

## **CURRICULUM VITAE**

### **1. Personal Details**

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### **2. Higher Education**

#### **A. Undergraduate and Graduate Studies**

<b>Period of Study</b>	<b>Name of Institution and Department</b>	<b>Degree</b>
1988-1991	Technion – Israel Institute of Technology Faculty of Biology	B.Sc.
1991-1995	Technion – Israel Institute of Technology Department of Biomedical Engineering	M.Sc.
1995-2000	Technion – Israel Institute of Technology Department of Biomedical Engineering	Ph.D.

#### **B. Post-Doctoral Studies**

<b>Period of Study</b>	<b>Name of Institution and Department</b>	<b>Degree</b>	<b>Name of host</b>
2003-2005	Technion – Israel Institute of Technology Department of Biomedical Engineering	Research Fellow	Alice Maroudas
2006-2008	University of Oxford, UK Department of Physiology, Anatomy and Genetics	Marie-Curie Research Fellow	Jill Urban

### **3. Academic Ranks and Tenure in Institutes of Higher Education**

<b>Dates</b>	<b>Name of Institution and Department</b>	<b>Rank/Position</b>
1992-2000	Technion – Israel Institute of Technology, Department of Biomedical Engineering	Teaching and Research Assistant
2000-2001	Technion – Israel Institute of Technology, Department of Biomedical Engineering	Research Fellow
2001-2003	Technion – Israel Institute of Technology, Department of Biomedical Engineering	Adjunct Lecturer
2003-2005	Technion – Israel Institute of Technology, Department of Biomedical Engineering	Postdoctoral Research Fellow
2006-2008	University of Oxford, UK Department of Physiology, Anatomy and Genetics	Adjunct Senior Research (Marie- Curie) Fellow
2008-2013	Technion – Israel Institute of Technology, Department of Biomedical Engineering	Adjunct Senior Research Fellow
10/12-10/14	Technion – Israel Institute of Technology, Department of Biomedical Engineering	Adjunct Senior Lecturer
08/2013- 10/2015	ORT Braude College of Engineering, Department of Biotechnology Engineering	Senior Lecturer
11/2015-present	ORT Braude College of Engineering, Department of Biotechnology Engineering	Associate Professor

### **4. Offices in Academic Administration**

<b>Dates</b>	<b>Name of Institution and Department</b>	<b>Rank/Position</b>
04/2018-present	ORT Braude College of Engineering	Vice President for Academic Affairs
08/2013-03/2018	ORT Braude College of Engineering, Department of Biotechnology Engineering	Head of Department
08/2013-03/2018	ORT Braude College of Engineering, Department of Biotechnology Engineering	Chairman, Internship Committee
08/2013-03/2018		Chairman, Curriculum Committee
08/2013-03/2018		Chairman, Student Advisory Committee
08/2013-03/2018		Chairman, Purchasing Committee

### **5. Scholarly Position and Activities outside the Institution**

<b>Years</b>	<b>Reviewing for Refereed Journals</b>
2010-present	Acta Biomaterialia
2011-present	Cartilage

2012-present	Connective Tissue Research
2012-present	Spine
2013-present	Advanced Drug Delivery Reviews
2013-present	Israel Journal of Chemistry
2015-present	Osteoarthritis and Cartilage
2007-present	European Spine Journal

<b>Years</b>	<b>Reviewing for Funding Bodies</b>
*2018-present	Israel Science Foundation (ISF)

<b>Years</b>	<b>Reviewing for Conferences</b>
*2017	Marie-Curie Actions Conference (Member in the Judge panel)
*2016	World Biomaterials Conference (Member in the Judge panel)

<b>Years</b>	<b>Membership in Professional Societies</b>
2003-2005	Orthopaedic Research Society (ORS)
2005-2013	American Society for Biochemistry and Molecular Biology (ASBMB)
2010-2012	Israel Society for Medical and Biological Engineering (ISMBE)

<b>Years</b>	<b>Membership in a Rank Promotion Committees</b>
*2015-present	ORT Braude College of Engineering
*2018	Promotion to the rank of Senior Lecturer (Azrieli College)

<b>Years</b>	<b>Research Affiliate</b>
*2019(Aug-Sep)	Visiting Professor, MIT (Prof. Robert Langer)

## **6. Participation in Scholarly Conferences**

### **A1. International Conferences**

(KN – Keynote; PP – paper presentation; Pos – poster presentation; IL – invited lecturer; Pan - panelist)

<b>Date</b>	<b>Name of Conference</b>	<b>Place of Conference</b>	<b>Subject of Lecture/Discussion</b>	<b>Role</b>
November, 1998	XIV <sup>th</sup> International Society for Artificial Organs	Bologna, Italy	Modification of hemoglobin with NAD-based molecules: design and synthesis	PP

