



Technion Research &
Development Foundation



- ▶ Clean-Tech
- ▶ Healthcare
- ▶ Engineering & Physical Sciences
- ▶ Computer Science

2011



Technion
Technology
Transfer

Excellence
Applied.



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Clean-Tech
Healthcare
Engineering &
Physical Sciences
Computer Science



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T³ - Technion Technology Transfer

T³ is the technology transfer arm of the Technion Research and Development Foundation Ltd. (TRDF). T³ takes the Technion's groundbreaking scientific ideas and matches them with investors and entrepreneurs to form exciting new ventures.

We at T³ aim to foster commercial investment through the licensing of intellectual property and the establishment of start-up companies. To date, T³ has secured a multitude of patents and has nurtured scores of innovative startups in sectors such as clean-tech, cell therapy, drug delivery, nanotechnology and others.

One of Technion's most outstanding successes is Rasagiline. This powerful anti Parkinson drug was discovered by Profs. Moussa Youdim and John Finberg and was later developed in collaboration with Teva Pharmaceutical Industries Ltd. Having received FDA approval, the revolutionary drug is now marketed worldwide as Azilect® and, to date, its worldwide sales have exceeded one Billion dollars.

Successful ventures include Mazor Surgical Technologies, a company that pioneered the development of miniature semi-robotic bone-mounted positioning systems for a wide range of orthopedic procedures; Biosense Inc., a company that developed 3D cardiac mapping and navigation technology; FineTech, a company that offers sophisticated chemical products and services to the pharmaceutical industry; Regentis Biomaterials Ltd., a medical material development company involved in the cartilage repair market; and Corindus Ltd., a company that provides robotic technologies for catheterization laboratories and radiology/special procedure suites.

Recently commercialized technologies include: 3D recognition ; auditory training system; automatic image processing software products for blood vessel analysis; cardiovascular treatment; cell sorting device; ceramic matrix nanocomposites; early detection of cancer; electrospinning; Hebrew morphological analyzer; mechanical lubrication for joint cartilage disease; medical robotics; membranes for desalination; novel treatment for neurodegenerative disorders; optimization module; project management decision support system; protein separation device; sealing surgical leaks; semiconductor light emitting sources; silicon air batteries; embryonic stem cells; water saving plants and others.

In addition to putting dozens of new companies on the road to success, T³ has formed strategic partnerships with international giants such as IBM, Intel, Philips, Johnson & Johnson, Coca Cola, Danone and SAP.

Throughout the years, T³ has built a strong community of incubators, private investors, VC's, angel Groups and entrepreneurs that help it commercialize Technion technologies.

We invite you too, to take a look at our fourth edition of the **T³ Book of Big Ideas**, join our growing network, and be part of the next successful venture!

Energy

10	CHM-0496	Ultra-rapid texturing of silicon for solar panel production
	CHM-1084	Silicon air batteries
	CHM-8013	Novel coolant for corrosion-protection of magnesium alloy engine parts
11	ENE-0980	Wind energy generation using active flow control
	ENE-0985	Novel hydrogen production and storage method
	ENE-1016	Photovoltaic cell spectrum manipulation
12	ENE-1017	Solar voltage amplifier
	ENE-1032	Tandem electrolyte fuel cell
	ENE-1053	A liquid desiccant system for cooling, dehumidification and air conditioning powered by solar or waste heat
	ENE-1137	Wind energy storage in compressed air & hot water and controlled conversion to grid rated electric power using modified wind turbines
	ENE-1167	Autonomous natural gas reformer for on-demand and on-site hydrogen generation
13	ENE-1191	Engineering of a non-lethal novel electron transfer pathway into PSII as a step towards biological energy production from photosynthetic organisms
	ENE-1229	Blowing & Pulsed blowing flow control performance prediction on a vertical axis wind turbine
	ENE-1239	Dry Power: Harnessing energy from evaporation
14	MAE-0935	Miniature Cryogenic Compressor
	MAE-1029	Simplified fuel atomization
	CHM-1272	Novel transparent conducting electrodes (TCOs)

Environmental

15	ENV-0798	Method and device for burning of sewage sludge
	ENV-1072	Remote pollution monitoring scheme
	ENV-1213	Pig manure treatment process
	ENV-1247	Methods, process and unit for separation, cleaning of flue gases and microalgae cultivation
	CHM-1202	Low-cost aerocellulose production; All-cellulose reinforced aerocellulose composites

Water

16	ENV-1135	Catalytic cloths for nitrate and nitrite removal from water
	WAT-0526	Bacterial DNA fingerprint detection
	WAT-0616	Chemical exposure measurement device (polymeric film sensor for polycyclic aromatic hydrocarbons)
	WAT-0829	Technique for catalytic oxidizing of dissolved matter in water by using adsorbent and nanocatalysts
17	WAT-0848	ROAKs for the capture and concentration of bacteria
	WAT-0929	A technique for phosphate removal from water solutions and its recovery by using nano-adsorbent
	WAT-0950	Encapsulation of pseudomonas ADP cells in electrospun core-shell fibers and their use in removing atrazine from water
	WAT-1078	Biological brine denitrification

Healthcare




Cell/Tissue Therapy

18	CTT-0739	Medical scaffold, methods of fabrication and uses thereof
	CTT-0744	Natural acellularized cardiac extracellular matrix for tissue engineering
	CTT-0838	Mesoscale bioactive 3D electrospun scaffold for bone repair
19	CTT-0895	3D vascularized pancreatic islets - for islets transplantation
	CTT-0905	An innovative electrospinning technology for fabricating non-woven tissue engineered albumin-based constructs
	CTT-1003	Methods for promoting cell transfection <i>in vivo</i> (ultrasound)
20	CTT-1023	Layered hydrospinning for the production of tissue engineering scaffold
	CTT-1164	Therapeutic use of modified Endothelial and Endothelial Progenitor Cells (EPCs)
	COM-1001	3D texture synthesis and fitting
	CTT-1036	Ultrasound-mediated drug delivery
	STM-0652	Methods of preparing feeder cells-free, xeno-free human embryonic stem cells and stem cell cultures




Diagnostic Kits

21	DIA-0845	Concomitant analysis of salivary tumor markers – A new diagnostic tool for oral cancer
	DIA-0887	Method and kits for diagnosis of schizophrenia
	DIA-1061	Detection of ABCG2 activity using OH-bearing Imidazoacridinones
	DIA-1092	A system for assessing chemosensitivity of lymphoblastic leukemia patients to high dose MTX-containing combination chemotherapy


PG Healthcare

- DIA-1109 Improved diagnosis and immunotherapy of diseases based on analysis of the repertoire of serum soluble MHC-peptide antigens
- DIA-1121 Hand-held probe for *in vivo* tooth ESR dosimetry
- 22  MED-1190 Brain surveillance window
-  WAT-0526 Bacterial DNA fingerprint detection
-  WAT-0848 ROAKs for the capture and concentration of bacteria

Drug Delivery

- CTT-1036 Ultrasound-mediated drug delivery
- DDL-0831 Encapsulation of biologically active chemicals for oral delivery
- 23  DDL-0912 Solid system for oral delivery of proteins-insulin
- DDL-0952 Encapsulation of enzymes in electrospun core-shell fibers
- DDL-1022 Nanoencapsulation of chemotherapeutic and other drugs in beta-casein micelles
- DDL-1026 Self-assembling capsids
- 24  DDL-1074 Compositions and methods for drug delivery
- DDL-1160 OAK cochleates: Method and composition for a delivery platform
- DDL-1161 Cell-derived liposomes for drug-delivery
- DDL-1279 Cell-cell fusion method with application in specific delivery of anti-nematode agents using proteins from the FF family
- DDL-1293 Thermally-induced protein-polyphenol co-assemblies: Beta lactoglobulin based nanocomplexes as protective nanovehicles for EGCG
- 25  NUT-1051 Nano-complexes of beta-lactoglobulin and polysaccharides as vehicles for hydrophobic bioactive molecules


Drug Discovery: Agents reducing smoking-associated injury

- DRS-0601 Methods, pharmaceutical compositions, oral compositions, filters and tobacco products for preventing or reducing tobacco smoke-associated injury in the aerodigestive tract of a subject
- DRS-0911 Tobacco and tobacco packaging material for preventing or reducing tobacco-associated injury in the aerodigestive tract
- DRS-0933 Prevention or reduction of injury induced by tobacco related materials as smoke in the aerodigestive tract with the copper chelator D-penicillamine
- 26  DRS-0938 Prevention or reduction of biological injury induced by tobacco related materials as smoke and/or free radicals and/or other inducers of oxidative stress through the MPTP/TSPO pathway
- DRS-1087 Novel discovery presenting potent protector against the lethal effect of cigarette smoke



Drug Discovery: Antiarrhythmic

- DRS-0546 Tricyclic compounds and their uses as antiarrhythmic antifibrillatory and defibrillatory agents


Drug Discovery: Anti-inflammatory

- 27  DRS-0659 Anti inflammatory compositions and the uses thereof
- DRS-1192 Novel class of antibiotics based on naturally lethal peptide sequence

Drug Discovery: Antibiotics

- DRS-0673 Bifunctional antibiotics for targeting rRNA and resistance-causing enzymes
- DRS-0816 Redesign of aminoglycosides for treatment of human genetic diseases caused by premature stop mutations
- 28  DRS-0932 Novel antimicrobial agents
- DRS-1006 OAKs: Novel library of antibiotics that mimic host defense peptides
- DRS-1049 Design, synthesis and evaluation of novel Fluoroquinolone-Aminoglycoside hybrid antibiotics
-  DRS-0607 Methods for the preparation of selectively-substituted corroles and new substituted corroles

Drug Discovery: Diabetes

- DRS-1000 Overcoming insulin resistance state via alleviating GLUT4 repression caused by AHNAK
- 29  DRS-1275 T-cell Receptor-Like (TCRL) antibodies directed to beta-Islets antigens presented by MHC class II

Drug Discovery: Hypolipidemic agents

- DRS-0934 Metallocorroles: A novel compound fighting Atherosclerosis and high blood Cholesterol levels

Drug Discovery: Immunomodulators

- DRS-0606 Methods and pharmaceutical compositions for immune deception, particularly useful in the treatment of cancer
- DRS-0655 An antibody fragment capable of modulating multidrug resistance

Drug Discovery: Neoplastic disorders

- 30**
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|----------|---|
| DRS-0607 | Methods for the preparation of selectively-substituted corroles and new substituted corroles |
| DRS-0896 | OAKs: Novel cancer-fighting mimics of host-defense peptides |
| DRS-0972 | A systems approach for understanding and controlling the reactivity of immune cell populations against cancer |

Drug Discovery: Neurodegenerative diseases

- 31**
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| DRS-0855 | Heterocyclic derivatives, pharmaceutical compositions and methods of use thereof |
| DRS-1019 | Multifunctional catalytic antioxidants as cyto-protective and cyto-rescuing agents for chronic, systemic, and neurodegenerative diseases |

Drug Discovery: Phosphate regulators

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| DRS-0710 | Compositions and methods for treating disorders associated with abnormal phosphate metabolism |
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Drug Discovery: Psychiatric drugs

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| DRS-0961 | An objective method for assessment and development of new psychiatric drugs |
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Drug Discovery: Renal disorders

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| DRS-0764 | Methods for treatment of Renal Failure |
| DRS-1273 | Nephroprotective effects of phosphodiesterase-V inhibitors during laparoscopic surgery |

Medical Device


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| MED-0706 | Electronic receptor and its application to controlling biological processes |
| MED-0781 | TipCAT: Semi-disposable self-propelled colonoscope |
| MED-0806 | Chest tube and automatic insertion system |
| 33 | MED-0835 Fast retinal imaging by parallel projections |
| | MED-0867 Vectorial vortex mode transformation for a hollow waveguide using subwavelength structures |
| | MED-0939 Cylindrical probe for ex-situ nuclear magnetic resonance spectroscopy |
| | MED-0967 ViRob – An autonomous crawling micro-robot |
| 34 | MED-0991 <i>In vivo</i> flow-cytometry |
| | MED-1138 System and method for near surface surgery simulation |
| | MED-1152 Techniques for spectrally encoded endoscopy |
| | MED-1190 Brain surveillance window |
| 35 | MED-1193 Microdevice for measuring water content <i>in vivo</i> and <i>in vitro</i> |
| | MED-1227 Multifocal ultrasound and its effect on biological tissues, in particular via ultrasound effect on biological membranes |
| | MED-0949 Detection and diagnosis of chronic renal failure and kidney related diseases by Electronic Nose |
| | MED-0971 Non-contact holographic stimulation technology for next-generation vision restoration devices |
| 36 |  CHM-0794 Ceramic coating on dental implant abutments |
| |  CHM-1097 Microstructure control of ceramic matrix nanocomposites |
| |  COM-1158 Cancer diagnostic probe |
| |  DIA-1121 Hand-held probe for <i>in vivo</i> tooth ESR dosimetry |

