalem Symposium on Medical Physics and Medical Instrumentation. Jerusalem College of Technology. Machon Lev. Jerusalem. Israel. April 8, 1998. Pp. 22-25
6. **Marks, R.S.** Array of analytical molecules on biochips. From science to industry; development of biotechnology in Israel. The Biotechnology Committee. The Weizmann Institute of Science. Rehovot. Israel. April 20, 1999.
7. **Marks, R.S.** Biopixel: Diagnostic biochips. Workshop on Biotechnology. German-Israel Cooperation Council for High and Environmental Technologies. BioGenTec. Germany. 15-16 March, 1999.
8. **Marks, R.S.** The development of optical fiber immunosensor diagnostics. The 21st GIF Meeting: advanced materials with emphasis on their nanostructure and applications in electro-optics and biotechnology. Jena. July 4-8, 1999.
9. **Marks, R.S.** Optical fiber immunosensors. The 43rd OHOLO Conference: Novel approaches in biosensors and rapid diagnostic assays. Eilat. Israel. October 10-14, 1999. p23.
10. **Marks, R.S.** Optical fiber biosensors. Life Science day. Ben Gurion University. Beer-Sheva. Israel.
11. **Marks, R.S.** Optical fiber biosensors. 2000 The Era of Biotechnology. Ben Gurion University. Beer-Sheva. Israel. October 26, 2000.
12. **Marks, R.S.** Macroelectrode PCR-array biochips in food diagnostics. DECHEMA. Frankfurt. Germany.
13. **Marks, R.S.** recA-lux fiber-optic biosensors to genotoxicants. Taskforce Toxicity Sensors. Verbund Sensorik in der Biotechnologie. Hannover. Germany. February 5, 2001.
14. **Marks, R.S.** Bioluminescent optical fiber biosensors to genotoxicants. Gordon Research Conference on Chemical sensors and Interfacial Design. Il Ciocco. Italy. May 6-11, 2001.
15. **Marks, R.S.** MADICA 2001. Journées Maghreb-Europe. Les matériaux et leurs applications aux dispositifs capteurs. Hamamet. Tunisia. October 29-31, 2001

16. **Marks, R.S.** FISEB 2002. Bioassays using optical fiber biosensors and a vision for a CMOS biochip technology. The 3rd Congress of the Federation of Israel Societies for Experimental Biology. Eilat, Israel. February 4-7, 2002. Pg. 120.
17. **Marks, R.S.** ISM 2002. Co-chairman. Annual Israel Society for Microbiology. The Hebrew University, Mount Scopus Campus, Jerusalem, Israel; Feb 19-20, 2002.
18. **Marks, R.S.** National Conference of the photoelectronic technology applied to sensing the environment. Plenary Lecture. Ching-Yun Institute of Technology. Jungli City. Taoyuan. Republic of China. May 11, 2002. Pg. 1-3.
19. **Marks, R.S.** Bioluminescent fiber-optic biosensors to genotoxicants and mercury. Workshop on Advanced Technologies in Real-Time monitoring and Modeling for Drinking Water Safety and Security. Hilton Gateway Hotel, Newark, New Jersey, USA. June 28, 2002.
20. **Marks, R.S., A. Novoa, T. Konry and S. Cosnier.** Antitoxin immunosensors based on electropolymerized indium tin oxide-coated optical fiber tips. NATO Advanced Research Workshop, Nanostructured materials and coatings for biomedical and sensor applications. Kiev, Ukraine; August 4-8, 2002
21. **Marks, R.S.** Fiber-optic biosensors to genotoxicants. Workshop on biological tests. Merkaz Hadracha of Mekorot. Holon Industrial area. August 15, 2002.
22. **Marks, R.S.** Fiber-optic biosensors to genotoxicants and mercury. Symposium on biosensor technologies and microbial diagnostics. Harvey W. Wiley Federal Building, College Park, Maryland, USA. October 7, 2002.
23. **Marks, R.S.** Optical fiber biosensor to identify water toxicity. Workshop on the demonstration of the needs to securing crucial civilian infrastructure through technological-scientific answers. The Ministry of Science, Culture and Sport. Jerusalem, Israel. October 15, 2002 (in Hebrew).
24. **Marks, R.S.** Optical fiber biosensor for the detection of toxicants. MAFAT Workshop on the Detection of toxicants, explosives, chemicals and pollutants. Tel-Aviv University, Ramat-Aviv, Israel. February 4, 2003.
25. Konry, T., A. Novoa, S. Cosnier and R.S. **Marks.** 39th Conference of the Israel Institute of Chemical Engineers (IChE). Tel-Aviv, Israel. June 19, 2003. 1-2ב.
26. **Marks, R.S.** Biosensors in environmental monitoring. The 7yh Conference of the Israel Analytical Chemistry Society. Kfar Maccabiah, Ramat Gan, Israel. January 20, 2004.
27. **Marks, R.S.** Protein NanoChips. Nano2Life Kick-Off Meeting. Autrans, France. February 3, 2004.
28. **Marks, R.S.** Fiber-optic biosensors for medical and environmental monitoring. Hi-Tech Technologies 2004. Electro-optic conference. 24 March 2004. Fair Center, Ganei Ta-aruh'a, Tel-Aviv, Israel.
29. **Marks, R.S.** Enzyme nanolithography. Bio-Tech Israel 2004. May 6, 2004. Tel-Aviv. Israel.
30. **Marks, R.S.** Monitoring water toxicity with fiber optic biosensors. AquaNano 2004. Joint Swedish Israeli Workshop on Nanoscience, Nanotechnology and Water. October 25, 2004. Jerusalem, Israel.
31. **Marks, R.S.** Fiber-optic biosensors. International Workshop on the Application of Nanotechnologies to Biosensor Development. December 6-7, 2004. Ispra, Italy.
32. **Marks, R.S.** The use of optical fiber immunosensors in the detection of viral antigen. Symposium on Dengue. Institut Pasteur. January 10-12, 2005. Paris, France.

33. **Marks, R.S.** Fiber-optic biosensors. The 6th Minerva student symposium on Molecular based devices. Weizmann Institute of Science. March 6-8, 2005. Rehovot, Israel.
34. **Marks, R.S.** Optical fiber based nano-biosensors. NanoMaTech 2005. Hotel Daniel. Herzliah Pituch. Israel. March 31, 2005.
35. **Marks, R.S.** Fiber-optic biosensors to bio-contaminants in water: heavy-metals, bio-toxins and viruses. European Workshop on water microbiology and virology: a genome/proteome approach. Institute for Environment and Sustainability, JRC-EC. Hotel La Palma. Stresa, Italy. April 11-12, 2005.
36. **Marks, R.S.** Fiber-optic immunosensors for the detection of viral antigen. The 4th Congress of the Israel Association for Medicinal Chemistry. Weizmann Institute of Science. Rehovot, Israel. April 14, 2005.

- **Contributed oral presentation of papers at conferences and meetings**

1. **Marks, R.S., Z.M. Hale, M.M. Levine, C.R. Lowe and F.P. Payne.** Single-mode tapered optical fiber loop immunosensor. II. Assay of cholera antitoxin. SPIE '94. Los Angeles. USA. January 22-29, 1994. SPIE: Biomedical optics. Pg. 77.
2. **Marks, R.S.** The single mode tapered optical fiber loop immunosensor. Technology International Exchange (TIE) Days. London, England. March 24-25, 1994.
3. **Marks, R.S.** The single mode tapered optical fiber loop immunosensor. The Third World Congress on Biosensors. Biosensors '94. New Orleans. USA. June 1-3, 1994. Elsevier Advanced Technology. Oxford. UK.
4. **Marks, R.S.** Magnetically-enhanced liquid core light guide immunosensor. The 10th Meeting on Optical Engineering in Israel. Jerusalem. Israel. March 2-6, 1997. pg. 294.
5. **Marks, R.S.** Immunosensors: from University to a technological Incubator. Link between academy and chemical industry. Chemical Engineering Society Meeting. Beer-Sheva. Israel. April 16-17, 1997. Pg.26.
6. **Marks, R.S., E. Bassis, A. Bychenko, and M.M. Levine.** Fluorescent and chemiluminescent optical fiber immunosensors to detect cholera antitoxin. 8th European Congress of Clinical Microbiology and Infectious Diseases. Lausanne. Switzerland. May 25-28, 1997. Pg. 193.
7. **Marks, R.S.** Immunosensor diagnostics of *C. albicans*. 13th Congress of the International Society for Human and Animal Mycology. Salsomaggiore Terme. Parma. Italy. June 8-13, 1997.
8. **Marks, R.S., E. Bassis, A. Bychenko and M.M. Levine.** Chemiluminescent optical fiber immunosensor to cholera antitoxin. European Biomedical Optics Week. BiOS Europe '97. San Remo. Italy. September 4-8, 1997.
9. **Marks, R.S.** Chemiluminescent and fluorescent optical fiber immunosensors. Bio/chemical analytical sensors workshop. The Ben-Gurion University of the Negev. Beer-Sheva, Israel. December 10, 1997.
10. **Marks, R.S.** Microbial acoustic sensor. Bio/chemical analytical sensors workshop. The Ben-Gurion University of the Negev. Beer-Sheva, Israel. December 10, 1997.
11. **Marks, R.S.** Optical fiber immunosensors for chemiluminescent and bioluminescent applications Europt(r)ode IV. Münster. Germany. March 29-April 1, 1998. Pg. 135-136.