July, 2004	XIX <sup>th</sup> Annual Federation of European Connective Tissue Society, FECTS Meeting,	Sicily, Italy	Turnover of human disc constituents using aspartic acid as a marker of molecular age	Pos
February, 2005	51 <sup>st</sup> Annual Meeting of the Orthopedic Research Society (ORS)	Washington D.C. USA	Racemization of aspartic acid and non-enzymatic glycation of human intervertebral disc constituents as measures of turnover	Pos
February, 2005	51 <sup>st</sup> Annual Meeting of the Orthopedic Research Society (ORS)	Washington D.C. USA	The origin of proteoglycans heterogeneity in the human intervertebral disc	Pos
September, 2005	World Tribology Congress-III	Washington D.C. USA	Effect of active additives on the friction of human articular cartilage	
December, 2006	International Society of Liposomes (ISL)	London, UK	Liposomes as potential biolubricant and wear reduction in human synovial joints	
June, 2007	ASME Summer Bioengineering Conference	Keystones, Colorado	Intra- and extrafibrillar exchange in the disc	
February, 2010	17th International LDDR - Local Drug Delivery meeting and cardiovascular course on Revascularization (LDDR) and Molecular Strategies	Geneva, Switzerland	Targeted delivery at stent surface of in-situ produced drugs: A novel therapeutic approach	
September, 2010	23rd European Society for Biomaterials, ESB2010	Tampere, Finland	Sulphonate based hydrogel for nucleus pulposus repair	
April, 2011	British Society for Matrix Biology (BSMS)	Bristol, UK	Cell density of the intervertebral disc is regulated by blood supply	

June, 2011	International Society for the Study of the Lumbar Spine (ISSLS)	Gothenburg, Sweden	Bovine caudal discs: relationship between disc height, cell density and blood supply.	
July 2011	Gordon Research Conference (GRC) Elastin & Elastic Fibers,	Biddeford, ME, USA	Molecular comparison of elastins from different human tissues	
September 2012	7th European Elastin Meeting	Ghent, Belgium	Molecular insights into alterations of elastic fibers	
November, 2012	Marie Curie People Conference (Winner of the 2012 Marie Curie Prize)	Nicosia, Cyprus	Technologies for disc repair	IL
May, 2013	7th Polish-German Symposium on Pharmaceutical Sciences	Gdańsk, Poland	Insights into the proline hydroxylation of elastin derived from different tissues and species	
November, 2014	BIT's 5th World Gene Convention-2014 (WGC-2014), Theme: Olympic Campaign of New Biotechnology	Haikou, China	Bio-inspired, enzymatically active, anti-restenotic/anti-thrombotic carrier	IL, Pan
* June, 2018	PolymerTech <sup>18</sup>	Meresburg, Germany	Biomimetic approach to the development of glycosaminoglycan analogues for intervertebral disc repair	KN
April, 2019	BioNanoMed 2019	Graz, Austria,	Preparation of PLGA nanospheres as carriers for copper oxide nanoparticles-based imaging contrast agent	PP

**A2. Local Conferences**

<b>Date</b>	<b>Name of Conference</b>	<b>Place of Conference</b>	<b>Subject of Lecture/Discussion</b>	<b>Role</b>
September, 1993	Annual Meeting Israeli Society of Medical and Biological Engineering	Tel Aviv	Enzyme-based molecular logic systems	IL
September, 2004	5 <sup>th</sup> Annual meeting of the Israeli Chapter of the Controlled Release Society (ICRS)	Tel Aviv	Immobilized biochemical systems: design and optimization of their spatial arrangement.	PP
2004	XXIV <sup>th</sup> Annual Meeting Israeli Society for Vision and Eye Research	Neve Ilan	Controlled release of local anesthetics from biodegradable and eye-injectable nanoparticles	
September, 2007	Israeli Controlled Release Society (ICRS)	Caesarea	Liposomes as potential biolubricant for friction and wear reduction in human synovial joints	
December, 2007	Innovations in Cardiovascular Innovations (ICI)	Tel Aviv	Drug factories on stents	PP
July, 2008	9th Biennial ASME Conference on Design and Analysis	Haifa	Surface active phospholipids as cartilage lubricants	
June, 2009	Soft Matter at Interfaces: From Self Assembly to Nano-Confinement	Neve Ilan	Phospholipid liposomes as potential biolubricants agents for friction and wear reduction in cartilage of human synovial joints: The role of phospholipid physical chemistry and nanoism	
February, 2010	Israeli Heart Society (IHS)	Haifa	Novel therapeutic approach: drug factories on stent.	PP

October, 2010	7 <sup>th</sup> Israeli Chapter of Controlled Release Society (CRS)	Haifa	Sequential multi-factorial releasing scaffolds for tissue engineering: fabrication by the solvent/non-solvent sintering technology	IL
February, 2011	Israeli Society for Medical and Biological Engineering (ISMBE)	Tel Aviv	Therapeutically-active implants exhibiting improved biocompatibility: an ex vivo study	PP
December, 2013	The 2nd Conference of the Israel Society for Biotechnology Engineering (ISBE)	Tel-Aviv	Injectable hydrogels with high fixed charge density and swelling pressure for nucleus repair: biomimetic glycosaminoglycan analogues	PP
October, 2014	10th OBC Interdisciplinary Research Conference	Nahariya	Bio-inspired implants for the treatment of restenosis	PP
*October, 2019	15th OBC Interdisciplinary Research Conference	Kfar Blum	Liposomes as effective biolubricants for friction, wear and pain reduction in human synovial joints	KN