Research Equipment

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|-----------|--|
| RES-0698 | Hardware architecture for spike recording, detection, sorting and alignment algorithms in neuroprocessors |
| RES-0837 | Floating electrode dielectrophoresis (feDEP) |
| 37 | RES-0870 Electrical control over antibody-antigen binding |
| |  DDL-1074 Compositions and methods for drug delivery |
| |  MAE-1038 Acoustic particle focusing |
| |  MED-1152 Techniques for spectrally encoded endoscopy |
| |  STM-0652 Methods of preparing feeder cells-free, xeno-free human embryonic stem cells and stem cell cultures |

Stem Cells

- | | |
|-----------|---|
| STM-0611 | Methods of generating human cardiac cells and tissues and uses thereof |
| 38 | STM-0613 Differentiated human embryoid cells and a method for producing them |
| | STM-0629 Endothelial cells derived from human embryonic stem cells |
| | STM-0630 Novel methods for the <i>in vitro</i> identification, isolation and differentiation of vasculogenic progenitor cells |
| | STM-0646 Method of dynamically culturing embryonic stem cells |
| 39 | STM-0652 Methods of preparing feeder cells-free, xeno-free human embryonic stem cells and stem cell cultures |
| | STM-0695 Engineering three-dimensional tissue structures using differentiating embryonic stem cells |
| | STM-0721 Growth and differentiation of human embryonic stem cells within three dimensional scaffolds |















- 40
- STM-0722 Stem cell lines derived from delayed blastocyst culture and their uses
 - STM-0777 L6-IL6 receptor chimera supports the feeder layer-free culture of hESCs
 - STM-0789 Multicellular systems of pluripotent human embryonic stem cells and cancer cells and uses thereof
 - STM-0800 Isolation, purification and characterization of human embryonic stem cell and human fetal stem cell derived progenitors and their differentiation into osteoblasts, chondrocytes and tendocytes
- 41
- STM-0801 Development of a dynamic process for the formation, propagation and differentiation of human embryoid bodies
 - STM-0890 Adult stem cell-derived connective tissue progenitors for tissue engineering
 - STM-0919 Ectodermal precursor cell line derived from human embryonic stem cells
 - STM-0923 Identification and selection of cardiomyocytes during human embryonic stem cell differentiation
 - STM-0956 Embryonic and adult stem cells encapsulation for cell based therapy and cancer
- 42
- STM-0988 Tissue engineering of vascularized cardiac muscle from human embryonic stem cells
 - STM-1132 Suspension culture for undifferentiated human iPSCs
 - STM-1136 Co-derivation and expansion of vasculogenic pericytes and endothelial cells from human ESCs and iPSCs
 - STM-1148 Pancreatic progenitor enrichment of hES cell culture by GLUT2 sorting
- 43
- STM-1209 Novel method to generate Induced Pluripotent Stem (iPS) cells from keratinocytes from human plucked hair follicle
 - STM-1234 Suspension culture for undifferentiated human iPSCs
 - STM-1270 Generation of induced Pluripotent Stem Cells (iPSCs) and cardiomyocytes from Catecholaminergic Polymorphic Ventricular Tachycardia (CPVT) and Long QT (LQT) patients
- 44
- STM-1283 Production of corneal tissue equivalents from human pluripotent stem cells
 - STM-1290 Novel method to derive Extracellular matrix (ECM) from human embryonic stem cells (hESCs) and human pluripotent stem cells (iPSCs) for regenerative medicine applications
-  DDL-1161 Cell-derived liposomes for drug-delivery

Food and Nutrition

- 45
- NUT-0833 Casein micelles for encapsulation of hydrophobic compounds
 - NUT-1015 Nano-Encapsulation of additives in Beta Casein assemblies for enrichment of foods, beverages and soft drinks Including clear drinks
 - NUT-1051 Nano-complexes of beta-lactoglobulin and polysaccharides as vehicles for hydrophobic bioactive molecules
 - NUT-1076 Addition of Prolactin to infant formulas





Engineering & Physical Sciences

Chemistry and Materials Science





- 46
- CHM-0599 Efficient synthesis of a polyacene monomer
 - CHM-0794 Ceramic coating on dental implant abutments
 - CHM-0989 Low cost onsite generation of high purity oxygen
 - CHM-1065 Barium titanate layer produced by aqueous suspension cathodic electrophoretic deposition
- 47
- CHM-1107 Facile production method of novel family of highly catalytic tridentate ligand complexes
 - CHM-1129 Novel hypergolic fuel
 - CHM-1159 Calixarenes – novel binding molecules
 - CHM-1202 Low-cost aerocellulose production; All-cellulose reinforced aerocellulose composite
- 48
- CHM-1236 Liquid droplet elastomer
 - CHM-1251 Production of iodides from carboxylic acids
 - CHM-1272 Novel transparent conducting electrodes (TCOs)
 -  CHM-0496 Ultra-rapid texturing of silicon for solar panel production
 -  CHM-0565 Voltage and light induced strains in porous crystalline materials
 -  CHM-0665 Copper CMP slurry composition
- 49
-  CHM-0708 Negative fullerene ion beams generation - method and apparatus
 -  CHM-0755 Printable materials
 -  CHM-0809 Exploitation of the ordering effect in liquids adjacent or confined by crystals to achieve novel structures during liquid phase epitaxial growth
 -  CHM-1054 Novel p-dopant for organic semiconductors
 -  CHM-1075 Seedless copper electroplating for Damascene process
 -  CHM-1097 Microstructure control of ceramic matrix nanocomposites
 -  CHM-1101 Novel fast and simple method of carving silicon down to the sub-micron scale
 -  CHM-1307 Electrospun metal and composite carbon-metal nanofibers
 -  COM-0619 Gamma ray detector
 -  ENE-1167 Adult stem cell-derived connective tissue progenitors for tissue engineering
 -  MAE-1033 Electrophiles and nucleophiles sensor

Measurement Methods and Systems



- 50
- CHM-0676 Determination of thin film topography
 - CHM-0804 Seamless dual-mode ACPD non-destructive testing (NDT)
 - COM-0884 Object distance and brightness estimation

51	COM-1157	Novel and powerful enhancement of measurement systems' resolution
	COM-1299	A CMOS (ISFET) pH sensor for medical applications
	MAE-1038	Acoustic particle focusing
	 CHM-0620	Variable lenslet array
	 CHM-0802	Single sided probe for ESR imaging of semiconductors
 CHM-1173	Direct and nondestructive chemical analysis of solid and liquid samples	
 MAE-0730	Active detection of asymmetry in turbomachinery via asynchronous excitation	











Mechanical Systems

52	COM-0995	Ferroelectric stack actuator and shape control algorithm
	MAE-0632	Increased life for gas filters using acoustic fields
	MAE-0682	Electrostatic modulation of surface roughness
	MAE-0730	Active detection of asymmetry in turbomachinery via asynchronous excitation
53	MAE-0862	Highly sensitive, real-time structural monitoring
	MAE-0935	Miniature Cryogenic Compressor
	 CHM-0804	Seamless dual-mode ACPD non-destructive testing (NDT)
	 MAE-0664	Actuation drive for laser video projection
	 MAE-1029	Simplified fuel atomization
	 MAE-1038	Acoustic particle focusing



MEMS and NEMS

54	MAE-0664	Actuation drive for laser video projection
	MAE-0918	Low-friction molecular rotary motors
 COM-0636	Low cost CMOS thermal / IR imaging sensor	
 MAE-0682	Electrostatic modulation of surface roughness	

Nanotechnology

55	CHM-0708	Negative fullerene ion beams generation - method and apparatus
	CHM-0755	Printable materials
	CHM-1034	Optical tweezers
	CHM-1054	Novel p-dopant for organic semiconductors
	CHM-1097	Microstructure control of ceramic matrix nanocomposites
56	CHM-1101	Novel fast and simple method of carving silicon down to the sub-micron scale
	CHM-1182	Novel durable tagging agents
	CHM-1307	Electrospun metal and composite carbon-metal nanofibers
	COM-0969	Membrane computing system and method
 CHM-0501	Source of intense coherent high-frequency radiation	
57	 CHM-0665	Copper CMP slurry composition
	 CHM-0989	Low cost onsite generation of high purity oxygen
	 CHM-1060	Chemically Sensitive field effect transistors for explosive detection
	 CHM-1084	Silicon air batteries
	 CHM-1202	Low-cost aerocellulose production; All-cellulose reinforced aerocellulose composite
	 CHM-1272	Novel transparent conducting electrodes (TCOs)
	 MAE-0918	Low-friction molecular rotary motors
	 MAE-1033	Electrophiles and nucleophiles sensor
 RES-0870	Electrical control over antibody-antigen binding	

Networks and Communication

58	COM-0954	Polarization-multiplexing based passive optical networks
	COM-0966	Blind reconstruction of multi-band analog signals
	COM-0970	Distorted signal recovery
	COM-0987	BENoC - Bus enhancement NoC
	COM-1106	Compact and wideband tapered slot antenna for WPAN applications
	COM-1122	Wideband analog to digital conversion and low rate baseband processing
59	 COM-0500	Wavelength-selectable laser
	 COM-1139	Single photon detector for long IR range

Optics and Lasers

60	CHM-0501	Source of intense coherent high-frequency radiation
	CHM-0565	Voltage and light induced strains in porous crystalline materials
	CHM-0620	Variable lenslet array
	CHM-1246	Improved Quantum Well Infrared Photodetector (QWIP)
	COM-0500	Wavelength-selectable laser

61	COM-0734	Method for acquisition of video with enhanced resolution
	COM-0753	Optical noise-free microphone
	COM-0808	Efficient method of shaping a laser beam
	COM-0945	LED-like photon pair source
	COM-1050	Optical logic gate
62	COM-1100	Stable high brightness, high temperature semiconductor lasers
	COM-1158	Cancer diagnostic probe
	COM-1186	Semiconductor two-photon laser
63	MAE-0593	Space-variant subwavelength polarization grating
	MAE-0614	Space-variant subwavelength dielectric grating
	MAE-0634	Geometrical phase optical elements with space-variant subwavelength gratings
	MAE-0763	Space-variant polarization manipulation of a thermal emission
64	MAE-0867	Vectorial vortex mode transformation for a hollow waveguide using subwavelength structures
	MAE-1112	Dilute nitride-based Quantum Well Infrared Photodetector (QWIP)
	MAE-1140	Nitrogen incorporation in atomic layer epitaxy growth of InAsN/GaAs quantum wells
	MAE-1216	Tuneable XBn and nBn and PV IR detectors
	MAE-1220	New active layer for GaAs-based lasers
	CHM-1034	Optical tweezers
	COM-0910	Deep nanopatterning FIB technology
65	COM-0954	Polarization-multiplexing based passive optical networks
	COM-1139	Single photon detector for long IR range
	COM-1157	Novel and powerful enhancement of measurement systems' resolution
	MAE-0664	Actuation drive for laser video projection

Security






66	CIV-1108	Automated detection of tunnel excavation
	COM-1181	Compact direction finding antenna
	MAE-0791	Autonomous control scheme for unmanned aerial vehicle flocks
	MAE-0877	Highly efficient spacecraft thruster - CAMILA
	MAE-1128	Agile kill vehicle against ballistic missiles
	CHM-1129	Novel hypergolic fuel
	CHM-1173	Direct and nondestructive chemical analysis of solid and liquid samples
	CHM-1182	Novel durable tagging agents
	MAE-0862	Highly sensitive, real-time structural monitoring
	MAE-1029	Simplified fuel atomization
	MAE-1033	Electrophiles and nucleophiles sensor

Sensors

67	CHM-1060	Chemically Sensitive field effect transistors for explosive detection
	CHM-1173	Direct and nondestructive chemical analysis of solid and liquid samples
	CHM-1238	Changing the properties of mechanical resonators by the means of electron beam induced deposition
	COM-0619	Gamma ray detector
68	COM-0636	Low cost CMOS thermal/IR imaging sensor
	COM-1102	CMOS -SOI-MEMS thermal sensors for THz imagin
	COM-1139	Single photon detector for long IR range
	COM-1253	CMOS-SOI-MEMS thermal antenna for THz thermal imaging
69	MAE-1033	Electrophiles and nucleophiles sensor
	MAE-1057	Self balancing motorcycle
	CHM-0620	Variable lenslet array
	CHM-1246	Improved Quantum Well Infrared Photodetector (QWIP)
	COM-0753	Optical noise-free microphone
	COM-1181	Compact direction finding antenna
	COM-1304	Blackbody as a THz emitter and a THz measurement and characterization set-up based on blackbody and THz filters
	MAE-0935	Miniature Cryogenic Compressor
	MAE-1112	Dilute nitride-based Quantum Well Infrared Photodetector (QWIP)
MAE-1140	Nitrogen incorporation in atomic layer epitaxy growth of InAsN/GaAs quantum wells	
	MAE-1216	Tuneable XBn and nBn and PV IR detectors


VLSI and Semiconductors

70	CHM-0665	Copper CMP slurry composition
	CHM-0802	Single sided probe for ESR imaging of semiconductors
	CHM-0809	Exploitation of the ordering effect in liquids adjacent or confined by crystals to achieve novel structures during liquid phase epitaxial growth
	CHM-1075	Seedless copper electroplating for Damascene process