12. **Marks, R.S.** Optical fiber immunosensors. The First France-Israel Bi-National Workshop on Biosensors and Biochips. The Ben-Gurion University of the Negev. Beer-Sheva. Israel.
13. **Marks, R.S.** Biopixel: diagnostic biochips. BioTech Forum. 2nd Conference of the Biotechnology and Finance Forum. Biovision. Lyon. France. March 26-29, 1999.
14. **Marks, R.S.** The development of optical fiber sensors for the clinical, environmental and food monitoring. The 7th International Conference of the Israel Society for Ecology and Environmental Quality Sciences on Environmental Challenges for the next Millenium. Jerusalem. Israel. June 13-18, 1999. Pg. 76.
15. **Marks, R.S.** The development of bioluminescent optical fiber diagnostics. The 9th European Congress on Biotechnology. ECB9. Brussels. Belgium. July 11-15, 1999. No. 2118.
16. **Marks, R.S.** Optical fiber biosensors. 11th International Meeting on Electro-Optics and Microelectronics in Israel. Tel-Aviv. Israel. November 11, 1999. Pg. 22.
17. **Marks, R.S.** Optical fiber bioluminescent whole-cell bioreporter biosensors to genotoxicants. Fourth Workshop on Biosensors and Biological Techniques in Environmental Analysis. Mao. Menorca. Balearic Islands. Spain. December 1-3, 1999. Pg. 04.
18. Polyak, B., E. Bassia, S. Belkin and R.S. **Marks**. Optical fiber bioluminescent whole-cell microbial bioreporter biosensors to genotoxicants. Extended Talk. The 5th National Conference on sensors and Microsystems, extended to Mediterranean countries. Lecce. Italy. February, 12-15, 2000. Pg. 34.
19. Polyak, B., E. Bassia, S. Belkin and R.S. **Marks**. Bioluminescent optical fiber whole-cell bioreporter sensors to genotoxicants. The 8th Otto Warburg Center for Agricultural Biotechnology. The Faculty of Agriculture. Hebrew University. Rehovot. Israel. March 5-6, 2000.
20. Polyak, B., E. Bassia, S. Belkin and R.S. **Marks**. Development of a bioluminescent disposable optical fiber whole-cell bioreporter sensors to genotoxicants. Keynote lecture. 5th European Conference on Optical Chemical Sensors and Biosensors. Europ(r)ode V. Optr(r)ode 2000. Lyon. Villeurbanne. France. April 16-19, 2000.
21. Polyak, B., E. Bassia, S. Belkin and R.S. **Marks**. Development of a bioluminescent disposable optical fiber whole-cell bioreporter sensors to genotoxicants. ENVIROBIOSENS. Cargèse. Corsica. France. May 14-17, 2000.
22. Polyak, B., E. Bassia, S. Belkin and R.S. **Marks**. Development of a bioluminescent disposable optical fiber whole-cell bioreporter sensors to genotoxicants. 8th International Meeting on Chemical Sensors. Basel. Switzerland. July 2-5, 2000.
23. **Marks, R.S.** *recA-lux* fiber-optic sensor. Biosensors for Environmental monitoring: monitoring in real environments. BIOSET. Cascais. Portugal. September 11-13, 2000.
24. **Marks, R.S.** *recA-lux* fiber-optic biosensor. Biosensors and Molecular approaches for water quality monitoring: Lake Kinneret as a model. Beer-Sheva. Israel. October 22, 2000.
25. **Marks, R.S.** Optical fiber biosensors. The 2nd France-Israel Bi-National Workshop on Bioanalytical sensors, Biochips and Nanobiotechnology. Autrans. France. December 12-15, 2000.
26. **Marks, R.S.** Genotoxicity monitoring of Meadowlands environmental samples using a bioluminescent optical fiber biosensor. 10th International Symposium on Toxicity Assessment. Quebec City. Quebec. Canada. August, 26-31, 2001.

27. **Marks, R.S.** EILATox, an International venue for the evaluation of toxicity assessment technologies. 10th International Symposium on Toxicity Assessment. Quebec City. Quebec. Canada. August, 26-31, 2001.
28. **Marks, R.S.** *recA-lux* fiber-optic biosensors to genotoxicants. 2nd European Meeting on Environmental Chemistry. Dijon. France. December 12-15, 2001.
29. **Marks, R.S.** *recA-lux* fiber-optic biosensors to genotoxicants. Biosensors and Molecular approaches for water quality monitoring: Lake Kinneret as a model. Kri Deshe (Kinneret). Israel. March 14, 2002.
30. **Marks, R.S.** *recA-lux* fiber-optic biosensors to genotoxicants. 12th International Symposium on Bioluminescence & Chemiluminescence. Robinson College. University of Cambridge. Cambridge. England. April 5-10, 2002.
31. **Marks, R.S., A. Novoa, T. Konry, R. Kraiss and S. Cosnier.** Indium tin oxide-coated optical fiber tips for affinity electro-polymerization. Sixth European Conference on Optical Chemical Sensors and Biosensors. Europt(r)ode VI. UMIST. Manchester. England. April 7-10, 2002.
32. **Marks, R.S.** Bioluminescent fiber-optic biosensors to genotoxicants. NATO Advanced Research Workshop, Nanostructured materials and coatings for biomedical and sensor applications. Kiev, Ukraine; August 4-8, 2002.
33. **Marks, R.S.** Bioluminescent fiber-optic biosensors to genotoxicants. EILATox-Oregon. Corvallis, Oregon, USA; September 9-14, 2002.
34. **Marks, R.S.** The application of electrochemistry on indium-tin-oxide-coated fiber-optics. Bi-National France-Israeli Symposium on Enabling Nano- and Micro-Technologies in Biotechnology. Beer-Sheva, Israel; October 31, 2002.
35. **Marks, R.S.** Fiber-optic biosensors to genotoxicants and mercury. SEDNET. Chemical Analysis and Risk Assessment of Emerging contaminants in sediments and dredged material. Barcelona, Spain; November 28-30, 2002.
36. **Marks, R.S.** Antitoxin immunosensors based on electropolymerized indium tin oxide-coated optical fiber tips. Optical probes 2003. 5th International topical conference on optical probes of conjugated polymers and organic & inorganic nanostructures. Venice S. Giuliano, Italy; 9-14 February, 2003.
37. Ionescu, R., R. S. **Marks**, L. Gheber. Enzyme nanolithography. Nanobiotechnologies II. Grenoble, France; 22-24 April, 2003.
38. **Marks, R.S.** Immobilization strategies in optical fiber sensors. The 3rd France-Israel Workshop on Biosensors, Biochips and Nanobiotechnology. Beer-Sheva & Eilat, Israel; Nov 30-Dec 4, 2003.
39. Ionescu, R., RS **Marks** and L. Gheber. Enzyme nanolithography. Ultimate Lithography and Nanoscience Engineering. Agelonde, France; June 13-16, 2004.
40. Konry, T., A. Novea, Y. Shemer-Avni, N. Hanuka, R.S. **Marks** and S. Cosnier. Indium tin oxide-coated fiber-optic immunosensor for the detection of anti-hepatitis C virus – E2 envelope protein. The 10th International Meeting on Chemical Sensors. Tsukuba, Japan. July 11-14. Vol. 20. Supplement B. 2C12. pg 214-215.
41. **Marks, R.S.** Fiber-optic biosensors to emerging and bio-defense-related viruses. EILATox-Pécs. A technical workshop on toxicity for bio-defense. University of Pécs, Pécs, Hungary. August 29-September 04, 2004.
42. **Marks, R.S.** EILATox, experience of a validation workshop. International Workshop on Biodefense to Biological Threats. Ben-Gurion University. Beer-Sheva, Israel. December 1-2, 2004.
43. **Marks, R.S.** Fiber-optic immunosensors to viral threats: the Biopen. International Workshop on Biodefense to Biological Threats. Ben-Gurion University. Beer-Sheva, Israel. December 1-2, 2004.

- **Contributed poster presentation at conferences or meetings**

1. **Marks**, R.S. and M. Sela. Dermatophytoses in art. International Society for Human and Animal Mycology (ISHAM). Baelona. Spain.1988.
2. **Marks**, R.S., D. Mirelman and M. Sela. Microbial antigens linked to silica particles enhance intestinal mucosal immunity. 7th International Congress of Bacteriology and Applied Microbiology Division. IUMS Congresses. Prag. Czech Republic. Pg. 190.
3. **Marks**, R.S., Z.M. Hale, M.M. Levine, C.R. Lowe and F.P. Payne. The single mode tapered optical fiber immunosensor probe. Gordon Research Conferences. Colby Sawyer. USA.
4. **Marks**, R.S., E. Bassis and A. Bychenko. Development of a chemiluminescent optical fiber immunosensor. The 62nd Meeting of the Israel Chemical Society. Technion City. Haifa. Israel. February 3-5, 1997. Pg. 255.
5. Bassis, E., A. Bychenko and R.S. **Marks**. Chemiluminescent optical fiber immunosensors to detect cholera antitoxin. Gordon Research Conferences on Bioanalytical Sensors. New England College. USA. July 27-Aug 1, 1997.
6. Schwarz, H., E. Bassis, A. Bychenko and R.S. **Marks**. Synthesis of biospecific nanomagnetic particles for use in a biosensor application. Gordon Research Conferences on Bioanalytical Sensors. New England College. USA. July 27-Aug 1, 1997.
7. Polyak, B., E. Bassis, S. Belkin and R.S. **Marks**. Optical fiber bioluminescent whole-cell microbial bioreporter biosensors to genotoxicants. Gordon research Conference. Chemical sensors and interfacial design. Ventura. California. USA. January 23-28, 2000.
8. Levy, Y., A. Novoa, T. Byrne and R. **Marks**. Monitoring toxicity after photocatalyzed degradation of organic material. EUROTOX. Budapest, Hungary. September 15-18, 2002.
9. Green, T., A. Ivask, B. Polyak, M. Virta and R. **Marks**. Optical fiber biosensor for the detection of mercury. EUROTOX. Budapest, Hungary. September 15-18, 2002.
10. Marks, R.S. On the road to Bionic Chip Array Biosensors. Nano2Life. Autrans, France. February 3-4, 2004.