### **B. Organization of Conferences or Sessions**

<b>Date</b>	<b>Name of Conference</b>	<b>Place of Conference</b>	<b>Subject of Conference/Role at Conference/Comments</b>	<b>Role</b>
April, 2011	Genodisc Meeting	Nahsholim, Israel	Disc degeneration linked pathologies /speaker	Member of the Organizing Committee
* September, 2016	14th International Symposium on Computer Methods in Biomechanics and Biomedical Engineering (CMBBE 2016)	Tel-Aviv, Israel	Spine biomechanics/session chair	Session Chair

**7. Invited Lecture\Colloquium Talks**

<b>Date</b>	<b>Place of Lecture</b>	<b>Name of Forum</b>	<b>Presentation/Comments</b>
April, 2004	Institut für Unfallchirurgische Forschung und Biomechanik, Universität Ulm, Germany	Annual EuroDisc Meeting	Major biochemical components of the intervertebral disc, their turnover and some functional properties
April, 2005	Department of Biomedical Engineering, University of Eindhoven, The Netherlands	Annual EuroDisc Meeting	Correlation of swelling pressure, intra-fibrillar water and collagen tensile in young and aged human intervertebral discs
September, 2005	University of Warwick, England	Annual EuroDisc Meeting	Turnover of the major components of the intervertebral disc
May, 2007	University of Oxford, England	Colloquium Talk	Biomimetic approach to nucleus disc replacement and repair
December, 2008	Istituto Ortopedico Galeazzi, Milan, Italy	Annual GenoDisc Meeting	Tissue turnover and matrix degradation: production and role of matrix fragments
March, 2009	Institute of Biology NCSR Demokritos, Athens	Annual GenoDisc Meeting	A needle micro-osmometer for measurement of glycosaminoglycans
March, 2010	Budapest, National Center for Spinal Disorders, Buda Health Center,	Annual GenoDisc Meeting	Determination of the turnover of collagen, aggrecan and elastin in the human intervertebral disc using aspartic acid
March, 2013	Department of Biomedical Engineering, Technion, IIT, Haifa, Israel	Colloquium Talk	Structure, degeneration and repair of intervertebral disc
May, 2013	Institute of Pharmacy, Biosciences, Martin Luther University, Halle-Wittenberg, Germany	Colloquium Talk	Biomimetic approach to repair of cartilaginous tissues
November, 2013	ORT Braude College of Engineering, Israel	Colloquium Talk	Biologically-inspired materials for connective



			tissue repair
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**8. Research Grants**

<b>Role in Research</b>	<b>Co-researchers</b>	<b>Title</b>	<b>Funded by/Amount</b> (C-competitive fund)	<b>Year</b>
Co-PI	Maroudas A. (PI)	Intervertebral disc degeneration: interplay of age, environmental and genetic factors. <b>Published papers:</b> 5, 6, 7, 9, 10, 12, 13,	European Commission, FP5 <sup>C</sup> : 'Quality of Life' - EURODISC)/ \$400,000 (out of 2.3M dollars)	2003-2005
Co-PI	Etsion, I. (PI) Maroudas A. (PI)	Nano particles to combat osteoarthritis in human joints. <b>Published papers:</b> 8, 15	Technion, IIT: NEVET/ \$10,000	2006-2007
PI		Development of injectable materials for intervertebral disc repair. <b>Published papers:</b> 13, 14, 16, 17, 18, 23	European Commission, FP6 <sup>C</sup> : Marie Curie Intra European Fellowship /\$335,000	2006-2008
Co-PI	Maroudas A. (PI)	Disc-degeneration linked pathologies: novel biomarkers and diagnostics for targeting treatment, prevention and repair. <b>Published papers:</b> 19, 21, 22	European Commission, PF7 <sup>C</sup> : 'Health' - GENODISC/220,000 Euros (out of 3.7M Euros)	2008-2013
PI		Molecular mechanism of synovial joint lubrication <b>Published papers:</b> 25	European Commission, FP7 <sup>C</sup> : Marie Curie European Reintegration Grant (ERG)/45,000 Euros	2011-2014
Co-PI	Klein J. (PI) Maroudas A. (PI)	The molecular origin of lubrication in synovial Joints	McCutchen Foundation/ \$100,000 (out of \$400,000)	2011-2013
*PI	Michal Amit (PI)	Novel injectable biomimetic glycosaminoglycan	Israel Science Foundation (ISF) <sup>C</sup> / 1,250,000 NIS	2017-2021

		analogues for intervertebral disc regeneration <b>Published papers:</b> 31, <sup>34</sup>		
*PI	Mirit Sharabi (PI)	Towards tissue engineering of a whole intervertebral disc: from a single lamella to a whole organ	Ministry of Science Technology and Space (MOST) <sup>C/</sup>	<b>Pending</b>

## 9. Honors and Awards

- 2006-2008 Marie-Curie Fellow, Intra-European Grant (EU-IRG): Novel biomimetic approach to disc repair. University of Oxford.
- 2009 Spine Award in Regenerative Technologies for the Intervertebral Disc Biomaterial: 2009 Best New Technology (Sponsored by *Orthopedics This Week*).
- 2011-2014 Marie-Curie Fellow, Re-integration (EU-ERG): Molecular mechanism of synovial joints lubrication.
- 2012 The 2012 Marie-Curie Prize for Innovation and Entrepreneurship (EU) Awarded for the development of biomimetics for disc and cartilage repair.