71	COM-0731	Gate diffusion inputs (GDI) circuit design
	COM-0894	Improved transistor structures
	COM-0910	Deep nanopatterning FIB technology
	CHM-0708	Negative fullerene ion beams generation - method and apparatus
	COM-0945	LED-like photon pair source
	COM-0987	BENoC - Bus enhancement NoC
	COM-1050	Optical logic gate
	COM-1100	Stable high brightness, high temperature semiconductor lasers

Computer Science

Signal, Audio and Image Processing

72	COM-0805	Image de-hazing
	COM-0834	Recovering object visibility and structure in a scattering medium when using artificial illumination
	COM-0914	Robust silhouette tracking in video streams
	COM-0948	Efficient real-time acquisition of textured 3D video
73	COM-0978	Super resolution with no explicit motion estimation
	COM-1009	Asynchronous multi-band signal sampling
	COM-1071	Texture and image interpolation using Markov models
	COM-1080	Pinpoint Microphone
74	COM-1103	Complex barycentric coordinates
	COM-1117	Texture mapping of 3-D models using casual images
	COM-1119	Saliency Algorithm: Automatic puzzle-like photo collage maker
	COM-1154	Photonic-enabled ultra-high-speed RF analog-to-digital conversion
75	COM-1194	Speckle-Noise elimination in holographic projection
	COM-1304	Blackbody as a THz emitter and a THz measurement and characterization set-up based on blackbody and THz filters
	MAE-1091	Video-based livestock health monitoring
	COM-1086	Fast Universal Synchronizers

Software and Algorithms

76	COM-0712	GeomCore - outstanding 3D graphics
	COM-0892	Interactive route planning
	COM-0921	Optimal measurement technique of variable arrays
	COM-0992	PIXSAR: Disk recluster for faster XML databases
77	COM-1035	Decision support tool for project management
	COM-1086	Fast Universal Synchronizers
	COM-1104	TCAM with fast error detection
78	COM-1162	Hidden 2D images in 3D models
	COM-1163	Optimal inspection of multidimensional regions
	COM-1274	Online Reconstruction of 3D Objects from Arbitrary Cross-Section Datas
	COM-1282	Mitigation of Inter-Cell Coupling Effects in NAND Flash Memory
	COM-1296	Cryo-probes optimal placement for cryo-surgical applications
	COM-0812	Monitoring multi-variate threshold functions over distributed data streams
	COM-1103	Complex barycentric coordinates
	COM-1150	Monitoring threshold functions over multiple nodes in distributed data sets

Web Sites and Web Technologies

79	COM-0779	Enriching document representation for information retrieval tasks
	COM-0812	Monitoring multi-variate threshold functions over distributed data streams
	COM-0913	Protection of copyrighted material on the web
	COM-0944	XPathL – logical language for integrating relational and XML databases
	COM-1067	Maximizing restorable throughput in MPLS networks
80	COM-1094	Advanced query language for social networks
	COM-1150	Monitoring threshold functions over multiple nodes in distributed data sets
	COM-1197	Social networks interaction protocol
	COM-1204	Multi-core XML query processing



Clean-Tech

TECHNION PATENT

DESCRIPTION

Energy

CHM-0496

Ultra-rapid texturing of silicon for solar panel production

This innovative electrochemical process for silicon etching achieves a very high level of speed, efficiency and control while utilizing environmentally friendly materials. Silicon etching or texturing has numerous applications including the production of microelectronics, production of more effective solar panels or improved efficiency of reclaiming or reprocessing used silicon wafers.

CHM-1084

Silicon air batteries

New metal-air batteries based on a silicon (Si) anode yield a capacity four times that of conventional Zn-air batteries. We have solved the low conductivity problem of Si by using highly doped and metalized silicon. The novelty in this method is the use of a semiconductor such as Si for generation of energy. It is accomplished by utilizing silica as the reaction product with oxygen and a particular ionic liquid as electrolyte.

CHM-8013

Novel coolant for corrosion-protection of magnesium alloy engine parts

The trend towards reduced fuel consumption for automobiles has led to an increase in the use of lighter metallic alloys in engines. Aside from weight reduction, magnesium alloys have other advantages such as reduction in material cost and reduction of manufacturing costs due to a more efficient manufacturing process.

Special attention has been placed on magnesium in the past ten years by the automobile industry worldwide. This innovative coolant is designed specifically to protect magnesium alloys from corrosion while also protecting all of the other metals in the engine for an efficient and long-lasting operation.

ENE-0980

Wind energy generation using active flow control

The presented invention pertains to personal, industrial and automotive cooling, ventilation, vacuuming and dust removal, inflating, etc. Other applications are computer component cooling, propulsors for air vehicles and for airboats, air-cushion vehicles, airships and model aircraft. The invention suggests using a dielectric barrier discharge plasma actuation in a new method in order to significantly improve the function of the applications mentioned above, and possibly decrease energy consumption wherever it is implemented.

TECHNION PATENT

DESCRIPTION

Energy

ENE-0985

Novel hydrogen production and storage method

Hydrogen is considered the ultimate fuel because of its extremely high energetic performance along with clean reaction products (water or water vapor) of minimal ecological impact. However, the production, storage and transport of hydrogen are expensive, difficult and hazardous. The present invention demonstrates a novel method for the safe and easily controlled production, storage, and use of hydrogen. An innovative, unique method for hydrogen production via a self-sustained reaction between powdered aluminum and water has been developed. It is based on the activation of aluminum particles by an original chemical treatment, enabling spontaneous reaction between aluminum and any type of water (pure water, tap water or sea water). Experiments at room temperature revealed a complete reaction, generating approximately 1.24 liters of hydrogen per gram of aluminum. The method can be considered a very compact means of in-situ production of hydrogen and hydrogen storage, and may be combined in fuel cells and other power generation cycles.

ENE-1016

Photovoltaic cell spectrum manipulation

There is a great advantage in down-and-up-conversion of photons that are not absorbed by a photo-voltaic cell. A central feature of the technique is that the transformation of the solar spectrum is done separately with (non-linear) materials that are not part of the actual solar cell. It increases the efficiency of an existing solar cell structure via additional coatings or external elements. The technology is the unique design of two filters that surround a "black-body" such that the input is the solar spectrum and the output is a relatively narrow spectrum. While the temperature of the black-body is not anticipated to exceed 2000°C – a factor of three smaller than the sun's temperature – the filtering between the black-body and the PV cell will transmit only the narrow spectrum required by the cell. In addition, the filter between the sun and the black-body should be optimized for minimum reflection.

ENE-1017

Solar voltage amplifier

Unlike PV cells that are standalone systems designed to produce current, the technology proposed here enables the addition of solar energy harvesting to any existing electrical system by connecting it in series. This novel concept of producing a solar voltage amplifier is applicable to both small and large scale operations. It can be designed as an "inverse lamp" for small appliances for private use or for large scale power plants capable of creating vast amounts of electricity. The system conceived in the Technion for solar energy conversion consists of an absorbing medium. Its population is inverted in a broad range of frequencies, corresponding to the solar spectrum. Once illuminated, the population of the majority of the energy states may be inverted and as a result, according to the PASER concept, the medium may act as a negative resistance component. In other words, power is transferred from the solar radiation to the electrons via the medium. This can be visualized as a voltage amplifier.

TECHNION PATENT	DESCRIPTION
Energy	
ENE-1032	<p>Tandem electrolyte fuel cell</p> <p>A new fuel cell (FC) is hereby proposed, constructed of two electrolytes instead of one with an interconnect. In this way, more robust FCs can be manufactured at lower costs. These FCs will be able to handle more fuels, at larger temperature ranges and with more robustness in terms of the fuel quality. This novel design is expected to produce less leakage and oxidation problems.</p>
ENE-1053	<p>A liquid desiccant system for cooling, dehumidification and air conditioning powered by solar or waste heat</p> <p>Global warming, has led to an increase in air conditioning demand not only in hot and humid climates such as in Mediterranean countries, but also in European countries with no air conditioning tradition. Electric utilities have their peak loads in hot summer days, and are often barely capable of meeting the demand, struggling with brown-out situations. With suitable technology, solar cooling can help alleviate, if not eliminate the problem. We developed a technology that is capable of using industrial waste heat or low-grade solar heat from low-cost flat plate collectors as their source of power, and have the potential to provide both cooling and dehumidification, as required by the load.</p>
ENE-1137	<p>Wind energy storage in compressed air & hot water and controlled conversion to grid rated electric power using modified wind turbines</p> <p>With the recent years surge in energy prices, there is an ongoing search after green, reliable and efficient renewable energy technologies. Technion researchers have developed small wind turbine (2-10kW) for rural markets that stores energy for future consumption. The new wind turbines are 40% more efficient than today's existing wind turbines allowing continuous electricity supply even when no wind is currently blowing.</p>
ENE-1167	<p>Autonomous natural gas reformer for on-demand and on-site hydrogen generation</p> <p>The demand for hydrogen fuel cells is growing and consequently, the need for hydrogen is growing as well. We offer a natural gas autonomous membrane reformer for on-site and on-demand small-scale hydrogen production to facilitate hydrogen fuel-cell stack power generation. A working prototype of this compact, efficient and thermally-independent unit has shown much promise for autonomous generation of ultra-pure hydrogen from natural gas.</p>

TECHNION PATENT

DESCRIPTION

Energy

ENE-1191

Engineering of a non-lethal novel electron transfer pathway into PSII as a step towards biological energy production from photosynthetic organisms

Modern science is searching for non-polluting ways to efficiently convert sunlight to energy. The inventors propose to construct a photocell that produces electricity and hydrogen, both extremely valuable resources of energy, without producing chemical pollutants. The technology involves the use of plants, seaweed or cyanobacteria, all organisms that produce energy by photosynthesis. Technion researchers have discovered that by performing a specific mutagenic modification in a membrane protein, a cultivar can be used as an alternative energy source.

ENE-1229

Blowing & pulsed blowing flow control performance prediction on a vertical axis wind turbine

Wind turbines convert kinetic energy from the wind into mechanical energy in a process that consumes no fuel, and emits no air pollution. They are an increasingly large source of commercial electric power. The invention pertains to the control of dynamic stall on cross flow turbine blades, mainly in vertical axis wind turbines. While the existing technology can increase the energy production only by a few percentages, the proposed technology has the ability to double or even triple it.

ENE-1239

Dry Power: Harnessing energy from evaporation

Energy, normally in the form of electricity, is a basic requirement for the modern life-style. The invention provides a novel mechanism and device for producing mechanical power, in the form of pressure oscillations (sound waves). The energy source for driving these self-sustained oscillations is the pressure change of dry air, induced by evaporation within an acoustic resonator. The pressure oscillations may be coupled to an external load, to be concurrently converted into electricity by means of a linear motor or, alternatively, be used to drive a thermo-acoustic heat pump producing heating/cooling, as required.

MAE-0935

Miniature Cryogenic Compressor

See 'Mechanical Systems', page 53

TECHNION PATENT

DESCRIPTION

Energy

MAE-1029

Simplified fuel atomization

The multitude of fuels required for different vehicle types causes various logistical problems for large organizations. This limitation could be solved by enabling spark ignition (gasoline) engines to use heavy fuels like kerosene and diesel. Unfortunately, all current approaches have major disadvantages in terms of added weight, cost, or technical complexity. Our method enables the use of diesel and kerosene fuels in gasoline vehicles with much lower material and technical costs.

CHM-1272

Novel transparent conducting electrodes (TCOs)

See 'Chemistry and Materials Science', page 48

Environmental

ENV-0798

Method and device for burning of sewage sludge

The present technology represents an efficient method and device for incineration of sludge and other waste biomass, based on an emulsification process, without prior dewatering. In the novel process proposed herein, the liquid sludge (with a humidity of up to 95-99%) is transformed into a fine disperse emulsion, consisting of fossil fuel and liquid sewage sludge, as well as an emulsifying agent, which is subsequently burnt in a furnace. This process is expected to bring about a significant reduction of operation costs as compared to traditional sludge incineration.

TECHNION PATENT

DESCRIPTION

Environmental

ENV-1072

Remote pollution monitoring scheme

Stricter air pollution regulations demand improved methods of enforcement. Our technology makes on-road remote sensing of air pollution more cost-effective for authorities. It enables over 4 times the coverage, more reliable readouts and lower cost of operation.

ENV-1213

Pig manure treatment process

Animal manure is a worldwide environmental problem, which is constantly increasing due to the rising demand for meat. The current invention is a process integrating novel technologies widely familiar from the waste treatment field together with the process for elimination of ammonia. This invention allows the optimization of waste treatment and pigs waste treatment in particular while producing highly valuable products (energy and struvite).

ENV-1247

Methods, process and unit for separation, cleaning of flue gases and microalgae cultivation

The presented technology may contribute to emitted CO₂ capture and reduction in power plant flue gas. The technology proposes a way to separate CO₂ from other flue gases and release it into reactors containing phytoplankton- an autotrophic component of the plankton plant community, which obtains energy through the process of photosynthesis. As a result, CO₂ pollution will be reduced, oxygen will be released to the atmosphere and biomass will be produced for varied uses.