- **Abstracts (oral or poster) presented by co-workers**

1. Hale, Z.M., R.S. **Marks**, C.R. Lowe and F.P. Payne. Single mode tapered optical fiber loop immunosensor: I. Characterisation with model analytes. SPIE '94. Los Angeles. California. USA. SPIE: Biomedical Optics. January 22-29, 1994. Pg. 76.
2. Hale, Z.M., R.S. **Marks**, C.R. Lowe and F.P. Payne. A tapered single-mode optical fiber as a penicillin sensor. Conference on lasers and electro-optics. CLEO[®]/IQEC. Anaheim. California. USA. May 8-13, 1994. Volume 8. OSA Technical Digest Series (Optical Society of America. Washington D.C.). Pgs. 14-15; 52. Advance Program.
3. Stevenson, A.C., R.S. **Marks**, R.S. Sethi and C.R. Lowe. A sandwich immunoassay for cholera anti-toxin based on a piezoelectric waveguide incorporating liquid immersed interdigitated electrodes. The Third World Congress on biosensors.

- Biosensors '94. New Orleans. USA. Elsevier Advanced Technology. Oxford. England.
4. Loessner, M.J., M. Rudolf, S. Scherer and R.S. **Marks**. Evaluation of luciferase reporter phage A511::LuxAB for detection of viable *Listeria* cells, and development of a species specific optical fiber "immunophage" biosensor. XIII International Symposium on Problems of Listeriosis. Halifax. Nova Scotia. Canada.
 5. Margalit, A., E. Bassis, A. Bychenko, N. Porat, R. Dagan, D. Cohen, G. Robin and R.S. **Marks**. The development of a chemiluminescent optical fiber immunosensor for the detection of humoral antibacterial antibodies. The First Israel-France Bi-National Workshop on Biosensors and Biochips. The Ben-Gurion University. Beer-Sheva. Israel.
 6. **Marks**, R.S., A. Stevenson and S. Leon. Development of new acoustic techniques for measuring viable cell accounts: the magneto-acoustic resonance (MARS). The First Israel-France Bi-National Workshop on Biosensors and Biochips. The Ben-Gurion University of the Negev. Beer-Sheva. Israel.
 7. Gigot, V., V. Zastenker and R.S. **Marks**. Magneto-Acoustic technique for detecting cells. 45th Annual Meeting of the Israel Physics Society. Tel-Aviv University. Ramat-Aviv. Israel. March 18, 1999.
 8. Polyak, B., E. Bassis, A. Novodvoretz, S. Belkin, J.-P. Lellouche and R.S. **Marks**. Bioluminescent optical fiber whole-cell biosensors to mutagens. The 7th International Conference of the Israel Society for Ecology and Environmental Quality Sciences on Environmental Challenges for the next Millenium. *Won the ISEEQS competition*. Jerusalem. Israel. June 13-18, 1999. Pg. 150.
 9. Polyak, B., E. Bassis, A. Novodvoretz, S. Belkin and R.S. **Marks**. The 43rd OHOLO Conference: Novel approaches in biosensors and rapid diagnostic assays. Eilat. Israel. October 10-14, 1999. Pg.15.
 10. El-Sana, E. Bassis, N. Porat, R. Dagan and R.S. **Marks**. Chemiluminescent optical fiber immunosensor to *Pneumococcus*. The 43rd OHOLO Conference: Novel approaches in biosensors and rapid diagnostic assays. Eilat. Israel. October 10-14, 1999. Pg. 3P.
 11. Perrié, K., J.-P. Lellouche, R.S. **Marks** and V. Strochin. Bifunctionalized pyrrole-biotin: a new derivative for the immobilization of biomolecules onto electrode surfaces. The 43rd OHOLO Conference: Novel approaches in biosensors and rapid diagnostic assays. Eilat. Israel. October 10-14, 1999. Pg 12P.
 12. Koellner, S., J.-P. Lellouche and R.S. **Marks**. Controlled chemiluminescence of the catalytic reaction involving luminol by photolabile protecting groups. Application in an optical fiber immunosensor. The 43rd OHOLO Conference: Novel approaches in biosensors and rapid diagnostic assays. Eilat. Israel. October 10-14, 1999. Pg.8P
 13. Har-Noy, G., S. El-Sana, N. Orr and R.S. **Marks**. Use of the avidin-biotin system in the chemiluminescence optical fiber immunosensor for the detection of LPS. The Israel Chemical Engineering Society Symposium. Beer-Sheva. Israel. June 25-26, 2000.
 14. Cosnier, S., S. Szunerits, R.S. **Marks**, J.-P. Lellouche and K. Perrié. Mediated electrochemical detection of catechol by tyrosinase-based poly(dicarbazole) electrodes. 2000 The Era of Biotechnology. Beer-Sheva. Israel. October 24-27, 2000.
 15. Polyak, B., S. Belkin and R.S. **Marks**. Fiber-optic recA-lux sensor to genotoxigants: storage behavior. 2000 The Era of Biotechnology. Beer-Sheva. Israel. October 24-27, 2000.

16. Rudoy, H., R.S. **Marks**, S. Geresh and J. Rishpon. Screen-printed electrochemical biosensors in a micro-flow injection system for the detection of environmental pollutants. The Second France-Israel Bi-National Workshop on Bioanalytical sensors, Biochips and Nanobiotechnology. Autrans. France. December 11-16, 2000. Pg. 57.
17. Cosnier, S., S. Szunerits, R.S. **Marks**, A. Novoa, L. Puech, E. Perez and I. Rico-Lattes. A rapid and easy procedure of biosensor fabrication by microencapsulation of enzyme in hydrophilic synthetic latex films. The Second France-Israel Bi-National Workshop on Bioanalytical sensors, Biochips and Nanobiotechnology. Autrans. France. December 11-16, 2000. Pg. 46.
18. Polyak, B., S. Belkin and R.S. **Marks**. Fiber-Optic *recA-lux* sensor to genotoxigants: system optimization. The Second France-Israel Bi-National Workshop on Bioanalytical sensors, Biochips and Nanobiotechnology. Autrans. France. December 11-16, 2000. Pg. 59.
19. Polyak, B. S. El-Sana, S. Belkin and R.S. **Marks**. Fiber-optic *recA-lux* sensor to genotoxigants: storage behavior. The Second France-Israel Bi-National Workshop on Bioanalytical sensors, Biochips and Nanobiotechnology. Autrans. France. December 11-16, 2000. Pg. 60.
20. Kahanovitz, L., T. Neufeld, R.S. **Marks** and J. Rishpon. Bioelectrochemical sensor for the detection of the hepatotoxin microcystin LR. 2nd European Meeting on Environmental Chemistry. Dijon. France. December 12-15, 2001.
21. Novoa, A., R.S. **Marks**, C. Mousty, A. Lepellec and S. Cosnier. Organic phase biosensors based on multilayered polyphenol oxidase protected by an alginate coating. FISEB 2002. The 3rd Congress of the Federation of Israel Societies for Experimental Biology. Eilat. Israel. February 4-7, 2002. Pg. 305.
22. Cosnier, S., S. Szunerits, R.S. **Marks**, J.P. Lellouche and K. Perie. Autogreffage de protéines et de médiateurs redox par des films de poly(dicarbazole-esters activés). Céret, France. March 27-29, 2002.
23. Ionescu, R., R.S. Marks and L.A. Gheber. Enzyme Nanolithography. Israel Vacuum Society. Tel-Aviv. September 12, 2002.
24. Taha, H., R. S. Marks, L. A. Gheber and A. Lewis. Protein printing with a nanofountainpen. Nanohappenings Israel. Israel Vacuum Society. Tel-Aviv. September 12, 2002.
25. Mousty, C., A. Lepellec, S. Cosnier, A. Novea and R.S. Marks. Fabrication of organic phase biosensors based on multilayered polyphenol oxidase protected by an alginate coating. Electrochemistry in Microscopic and Molecular Dimensions. 53rd Annual Meeting of the International Society of Electrochemistry. Düsseldorf, Germany. September 15-20, 2002.
26. Ionescu, R. E., R. S. **Marks**, L. A. Gheber. Enzyme nanolithography. Bi-National France-Israeli Symposium on Enabling Nano- and Micro- Technologies in Biotechnology. Beer-Sheva, Israel; October 31, 2002.
27. Konry, T., A. Novoa, S. Cosnier, and R.S. **Marks**. An innovative strategy for receptor protein immobilization onto an ITO coated optical fiber using poly(pyrrole-biotin). Bi-National France-Israeli Symposium on Enabling Nano- and Micro- Technologies in Biotechnology. Beer-Sheva, Israel; October 31, 2002.
28. **Marks**, R.S., A. Novoa, T. Konry and S. Cosnier. Antitoxin immunosensors based on electropolymerized indium tin oxide-coated optical fiber tips. Bi-National France-Israeli Symposium on Enabling Nano- and Micro- Technologies in Biotechnology. Beer-Sheva, Israel; October 31, 2002.