## 10. Teaching

### A. Courses Taught in Recent Years

Year	Name of Course	Type of Course	Degree	Number of Students
2012-2015	Engineering Principles in Biology and Biotechnology	Lecture	B.Sc, M.Sc, Ph.D.	30-40
2013-present	Technologies in Cells and Tissue Engineering	Lecture/Lab	M.Sc.	8-10
2013-2018	Metabolism and Enzymology	Lecture/Lab (Mandatory)	B.Sc.	30-35
2013-2018	Methods in Separation and Diagnostics	Lab Course (Mandatory)	B.Sc.	30-40
2013-2016	Scientific Writing	Workshop (Mandatory)	B.Sc.	25-30

**B. Supervision of Graduate and Undergraduate Students**

<b>Name of Student</b>	<b>Title of Thesis</b>	<b>Degree</b>	<b>Date of Completion / in Progress</b>	<b>Student's Achievement</b>
Sheskin Tali	Polymeric systems for ocular drug delivery	M.Sc. (with Prof. N. Lotan and O. Geyer)	2005	Co-author on paper: #33
Merkher Yulia	The effect of new lubrications on the friction of human cartilage	M.Sc. (with Profs. I. Etsion and A. Maroudas)	2006	Co-author on papers: # 6, 8, 12, 15
Ne'eman Nitsa	Biological materials in polymeric matrices: multi-functional systems for applications in tissue engineering	M.Sc. (with Prof. N. Lotan)	2006	Co-author on paper: #20
Langzam-Sinai Ronit	Neutral and ionizable polymeric hydrogels in biomedical engineering	M.Sc. (with Profs. N. Lotan and Y. Lanir)	2006	
Tsitron Eve	Molecular age and turnover of proteoglycans and collagen of the human intervertebral disc	M.Sc. (with Prof. A. Maroudas)	2006	Co-author on papers: #7, 9, 13
Alagem Meital	Converging technologies at the interface between natural and artificial bio-systems	M.Sc. (with Profs. N. Lotan and R. Beyar)	2011	Co-author on paper: #24 Presentation in conferences (see F. #13,15)
Hanukayev Yuliana	Rheumatoid arthritis (RA) therapeutics methods by micro/nano particles	M.Sc. (with Prof. R. Azhari)	2014	

**PUBLICATIONS****A. Ph.D. Dissertation**

**Title:** Molecular engineering of bioactive materials with predefined specificity: design and synthesis of hemoglobin derivatives

**Date of submission:** April, 2000

**Name of Supervisors:** Prof. Noah Lotan and Prof. Rafael Beyar

**University:** Technion - Israel Institute of Technology

**B. Scientific Books (refereed)****Authored Books**

1. Wilke CN, Urban JPG, Roberts S, Maroudas A, **Sivan S**, Kletsas D, Videman T, Huyghe J. (Wilke AJ. Ed.). (2006). Why do intervertebral discs degenerate? Presentation of the European Research Project EURODISC. In: *Proceeding of the Ergo Mechanics 2*, Shaker-Verlag GMBH (Germany) pp. 124-137. **Co-authors have equal contribution.**

**C. Articles in Refereed Journals****Published**

(Note: The following abbreviation is used: Q=Quartile)

1. **Sivan S**, Lotan N. A biochemical logic gate using an enzyme and its inhibitor.1. The inhibitor as switching element. *Biotechnology Progress* (1999) 15(6):964-70. (**Invited paper**). (**Q2**).
2. **Sivan S.**, Lotan N. Molecular Engineering of Proteins with Predefined Function: Part I: Design of hemoglobin-based oxygen carrier. *Biomolecular Engineering* (2003) 20(3):83-90.
3. **Sivan S**, Lotan N. A biochemical logic gate using an enzyme and its inhibitor. 2. The logic gate. *BioSystems* (2003) 70(1):21-33. (**Q2**).
4. Filo O, Guzy S, **Sivan S**, Sideman S, Lotan N. Process analysis of a reactor-separator system: enzymic degradation of polymeric substrates. *Israel Journal of Chemistry* (2005) 45(4):495-505. (**Q1**).
5. **Sivan S**, Neidlinger-Wilke C, Wurz K, Maroudas A, Urban JPG. Diurnal fluid expression and activity in intervertebral disc cells. *Biorheology* (2006) 43(3-4):283-291. (**Q3**).
6. **Sivan S**, Wachtel E, Merkher Y, Maroudas A. Correlation of swelling pressure and intra-fibrillar water in young and aged annuli of human intervertebral discs. *Journal of Orthopedic Research* (2006) 24 (6), 1292-1298 (**Q1**).
7. **Sivan S**, Tsitron E, Wachtel E, Roughley P, Sakkee AN, van-der Ham F, DeGroot J, Roberts S, Maroudas A. Aggrecan turnover in human intervertebral disc as determined by the racemization of aspartic acid. *Journal of Biological Chemistry* (2006) 281(19):13009-14. (**Q1**).
8. Merkher Y, **Sivan S**, Etsion I, Maroudas A, Halperin G, Yosef A. A rational human joint friction test using a human cartilage-on-cartilage arrangement. *Tribology Letters* (2006) 22(1):29-36. (**Q1**).