CHM-1202

Low-cost aerocellulose production; All-cellulose reinforced aerocellulose composite

See 'Chemistry and Materials Science', page 47

TECHNION PATENT	DESCRIPTION
Water	
ENV-1135	<p>Catalytic cloths for nitrate and nitrite removal from water</p> <p>The increasing shortage of fresh water has highlighted the importance of reclaiming polluted wells and protecting clean ones. Nitrates are one of the most problematic toxic groundwater pollutants and are found in dangerous concentrations in many freshwater wells due to the widespread use of fertilizers and the prevalence of nitrates in industrial waste. This novel method of nitrate removal converts the pollutant into nitrogen gas simply, efficiently and cost-effectively. Unlike other methods, these woven catalytic cloths work quickly, are easy to handle and don't create polluted tertiary waterways with highly-concentrated nitrates.</p>
WAT-0526	<p>Bacterial DNA fingerprint detection</p> <p>This is a fast and highly accurate system for identifying the presence of bacteria, based on the detection of its DNA sequence in the inspected medium. The technology is capable of identifying bacterial strains and can be easily adaptable to any bacteria. This new technology can be used to automatically detect the presence of bacteria in food and water, as well as in biological and medical samples.</p>
WAT-0616	<p>Chemical exposure measurement device (polymeric film sensor for polycyclic aromatic hydrocarbons)</p> <p>The device will monitor exposure to chemicals and pollutants. It consists of a polymer film that, over an extended period, absorbs chemicals in the surrounding air. The accumulated chemicals are measured using a fast optical inspection and screening procedure. The novelty is a polymer film that is capable of collecting polycyclic aromatic hydrocarbons (PAHs) in an ambient environment. The production cost of the proposed device is a few cents and the optical inspection is completed in a matter of seconds.</p>
WAT-0829	<p>Technique for catalytic oxidizing of dissolved matter in water by using adsorbent and nanocatalysts</p> <p>The present invention relates to an adsorption/catalytic regeneration process for the regeneration of absorbing material such as active carbon, as well as for the treatment of fluids containing undesired contaminants. In the method proposed, the spent adsorbent material is regenerated in an advanced oxidation process using a nanocatalyst. This technology also provides an efficient method for cleaning fluids containing organic and inorganic contaminants.</p>

TECHNION PATENT

DESCRIPTION

Water

WAT-0848

ROAKs for the capture and concentration of bacteria

This is a method for the filtration and concentration of bacterial contaminants. Most water, food, and clinical samples usually contain bacteria below detection limits. This innovative technology proposes a system that assembles the bacteria into a larger mass. The system exploits the affinity of microorganisms for peptidomimetic compound oligoacyllsines (OAKs), which were recently developed by the inventors as antimicrobial agents. OAKs are linked to an inert supporting material (resin), resulting in a resin-linked OAK (ROAK) that maintains high binding affinity for microbial cells.

WAT-0929

A technique for phosphate removal from water solutions and its recovery by using nano-adsorbent

The present invention relates to an environmentally compatible, efficient and cost effective method for selective phosphate removal from water. The novel method proposed herein is unique in its ability to treat large quantities of fluid with high phosphate concentrations, recover removed adsorbent for secondary usage and produce a concentrated pure phosphate solution or slurry of crystals for secondary exploit. The technique may be employed for purifying potable water, groundwater, industrial, agricultural and municipal wastewater; selective phosphate removal; and the production of a large quantity of phosphates for secondary usage.

WAT-0950

Encapsulation of pseudomonas ADP cells in electrospun core-shell fibers and their use in removing atrazine from water

Electrospinning provides a simple and versatile method for generating nanofibers. The method described here is one application of encapsulating complete microorganisms using electrospinning that does not destroy their desired properties. Atrazine is a toxic, commonly used herbicide that enters the water supply. A bacterium, Pseudomonas ADP, can mineralize atrazine, thus rendering it non-toxic. The method developed at the Technion creates a structure of bacterial cells encapsulated inside electrospun nanofibers with an insoluble shell and a water soluble core. Experiments show that this structure removes atrazine from water.

WAT-1078

Biological brine denitrification

Recently developed membrane processes for water treatment inherently produce brine with problematic disposal to the environment. There are no available solutions to the present problem of nitrogen compounds in brines. Technion researchers have developed a method that is suitable for large amounts of nitrogen using biological denitrification.

A photograph of laboratory glassware on a dark, textured surface. In the center is a small, round glass dish containing a yellow liquid. To its right is a larger glass beaker, also containing yellow liquid. In the upper left, a pair of metal tweezers is visible. The background is a dark, fine-grained material.

Healthcare

TECHNION PATENT

DESCRIPTION

Cell/Tissue Therapy

CTT-0739

Medical scaffold, methods of fabrication and uses thereof

The present invention is a method for manufacturing medical scaffolds and their uses in bone repair, and in dental and orthopedic surgeries. The scaffolds are composed of electrospun nanofibers that have a continuous or stepwise gradient of porosity, and an average pore size and weight per volume. The electrospun scaffold has a 3D structure of non-woven uniform, randomly oriented nanofibers with a diameter of 300-500 nm. The combination of the culture of osteogenic cells with an electrospun 3D scaffold provides an *in vitro* system that simulates the natural 3D environment capable of supporting bone repair. Note: available for commercialization for applications from the neck down.

CTT-0744

Natural acellularized cardiac extracellular matrix for tissue engineering

This invention is a cleaning procedure that results in a natural heart-derived cardiac ECM (extracellular matrix) scaffold for cardiac tissue engineering. A natural animal acellularized cardiac ECM as described by the invention is the most suitable scaffold for cardiac tissue engineering: due to the acellularization process it does not evoke an immune response, yet it retains its original properties. The produced scaffolds were shown (*in vitro*) to support cultures of muscles as well as embryonic stem cell-driven cardiac myocytes. This technology may be used for various purposes in the field of cardiac tissue engineering such as cell support, tissue replacement and tissue remodeling.

CTT-0838

Mesoscale bioactive 3D electrospun scaffold for bone repair

The present invention relates to a 3D cubic mesoscale electrospun fibrous scaffold, suitable for implantation in defective bone. The new technology offers nanoscale fibers (PCL) with embedded hydroxyapatite (HA) particles. The combination of electrospun fibers at the nanometric scale and larger mesoscale HA particles imitates the natural structure of bone matrix. This mesoscale scaffold, combined with ceramics and growth factors, constitutes the optimal scaffold to support proliferation and osteogenic differentiation as well as vascularization. It provides a promising surgical tool for bone tissue engineering for many clinical aspects of orthopedic, cranio-maxillofacial and dental applications.

TECHNION PATENT

DESCRIPTION

Cell/Tissue Therapy

CTT-0895	<p>3D vascularized pancreatic islets - for islets transplantation</p> <p>The present invention provides an advanced tissue-engineering technique for the development of 3D co-culture systems that reconstruct vascularization of pancreatic tissue <i>ex vivo</i>. In this novel engineered 3D pancreatic model, isolated pancreatic islets can be co-cultured with endothelial cells. The endothelial cells organize into 3D tubes throughout the engineered construct and form vascular network-like structures resembling <i>in vivo</i> vasculature. This presence of endothelial cells forming 3D vessel-like structures was found to be critical for islet survival. This model can provide an important tool for the therapeutic transplantation of islets, greatly increasing the success of the procedure.</p>
CTT-0905	<p>An innovative electrospinning technology for fabricating non-woven tissue engineered albumin-based constructs</p> <p>The present invention relates to a method for the fabrication of strong biological glue, useful in medical applications and in the field of tissue engineering. This novel material is unique in that in addition to supporting the growth of cells into tissues, it can also serve as laser-assisted photoactivated glue that can be used as a wound closure fastener or a very strong tissue adhesive. Among the many advantages of this material are its adhesive strength and the fact that it is conveniently photoactivated.</p>
CTT-1003	<p>Methods for promoting cell transfection <i>in vivo</i> (ultrasound)</p> <p>Presently, no vector has been approved by the FDA for <i>in vivo</i> gene delivery due to side effects and the death of patients in clinical trials of viral vectors. Technion researchers have developed a method for using non-viral vectors – therapeutic ultrasound waves for the delivery of genes with or without the help of additives. The uses of the invention are gene delivery for laboratory use as well as gene delivery for clinical applications to most tissues and organs. Currently a gene gun is used in some applications but only for superficial skin delivery with very low and transient transfection. The invention describes using therapeutic ultrasound waves, approved for drug delivery to the skin, for the delivery of naked DNA to most tissues and internal organs.</p>
CTT-1023	<p>Layered hydrospinning for the production of tissue engineering scaffold</p> <p>Scaffolds seeded with cells are needed for tissue engineering. The present invention utilizes electrospinning with a twist. Instead of spinning on a solid electrode, we spin on the surface of a liquid reservoir. The resulting nanofibrous membrane formed on the surface of the liquid is then assembled on a glass slide, and cells are seeded between each layer. Many such assemblies create a layered scaffold. The final scaffold is put in a vacuum environment, where it swells massively in size. This invention provides a novel scaffold with a few cubic centimeters in volume that is filled with cells and is capable of tasks such as filling a critical gap in bone healing.</p>

TECHNION PATENT

DESCRIPTION

Cell/Tissue Therapy

CTT-1164

Therapeutic use of modified Endothelial and Endothelial Progenitor Cells (EPCs)

This invention suggests transplanting the gene for the proteins nephrin and podocin, which forms a filtering layer called slit diaphragm, to the Endothelial Progenitor Cells (EPCs). We expect the engineered cells to become a part of the kidneys endothelial layer, forming a new barrier and preventing excessive exit of proteins through the urine. In addition, the special feature of the new layer may be used as a microcapsule.

COM-1001

3D texture synthesis and fitting

CAD designers and CGI artists spend countless hours working with intricate 3D patterns. Our technology enables the generation of seemingly-random 3D patterns from sample geometry. These patterns and scaffolds are designed to merge seamlessly with existing patterned geometry. Possible uses include rapid prototyping (RP) of patterned objects such as bone implants, automatic mending of damaged models and stronger RP models using efficient supporting geometry.

CTT-1036

Ultrasound-mediated drug delivery

See 'Drug Delivery,' page 22

STM-0652

Methods of preparing feeder cells-free, xeno-free human embryonic stem cells and stem cell cultures

See 'Stem Cells,' page 39

Diagnostic Kits

DIA-0845

Concomitant analysis of salivary tumor markers – A new diagnostic tool for oral cancer

The present invention relates to a method and diagnostic kit for diagnosing oral or oral-pharyngeal cancer using salivary testing. The novel method examines salivary tumor markers. A concurrent analysis of these markers showed sensitivity, specificity, and negative and positive predictive values in the range of 72-75%. Salivary testing is a non-invasive, effective and attractive alternative to serum testing.

TECHNION PATENT

DESCRIPTION

Diagnostic Kits

DIA-0887	<p>Method and kits for diagnosis of schizophrenia</p> <p>Methods and kits for the diagnosis of schizophrenia, employing mitochondrial complex I as a peripheral biological marker, have been developed. Minimizing the impact of the disease depends mainly on early diagnosis and appropriate pharmacological and psycho-social treatment. At the present, diagnosis is based on the self-reported experiences of the patient, in combination with secondary signs observed by a psychiatrist or clinical psychologist; hence misdiagnosis is not a rare event. The identification of this biological marker provides a more precise diagnosis and prognosis.</p>
DIA-1061	<p>Detection of ABCG2 activity using OH-bearing Imidazoacridinones</p> <p>Multidrug resistance efflux pumps are a major obstacle to cancer patients' recovery using chemotherapy. Despite the major advance in chemotherapy protocols and the novel potent anti-cancer drugs, chemotherapy of many cancer patients remains statistical and the patient is treated solely based on the pathological diagnosis of his cancer. Application of anticancer drug that is extruded by the MDR pump does not improve the patient's status, exposes him to the harsh chemotherapy side-effects and leads to a tumor which is highly refractory to chemotherapy. In this invention Technion leading researchers have developed a method for identification and quantification of MDR pumps within cancer cells within one hour.</p>
DIA-1092	<p>A system for assessing chemosensitivity of lymphoblastic leukemia patients to high dose MTX-containing combination chemotherapy</p> <p>An efficient treatment of leukemia patients depends on many factors. One of them is the patients' responsiveness to the anticancer drug MTX. Technion researchers have discovered that impaired splicing of the FolyPolyGlutamate Synthetase (FPGS) enzyme may result in resistance to MTX and consequently to treatment failure. Our technology enables to predict the patient's chemotherapy treatment responsiveness.</p>
DIA-1109	<p>Improved diagnosis and immunotherapy of diseases based on analysis of the repertoire of serum soluble MHC-peptide antigens</p> <p>The ssHLA- serum-soluble HLA molecules are found in high levels in the serum of humans afflicted with viral infections, autoimmune diseases, different types of cancers and in acute rejection after allotransplantation. This new discovery serves as an excellent prognostic tool for early detection of cancer as well as therapeutic targets and vaccine.</p>
DIA-1121	<p>Hand-held probe for <i>in vivo</i> tooth ESR dosimetry</p> <p>Nowadays when the risk of exposure to doses of ionizing radiation arises, there is an ongoing need for a simple, inexpensive and accurate detecting device for radiation exposure dosage. The new technique based on Electron Spin Resonance (ESR) measures the absorbed radiation in human tooth enamel. It is perhaps the only such method which can differentiate among dosage sufficiently for classifying individuals that has been exposed.</p>

TECHNION PATENT

DESCRIPTION

Diagnostic Kits

MED-1190

Brain surveillance window*See 'Medical device', page 34*

WAT-0526

Bacterial DNA fingerprint detection*See 'Water', page 16*

WAT-0848

ROAKs for the capture and concentration of bacteria*See 'Water', page 17*

Drug Delivery

CTT-1036

Ultrasound-mediated drug delivery

Presently, no vector has been approved by the FDA for *in vivo* gene delivery due to side effects and the death of patients in clinical trials of viral vectors. Technion researchers have developed a method for using non-viral vectors – therapeutic ultrasound waves for the delivery of genes with or without the help of additives. The uses of the invention are gene delivery for laboratory use as well as gene delivery for clinical applications to most tissues and organs. Currently a gene gun is used in some applications but only for superficial skin delivery with very low and transient transfection. The invention describes using therapeutic ultrasound waves, approved for drug delivery to the skin, for the delivery of naked DNA to most tissues and internal organs.