29. **Marks**, R.S., B. Leshem, G. Safarti and A. Novoa. Photochemical attachment of bio-molecules onto fiber-optics for biosensor construction. Bi-National France-Israeli Symposium on Enabling Nano- and Micro- Technologies in Biotechnology. Beer-Sheva, Israel; October 31, 2002.
30. Polyak, B., S. Belkin and R.S. **Marks**. Fiber-optic recA-lux sensors for the detection of genotoxic compounds. Bi-National France-Israeli Symposium on Enabling Nano- and Micro- Technologies in Biotechnology. Beer-Sheva, Israel; October 31, 2002.
31. Taha, H., R.S. **Marks**, L.A. Gheber and A. Lewis. Protein printing with a nanofountain pen. Bi-National France-Israeli Symposium on Enabling Nano- and Micro- Technologies in Biotechnology. Beer-Sheva, Israel; October 31, 2002.
32. Ionescu, R., R. S. **Marks**, L. Gheber. Modulation of nano-depressions in proteinaceous substrates by enzyme nanolithography. Nanobio-technologies II. Grenoble, France; 22-24 April, 2003.
33. Ionescu, R., R. S. **Marks**, L. Gheber. Enzymatic nanolithography. Gordon research Conference. Newport, USA; August, 2003
34. Ionescu, R., R. S. **Marks**, L. Gheber. Nano-modulation of a proteinaceous substrate using a proteolytic enzyme. 22nd IVS Annual Conference and technical Workshop; Tel-Aviv, October 22, 2003
35. Ionescu, R.E., R.S. **Marks** and L.A. Gheber. Nano-patterning biomolecules and bio-surfaces with SPM. The 3rd France-Israel Workshop on Biosensors, Biochips and Nanobiotechnology. Beer-Sheva & Eilat, Israel; Nov 30-Dec 4, 2003.
36. Mor, A., T. Green, M. Virta and R.S. **Marks**. Storage solutions for bioluminescence bacteria immobilized in a calcium alginate hydrogel onto an optic fiber tip. The 3rd France-Israel Workshop on Biosensors, Biochips and Nanobiotechnology. Beer-Sheva & Eilat, Israel; Nov 30-Dec 4, 2003.
37. Novoa, A., B. Kovacs, R. Ionescu, R.S. **Marks** and L. Gheber. Preliminary results on luminol electropolymerization and its use in fiber-optic based biosensors. The 3rd France-Israel Workshop on Biosensors, Biochips and Nanobiotechnology. Beer-Sheva & Eilat, Israel; Nov 30-Dec 4, 2003.
38. Strashnikova, N., V. Papper, P. Parkhomyuk, G.I Likhtenstein, V. Ratner and R.S. **Marks**. Local medium effects in the photochemical behaviour of substituted stilbenes immobilized on quartz surface. The 3rd France-Israel Workshop on Biosensors, Biochips and Nanobiotechnology. Beer-Sheva & Eilat, Israel; Nov 30-Dec 4, 2003.
39. Shani-Seckler, M., Y. Levi, B. Polyak, A. Novoa, P.S.M. Dunlop, J.A. Byrne and R.S. **Marks**. Monitoring genotoxicity during the photocatalytic degradation of *p*-nitrophenol. The 3rd France-Israel Workshop on Biosensors, Biochips and Nanobiotechnology. Beer-Sheva & Eilat, Israel; Nov 30-Dec 4, 2003.
40. Freifeld, Z., C. Porat, M. Lichtenberg, M.J. Loessner and R.S. **Marks**. Magnetic-Immunophage assay for monitoring *Listeria monocytogenes* in food samples. The 3rd France-Israel Workshop on Biosensors, Biochips and Nanobiotechnology. Beer-Sheva & Eilat, Israel; Nov 30-Dec 4, 2003.
41. Green, T., A. Ivask, A. Mor, M. Virta and R.S. **Marks**. Optical fiber biosensor for the detection of mercury. The 3rd France-Israel Workshop on Biosensors, Biochips and Nanobiotechnology. Beer-Sheva & Eilat, Israel; Nov 30-Dec 4, 2003.
42. Herrman, S., B. Leshem, S. Landes, B. Rager-Zisman and R.S. **Marks**. Optical fiber immunosensor for the detection of anti-West Nile Virus antibodies. The 3rd France-Israel Workshop on Biosensors, Biochips and Nanobiotechnology. Beer-Sheva & Eilat, Israel; Nov 30-Dec 4, 2003.

43. Ionescu, R.E., C. Gondran, R.S. **Marks**, L.A. Gheber and S. Cosnier. Comparison between the analytical performances of three markers in amperometric immunosensors for the detection of cholera antitoxin. The 3rd France-Israel Workshop on Biosensors, Biochips and Nanobiotechnology. Beer-Sheva & Eilat, Israel; Nov 30-Dec 4, 2003.
44. Ionescu, R.E., R.S. **Marks** and L.A. Gheber. Nano-lithography using protease etching of protein surfaces. The 3rd France-Israel Workshop on Biosensors, Biochips and Nanobiotechnology. Beer-Sheva & Eilat, Israel; Nov 30-Dec 4, 2003.
45. Konry, T., A. Novoa, Y. Shemer-Avni, S. Cosnier and R.S. **Marks**. Indium tin oxide-coated fiber-optic immunosensor for the detection of anti-hepatitis C virus-E2 envelope protein. The 3rd France-Israel Workshop on Biosensors, Biochips and Nanobiotechnology. Beer-Sheva & Eilat, Israel; Nov 30-Dec 4, 2003.
46. Leshem, B., G. Sarfati, A. Novoa, I. Breslav and R.S. **Marks**. Photochemical attachment of bio-molecules onto fiber-optics for biosensor construction. The 3rd France-Israel Workshop on Biosensors, Biochips and Nanobiotechnology. Beer-Sheva & Eilat, Israel; Nov 30-Dec 4, 2003.
47. Polyak, B., S. Geresh and R.S. **Marks**. Synthesis and characterization of a biotin-alginate conjugate and its application in a biosensor construction. The 3rd France-Israel Workshop on Biosensors, Biochips and Nanobiotechnology. Beer-Sheva & Eilat, Israel; Nov 30-Dec 4, 2003.
48. Ionescu, R., R.S. **Marks** and L. Gheber. Enzyme nanolithography. The 38th Annual Scientific Meeting. Jerusalem, Israel, 11 May 2004.
49. Konry, T., A. Novoa, S. Cosnier and R.S. **Marks**. Indium tin oxide-coated fiber optic immunosensor for the detection of viral antigen. The Eighth World Congress on Biosensors. Granada, Spain; 24-26 May, 2004.
50. Ionescu, R., R.S. **Marks** and L. Gheber. Enzyme nanolithography. Nano-8, 8th International Conference on Nanometer Scale Science and Technology. Venice, Italy, June 27-July 2, 2004.
51. Salama, O., S. Hermann, L. Lobel, I. Trakht and R.S. **Marks**. Chemiluminescence fiber-optic immunosensor for the detection with increased sensitivity of autoantibodies to ovarian cancer associated antigens. The 6th Minerva student symposium on Molecular based devices. Weizmann Institute of Science. March 6-8, 2005. Rehovot, Israel.
52. Sintov, E., S. Herrmann and R.S. **Marks**. Detection of a West Nile virus derived nucleic acid sequence with an optical fiber DNA biosensor. The 6th Minerva student symposium on Molecular based devices. Weizmann Institute of Science. March 6-8, 2005. Rehovot, Israel.

- **Presentation at informal International Seminars, Workshops and Meetings**

1. **Marks**, R.S. The development of immunosensor diagnostics. European Federation on Biotechnology, Bioprocess Engineering Course. Supetar, Island of Brač. Croatia. September 27-October 2, 1998.
2. **Marks**, R.S. On the development of fiber-optic *recA-lux* sensors to nitrates. Kick-Off Meeting. PEBCAT (EC Project). Jordanstown, Northern Ireland. February 16, 2001.
3. **Marks**, R.S. Progress in the synthesis of biotinylated alginate as entrapment medium for the photo-electro-bio-catalytic reactor. PEBCAT (EC Project). Grenoble. France. February 22, 2002.

4. **Marks, R.S.** Biosensors and water biotoxicity. Marine/Freshwater biomedical sciences center research retreat. Oregon State University, Corvallis, Oregon, USA. July 8, 2002.
5. **Marks, R.S.** Synthesis of biotinylated alginate as entrapment matrix in the formation of beads for fiber-optic biosensors. MENDOS (EC 5th Project). Wien. Austria. September 23, 2003.
6. **Marks, R.S.** Biosensors and nanobiotechnology. Nanoscience Center. University of Cambridge. Cambridge. England. September 1, 2003.
7. **Marks, R.S.** Biosensors and nanobiotechnology. School of Pharmaceutical sciences. University of Nottingham. Nottingham. England. September 2, 2003.
8. **Marks, R.S.** Biosensors and nanobiotechnology. Department of Chemistry. Sheffield University. Sheffield. England. September 3, 2003.
9. **Marks, R.S.** Biosensors and nanobiotechnology. Department of Physics and Astronomy. University of Leeds. Leeds. England. September 3, 2003.
10. **Marks, R.S.** Biosensors and nanobiotechnology. Institute of Nanoscale Science & Technology (INSAT). University of Newcastle upon Tyne. Newcastle. England. September 4, 2003.
11. **Marks, R.S.** Biosensors and nanobiotechnology. Northern Ireland BioEngineering Centre. University of Ulster. Jordanstown. Northern Ireland. September 5, 2003.
12. **Marks, R.S.** Bioluminescent optical-fiber bio-reporter sensor to endocrine disrupting compounds. MENDOS EC 5th Framework Progress Meeting. National Institute of Oncology. Budapest. June 22, 2004.