9. **Sivan S**, Tsitron E, Wachtel E, Roughley P, Sakkee N, van der Ham F, DeGroot J, Merkher Y, Maroudas A. Age-related accumulation of pentosidine in aggrecan and collagen from human intervertebral disc. *Biochemical Journal* (2006) 398(1):29-35. **(Q1)**
10. Johnson WEB, **Sivan S**, Wright KT, Eisenstein SM, Maroudas A, Roberts S. Human intervertebral disc cells promote nerve growth over substrata of human intervertebral disc aggrecan. *Spine* (2006) 31(11):1187-93. (Invited paper). **(Q1)**.
11. **Sivan S**, Filo O, Siegelmann H. Application of expert networks for predicting proteins secondary structure. *Biomolecular Engineering* (2007) 24(2):237-43.
12. Schroeder Y, **Sivan S**, Wilson W, Huyghe JM, Merkher Y, Maroudas A, Baaijens FPT. Are disc pressure, stress and osmolarity affected by intra- and extrafibrillar fluid exchange? *Journal of Orthopedic Research* (2007) 25(10):1317-43. **(Q1)**.
13. **Sivan S**, Wachtel E, Tsitron E, Sakkee AN, van-der Ham F, DeGroot J, Maroudas A. Collagen turnover in healthy and pathological human intervertebral disc as determined by the racemization of aspartic acid. *Journal of Biological Chemistry* (2008) 283(14):8796-801. **(Q1)**.
14. Roberts S, Menage J, **Sivan S**, Urban JPG. Bovine explant model of degeneration of the intervertebral disc. *BMC Musculoskeletal Disorders* (2008) 9(1):24. **(Q1)**.
15. **Sivan S**, Schroeder A, Verberne G, Merkher Y, Diminsky D, Prieve A, Maroudas A, Halperin G, Nitzan D, Etsion I, Barenholz Y. Liposomes act as effective biolubricants for friction reduction in human synovial joints. *Langmuir* (2010) 26(2):1107-16. **(Q1)**.
16. Boubriak O, Watson N, **Sivan S**, Stubbens N, Lee RB, Urban JPG. Cell density of the intervertebral disc is regulated by blood supply. *International Journal of Experimental Pathology* (2011) 92(6):A14-A15. **(Q2)**.
17. **Sivan S**, Merkher Y, Wachtel E, Van El B, Zuurmund AM, Schmeltzer C, Heinz, A, Varga PP, Lazary A, Brayda M, Maroudas A. Longevity of elastin in human intervertebral disc as probed by the racemization of aspartic acid. *Biochimica et Biophysica Acta* (2012) 1820(10):1671-7. **(Q1)**.
18. Boubriak OA, Watson N, **Sivan S**, Stubbens N, Lee RB, Urban JPG. *Journal of Anatomy* (2013) 222(3):341-8. **(Q1)**.
19. **Sivan S**, Merkher Y, Wachtel E, Urban JPG, Lazary A, Maroudas A. A needle micro-osmometer for determination of glycosaminoglycan concentration in excised nucleus pulposus tissue. *European Spine Journal* (2013) 22(8):1765-73. **(Q1)**.
20. Ne'eman N, Marbach D, Chen-Konak L, Kaufman-Francis K, Berkovich M, Levenberg S, Lotan N, **Sivan S**. Multi-factor, sequentially releasing scaffolds for tissue engineering: Fabrication by the novel solvent/non-solvent sintering technology. *Israel Journal of Chemistry* (2013) 53:821-8. **(Invited paper)**. **(Q1)**.
21. Brayda-Bruno M, Tibiletti M, Ito K, Fairbank J, Galbusera F, Zerbi A, Roberts S, Wachtel E, Merkher Y, **Sivan S**. Advances in the diagnosis of degenerated discs and their possible clinical applications. *European Spine Journal* (2014) 3:315-23. **(Q1)**.