DDL-0831

Encapsulation of biologically active chemicals for oral delivery

The present invention relates to encapsulation of bioactive chemicals for controlled oral delivery. The invention is a capsule in which bioactive chemicals are entrapped in starch at the molecular level. As a result of this molecular inclusion, the encapsulated chemical is protected from thermal treatments and oxidation. In addition, the capsule does not release the chemical due to dissolution over a wide range of pHs. The encapsulated chemical is released by enzymatic digestion of the starch. In this innovative method of encapsulation, capsules are produced from starch and not from pure amylose, and are therefore much cheaper to produce. Moreover, this technology enables the formation of sub-micron size capsules and/or nanocapsules.

TECHNION PATENT

DESCRIPTION

Drug Delivery

DDL-0912

Solid system for oral delivery of proteins-insulin

The present invention relates to a system that enables oral delivery of insulin and other peptides and proteins that are today delivered by injection. The present invention is a system that allows for the passage of peptides and proteins through the digestive tract and into the blood. The system is designed to provide the timely release of the protein. In addition, a specific formulation provides maximal stability of the ingredients during storage at ambient temperatures, thereby providing further ease of use for the patient. Insulin is the primary candidate for use by this invention, and the prototype form successfully reduced blood glucose levels in animals.

DDL-0952

Encapsulation of enzymes in electrospun core-shell fibers

Electrospinning provides a simple and versatile method for generating nanofibers. The breakthrough by Technion researchers of creating core-shell micro/nano-fibers by electrospinning has paved the way for the encapsulation of enzymes and bacterial cells within such fibers. The technology allows for the creation of cell-like structures in which the biological material is trapped within nanofiber tubes, safeguarding them from the external environment. Alongside in-situ manufacturing of enzyme products, slow release of molecules, and in particular, proteins such as enzymes or antibodies can be produced and the rate of release controlled by varying pore size.

DDL-1022

Nanoencapsulation of chemotherapeutic and other drugs in beta-casein micelles

Ideally, all drugs could be taken orally at home, optimizing patient response to treatment, treatment costs and patient quality of life. However, the hydrophobic nature of some drugs, especially chemotherapeutic ones, has prevented us from reaching this ideal situation. In this invention beta-casein (and other casein molecules) micelles are used to encapsulate hydrophobic chemotherapeutic drugs, enabling their oral uptake. These preparations may, of course, be further coated with materials that make them gastro-intestinal tract site specific, as in targeted chemotherapy.

DDL-1026

Self-assembling capsids

This invention describes a general synthetic strategy for producing chemical capsids at size scales between fullerenes and spherical viruses. Mimicking the natural process by which the spherical envelope of virus particles is self assembled, the synthetic capsids are assembled from pentagonal organic molecules that have a built-in binding device on each of their five edges. Such structures can serve numerous functional roles, including chemical microencapsulation and delivery of drugs and biomolecules, epitope presentation to allow for a new platform for immunization, observation of encapsulated reactive intermediates, synthesis of nanoparticles of uniform size, and as structural elements for supramolecular constructs.

TECHNION PATENT	DESCRIPTION
Drug Delivery	
DDL-1074	<p>Compositions and methods for drug delivery</p> <p>The present invention is of a hydrogel containing an immobilized, naturally-occurring protein drug carrier which may be used for sustained or controlled drug delivery applications. This hydrogel matrix can also be made to be biodegradable. Following this concept, a photopolymerizable hybrid hydrogel was developed, made of poly-ethylene-glycol conjugated to PEGylated albumin for affinity based drug delivery and tissue engineering applications.</p>
DDL-1160	<p>OAK cochleates: Method and composition for a delivery platform</p> <p>Cochleate structures are essential in drug delivery field and may be used as adjuvants. The current invention suggests the formation of Cochleates from oligy acyl-lysine (OAK) compound. The modified OAK may have favorable properties with regard to cost of production, lack of toxicity, stability and size.</p>
DDL-1161	<p>Cell-derived liposomes for drug-delivery</p> <p>A major challenge facing cancer therapy is achieving specific cytotoxic effect towards cancer cells while sparing the healthy ones. This invention describes the development of an innovative targeted system for cancer therapy based on Mesenchymal Stem Cell (MSC) derived liposomes. The engineered liposome may contain variety of anti-cancer or cytotoxin compounds which will be released directly into the cancer cells.</p>
DDL-1279	<p>Cell-cell fusion method with application in specific delivery of anti-nematode agents using proteins from the FF family</p> <p>A new fusion method developed by Technion researchers depends on the expression of a certain glycoprotein of nematode origin in the membranes of both fusion partners. The new method for biological, protein mediated, cell to cell and virus to cell fusion can be used for targeting anthelmintics in a nematode specific manner. The homotypic character of the fusion may have many applications in the medical and research fields.</p>
DDL-1293	<p>Thermally-induced protein-polyphenol co-assemblies: Beta lactoglobulin based nanocomplexes as protective nanovehicles for EGCG</p> <p>EGCG is a water-soluble polyphenol (potent antioxidant) present in green tea with numerous attributed health benefits. However, this compound is highly susceptible to oxidation, limiting drinks enrichment with EGCG. The present invention demonstrates the use of thermally modified β-lactoglobulin, forming clear solution containing nano-complexes smaller than 50nm. The nano-complexes provide good protection against polyphenol deterioration and unwanted taste.</p>

TECHNION PATENT

DESCRIPTION

Drug Delivery

NUT-1051

Nano-complexes of beta-lactoglobulin and polysaccharides as vehicles for hydrophobic bioactive molecules

See 'Food and Nutrition', page 45

Drug Discovery: Agents reducing smoking-associated injury

DRS-0601

Methods, pharmaceutical compositions, oral compositions, filters and tobacco products for preventing or reducing tobacco smoke-associated injury in the aerodigestive tract of a subject

The present invention relates to methods for preventing or reducing pathogenesis of oxidant stress-associated diseases of the aerodigestive tract. The invention describes methods for employing hydroxocobalamin (vitamin B12a, OH-CO), deferoxamine (DES) and possibly reduced glutathione (GSH) to reduce or prevent tobacco smoke-induced cellular or macromolecular damage in the aerodigestive tract. The above chemicals may be applied in cigarettes tobacco filters as well as in other forms, such as toothpaste, powder, liquid dentifrice, mouthwash, denture cleanser, chewing gum, lozenge, paste, gel, aerosol spray or candies.

DRS-0911

Tobacco and tobacco packaging material for preventing or reducing tobacco-associated injury in the aerodigestive tract

Ho-Co was shown to reduce the level of HCN in cigarette smoke (CS) and to protect the oral cavity and airway peroxidases while DES neutralizes the redox active iron in CS and saliva. These two chemicals provide ample protection from CS and tobacco products associated with oxidative damage and inflammatory and carcinogenesis processes. Adding them to tobacco or tobacco products will decrease tobacco related health problems.

DRS-0933

Prevention or reduction of injury induced by tobacco related materials as smoke in the aerodigestive tract with the copper chelator D-penicillamine

Oral and oropharyngeal cancer, which is usually squamous cell carcinoma (OSCC), is the sixth most common cancer worldwide. It is primarily induced by exposure to tobacco. The present invention describes how, when chelating copper prior to exposure of cells to cigarette smoke (CS) in the presence of saliva, we were able to prevent the induced damage. By adding a copper chelator to lung cancer cells (H1299 cell line), which were exposed to CS in the presence of saliva, we prevented the cell death induced by the synergetic effect of CS and saliva.

TECHNION PATENT

DESCRIPTION

Drug Discovery: Agents reducing smoking-associated injury

DRS-0938

Prevention or reduction of biological injury induced by tobacco related materials as smoke and/or free radicals and/or other inducers of oxidative stress through the MPTP/TSPO pathway

MPTP and/or TSPO have been previously correlated with various pathologies. However, they have never been correlated with the biological injury induced by tobacco products such as cigarette smoke (CS), nor has it been suggested that MPTP/TSPO related drugs/ligands be used to avoid such pathologies. Initial results of both *in vivo* and *in vitro* experiments showed that CS induced a significant alteration in the specific binding capacity of TSPO, which may be related to the pathogenic pathways leading to various CS induced pathologies such as cancer, aerodigestive and lung diseases such as COPD, cardiovascular diseases, oral periodontitis and many others.

DRS-1087

Novel discovery presenting potent protector against the lethal effect of cigarette smoke

Cigarette smoke (CS) is the major risk factor for epithelial cancer in the aero-digestive tract and especially for lung and oral cancers. Technion researchers evaluated the protective effect of D-Penicillamine (PenA) against the lethal effect of cigarette smoke (CS) both in the absence of saliva and in its presence (a most pro-oxidative condition). This novel demonstration is of paramount importance and can be used to attenuate the risks associated with smoking.

Drug Discovery: Antiarrhythmic

DRS-0546

Tricyclic compounds and their uses as antiarrhythmic antifibrillatory and defibrillatory agents

The invention here centers on the production of novel compounds with antiarrhythmic, anti-fibrillating activity. Ventricular arrhythmia, such as ventricular tachycardia and ventricular fibrillation (VF), plays a major role in sudden cardiac death. The novel compounds under discussion were shown to be effective ventricular defibrillating drug candidates. They exhibit significant *in vivo* defibrillatory activity. These compounds also exhibit antifibrillatory activity by elevating the fibrillation threshold potential. All of these behaviors suggest that such drugs could be used to treat VF either by themselves or together with electrical defibrillators.

TECHNION PATENT

DESCRIPTION

Drug Discovery: Anti-inflammatory

DRS-0659

Anti inflammatory compositions and the uses thereof

This novel pharmaceutical platform is based on a recent discovery that inflammation involves generation of ozone by white blood cells, and that ozone itself is an inflammatory mediator that recruits additional white blood cells to the inflammation site. The approach described in the invention is based on chemical interception of ozone by the administration of proprietary ozone scavengers, and is strongly supported by preliminary *in vivo* experiments using animal models. This platform technology is expected to yield a new line of products for specific indications, all associated with inflammation and oxidative stress.

DRS-1192

Novel class of antibiotics based on naturally lethal peptide sequence

The increasing appearance of antibiotic resistant bacteria has raised the need for discovery of new antibiotics. We discovered naturally lethal peptide sequence which can cause inhibition of protein synthesis and arrest of the ribosome function, ending with cell death. This sequence can be used as a compound in novel antibiotics highly specific and very efficient.

Drug Discovery: Antibiotics

DRS-0673

Bifunctional antibiotics for targeting rRNA and resistance-causing enzymes

Neomycin B is an important antibiotic, commonly used as a food-additive for agricultural purposes. As a result of antibiotic formulations having been used for several decades, resistance to antibiotics has been evolving. The present invention is a Neomycin B that has been modified by the addition of one extra sugar ring. This modification has been shown to both enhance its antibacterial activity against pathogenic bacterial strains and to produce a significant decline in bacterial resistance. The compounds are also active against *Bacillus anthracis* (anthrax) and are able to inhibit the proteolytic activity of its lethal factor.

DRS-0816

Redesign of aminoglycosides for treatment of human genetic diseases caused by premature stop mutations

Cystic fibrosis, Duchenne muscular dystrophy and Hurler syndrome are some of the diseases caused by nonsense mutations: false stop signals in the DNA sequence that bring about the premature termination of the synthesis of specific proteins. Some aminoglycoside antibiotics have been found effective in overcoming this problem, but they cannot be used clinically due to high levels of toxicity. Technion researchers have successfully synthesized minimally toxic aminoglycosides, with an improved functional activity, which can be used for medicinal treatment.

TECHNION PATENT

DESCRIPTION

Drug Discovery: Antibiotics

DRS-0932

Novel antimicrobial agents

Over the past decades, advancement in the field of antimicrobial agents had reduced dramatically illness and death due to infectious diseases. However, almost all the prominent infection causing bacterial strains have developed resistance to antibiotics. The present invention relates to novel antimicrobial agents (polymers) designed for exertion of antimicrobial activity while being stable, non-toxic and avoiding development of resistant strains.