- **Seminar presentations at academic and research institutions**

1. Weizmann Institute of Science. Department of Chemical Immunology. Mucosal immune responses to cholera toxin B subunit synthetic peptides. PhD thesis presentation. 1992. Rehovot. Israel.
2. Ben-Gurion University. Department of Microbiology and Immunology. Single mode optical fiber loop immunosensor. May 1996. Beer-Sheva. Israel
3. Ben-Gurion University. Unit of Biotechnology. Optical immunosensors. November 3, 1996. Beer-Sheva. Israel
4. Massachusetts Institute of Technology. Center for Biomedical Engineering and Department of Biology. Chemiluminescent optical fiber immunosensors. August 1, 1997. Boston. USA.
5. University of Maryland School of Medicine. Center for Vaccine Development. Developing immunosensors as state-of-the-art diagnostic devices. August 5, 1997. Baltimore. USA.
6. Technische Universität München. Institut für Mikrobiologie. Forschungs-zentrum für Milch und Lebensmittel Weihenstephan. Chemiluminescent and fluorescent optical fiber immunosensors. Freising-Weihenstephan. Germany. September 18, 1997.
7. Biomérieux. Optical and acoustic immunosensors. March 1?, 1998. Lyon, France.
8. Université Joseph Fourier. Laboratoire d'Électrochimie Organique et de Photochimie Redox. Development of optical and acoustic immunosensors. March 2, 1998. Grenoble. France.
9. Ben-Gurion University of the Negev. Department of Chemistry. Optical and acoustic immunosensors. May 11, 1998. Beer-Sheva. Israel.

10. Technion Institute of Technology. Department of Chemistry. Optical fiber immunosensors. May 11, 1998. Haifa. Israel.
11. Central Public Health Laboratory. Use of immunosensors for molecular diagnostics. August 11, 1998. London. England.
12. University of Ulster. NIBEC. Optical fiber sensors. September 22, 1999. Jordanstown. Northern Ireland.
13. German Aerospace Center. Institute of Aerospace Medicine. Optical fiber sensors. April 7, 2000. Linder Höhe. Germany.
14. Centre Européen des Sciences du Goût. Optical fiber biosensors. May 18, 2000. Dijon. France.
15. Centre d'Énergie Atomique (CEA). Laboratoire d'Électrochimie moléculaire et de structures des interfaces. SI3M. Optical fiber biosensors. May 26, 2000. Grenoble. France.
16. The State University of New Jersey at Rutgers. A MERI/CIMIC seminar. Meadowlands Environmental Research Institute. The Hackensack Meadowlands Development District (HMDC). Coupling bioluminescent bacteria with fiber-optics to detect environmental toxicants. December 8, 2000. Newark. New Jersey. USA.
17. Ecole Normale Supérieure. Département de Chimie. *RecA-lux* fiber-optic biosensors to genotoxicants. February 20, 2001. Paris. France.
18. Universitatea din București. Faculty of Chemistry. Optical fiber biosensors. April 9, 2001. București. Romania.
19. The State University of New Jersey at Rutgers. Department of AgBiotech. *RecA-lux* fiber-optic biosensors to genotoxicants. August 23, 2001. New Brunswick. New Jersey. USA.
20. University of Turku. Department of Biotechnology. Optical fiber immunosensors and fiber-optic bioreporter whole-cell sensors. November 9, 2001. Turku. Finland.
21. Tel-Aviv University. Fiber-optic biosensors for clinical and environmental applications. Department of Human Microbiology. Sackler School of Medicine. February 28, 2002. Ramat-Aviv. Israel.
22. National Taiwan University. Department of Biomedical Engineering. Optical fiber biosensors in environmental applications. College of Medicine. May 13, 2002. Taipei. Taoyuan. Republic of China.
23. Columbia University. Fiber-optic biosensors to genotoxicants: use of fiber-optic biosensors to combat bioterrorism and detect biohazards. College of Physicians and Surgeons. Institute of Human Nutrition and Columbia Innovation Enterprises. Health Sciences Campus. June 25, 2002. New York, USA.
24. Ben-Gurion University. Fiber-optic biosensors. November 25, 2002. Beer-Sheva, Israel.
25. Ben-Gurion University. Fiber-optic biosensors. Institutes for Applied Research. November 27, 2002. Beer-Sheva, Israel.
26. University of Pecs, Hungary. Fiber-optic biosensors. Department of General and Physical Chemistry. December 5, 2002. Pecs, Hungary.
27. Istituto Di Ricerche Farmacologiche "Mario Negri". Fiber-optic biosensors in the environment. January 16, 2003. Milano, Italy.
28. National Institute of Immunology. Biosensors in medicine and the environment. January 21, 2003. New Delhi, India.
29. Ben-Gurion University of the Negev. Katz Ilse Center. Biosensors and nanobiotechnology, in pursuit of medical diagnostics, and environmental monitoring. March 26, 2003. Beer-Sheva, Israel.

30. Ecole Normale Supérieure de Cachan. Laboratoire de Photonique Quantique et Moléculaire (LPQM-UMR CNRS 8537). Senseurs biologiques à fibres optique. April 18, 2003. Cachan, France.
31. Institute of Radio Engineering and Electronics. Academy of Sciences of the Czech Republic. Fiber-optic biosensors. July ?, 2003. Prague, Czech Republic.
32. Université Joseph Fourier (LEOPR-LEDSS UMR CNRS 5616) Enzyme nanolithography. July 8, 2003. Grenoble, France.
33. Centre d'Énergie Atomique (CEA) Laboratoire des structures et propriétés des architectures moléculaires (LEMSI-UMR 5819) Indium tin oxide coated fiber-optic immunosensors. July 11, 2003. Grenoble, France.
34. University of Ulster. NIBEC. Enzyme nanolithography. July 30, 2003. Jordanstown, Northern Ireland.
35. Ben-Gurion University. Unit of Environmental Engineering. Optical fiber biosensors in environmental monitoring. November 13, 2003. Beer-Sheva, Israel
36. Université Joseph Fourier (LEOPR) Nanolithographie enzymatique. February 2, 2004. Grenoble, France.
37. Laboratory for Analysis and Architecture of Systems (LAAS-CNRS). NanoGroup, Nanoaddressing, Nanobiotechnologies. Biocapteurs et nanobiotechnologies dans le diagnostique. February 23, 2004. Toulouse, France.
38. Weizmann Institute of Science. Department of physics of complex fluids. March 8, 2004. Rehovot, Israel.
39. Ben-Gurion University. Biomedical Physics Group. April 25, 2004. Beer-Sheva, Israel.
40. University of Pecs. Optical fiber biosensors. Department of General and Analytical Chemistry. June 25, 2004. Pecs. Hungary.
41. University of Tokyo. Biosensors and Nanolithography. Institute of Industrial Science. Laboratory for Integrated Micro-Mechatronic Systems. LIMMS/CNRS-IIS. July 15, 2004. Tokyo. Japan.
42. Institut Pasteur. Développements en immunocapteurs et nanobiotechnologies pour des applications en virologie. Virologie. October 8, 2004. Paris. France.
43. Ben-Gurion University of the Negev. Department of Biomedical Engineering. Fiber-optic biosensors. November 8, 2004. Beer-Sheva. Israel.
44. Ecole Normale Supérieure de Cachan. Laboratoire de Photonique Quantique et Moléculaire (LPQM-UMR CNRS 8537). Colloques d'Alembert. Le 7^{ème} sense: les fibres optiques bioniques. January 26, 2005. Cachan, France.
45. Ecole Normale Supérieure de Cachan. Laboratoire de Photonique Quantique et Moléculaire (LPQM-UMR CNRS 8537). Colloques d'Alembert. La nanolithographie enzymatique à l'aide des laboratoires miniaturisés. February 3, 2005. Cachan, France.
46. Ben-Gurion University. Department of Chemistry. Seminar in Organic/Biophysics Chemistry. March 16, 2005. Beer-Sheva, Israel.
47. Ben-Gurion University. Department of Electrical Engineering. March 30, 2005. Beer-Sheva, Israel.

PATENTS (issued or awaiting to be issued)

1. USA Patent number 5,532,493. 2 July 1996. Optical sensor. Applicant: Department of Air Force (USA).

2. USA Patent number 5,869,748. 9 February 1999. Non-contact acoustic biosensor and reader. Assignee: BioSensing Technologies Ltd (Israel).
3. USA Patent number 6,203,758. 20 March 2001. Micro-circuit system with array of functionalized microelectrodes. Applicant: Bio-Pixel Ltd (Israel).

Filed

1. Enzyme nanolithography. 02.12.2003. 159155. USA
2. BioPen. 2003. USA.
3. Personal aid and monitoring device for enhancing success in early fertility treatment 2004
4. Phagolum. 2004

Discontinued

1. PCT/EP95/01661. 02 May 1995. Vaccines for oral immunization against infecting agents. Applicant: YEDA Research and Development Co. (Israel).
2. Israel Patent number 121102. 30 May 2000. A method for the enhanced coupling of emitted radiation in chemiluminescent systems. Applicant: BG Negev (Israel).
3. US Patent application. Luminescent Microbe assay. Applicant: BG Negev (Israel).
4. Israel application: 125,847. Matrixes of probes and their preparation. Applicant: BG Negev (Israel).