22. **Sivan S**, Hayes A, Wachtel E, Caterson B, Merkher Y, Brown S, Maroudas A., Roberts, S. Biochemical composition and turnover of the extracellular matrix of the normal and degenerate intervertebral disc. *European Spine Journal* (2014) 23(3):344-353. **(Q1)**.
23. **Sivan S**, Roberts S, Urban JP, Menage J, Bramhill J, Campbell D, Franklin V, Lydon F, Merkher Y, Maroudas A, Tighe B. Injectable hydrogels with high fixed charge density and swelling pressure for nucleus repair: biomimetic glycosaminoglycan analogues. *Acta Biomaterialia* (2014) 10(3):1124-1133. **(Q1)**.
24. Alagem M, Kivovich E, Tzchori I, Falah M, Flugelman M, Lanir N, Beyar R, Lotan N, **Sivan S**. The formation of an anti-restenotic/anti thrombotic surface by immobilization of nitric oxide synthase. *Acta Biomaterialia* (2014) 10(5):2304–2312. **(Q1)**.
25. **Sivan S**, Wachtel E, Roughley P. Structure, function, ageing and turnover of aggrecan in the intervertebral disc. *Biochimica et Biophysica Acta* (2014) 1840(10):3181-3189. **(Q1)**.
- \*26. Schmelzer CEH, Nagel M, , Dziomba S, Merkher Y, **Sivan S**, Heinz A. Prolyl hydroxylation in elastin is not random. *Biochimica et Biophysica Acta* (2016) 1860(10):2169-77. **(Q1)**.
- \*27. Perlman O, Weitz IS, **Sivan S**, Abu-Khalla H, Benguigui M, Shaked Y, Azhari H. Copper oxide loaded PLGA nanospheres: toward a multifunctional nanoscale platform for ultrasound-based imaging and therapy. *Nanotechnology* (2018) 4:29(18) doi: 10.1088/1361-6528/aab00c. **(Q1)**.
- \*28. Li Z, Behrens AM, Ginat N, Tzeng SY, Lu X, **Sivan S**, Langer R, Jaklenec A. Probiotics: Biofilm-inspired encapsulation of probiotics for the treatment of complex infections (2018) *Advanced Materials*. 30(51). 1870389 doi: 10.1002/adma.201803925. **(Q1)**.
- \*29. Benguigui M, Weitz IS, Timaner M, Kan T, Shechter D, Perlman O, **Sivan S**, Raviv Z, Azhari H, Shaked Y. Copper oxide nanoparticles inhibit pancreatic tumor growth by targeting tumor initiating cells (TICs). (2019) *Clinical and Experimental Metastasis* 36(2):155.
- \*30. Benguigui M, Weitz IS, Timaner M, Kan T, Shechter D, Perlman O, **Sivan S**, Raviv Z, Azhari H, Shaked Y. Copper oxide nanoparticles inhibit pancreatic tumor growth primarily by targeting tumor initiating cells. (2019) *Scientific Reports*. 9(1):1-10. **(Q1)**.
- \*31. Knani D, Eilon M, **Sivan S**. Molecular modeling of glycosaminoglycan-analogues for intervertebral disc repair. (2020) *Polymers for Advanced Technologies*. 31:2733–2741. **(Q1)**.
- \*32. Weitz IS, Perlman O, Azhari H, **Sivan S**. Synthesis and characterization of MRI-visible, copper-containing PLGA-based nanospheres: in vitro evaluation. (2021). *Journal of Materials Science*. 56:718–730. **(Q1)**.
- \*33. Sheskin T, Geyer O, Lotan N, **Sivan S**. Controlled and time-scheduled delivery of drugs: Polyanhydride-based nanoparticles as carriers for ocular medication. (2021). *Polymers for Advanced Technology*. **(Q2)**.
- \*34 **Sivan S**, Bonstein I, Marmor Y, Peled, G, Gazit, Z, Amit M. Encapsulation of bone marrow-derived mesenchymal stem cells in small alginate beads using emulsification by internal gelation. *Submitted*.
- In Preparation:**
- \*35 **Sivan S**, Bonstein I, Amit M. The effect of GAG-analogues stiffness on their mechanical properties towards disc replacement.

- \*36 Weitz IS, Azhari H, **Sivan S**. Metal-containing (drug) delivery systems for medical imaging (Review).
- \*37 Mordechai HS, Ben-Yehuda A, Bonshtein I, **Sivan S**, Sharabi M. Towards intervertebral disc engineering: simultaneous biomimetics of the annulus fibrosus and nucleus pulposus.

## **D. Chapters in Books**

1. **Sivan S**, Lotan N. (2006). Artificial blood. In: Wiley Encyclopedia of Biomedical Engineering (Akay, M. Ed.) pp. 1:130-143.
2. Wilke CN, Urban JPG, Roberts S, Maroudas A, **Sivan S**, Kletsas D, Videman T, Huyghe J. (Wilke, A.J. Ed.). (2006). Why do intervertebral discs degenerate? Presentation of the European research project EURODISC. In: Proceeding of the Ergo Mechanics 2, Shaker-Verlag GMBH (Germany) pp. 124-137.
- \*3. Wachtel E, Maroudas A, **Sivan S**. (Casado-Zapico. Ed.). (2017). Aspartic acid racemization and aging in cartilaginous tissue. In: Mechanisms linking aging, diseases and biological age estimation. CRC Press. pp. 39-53.

## **E. Conference Proceedings**

1. **Sivan S**, Lotan N. Modification of hemoglobin with NAD-based molecules: design and synthesis. *Proceedings of the International Journal of Artificial Organs*, Italy, 1998, 21(10):600. See also C2.
2. Sheskin T, **Sivan S**, Geyer O, Lotan N. Controlled release of local anesthetics from biodegradable and eye-injectable nanoparticles. *XXIV<sup>th</sup> Annual Meeting Israeli Society for Vision and Eye Research*. Israel, 2004, p. 88.
3. Rougley PJ, Melching L, Mort JS, Pearce RH, **Sivan S**, Maroudas A. The structure, degradation and life-span of aggrecan in the human intervertebral disc. *European Cells and Materials, ECM VI*, Switzerland, 2005, 10(3):17. See also C7.
4. Schroeder Y, **Sivan S**, Wilson W, Huyghe A, Maroudas A, Baaijens FPT. Intra- and extrafibrillar exchange in the disc. *Proceeding of the ASME Summer Bioengineering Conference (SBC2007-176329)*, Keystone, Colorado, June 2007, pp. 367-368. See also C15.
5. Schoroeder A, Verberne G, Merker Y, Diminsky D, Maroudas A, Halperin G, Nitzan D, Etsion I, Barenholz Y, **Sivan S**. Surface active phospholipids as cartilage lubricants. *ASME 2008 9th Biennial ASME Conference on Design and Analysis (ESDA2008), Proc. ASME ESDA*. Israel, 2008, pp. 549-553. See also C15.