DRS-1006

OAKs: Novel library of antibiotics that mimic host defense peptides

In this invention a novel library of peptides that mimics host-defense peptides was created. The peptides form a new family of antibiotics with new mechanisms of action that render resistant bacteria susceptible again.

DRS-1049

Design, synthesis and evaluation of novel Fluoroquinolone-Aminoglycoside hybrid antibiotics

Bacterial resistance to antibiotics plays a major role in today's medical world. A series of new hybrid antibiotics containing fluoroquinolone and aminoglycoside antibiotics were designed, synthesized and their antibacterial activities were determined. This combination yielded a new superior antibiotic: very potent on the one hand and resistant to bacterial resistance enzymes on the other.

DRS-0607

Methods for the preparation of selectively-substituted corroles and new substituted corroles

See 'Drug Discovery: Neoplastic Disorders', page 30

Drug Discovery: Diabetes

DRS-1000

Overcoming insulin resistance state via alleviating GLUT4 repression caused by AHNAK

AHNAK is a giant phospho-protein that plays a role in glucose homeostasis by modulating GLUT4 gene repression by arachidonic acid. Its levels were shown to be increased in adipose and muscle tissues in insulin resistance states like obesity. According to the above, AHNAK is an excellent molecular therapy target for molecular therapy in insulin resistance states like obesity and type II diabetes.

TECHNION PATENT

DESCRIPTION

Drug Discovery: Diabetes

DRS-1275

T-cell Receptor-Like (TCRL) antibodies directed to beta-Islets antigens presented by MHC class II

Type 1 diabetes (T1D) occurs when the autoimmune reaction against the pancreatic beta-islet cells prevents production of the hormone insulin. Technion researchers have developed specific antibodies that can bind the MHC II-peptide complexes in a peptide-specific HLA-restricted manner. The antibody binding prevents the binding of T-cells and the following autoimmune reaction which may lead to the development of Type 1 diabetes.

Drug Discovery: Hypolipidemic agents

DRS-0934

Metalloporphyrins: A novel compound fighting Atherosclerosis and high blood Cholesterol levels

Cardiovascular disease and stroke resulting from atherosclerosis might be decreased by using new substances such as metalloporphyrins, which effectively reduce cholesterol levels and LDL oxidation, thereby slowing and possibly preventing the formation of atheromatous plaques.

Drug Discovery: Immunomodulators

DRS-0606

Methods and pharmaceutical compositions for immune deception, particularly useful in the treatment of cancer

In the field of Oncology, tumor cells have developed sophisticated strategies to escape immune effector mechanisms. One of the well known escape mechanisms is using the downregulation of MHC class I molecules, which are the antigens recognized by the immune system cells. This invention presents a new recombinant molecule that binds to cancer cells, making them detectable by immune system cells. This new discovery may open the way for the development of new immunotherapeutic strategies.

DRS-0655

An antibody fragment capable of modulating multidrug resistance

This invention relates to an antibody fragment for inhibiting drug efflux activity in MDR cancer cells. Cancer chemotherapy often fails due to the development of acquired or intrinsic resistance in cancerous cells to a wide variety of anticancer drugs, such as colchicine, vinblastine, vincristine and doxorubicin. This phenomenon, which is known as multidrug resistance (MDR), is a major barrier to cancer chemotherapy. A key mechanism of MDR is the overexpression of an energy-dependant efflux pump, known as the multidrug transporter. This efflux pump is a 170 kDa P-glycoprotein (Pgp), encoded by the MDR1 gene. Pgp-mediated MDR plays an important role in the resistance of various tumor cells to chemotherapy; studies have shown a clear correlation between *mdr1* expression and the lack of response to chemotherapy. The present invention demonstrates an antibody selectively reacts with Pgp-overexpressing cells and is therefore an effective inhibitor of drug-efflux activity in multi-drug resistant cells.

TECHNION PATENT

DESCRIPTION

Drug Discovery: Neoplastic disorders

DRS-0607

Methods for the preparation of selectively-substituted corroles and new substituted corroles

Technion researchers have developed a method for synthesizing selectively-substituted corroles and new substituted corroles. The invention demonstrates that highly selective functionalization of beta-pyrrole-unsubstituted corroles can be used for the easy preparation of novel amphiphilic derivatives and of complexes with metal-centered chirality. These novel compounds may be used for tumor detection and treatment, in photovoltaic devices, as catalysts and as intermediates.

DRS-0896

OAKs: Novel cancer-fighting mimics of host-defense peptides

In this invention a novel library of peptides that mimics host-defense peptides was created. The peptides in this library were found to have anti-cancerous activity.

DRS-0972

A systems approach for understanding and controlling the reactivity of immune cell populations against cancer

Tumor infiltrating lymphocytes (TILs) form immune populations with potential reactivity against melanoma. The degree of reactivity varies considerably among different TIL populations but the underlying network that governs the reactivity is poorly understood. The inventors were able to extract a simple set of subpopulation composition-based rules that explain reactivity to a large extent. Guided by the rules, they were able to restore anti-melanoma reactivity of nonreactive TILs by rational depletion and enrichment of selected subpopulations. This invention describes a generic approach for the prediction, understanding and control of a cell mixture function.

Drug Discovery: Neurodegenerative diseases

DRS-0855

Heterocyclic derivatives, pharmaceutical compositions and methods of use thereof

In this invention a new compound, a ligand to the peripheral-type benzodiazepine receptor (PBR), is introduced. The PBR-ligand attachment induces anti-apoptotic activity, which is of extreme value in neurodegenerative diseases and traumatic brain damage. Traumatic brain injury is the leading cause of disability in individuals below the age of 40.

TECHNION PATENT

DESCRIPTION

Drug Discovery: Neurodegenerative diseases

DRS-1019

Multifunctional catalytic antioxidants as cyto-protective and cyto-rescuing agents for chronic, systemic, and neurodegenerative diseases

Treatment of neurodegenerative disorders, such as Huntington's disease and amyotrophic lateral sclerosis (ALS), as well as disorders such as diabetes, has been frustrated by the shortcomings of the available symptomatic drugs. These drugs are incapable of slowing down the progression of the disease and neuronal degeneration. Ongoing research has clearly indicated that therapies aimed at blocking oxidative processes involving reactive oxygen species (ROS) and nitric oxide (NO) production may delay the progression of the disease. Metalloporphyrins designed in the invention have demonstrated remarkable antioxidant properties and have been proposed as an ingested medicine for the above stated conditions in addition to the previous work on atherosclerosis.

Drug Discovery: Phosphate regulators

DRS-0710

Compositions and methods for treating disorders associated with abnormal phosphate metabolism

The present invention relates to methods for treating disorders associated with abnormal phosphate metabolism. Hyperphosphatemia has been associated with elevated mortality and morbidity among patients with chronic renal failure. The invention suggests assessing inducers of GalNAc-T3 as a new strategy for the treatment of hyperphosphatemia-related disorders such as renal failure, as well as assessing inhibitors of GalNAc-T3 for the treatment of disorders associated with hypophosphatemia, such as hypophosphatemic rickets.

Drug Discovery: Psychiatric drugs

DRS-0961

An objective method for assessment and development of new psychiatric drugs

The development of new drugs for schizophrenia and other psychiatric illnesses is limited both by a lack of knowledge of the biological causes and pathological processes of the illnesses, as well as by a lack of knowledge of the mechanisms of action of antipsychotic and other psychotropic drugs. Likewise, there are currently no objective biological markers for gauging the response to treatment. In this invention, new biological screening methods for the detection of novel drugs and biological markers of treatment response were identified and their pattern of change during treatment detailed, thus establishing a novel criterion set. Two important applications stem from this: on the clinical side, the physician now has the ability to objectively measure treatment effectiveness and response using a simple blood sample. On the research and development side, the researcher now has an innovative tool by which s/he can detect and compare candidate drugs and use objective measures to predict their clinical effectiveness. The psychiatric conditions for which this invention relates include schizophrenia, depression, obsessive-compulsive disorder (OCD), and dementia.

TECHNION PATENT

DESCRIPTION

Drug Discovery: Renal disorders

DRS-0764

Methods for treatment of Renal Failure

Rasagiline is an approved anti-Parkinson drug in Europe and Israel. The present invention describes *in vivo* experiments demonstrating the improvement in function of hypoperfused as well as normal kidneys pretreated with Rasagiline and its derivatives. Rasagiline derivatives produce significant diuretic and natriuretic responses in association with increased GFR in rats with CHF as well as induce diuretic and natriuretic responses accompanied by improved GFR in the ischemic kidney. It is proposed that this derivative can be used for the treatment of acute and chronic kidney failure.

DRS-1273

Nephroprotective effects of phosphodiesterase-V inhibitors during laparoscopic surgery

Laparoscopic surgery is a minimally invasive technique of performing surgeries in the abdomen, including living kidney donations. This type of surgery requires an induced pneumoperitoneum (insufflation of the abdominal cavity), which causes a transient, and possibly long term, decrease in renal function and renal blood flow. The invention proposes the use of phosphodiesterase inhibitors, which are commonly used as treatment for impotence and for reducing blood pressure, as a preventive medicine taken before laparoscopic surgeries. Lab trials on rats have shown that these phosphodiesterase inhibitors are effective in preventing the adverse effects of pneumoperitoneum.

Medical Devices

MED-0706

Electronic receptor and its application to controlling biological processes

The present invention aims at gaining electrical control over biological processes, namely, triggering or suppressing a selected biological pathway by an electronic signal presented to the system. The strategy relies on the selection of antibodies that recognize and bind a specific set of nano-scale electrodes biased to a certain voltage configuration. The implications of such an interface are far reaching. One may envision sensors that probe several biological parameters, converting them into electronic signals.

MED-0781

TipCAT: Semi-disposable self-propelled colonoscopes

The TipCAT is a unique semi-disposable endoscope with a self-propulsion mechanism. The TipCAT has been examined *in vivo* with excellent results.

MED-0806

Chest tube and automatic insertion system

The present invention is a novel chest tube and automatic insertion system (AIS). The device is designed to resolve the major problems associated with chest tube insertion and use (drainage failure, internal organ injury and lengthy insertion time). The device is a simple, non-electrical system that enables safe and quick insertion of the chest tube.

TECHNION PATENT

DESCRIPTION

Medical Devices

MED-0835

Fast retinal imaging by parallel projections

The present invention relates to a device and method for fast retinal imaging and extraction of medical parameters from these retinal images. The innovative technology provides an imaging system that takes a single shot of the retina at various depths, obtaining retinal depth information immediately and providing fast information and continuity of data. The expected price of the system should be less than optical coherence tomography systems, and only slightly more than fundus cameras.

MED-0867

Vectorial vortex mode transformation for a hollow waveguide using subwavelength structures

Transformation and inverse transformation between a free space, linearly polarized beam and the vectorial vortex mode of a circular hollow waveguide by use of Pancharatnam-Berry Phase Optical Elements (PBOEs) is proposed. The mode transformations and the excitation of a single vectorial mode inside the hollow waveguide were verified by full polarization measurements. In addition, the inverse mode transformation of the single vectorial mode excitation in the waveguide enabled us to experimentally obtain a linearly polarized bright spot with a high central lobe.

MED-0939

Cylindrical probe for ex-situ nuclear magnetic resonance spectroscopy

This invention is a new type of ex situ nuclear magnetic resonance (NMR) probe with spectroscopic capability. NMR, and its descendant, magnetic resonance imaging (MRI) are among the most powerful and versatile analytic and diagnostic methods in science. Current devices suffer from the need to employ large magnets that surround the examined sample/object. The large magnet and the correspondingly large RF coils are a major factor in the complexity and the high cost of NMR and MRI systems. In addition, in many cases the sample cannot be placed inside the bore of the magnet or cannot be moved. The present invention describes a new type of ex situ NMR probe, which through innovative design, achieves mobile NMR/MRI capability. The achievable spectral resolution is on the order of ~0.5-1 ppm.

MED-0967

ViRob – An autonomous crawling micro-robot

Micro-robots can be categorized into two main groups: those that are designed for swimming and those that crawl by gripping inner pipe walls. The first group is applicable in situations where almost no flow exists, while crawling micro-robots withstand even massive flows. The robot developed at the Technion has the ability both to crawl within cavities that have changing diameters and to control its activity for an unlimited period of time. The ViRob can be used for multiple applications including leak detection in medium and small diameter pipelines and also for various medical applications where the autonomous micro-robot crawls inside the lumens of a human body.

TECHNION PATENT

DESCRIPTION

Medical Devices

MED-0991

***In vivo* flow-cytometry**

In this invention, a method for imaging the cross section of a vessel for detecting the flow of cells using spectrally encoded imaging was developed. This method provides visual information on the scattering particles, including their size, shape, brightness, as well as their location within the vessel. Such information could significantly increase the accuracy of flow cytometry and provide additional capabilities, such as cell sorting and the modification and destruction of specific cells. Potential applications include *in vivo* and *ex vivo* flow cytometry for industrial and clinical applications. For *in vivo* applications, the compact dimensions and simplicity of the probe, which is approximately 20 x 5 x 5 mm in size with no moving parts, could enable endoscopic flow cytometry in various locations in the body.