INTERNATIONAL COMPETITIVE RESEARCH GRANTS

1. 1997 - **Fogarty International Research Collaboration award (NIH)**, Rapid diagnostic biosensor for Group B *Neisseria meningitides* in blood, Co-I with Levine - **\$12,600**
2. 1998 - **European Commission DGXIII E D. Innovation Program. Definition Phase**, *Listeria monocytogenes* monitoring by a bioluminescent optical fiber immunophage biosensor, Co-PI with Loessner; BST Ltd; DNA Ltd - **\$49,000**
3. 2000-2001 - **NATO Science Program. Collaborative Research Grant**, Optical fiber bundle endface electrochemically conjugated for immunotoxin detection, Co-PI with Cosnier - **\$8,800**
4. 2001 - **Office of Naval Research International Field office. US Airforce European Office of Aerospace R&D. USA R&D and standardization group-UK**, The Second Israel-France Workshop on Bioanalytical sensors, biochips and nanobiotechnology (conference support) - **\$16,000**
5. 2001-2003 – **EC 5th Framework Program Energy, Environment and sustainable Development Program**; Photo-Electro-Bio-Catalytic treatment of drinking water (PEBCAT); Eggins; Beenackers; Cosnier; Biopixel Ltd; Texam ltd - **EUR 305,520**; (EUR 1,236,714)
6. 2001-2002 - **MERI/CIMIC (USA)**, Genotoxicity monitoring of Meadowlands environmental samples using a bioluminescent optical fiber biosensor - **\$80,000**

7. 2003-2006 - **EC 5th Framework Program**, Biomimetic optical sensors for environment endocrine disruptor screening (MENDOS), Co-PI with Preininger, Haberhauer, Mizaikoff, Gauglitz, Niessner, Blum, L, Homola, Csuka, Gheber, and Haupt - **EUR 229,200**; (EUR 2,004,372)
8. 2002-2004 – **NIOSH/CDC**, Guidelines for the development and evaluation of Direct Reading Instruments for Biological Organisms (DRIFBO), Co-PI with Rasooly, Lampel, Chizhikov, Homola, Nedelkov, D - (\$142,200) (travel costs)
9. 2004-2007 – **EC 6th Framework Network of Excellence**, Nano2Life, bringing nanotechnologies to life; BGU representative, 174 participants, NoE
10. 2004 – **US Army International Technology Center-Atlantic, European Research Office**, EILATox-Pecs, Technical Workshop on Toxicity for Biodefense, **\$20,000** (for workshop)
11. 2004-2006 - **NATO Science Program. Collaborative Research Grant**, Indium Tin Oxide-coated fiber-optic immunosensor for the detection of viral antigen, Co-PI with Cosnier. - **EUR 16,100**

NATIONAL COMPETITIVE RESEARCH GRANTS

1. 1995-1999 - **Israel Ministry of Science and the Arts**, Chemiluminescent optical fiber immunosensor, Co-PI with Dagan, Cohen, Porat, and Levine - **\$280,000** (\$400,000)
2. 1996 - **Israel Ministry of Science and the Arts**, Equipment award - **\$ 8,000**
3. 1997-1998 - **Israel Ministry of Trade and Industry**, REMABS (Biosensing Technologies Ltd), co-PI with Stevenson - **\$220,000**
4. 1998-1999 - **Israel Ministry of Trade and Industry**, Array of functionalized microelectrodes (Biopixel Ltd), Co-PI with Lellouche - **\$250,000**
5. 1999-2002 - **Israel Ministry of Science and the Arts**, Biosensors and molecular approaches to water quality monitoring: lake Kinneret as a model. Co-PI with Belkin, Lev, Lellouche, Rishpon, Ron, E., Kaplan, A., Sukenik - **\$210,000**; (\$1,000,000)
6. 2000-2004 - **Israel Science Foundation**, Biochemical nanophotolithography, Co-PI with Gheber - **\$130,000**; (\$230,000)
7. 2001-2004 - **Israel Ministry of Science and the Arts**, NSOM nano-arrayed biochips, Co-PI with Gheber and Lewis, A - **\$90,000**; (\$300,000)
8. 2002-2006 - **Israel Ministry of Defense (Mafat)**, Biologic sensors, **\$150,000**
9. 2005-2006 – **France-Israel Research Network Program in Medical and Biological imaging**. New methods for cellular and intracellular neural imaging: towards a “contactless optical patch clamp” probe, Co-PI with Brasselet, Cattaert and A. Lewis, **\$ 20,000** (\$100,000)
10. 2005 – **Israel Cancer Association**, Co-PI with Lobel - **\$10,000**

BEN-GURION UNIVERSITY COMPETITIVE RESEARCH GRANTS

1. 1995-1997 - **Institute for Applied Biosciences**, Photonics capital equipment - **\$31,000**
2. 1998 - **Institute for Applied Biosciences**, Multiprobe array – co-PI with Lellouche - **\$20,000**

3. 1999-2000 - **Institute for Applied Biosciences**, *Listeria monocytogenes* monitoring by a bioluminescent optical fiber immunophage probe - **\$15,000**
4. 1999-2000 - **Institute for Applied Biosciences**, Microtiter cell-based sensors for toxin detection, co-PI with Cohen and Lapidot - **\$30,000**
5. 2000-2001 – **Harry Stern Applied Research Fund**, *Listeria monocytogenes* monitoring by a bioluminescent optical fiber immunophage probe - **\$16,000**
6. 2003-2004 – **Harry Stern Applied Research Fund**, Fiber-optic biosensors for the detection of canine distemper virus - **\$16,000**

Total: US\$ 2,233,22

SYNOPSIS OF RESEARCH

Our laboratory has developed a number of optical fiber biosensor configurations, innovating in novel chemical immobilization strategies and creating new fiber-optic transducers. From the original work done as a post doctorate at the University of Cambridge (Lowe, Payne & Hale) with the development of a novel **single mode tapered optical fiber loop immuno-sensor** based on fluorescence spectroscopy, with incredibly high sensitivity [2; Patent 1], a new system was developed, the first **chemiluminescent fiber optic immunosensor**, which had similar sensitivity without the need for a light source, as we matched the fiber-core diameter to the numerical aperture, modulated the environmental refractive index, and used chemiluminescence enhancers [3,4,5]. This work was continued with the development of immunosensors being the most sensitive assays made to-date for the detection of *Streptococcus pneumoniae* [5], West Nile virus [32], ovarian cancer developed with GIPC antigen, meningitidis and Brucellosis in collaboration with with Menachem Banai. In order to create fiber bundles, that would enable to detect many analytes at the same time, a practical problem needs to be solved in terms of the cross-contamination of adjacent fiber core end faces, when these are being chemically modified, so that each one of them holds a different bio-receptor. For this, we have synthesized **silane-benzophenone** [25] so as to deposit a UV photo-sensitive layer on the bundle end-face with illumination of each core one by one to bind at its end-face the bio-receptor of interest. Further insights into alternative bio-receptors have brought us to develop **fiber-optic oligonucleotide sensors** for the detection of viruses in blood, including West Nile virus; and **aptamer fiber-optics**, for the detection of steroids in urine, in collaboration with Milan Stojanovic of Columbia University. This work is now forming the basis for the development of the first **lab-in-a-pen**, the **BioPen**, where the fiber-optic immunosensors are encased in a Pen-like structure and the immunological steps processed using a fluidics system, and the resulting data read by a ‘cap-like’ miniaturized optoelectronics system.

We also developed the first self-contained, disposable, **bioluminescent fiber-optic biosensor**, requiring a single step operation. These use genetically engineered bio-reporter bacterial cells, entrapped into ad-layers of calcium-alginate films, absorbed onto de-clad fiber tip cores and are capable of assess the bio-availability of toxicants in environmental water samples using a customized field-operable optical-fiber photo-detector device that allows for on-site measurements [6,9,25,26]. The field-operable device is now being automated for lab bench use. We further improved the configuration of the immobilized bacterial cells on fiber optics by synthesizing a novel polymer, **biotin-modified alginate**, which, produced as a bead containing bacterial bio-reporters, can be set onto the end-face of fiber-optics by simple linking to avidin-modified fibers [28]. Our laboratory is developing a fiber-optic biosensor to

endocrine disrupting compounds, using engineered yeast that includes hormone receptors and mercury, using *lux-mer* bacterial bioreporters with Marko Virta in Turku, Finland. The biotin-conjugated alginates have also been tested as possible enzyme-immobilization matrices, providing hydrophilic microenvironments, for electrode-based biosensors in organic environments [15, 16] In addition, these were shown to provide architecture for the 3D affinity binding of enzymes. In order to better understand the function of bioluminescent bioreporters, we are imaging **single cell bioluminescence**. In addition, we have synthesized, characterized, a novel hybrid hydrogel, **pyrrole-alginate**, for improving microbial and enzymatic retention, as well as, providing conduction, whenever needed [submitted].

We have created the first **surface conductive fiber optic biosensors**, coined ‘**electroprode**’. We first demonstrated that it was possible to polymerize a film onto a fiber optic endface by FeCl_3 [19], but the film lacked resiliency. A new principle was tested, based on creating a **conductive and transparent layer of ITO onto the resistive fiber-optic surface**, thus, allowing to coat the fiber surface with electropolymerizable monomers, such as biotin-pyrrole or pyrrole-benzophenone. The immunosensor produced was shown to be highly sensitive [17, 20] and the conductive layer materials engineering studied, as well as, the unique microscopic structure of the polymerized pyrrole on the ITO surface [submitted]. The ITO fiber-optic immunosensor was shown to be highly sensitive in blind trials, by the reduction by 50% of false-negatives from a local hospital for Hepatitis C virus [34]. We have now embarked on adapting this system for the detection of Ebola virus infected sera, to be tested in Uganda.

We have developed a novel phagocyte fiber-optic biosensor to provide prognostic data on the therapy of infected patients. The phagocytes sit intimately on the fiber-optic end-face surfaces, are exposed to a drop of blood, and their production of extrinsic and intrinsic chemiluminescence is monitored over time. This technique has shown to be very sensitive and is unique [submitted].

In addition, we will be developing with Rossi at JRC, Ispra, **PACVD** coating of fiber-optics and high **flux metal ion implants** into fiber-optic surface. With Cosnier of UJF, Grenoble, we are developing **ruthenium ITO** fiber-optic biosensors. We will study the feasibility of fiber-optic **polymer ring amplification** luminescence.