## **F. Other Scientific Publications**

### **Patents**

1. **Sivan S**, Dinnar U, Lotan N. Intravascular apparatus and method. (2003) US Pat 6569688.



2. Barenholz C, Nitzan D, Etsion I, Schroeder A, Halperin G, **Sivan S**. Methods for joint lubrication and cartilage wear prevention making use of glycerophospholipids (2006) US 20100098749.
3. Tighe B, Franklin V, Lyndon FJ, Roberts S, Urban JP, **Sivan S**. Intervertebral disc and intraocular lens. (2008) US Pat. 12/736,540.
4. **Sivan S**, Elata D, Merkher Y, Maroudas A. A micro-device for measuring water in vivo and in vitro. (2009) Patent Pending.
5. **Sivan S**, Merkher Y, Maroudas A. A micro device for in vivo and in situ measurements in cartilaginous tissues (2011) US Patent 61/633571.
- \*6 Molinari M, Coussios CC, Gibbons DS, Arora M, Urban JP, **Sivan S**. Intervertebral disc treatment method and apparatus (2016) US Patent 9,408,624.
- \*7. Karpuj MV, **Sivan S**. Composition for sampling body fluids and secretions for detecting pathogenic agents nucleic acids and for disinfection (2020) US 63/032,650.

### Abstracts and posters

1. **Sivan S**, Lotan N. Enzyme-based molecular logic systems. *Annual meeting of the Israeli Society of Medical and Biological Engineering (ISMBE)*, Israel, September, 1993.
2. **Sivan S**, Tsitron E, Roughley P, DeGroot J, Verzijl N, Bank RA, Maroudas A. Turnover of human disc constituents using aspartic acid as a marker of molecular age. *XIX<sup>th</sup> Annual Federation of European Connective Tissue Society, FECTS Meeting*, Italy, July, 2004.
3. Tzor O, **Sivan S**, Lotan N. Immobilized biochemical systems: design and optimization of their spatial arrangement. *5<sup>th</sup> Annual meeting of the Israeli Chapter of the Controlled Release Society, ICRS*, Israel, September, 2004.
4. **Sivan S**, Tsitron E, Roughley P, DeGroot J, Verzijl N, Bank RA, Merkher Y, Maroudas A. Racemization of aspartic acid and non-enzymatic glycation of human intervertebral disc constituents as measures of turnover. *51<sup>st</sup> Annual Meeting of the Orthopedic Research Society, ORS*, Washington D.C. February, 2005.
5. Roughley PJ, Melching LI, **Sivan S**, Tsitron E, Maroudas A, DeGroot J, Mort JS. The origin of proteoglycans heterogeneity in the human intervertebral disc. *51<sup>st</sup> Annual Meeting of the Orthopaedic Research Society, ORS*, Washington D.C. February, 2005.
6. Merkher Y, **Sivan S**, Halperin G, Nahir M, Etsion I, Nitzan D, Barenholtz Y. Effect of active additives on the friction of human articular cartilage. *World Tribology Congress-III*, Washington D.C. September, 2005.
7. Schroeder A, **Sivan S**, Merkher Y, Rahamim E, Diminisky D, Prieve A, Yosef A, Maroudas A, Halperin G, Barbur A, Nitzan D, Etsion I, Barenholz Y. Liposomes as potential biolubricant and wear reduction in human synovial joints. *International Society of Liposomes (ISL)*, London, December, 2006.
8. Schroeder A, **Sivan S**, Merkher Y, Rahamim E, Diminisky D, Prieve A, Yosef A, Maroudas A, Halperin G, Barbur A, Nitzan D, Etsion I, Barenholz Y. Liposomes as potential biolubricant for friction and wear reduction in human synovial joints. *Israeli Controlled Release Society, ICRS*, Caesarea, September 2007.