MED-1138

System and method for near surface surgery simulation

This novel invention describes a system and method for simulation of near surface surgeries, allowing full visual, audio and haptic imaging. This invention uses a unique prism based mass-spring physical simulation to illustrate necessary operations for near surface (skin) surgeries such as real-time incisions and undermining with force feedback. This tool will allow surgeons to practice surgical procedures near surface without using animals or cadavers.

MED-1152

Techniques for spectrally encoded endoscopy

We propose a few innovative techniques for spectrally encoded endoscopy. One technique is a method for multiple-channel spectrally encoded endoscopy (MC-SEE), in which the illumination and the collection of optical paths are separated in space. This invention enables a larger depth of field imaging, speckle noise reducing and signals detection of different excitation and emission wavelengths. The other technique, using dispersion, may be effective in optimizing imaging quality and field of view.

MED-1190

Brain surveillance window

Due to the structure of the skull, up to date there is no simple and low cost way of brain tissue imaging. Our technology suggests implanting Brain Surveillance Window (BSW) in the skull following a brain surgery for further monitoring with Ultra Sound (US) probe. The innovative method can potentially reduce the need of high cost screening methods such as MRI and CT.

TECHNION PATENT

DESCRIPTION

Medical Devices

MED-1193

Microdevice for measuring water content *in vivo* and *in vitro*

Water content in tissue, is strongly associated with ageing and degeneration. Early detection of variations in water content in tissue may be of immense diagnostic benefit and is of crucial importance in preventing future pathological processes. Furthermore, knowledge of water content is also important in applications of tissue engineering. Unfortunately, up to date, simple and direct techniques to evaluate water content in tissue are not available yet. Our technology proposes a solution to the problem. The technology is minimally invasive, provides real time results and reduces extra manufacturing costs.

MED-1227

Multifocal ultrasound and its effect on biological tissues, in particular via ultrasound effect on biological membranes

Ultrasound has been extensively used for imaging for 60 years, and is now being studied towards clinical therapeutic application. Understanding the basic mechanism of its function is critical. Technion Researchers propose a hypothesis whereby ultrasound induces bubble formation in the intra-membrane space in cells, between the two lipid leaflets. Those bubbles accumulate, creating pockets of gas. As the pockets grow, surrounding structures are being pushed. A possible therapeutic application of this discovery is in the field of neurophysiology, where the use of multifocal ultrasound on neural tissues is likely to become essential to future treatment for people who have a major deficiency in their sensory systems, such as blindness or deafness.

MED-0949

Detection and diagnosis of chronic renal failure and kidney related diseases by Electronic Nose

End-Stage renal disease (ESRD) is a debilitating medical condition of chronic kidney failure, which requires intensive and costly treatment through dialysis or transplantation. Early screening and intervention may reduce neuropathy progression and may bring to remission increasing. Our suggested technology may be able to differentiate between "healthy" and "renal failure" breath, which may contribute to the early detection of the disease.

MED-0971

Non-contact holographic stimulation technology for next-generation vision restoration devices

A unique technology for direct optical stimulation of neurons has been developed in the Technion. This Technology could have diverse applications in the field of advanced neurological devices and particularly the development of next-generation vision restoration devices. The new, non-contact method is based on rapid holographic stimulation and enables energy- efficient patterned activation of many neurons with high resolution (single cells) and high light efficiency.

TECHNION PATENT	DESCRIPTION
Medical Device	
CHM-0794	<p>Ceramic coating on dental implant abutments <i>See 'Chemistry and Materials Science', page 46</i></p>
CHM-1097	<p>Microstructure control of ceramic matrix nanocomposites <i>See 'Nanotechnology', page 55</i></p>
COM-1158	<p>Cancer diagnostic probe <i>See 'Optics and Lasers', page 61</i></p>
DIA-1121	<p>Hand-held probe for <i>in vivo</i> tooth ESR dosimetry <i>See 'Diagnostic Kits', page 21</i></p>
Research Equipment	
RES-0698	<p>Hardware architecture for spike recording, detection, sorting and alignment algorithms in neuroprocessors The present invention relates to microelectronic chips for electronic interfacing with neurons or other living cells, in portable applications, both <i>in vivo</i> and <i>in vitro</i>. The neuroprocessor electronic chips described herein can be placed next to the recording electrodes and perform front-end analog processing as well as spike D&A and spike sorting, achieving significant data reduction. Processing of the neuronal signals very close to the recording electrodes enables wireless communication, allowing free movement of the test subject. The <i>in vitro</i> type chip, which senses the electrical activity of the cells that are cultured on it, enables millions of contact points. The developed chips can also electrically stimulate the cells by sending them current pulses.</p>
RES-0837	<p>Floating electrode dielectrophoresis (feDEP) The present invention relates to the use of electrically floating electrodes (fe) for the dielectrophoretic (DEP) manipulation of bioparticles. feDEP is an enabling technology that offers a significant leap towards cheap, disposable, and therefore, commercially available DEP devices. The use of floating electrodes will considerably facilitate device fabrication and operation, as well as reduce device dimensions and offer interconnect-free devices. Also, since floating electrodes do not require an external connection, their geometries are much more flexible. This opens a doorway for using feDEP in cellular patterning and tissue engineering.</p>

TECHNION PATENT

DESCRIPTION

Research Equipment

RES-0870	<p>Electrical control over antibody-antigen binding</p> <p>Technion inventors have discovered a method to electrically control the binding of an antibody to its antigen. The formation of such bond is highly influenced by surrounding voltage, because the electrical charges of the amino acid's residues in the antibody protein are affected by it. The method facilitates exquisite control over one of the main interactions responsible for biomolecular recognition, which is a prominent function of the immune system.</p>
DDL-1074	<p>Compositions and methods for drug delivery</p> <p><i>See 'Drug Delivery', page 24</i></p>
MAE-1038	<p>Acoustic particle focusing</p> <p><i>See 'Measurement Methods and Systems', page 51</i></p>
MED-1152	<p>Techniques for spectrally encoded endoscopy</p> <p><i>See 'Medical device', page 34</i></p>
STM-0652	<p>Methods of preparing feeder cells-free, xeno-free human embryonic stem cells and stem cell cultures</p> <p><i>See 'Stem Cells', page 39</i></p>

Stem Cells

STM-0611	<p>Methods of generating human cardiac cells and tissues and uses thereof</p> <p>This new technology consists of a method for generating cells having characteristics associated with a cardiac phenotype. The phenotypic properties of cardiomyocytes derived from human ES (embryonic stem) cells are characterized by cardiac-specific antibodies, confirmed by electron microscopy and RT-PCR of several cardiac-specific genes and transcription factors. Positive and negative chronotropic effects were induced by application of isoproterenol and carbamylcholine, respectively. The generated human ES cell-derived cardiomyocytes displayed structural and functional properties of early-stage cardiomyocytes. Establishment of this unique differentiation system may have significant impact on the study of early human cardiac differentiation, functional genomics, pharmacological testing, cell therapy, and tissue engineering.</p>
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TECHNION PATENT	DESCRIPTION
Stem Cells	
STM-0613	<p>Differentiated human embryoid cells and a method for producing them</p> <p>The present invention is a process for obtaining human derived embryoid bodies (hEB). It is based on the finding that human embryoid bodies may be obtained <i>in vitro</i> from human embryonic stem cells suspended in a liquid medium. These hEBs contain mesoderm, ectoderm and endoderm cell lineages and may be used as a source of cells of the different lineages. The hEBs can then be used as a source of cells for use in transplantation or inoculation into a human recipient, in order to treat various diseases or disorders, to assist in tissue repair, and to substitute for degenerated tissue.</p>
STM-0629	<p>Endothelial cells derived from human embryonic stem cells</p> <p>This innovative technology enables the production of a population of embryonic endothelial cells <i>in vitro</i> from human embryonic stem (ES) cells. The process mimics the differentiation steps of human ES cells into endothelial cells, forming vascular-like structures. Human embryonic-derived endothelial cell behavior was characterized <i>in vitro</i> and <i>in vivo</i>. <i>In vivo</i>, when transplanted into SCID mice, the cells appear to form microvessels containing mouse blood cells. These cells could be beneficial for applications such as engineering new blood vessels, endothelial cell transplantation into the heart for myocardial regeneration, and induction of angiogenesis for treatment of regional ischemia.</p>
STM-0630	<p>Novel methods for the <i>in vitro</i> identification, isolation and differentiation of vasculogenic progenitor cells</p> <p>The present invention is of a simplified and inexpensive method for the <i>in vitro</i> identification, isolation and culture of human vasculogenic progenitor cells. The technology allows for the isolation and enrichment of a common precursor for endothelia, smooth muscle and hematopoietic cells derived from human embryonic stem cells. This precursor has been found to express early endothelial and hematopoietic markers and under specific conditions, it persists in endothelial differentiation, forms vessel-like structures with blood cells, and differentiates into smooth muscle cells (SMC). The method and the progenitor cells described may be used for <i>in vitro</i> vascular engineering, among other things.</p>
STM-0646	<p>Method of dynamically culturing embryonic stem cells</p> <p>The present invention is a method for dynamically generating human embryoid bodies that can be used for generating lineage-specific cells and cell lines. All potential applications depend on the availability of a controlled scaleable bioprocess of the differentiated cells. The present invention describes the formation of human embryoid bodies (hEBs) in dynamic systems, and discloses simple, culture-specific conditions that allow the formation of hEBs. The initial event participants in the developing hEBs did not change when moved from their conventional culture to dynamic systems, indicating the possibility of simple scaleable cell production in a well-defined dynamic environment for clinical and industrial applications.</p>

TECHNION PATENT

DESCRIPTION

Stem Cells

STM-0652

Methods of preparing feeder cells-free, xeno-free human embryonic stem cells and stem cell cultures

Human Embryonic Stem (hES) cells have already made a great contribution in research on early human development, and they are very likely to be used in the future for cell-based therapies. Traditionally, these cells have been cultured on mouse embryonic fibroblast (MEF) feeder layers, which allow their continuous growth in an undifferentiated state. However, the use of hES cells in human therapy requires an animal-free culture system where the exposure to mouse retroviruses is prevented. The present invention provides a novel feeder layer-free culture system for hES cells, based on medium supplemented with 20% serum replacement, combination of growth factors and fibronectin matrix.

STM-0695

Engineering three-dimensional tissue structures using differentiating embryonic stem cells

Human embryonic stem (hES) cells hold promise as an unlimited source of cells for transplantation therapies. The present invention is a method for the control of hES cell proliferation and differentiation into complex, viable 3D tissue constructs. The invention describes the use of biodegradable polymer scaffolds for promoting hES cell growth and differentiation, and for the formation of 3D structures. This approach provides a unique culture system for addressing questions in cell and developmental biology, and provides a potential mechanism for creating viable human tissue structures for therapeutic applications.

STM-0721

Growth and differentiation of human embryonic stem cells within three dimensional scaffolds

The present invention relates to methods for generating embryoid bodies (EB) using three-dimensional scaffolds. The invention describes, for the first time, the generation of EBs on porous scaffolds and demonstrates that hEBs can be generated directly from hES suspensions within 3D porous alginate scaffolds. The scaffold-borne EBs were of a high quality, essentially devoid of necrotic centers, and exhibited a high proliferation rate and differentiation to all three germ layers, while displaying minimal agglomeration. These new methods can be used for isolating multipotent lineage-specific cells and for the large-scale production of lineage-specific differentiated cells.

STM-0722

Stem cell lines derived from delayed blastocyst culture and their uses

The present invention relates to a method for generating stem cell lines from extended blastocyst cultures (embryos beyond the blastocyst stage). The new technology demonstrates for the first time that multipotent or pluripotent cell lines can be derived from embryos at a later stage than the blastocyst stage. The newly developed method is an opportunity to gain insights into the features of the cells in the post-implantation human embryo – between implantation and gastrulation – using *in vitro* models.

TECHNION PATENT

DESCRIPTION

Stem Cells

STM-0777

L6-IL6 receptor chimera supports the feeder layer-free culture of hESCs

Human embryonic stem cells (hESCs) have contributed significantly to the research on early human development and may have future application in cell-based therapies. These cells have been cultured on mouse embryonic fibroblast (MEF), causing increased risk for exposure to mouse retrovirus. The present invention provides a new feeder layer-free culture system for undifferentiated hESCs for any industrial or clinical uses.

STM-0789

Multicellular systems of pluripotent human embryonic stem cells and cancer cells and uses thereof

The invention is a novel experimental platform for cancer research that uses human stem cell technology. The process grows human tumor cells in a pre-clinical experimental setting in a tissue micro-environment consisting of differentiated human cells. The multicellular composition is placed in an animal model. The model takes advantage of the potential of human stem cells to differentiate in the experimental setting into any and all of the body's different cell types, and thus mimics a normal human tissue micro-environment.