Sensor surfaces need to produce greater amounts of probe densities, as found in Biochips or microarrays, and new technologies need to be developed in order to produce them. For this, we have teamed up with Dr. Levi Gheber to create a new enabling tool we call enzyme nanolithography. This method allows the nanometer-scale lithography within proteinaceous thin layers. A pipette, with an orifice at around 200 nm, is used to deposit in air, trypsin protease, at a single site or along a line, above the protein surface, thus, creating nano-wells or nano-grooves [23]. This work derives from an earlier study in which we deposited green fluorescent protein as the nano-ink of the nanofountainpen [21]. We are further have done some initial studies in **nanometer scale fluidics** [35]. This next steps will include the creation of nanowires within nanogrooves, and the use of synthetic polypeptides with pre-determined cleavage sites to create 3D structures at the nanometer scale. We are also developing a phase display-on-a-chip using nanoscale precision. In addition, we have studied **light-generated chip configurations** using polypyrrole-benzophenone surfaces in collaboration with Whellan at JRC Ispra. Finally, ‘**live**’ **microarrays** of bioreporter cells are also being developed.

University Collaborations (past and present) formalized by joint publications

Belkin, Shimshon	The Hebrew University of Jerusalem, Jerusalem, Israel
Byrne, Tony	University of Ulster, Jordanstown, Northern Ireland
Cosnier, Serge	Université Joseph Fourier, Grenoble, France
Dagan, Ron	Pediatric Infectious Disease Unit, The Ben-Gurion University of the Negev, Beer-Sheva, Israel
Geresh, Shimona	Department of Biotechnology Engineering, Be-Gurion University of the Negev, Beer-Sheva, Israel
Gheber, Levi	Department of Biotechnology Engineering, Be-Gurion University of the Negev, Beer-Sheva, Israel
Lellouche, Jean-Paul	Ben-Gurion University of the Negev, Beer-Sheva, Israel
Lev, Ovdia	The Hebrew University of Jerusalem, Jerusalem, Israel
Levine, Mike	Center for Vaccine development, University of Maryland Medical school, Baltimore, USA.
Lewis, Aaron	Applied Physics Division. Hebrew University of Jerusalem, Jerusalem, Israel.
Likhtenstein, Gertz	Department of Chemistry, The Ben-Gurion University of the Negev, Beer-Sheva, Israel.
Rager, Bracha	Department of Microbiology and Immunology, The Ben- Gurion University of the Negev, Beer-Sheva, Israel.
Shemer-Avni, Yonat	Department of Virology, The Ben-Gurion University of the Negev, Beer-Sheva, Israel
Virta, Marko	Department of Biotechnology. Turku University, Turku, Finland

ADDITIONAL INFORMATION

- **Reader of Scientific Journal Manuscripts**

Advances in Biochemical Engineering/Biotechnology (2003)
Applied Biochemistry and Biotechnology (1999)
Analytica Chimica Acta (2000)
Biomacromolecules (2004)
Biomaterials (2004)
Biosensors and Bioelectronics (1994)
Biotechnology Progress (2004)
Journal of Biochemical and Biophysical Methods (2004)
Materials Science and Engineering (2001)
NanoLetters (2004)
Nanoscience Letters (2003-2004)
Optical Engineering (2004)
Sensor and Actuators (2004)
NATO Research Proceedings (2002)
Talanta (2002)

- **Grant Evaluator**

BARD (2004)
 European Commission 6th Framework (2004)
 FWF-Der Wissenschaftsfonds. Fonds zur Förderung der Wissenschaftlichen
 Forschung. Austria (2004)
 Human Science Frontier Program (2004)
 Israel Science Foundation (2003)
 Israel Ministry of Science and BMBF (1997)
 Israel Ministry of Science (1997, 2002, 2004)
 Yissum, Israel (1998; 2000)
 German-Israeli Foundation for Scientific Research & Development (GIF) (1999,
 2002, 2003)
 Israel Ministry of Science/Canadian-Israeli Research Grant (2000)

- **Student thesis refereeing (other than from my laboratory)**

Keren Embar (2004) MSc. Environmental Engineering, BGU

- **Technical Workshops, Partnering Meetings and Courses**

1. Histopathology of Mycoses. International Society for Human and Animal Mycology. Université de Montréal. Montréal. Quebec. Canada. June 28-29, 1991
2. Molecular Sensor Technology. Erasmus Program of the European Community. Euro Course on Analytical Chemistry. European Course on Biosensors. Cambridge, England. Sponsor: Institute of Biotechnology, Cambridge. December 6-11, 1993.
3. Listeria monocytogenes Innovation Program. AES Laboratoire, Yves Ach, JF Bloch, Gamma S.A. (Angleur-Liège, Belgium); Eurogenetics (Tessenderloo, Belgium); Institut für Mikrobiologie (Weihenstephan, Germany); MCA Development (Groningen, Netherlands). Sponsor: European Commission. July 29-Aug 12, 1998.
4. Technology Validation and Technology Transfer Project Definition Phase Review. Contract No IN30894D. Luxembourg. Sponsor: European Commission. October 8, 1998.
5. Bioprocess Engineering Course. European Federation of Biotechnology, Section on Biochemical Engineering Science. Sponsor: Ben-Gurion University. Supetar, Island of Brac, Croatia. September 27- October 2, 1998.
6. Technical Workshop on Genotoxicity Biosensing. TECHNOTOX. Flemish Institute for Technological Research. Sponsor: BIOSET. Mol, Belgium. May 8-12, 2000.
7. EUROBIZ. Eurobiobiz (Michel Lepers). Sponsor: European Commission and Arthur Andersen. Tel-Aviv. Israel. September 5-7, 2000.
8. International Conference and Bio-partnering Meeting. Seebio. Sponsor: Southern Bioscience. Brands Hatch Conference Center. Kent. England. February 5-6, 2002.
9. Advanced Study Course on Optical Chemical Sensors. ASCOS. Wroclaw, Poland. September 25-29, 2002.

10. SENSPOL Technical Meeting on Sensors for characterization and monitoring of contaminated sites. Sevilla, Spain, November 6-9, 2002.
11. Nano-Int EC IP partnering meeting. European Commission. Joint Research Center. Institute for Health and Consumer Protection. Ispra, Italy. December 10-12, 2002.
12. Nano-Int EC IP partnering meeting II. European Commission. Joint Research Center. Institute for Health and Consumer Protection Ispra, Italy. January 17, 2003.
13. Common Kick-off meeting of endocrine disrupter projects and MENDOS project Meeting. University of Milano, Milano, Italy. Feb 7-8, 2003.
14. End-of-Year Meeting II of the Photo-Electro-Bio-Catalytic treatment of drinking water PEBCAT project. Groningen University, The Netherlands. Feb 21, 2003.
15. Convergence high-tech-biotech-bilan et perspectives. Table-Ronde conviviale. Biocapterus et Biopuces dans le diagnostique du bioterrorisme: réussites ou échecs? Tel-Aviv, Israel. Mar 20, 2003.
16. End-of-Year Meeting II of the Biomimetic optical sensors for environment endocrine disruptor screening (MENDOS) project. Wien, Austria. September 21-23, 2003.
17. Technical Meeting on problems related to diffuse pollution sources: characterization of sediment, dredged material and groundwater; SENSPOL technical meeting; Koblenz, Germany; October 28-31, 2003. (performed by Amit Mor and Zohar Miller).
18. Mid-Term Meeting III of the Biomimetic optical sensors for environment endocrine disruptor screening (MENDOS) project. Budapest, Hungary. , 2004.
19. Mid-Term Meeting IV of the Biomimetic optical sensors for environment endocrine disruptor screening (MENDOS) project. München, Germany. February 20-23, 2005.
20. Meeting of the Israeli researchers participating in the France-Israel Medical and Biological Imaging projects. Tel-Aviv, Israel. March 23, 2005

- **Scientific missions (invited and other)**

1. Perrot (Paris); CisBio (Saclay); Ecole Normale Supérieure (Lyon); Université Joseph Fourier (Grenoble); Christian Dalet (Montpellier). February 19- March 8, 1998. Sponsor: Biopixel.
2. Université Joseph Fourier. Host: Serge Cosnier. Grenoble. France. July 23-31, 1999. Sponsor: Ambassade de France en Israël.
3. University of Ulster. Host: Brian Eggins. Jordanstown. North Ireland. September 19-25, 1999. Sponsor: European Commission.
4. MIRA Diagnostica GmbH. Host: Matthias Leiser. Leverkusen. Germany. April 3-9, 2000. Sponsor: Gesellschaft für Biotechnologische Forschung.
5. Université Joseph Fourier. Host: Serge Cosnier. Grenoble. France. May 1-31, 2000. Sponsor: Arc-en-ciel/Keshet (France- Israël).
6. DECHEMA. Host: GBF. Frankfurt. Germany. November 6-8, 2000. Sponsor: Gesellschaft für Biotechnologische Forschung.
7. State University of New Jersey. Host: Francisco Artigas. Newark. New Jersey. USA. December 5-9, 2000. Sponsor: Center for Information Management, Integration and Connectivity.