9. **Sivan S**, Lotan N, Dinnar U. Drug factories on stents. *Innovations in Cardiovascular Innovations, ICI*, Tel-Aviv, December, 2007.
10. Etsion I, Verbene G, Schroeder A, **Sivan S**, Merkher Y, Halperin G, Maroudas A, Barenholz Y. Phospholipid liposomes as potential biolubricants agents for friction and wear reduction in cartilage of human synovial joints: The role of phospholipid physical chemistry and nanoism. *Soft Matter at Interfaces: From Self Assembly to Nano-Confiment*. Neve Ilan, June, 2009.
11. Alagem M, **Sivan S**, Flugelman M, Beyar R, Dinnar U, Lotan N. Targeted delivery at stent surface of in-situ produced drugs: A novel therapeutic approach. *17th International LDDR - Local Drug Delivery meeting and cardiovascular course on Revascularization (LDDR) and Molecular Strategies*. Geneva, February, 2010.
12. Ne'eman N, Marbach D, Chen-Konak L, Kaufman-Francis K, Berkovich M, Levenberg S, Lotan N, **Sivan S**. Sequential multi-factorial releasing scaffolds for tissue engineering: fabrication by the solvent/non-solvent sintering technology. *7<sup>th</sup> Israeli Chapter of Controlled Release Society*, Haifa, October 2010.
13. Alagem M, **Sivan S**, Flugelman M, Beyar R, Dinnar U, Lotan N. A novel therapeutic approach: drug factories on stent. *Israeli Heart Society (IHS)*, Haifa, Israel, February, 2010.
14. Bramhill JH, Tighe BJ, Campbell DC, Lydon F, Urban J, Roberts S, **Sivan S**. A sulphonate based hydrogel for nucleus pulposus repair. *23<sup>rd</sup> European Society for Biomaterials, ESB2010*. Finland, September, 2010.
15. Alagem M, Kivovich E, Lanir N, Zchori I, Falah M, **Sivan S**, Flugelman M, Beyar R, Dinnar U, Lotan N. Therapeutically-active implants exhibiting improved biocompatibility: an ex vivo study. *Israeli Society for Medical and Biological Engineering, ISMBE*, Afeka, February, 2011.
16. Boubriak OA, Watson N, **Sivan S**, Stubbens N, Lee RB, Urban JPG. Cell density of the intervertebral disc is regulated by blood supply, *BSMS*, Bristol, UK, April, 2011.
17. Boubriak OA, Stubben N, Watson S, **Sivan S**, Urban JPG. Bovine caudal discs: relationship between disc height, cell density and blood supply. *International Society for the Study of the Lumbar Spine, ISSLS*, Sweden, June, 2011.
18. Jung MC, Dcharm M, Heinz A, Pankau R, Wohlrab J, **Sivan S**, Merkher Y, Maroudas A, Neubert RHH, Schmeltzer CEH. Molecular comparison of elastins from different human tissues. *Gordon Research Conference (GRC) Elastin & Elastic Fibers*, Biddeford, ME, USA, July 2011.
19. Schmelzer CEH, Jung MC, **Sivan S**, Scharm M, Pankau R, Neubert RHH, Heinz A. Molecular insights into alterations of elastic fibers, *7th European Elastin Meeting*, September 2012, Ghent, Belgium.
20. Nagel MBM, Heinz A, **Sivan S**, Pankau R, Neubert RHH, Schmelzer CEH. Insights into the proline hydroxylation of elastin derived from different tissues and species, *7th Polish-German Symposium on Pharmaceutical Sciences*, Gdańsk, May, 2013.
21. **Sivan S**, Roberts S, Urban JP, Menage J, Bramhill J, Campbell D, Franklin V, Lydon F, Merkher Y, Maroudas A, Tighe B. Injectable hydrogels with high fixed charge density and swelling pressure for nucleus repair: biomimetic glycosaminoglycan analogues. *The 2nd Conference of the Israel Society for Biotechnology Engineering (ISBE)* Tel-Aviv, December, 2013.

22. Alagem M, Kivovich E, Tzchori I, Lanir N, Falah M, Flugelman M, Dinnar U, Beyar R, Lotan N, **Sivan S**. Bio-inspired implants for the treatment of restenosis. *10th OBC Research Day*, Nahariya, October, 2014.
23. Alagem M, Kivovich E, Tzchori I, Lanir N, Falah M, Flugelman M, Dinnar U, Beyar R, Lotan N, **Sivan S**. Bio-inspired, enzymatically active, anti-restenotic/anti-thrombotic carrier. BIT's 5th World Gene Convention-2014 (WGC-2014), Theme: Olympic Campaign of New Biotechnology, Co-Chair: Path 6: Biocatalysis and biotransformation and scale up of bioprocesses, Haikou, China, November 2014.
24. Benguigui M, Weitz IS, Timaner M, Kan T, Shechter D, **Sivan S**, Raviv Z, Azhari H Shaked Y. Copper oxide nanoparticles inhibit pancreatic tumor growth by targeting tumor initiating cells. 17th Biennial Congress of the Metastasis Research Society and Young Investigator Satellite Meeting. Princeton University, August 2018.
25. Weitz IS, Perlman O, **Sivan S**, and Azhari H, Synthesis and Characterization of Copper Oxide Based Polymeric Nano-systems for Biomedical Imaging, CIMTEC 2018, 8th Forum on New Materials, Perugia, Italy, June, 2018.
26. Weitz IS, **Sivan S**, Perlman O, Azhari H. Preparation of PLGA nanospheres as carriers for copper oxide nanoparticles based imaging contrast agent. BioNanoMed 2019.

### **Spin off**

***Moebius Medical***. Based on a joint IP (patent #2), *Moebius Medical*, a spin-off company, was established. *Moebius Medical* has recently completed a first-in-man clinical study at Hadassah Medical Center, demonstrating its product's (MM-II) fast action onset and its efficacy and safety for alleviating osteoarthritis pain as compared to hyaluronic acid injection. *Sun Pharma*, the world's fifth largest specialty generic pharmaceutical company and India's top pharmaceutical company, will fund further development of MM-II and undertake its global commercialization.