8. Université Joseph Fourier. Host: Serge Cosnier. Grenoble. France. February 8-25, 2001. Sponsor: NATO Science Programme, CLG.
9. University of Ulster. Host: Brian Eggins. Jordanstown. Northern Ireland. February 14-17, 2001. Sponsor: European Commission (PEBCAT kick-off).
10. State University of New Jersey. Host: Kirk Baret. Newark. New Jersey. USA. August 20-25, 2001. Sponsor: Center for Information Management, Integration and Connectivity.
11. Meadowlands Environmental Research Institute. Host: New Jersey Meadowlands Commission. Newark. New Jersey. USA. September 23-30, 2001. Sponsor: Center for Information Management, Integration and Connectivity.
12. German-Israeli Biotechnology Cooperation project. Hosts: Sebastian Delbrück, Scienion AG (Berlin) and Patric Zeltz, BioChip Technologies GmbH (Freiburg). March 29-April 4, 2002. Sponsor: Biotechnology Division 31; Forschungszentrum Jülich GmbH.
13. Ching-Yun Institute of Technology. Host: Hong, Rong-Moo. Jungli City. Taoyuan. Republic of China. May 8-14, 2002. Sponsor: National Council
14. Oregon State University. Host: Phil McFadden. Corvallis, Oregon, USA. July 7-14, 2002. Sponsor: EILATox.
15. Center for Food Safety and Applied Nutrition. Host: Avi Rasooly. College Park, Maryland, USA. October 6-10, 2002. Sponsor: Center for Disease Control.
16. Université Joseph Fourier. Host: Serge Cosnier. Grenoble. France. December 12-15, 2002. Sponsor: European Commission (PEBCAT inter-university visit)
17. Institut National de Santé Publique du Québec, Montreal, Québec, Canada and Health Canada, Winnipeg, Manitoba, Canada. Mar 13-18, 2003. Sponsor: Tesslin Biosciences Inc., Montreal, Canada.
18. Université Joseph Fourier. Host: Serge Cosnier. Grenoble. France. April 15-24, 2003. Sponsor: NATO Science Programme, CLG.
19. Turku University. Host: Marko Virta. Turku, Finland. July 13-17, 2003. Sponsor: SENSPOL Exchange Visit.
20. Survey delegation in the Field of Nanobiotechnology for Biosensors and Biochips. Organizer. Host: University of Sheffield, University of Cambridge, University of Nottingham, University of Leeds, University of Newcastle, University of Ulster. United Kingdom. August 31-September 6, 2003. Sponsor: British Council and the Israel Ministry of Science.
21. University of Ulster. Host: Brian Eggins. Jordanstown. Northern Ireland. February 8-10, 2004. Sponsor: European Commission (EC 5th Framework; PEBCAT Final Meeting).
22. University of Pecs. Host: Barna Kovacs. Pecs. Hungary. June 24-29, 2004. Sponsor: EILATox-Pecs.
23. Université Joseph Fourier. Host: Serge Cosnier. Grenoble. France. September 28–October 17, 2004. Sponsor: NATO.
24. European Commission. Member of a panel of experts in the evaluation of scientific projects following calls for under the 6th RTD Framework. Second Joint call IST-NMP-2 on Bio-sensors for Diagnostics and Healthcare. Bruxelles, Belgium. November 14-21, 2004. Sponsor: European Commission, DG INFSO C2.
25. Université Joseph Fourier. Host: Serge Cosnier. Grenoble. France. December 9–December 13, 2004. Sponsor: Arc-en-ciel/Keshet.
26. Northeastern University. Host: Ahmed Abdelal. Boston. USA. February 6-10, 2005. Sponsor: Rector's Office, BGU and Northeastern University.

27. Université Joseph Fourier. Host: Serge Cosnier. Grenoble. France. April 20–April 30, 2005. Sponsor: NATO.

- **Postdoctoral fellows and research assistantships mentored**

Dina Berman	(1996-1998) Russia; Israel Ministry of Absorption
Igor Breslav	(2002-2003) Russia; Israel Ministry of Absorption
Dr. Alexei Bychenko	(1996-1999) Uzbekistan; Israel Ministry of Absorption
Abby Deckelbaum	(2004 to-date) USA; European Commission
Dr. Salem El-Sana	(1998-1999) Israel; Israel Ministry of Science
Dr. Vincent Gigot	(Oct 98-Sept 99) France
Sharon Herrman	(2002-2003) France; Ministère des Affaires Étrangères
Dr. Moni Magrisso	(2003-to date) Bulgaria; Israel Ministry of Absorption
Dr. Alon Margalit	(Nov 97- Jan 99) Israel; Israel Ministry of Absorption
Dr. Andres Novoa	(01-2004) Cuba; Israel Ministry of Absorption
Dr. Karine Perie	(1998) France; Institute for Applied Biosciences
Dr. Michal Shani-Seckler	(2002-to date) Israel
Dr. Natalya Strashnikova	(1996-1999) Russia; Israel Ministry of Absorption
David Thomassey	() France; Ministère des Affaires Étrangères

- **Guest research scientists (past and present) visiting laboratory**

Dr. Martin Loessner	Technische Universität München. Freising-Weihenstephan, Germany (January 98, September 98).
Sebastien Herrmann	Montpellier, France (July-August, 2002); Sponsor: Ministry of Absorption
Sharon Herrman	Montpellier, France (July-August, 2002); Ministry of Absorption
Angela Ivask	National Institute of Chemical Physics and Biophysics, Akadeemia tee 23, Tallin 12618 Estonia (April 7-May 3, 2002)
Prof. Barna Kovacs	Department of General and Physical Chemistry, University of Pécs, Pécs, Hungary (June 2003); Sponsor: SENSPOL exchange visit
Dr. Serge DaSilva	Université Joseph Fourier, Grenoble, France (October-December 2003). Sponsor: Arc-en-ciel/Keshet travel award.
Dr. Howard Weetall	Environmental Protection Agency, Las Vegas, USA (November-December 2003). Sponsor: NATO-CLR.
Edina Szaszko	Department of General and Physical Chemistry, University of Pécs, Pécs Hungary (July-August 2004)

- **Industrial collaborations (scientific aspects)**

BioSensing Technologies Ltd, Beer-Sheva, Israel (1996-2002)
Biopixel Ltd, Beer-Sheva, Israel (1998-2002)

- **Media coverage on group's research**

Newspaper

Jerusalem Post, Sun 24 September, 2000; "Look-a portable water tester for cancer-causing pollutants".

Le Dauphiné, Saturday 16 December 2000; "L'avenir passe par les micro et nano biotechnologies".

South Bergenite, 3 October, 2001; "New group takes another step to clean up the Meadowlands"

Jerusalem Post, 27 November 2001; "Sensor of chemical warfare agents in water developed by BGU team".

גלובוס. 27 November 2001 "חוקרים מאוניברסיטת בן-גוריון פיתחו מערכת ביו-חיישנים לאיתור חומרי לוחמה ביוכימית במאגרי מים".

שבוע. 29 November 2001 "להגן על מאגרי המים בעת לוחמה ביוכימית".

הארץ. 29 November 2001 "פותח חיישן לגילוי רעלים במאגרי מים".

כל הנגב. 30 November 2001 "המערכת תאתר מתקפה כימית על מאגרי מים". Pg 58.

כל-בי. 6 December 2001 "מערכת מהפכנית שפותחה באביג תריע מפני פיגועים כימיים".

הארץ. 10 December 2001. שיטת החיידק הזוהר.

הארץ. 10 December 2001 "נייזת לזיהוי חומרים מסוכנים הוזעקה למקום הפיגו".

מעריב. "ביו-חיישן לאיתור חומרי לחימה ביוכימיים".

Ha'aretz, 10 December 2001; "Combating chemical and biological threats".

מקור ראשון-שבועון. 14 December 2001 "מערכת לזיהוי מתקפה ביו-כימית במאגרי מים".

Globes, Sun 2 March 2003; "Ben Gurion University develops new water pollutant sensor"

Jerusalem Post, Mon 3 March 2003; "BGU scientist develops method to detect, clean contaminated water".

Dunántúli Napló. A terrorizmus és a rákok pusztulása. Sept 1, 2004. Pg. 7

Jerusalem Post. Entebbe, 5 December 2004. Beersheva scientists cooperate to fight viruses. pg. 4.

כלבי-מקומון 02 December 2004 "טרור ביולוגי באוניברסיטת בן-גוריון"

הארץ 20 February 2005 המים הורעלו? הלשון המלאכותית תבדוק ותזהה.

Magazine

Optics & Laser Europe. OLE. News. Optical biosensor detects 1 ppb of 'practically anything'. August 1994. pg 7.

Le Point. Éditions Grandes Écoles & Universités. 2 March, 2000. iv-vi; "L'Université du desert"

The Jerusalem Report. 31 December 2001; "Israeli scientist perfects rapid test to detect water poisoning".

Israel High-Tech & Investment Report. Talking about a BioSensor with Dr. Robert Marks at Ben Gurion University. January 2002.

Biofutur (Le Technoscope) Biocapteurs: vers des microsystèmes hybrids autonomes. 225/143: 7, September 2002

Nature materials. Penning a protein pattern. Philip Ball. August 25, 2003.

Biotechnologies & Finances. Nanobiotechnologies: effervescences franco-israélienne à Beer Sheva début début décembre. 10 november 2003. 176: 5.

Jerusalem Report. The very real bioweapons threat. December 27, 2004. pg 48.

Newsletter

[BGU@30](#). September 2000; 2-3; “Simplified testing of water for cancer-causing pollutants”.

Daguesh. Mars 2004; pg 2. “Les biocapteurs au gout du jour”.

News @ BGU. February 2005; 5; “The war on bioterrorism”.

Electronic news

www.Israel21c.com; December 12, 2004. ‘Israeli bioterror experts coming up with the right answers’. Tania Hershmann.

Televised

Arutz 8, March 25, 2003, Israel.

TV2, September 1, 2004, Hungary

HR TV, September 1, 2004, Hungary

Radio

01/12/04 at 22:48:00 Reshet Beth.

01/12/04 at 06:30:00 Reshet Beth

01/12/04 at 11:44 Arutz 7