STM-0800

Isolation, purification and characterization of human embryonic stem cell and human fetal stem cell derived progenitors and their differentiation into osteoblasts, chondrocytes and tendocytes

The present invention describes a method for the efficient derivation of connective tissue progenitors (CTPs) from hES cells. These cells have multi-lineage developmental potential, yet are committed to connective tissue derivatives. Moreover, the potential of these cells to generate tendon-like structures is also shown. By applying the long-term high-density culture technique to these cells, the researchers successfully assembled cylinder-shaped constructs that contained typical ultrastructure characteristics and biomechanical properties of early tendons.

STM-0801

Development of a dynamic process for the formation, propagation and differentiation of human embryoid bodies

This technology focuses on a platform for production of human embryoid bodies (EB) from human embryonic stem cells. The production takes place in a controlled stirred tank reactor (STR) in a robust scalable process with high efficiency.

TECHNION PATENT

DESCRIPTION

Stem Cells

STM-0890

Adult stem cell-derived connective tissue progenitors for tissue engineering

The present invention provides methods for generating and utilization of connective tissue progenitor cells from adult stem cells, successfully overcoming shortcomings of presently known configurations. Adult stem cells differentiate into connective tissue progenitor cells capable of being maintained in a proliferative, non-terminally differentiated state for at least 20 passages in culture, and capable of differentiating into cells of chondrogenic lineage, osteogenic lineage, adipocytic lineage, tendon lineage and ligament lineage. The connective tissue progenitor cells are capable of forming extracellular matrix, mineralized matrix, bone tissue, cartilage tissue, tendon tissue and ligament tissue.

STM-0919

Ectodermal precursor cell line derived from human embryonic stem cells

The present invention provides an isolated stable ectodermal IT1 cell line from human ESC, capable of differentiating into epidermal and corneal cells that could reconstitute *in vitro* pluristratified epidermis and cornea. Applications of this invention include use for pre-clinical trials concerning skin and cornea pathologies, production of transplantable epidermis, repair of wounded corneas and design of cellular models for cosme-toxicology.

STM-0923

Identification and selection of cardiomyocytes during human embryonic stem cell differentiation

Human embryonic stem (hES) cells are pluripotent cell lines that can differentiate *in vitro* into cell derivatives of all three germ layers, including cardiomyocytes. The present invention is the generation of transgenic hES cell lines and single-cell clones that express a reporter gene (eGFP) under the transcriptional control of a cardiac-specific promoter. The generation of these transgenic hES cell lines may be used to identify and study early-cardiac precursors for developmental studies, to robustly quantify the extent of cardiomyocyte differentiation, to label the cells for *in vivo* grafting, and to allow for the derivation of purified cell populations of cardiomyocytes for future myocardial cell therapy and tissue engineering strategies.

STM-0956

Embryonic and adult stem cells encapsulation for cell based therapy and cancer

Stem cells are potentially the ultimate source of transplantable cells for many different tissues. A major obstacle in the clinical use of stem cells is their possible immunogenicity. Our technology's innovative approach is to entrap the cells in capsules made of biocompatible polymers. This approach was specifically designed to take advantage of the immortality of these cells, while avoiding any possible immune response or the formation of teratomas. These capsules protect the cells from the immune system and act as a mini bioreactor, allowing them to secrete the engineered factor or natural therapeutic near sites of interest.

TECHNION PATENT	DESCRIPTION
Stem Cells	
STM-0988	<p>Tissue engineering of vascularized cardiac muscle from human embryonic stem cells</p> <p>Tissue engineering is the use of a combination of cells, engineering and materials methods, and suitable biochemical and physio-chemical factors to improve or replace biological functions. This technology introduces a novel approach for generating vascularized human cardiac tissue <i>in vitro</i>. The engineered human cardiac tissue exhibited typical structural and functional properties of early-cardiac tissue. In addition, this innovative technology may provide unique applications for tissue replacement therapy and stem cell research.</p>
STM-1132	<p>Suspension culture for undifferentiated human iPS cells</p> <p>Induced pluripotent cells (iPS) are cells derived from somatic cells that had shown the ability to differentiate into each cell type of the adult body. However, any future use of these cells in clinic or industry requires efficient defined control system. Technion researchers have discovered a unique suspension culture system for iPS cells consisting of serum replacements and growth factors, allowing their continuous growth in the undifferentiated state.</p>
STM-1136	<p>Co-derivation and expansion of vasculogenic pericytes and endothelial cells from human ESCs and iPS</p> <p>Technion researchers have discovered a method for efficient, simple and inexpensive co-derivation of the two blood vessel cellular components: pericytes and endothelial cells, from a single pluripotent cell source. The robust expansion of mature vasculogenic cells, derived from pluripotent cells has the potential to achieve sufficient cell numbers for clinical transplantation.</p>
STM-1148	<p>Pancreatic progenitor enrichment of hES cell culture by GLUT2 sorting</p> <p>Type I diabetes mellitus is caused by an autoimmune destruction of the insulin-producing β cells. The major obstacle in using transplantation for curing the disease is the limited source of insulin-producing cells. The earliest human pancreatic progenitors are marked by the transcription factor pancreatic duodenal homeobox (PDX1). In normal β cells, PDX-1 transactivates the insulin gene and other genes involved in glucose sensing and metabolism, such as GLUT2 and glucokinase. Several protocols have been tested, in order to increase the PDX1 expressing population in differentiating human embryonic stem cells (hES) or human inducible pluripotent stem cells (iPS), in an attempt to obtain pancreatic progenitors cells which may further develop into insulin producing cells.</p>

TECHNION PATENT

DESCRIPTION

Stem Cells

STM-1209

Novel method to generate Induced Pluripotent Stem (iPS) cells from keratinocytes from human plucked hair follicle

Induced Pluripotent Stem (iPS) cells are human somatic cells that have been reprogrammed to a pluripotent state, resembling human embryonic stem cells. The iPS cells are mostly produced from fibroblasts derived from the skin, a painful procedure that may be problematic in certain patients. Technion researchers have discovered a non-painful method for production of iPS cells from the keratinocytes of the outer root of human hair.

STM-1234

Suspension culture for undifferentiated human iPS cells

Induced pluripotent cells are pluripotent cells derived from somatic cells. Similar to human embryonic stem cells, they differentiate into each cell type of the adult body. This invention presents a new method of culturing induced pluripotent cells, which may be suitable for clinical and industrial needs. The field of induced pluripotent cells has the potential to dramatically change the treatment of human disease, but the traditional method of culturing those cells is not compatible with any practical future use of them. Thanks to this new technology, it has become possible to culture induced pluripotent cells in a 3D structure without waiving any of the typical features of those unique cells. This is a huge step in the passage to mass production of induced pluripotent cells for therapeutic ends.

STM-1270

Generation of induced Pluripotent Stem Cells (iPSCs) and cardiomyocytes from Catecholaminergic Polymorphic Ventricular Tachycardia (CPVT) and Long QT (LQT) patients

CPVT (Catecholaminergic polymorphic ventricular tachycardia) and LQTS (long QT syndrome) are inborn heart diseases causing arrhythmia, which may lead to sudden cardiac death. The presented technology offers to create induced pluripotent stem cells and cardiac cells from reprogrammed fibroblasts taken from patients. The produced cells will be an important device in research of the pathological mechanism of inborn arrhythmia. Additionally, the cells will be used as an instrument for determining the best treatment for each patient and in developing new antiarrhythmic drugs.

STM-1283

Production of corneal tissue equivalents from human pluripotent stem cells

In severe cases of corneal diseases such as total limbal stem cell deficiency, allo-grafts are obtained from patient's relatives or from post mortem donors. This approach is commonly used for years. However, shortage of donors and graft rejection are major drawbacks of this approach. Our novel invention is based on the production of corneal cells from human Embryonic Stem cells (hES), allowing the production of unlimited amount of corneal epithelia ready to be transplanted into injured eye of patient.

TECHNION PATENT

DESCRIPTION

Stem Cells

STM-1290

Novel method to derive Extracellular matrix (ECM) from human embryonic stem cells (hESCs) and human pluripotent stem cells (iPSCs) for regenerative medicine applications

The extracellular matrix (ECM) composition affects the cell attachment, migration, proliferation and 3D arrangement. This new invention uses differentiated human Embryonic Stem cells (hES) or human induced Pluripotent Stem cells (iPS) to generate ECM for surgical applications. This new invention may be used as a biological a-cellular scaffold with the advantages of homogeneity, availability, bioactivity, biocompatibility and safety for surgical application.

DDL-1161

Cell-derived liposomes for drug-delivery

See 'Drug Delivery', page 24

Food and Nutrition

NUT-0833

Casein micelles for encapsulation of hydrophobic compounds

A novel approach is proposed to harness casein-micelles (CM), which are natural nanocapsules of essential nutrients for the neonate, by incorporating nutraceuticals in their core. The potential benefits include supplementation of nutraceutical substances (NS) via a staple food, such as milk, with minimal effect on its functional and sensory properties, enrichment of non-fat milk products with fat-soluble micronutrients (e.g. vitamins D, A, K, E, lycopene, omega-3 fatty acids etc.), and protection against their degradation during processing and shelf life.

NUT-1015

Nano-Encapsulation of additives in Beta Casein assemblies for enrichment of foods, beverages and soft drinks Including clear drinks

The invention is the ability to encapsulate beneficial food additives within beta-casein assemblies either below or above the protein pI, and thus utilize them as vehicles for challenging delivery tasks, such as via transparent beverages and other foods and drinks, particularly clear, nonfat acidic beverages. The beta-casein micelles may be loaded with hydrophobic or other nutraceuticals for enrichment of nonfat, low fat and other foods and beverages including clear ones, without compromising transparency, or other sensorial properties, while providing stability and protection to the encapsulated nutraceuticals.

TECHNION PATENT

DESCRIPTION

Food and Nutrition

NUT-1051

Nano-complexes of beta-lactoglobulin and polysaccharides as vehicles for hydrophobic bioactive molecules

Although foods and drinks are enriched today on a wide basis, enriching with hydrophobic content remains a problem. When enriching clear drinks the problem further complicates since except that the method should protect and solubilize the enriching hydrophobic ingredients, the drink must also maintain its quality of transparency. In this invention compositions and methods for the formation of nanoparticles useful for carrying biologically active molecules were developed. Moreover, this invention provides a solution to clear drinks enrichment with hydrophobic biologically active molecules.

NUT-1076

Addition of Prolactin to infant formulas

Breast-feeding supports the provision of Prolactin, which plays an important role in regulating calcium absorption in mammals during neonatal, and may have other physiological functions as it can be absorbed in the intestine of neonates. The present invention suggests the addition of human Prolactin to infant's formula in a concentration similar to that present in human milk in order to make it more similar to human milk and enjoy the major benefits of Prolactin.



Engineering & Physical Sciences

TECHNION PATENT

DESCRIPTION

Chemistry and Materials Science

CHM-0599

Efficient synthesis of a polyacene monomer

An efficient method has been developed for synthesizing a monomer that, when polymerized, is anticipated to exhibit directional (i.e. anisotropic) conductivity, substantial (possibly immense) mechanical strength, and possibly even room temperature superconductivity. These polymers are named polyacenes. Possible applications include VLSI interconnects, long distance transmission lines, MRI/NMR, RF, and microwave filters, among others.

CHM-0794

Ceramic coating on dental implant abutments

Dental abutments serve as the base on which the dental crown is fitted. They are connected to the dental implant, which is integrated into the bone, via a screw, creating the implant-abutment-crown complex. Abutments are generally made of titanium or titanium alloy Ti-6Al-4V. In order to decrease healing time, which takes several months, and also for aesthetic reasons, a ceramic coating made of alumina or alumina-zirconia on the abutment is needed (Later the crown is built over the coated surface). However, the ceramic on metallic substrate coating process is still difficult to achieve, thus most of the abutments currently in use have no coating. Our invention relates to a method for ceramic coating of a metallic substrate using a laser sintering process.

CHM-0989

Low cost onsite generation of high purity oxygen

Oxygen generators are important devices with many applications. Current on-site generators separate oxygen from the air using adsorption. These generators provide insufficient oxygen purity for most applications, in particular when producing high flow rates. Our technology uses a ceramic membrane that allows for fast generation of high quality oxygen at practically 100% concentration under any desired flow rate. This invention can be applied to several industries and applications such as: medicine, chemical manufacture, coal gasification, oxyfuel combustion, fish farms, aircraft, gear for trauma medicine, SCUBA or other breathing apparatuses.

CHM-1065

Barium titanate layer produced by aqueous suspension cathodic electrophoretic deposition

Barium titanate (BaTiO_3) is one of the most important ceramic materials used in electronics. As an intrinsic ferroelectric material it can be utilized for various applications like multilayer capacitors, grain boundary capacitors, low-temperature sensors and thermistors. There is a growing need for efficient methods of producing barium titanate layers, particularly if they are thin and crack-free. This method allows for the preparation of thin, whole layers even in complex shapes without the use of extremely toxic solutions currently in use in other methods.

TECHNION PATENT

DESCRIPTION

Chemistry and Materials Science

CHM-1107

Facile production method of novel family of highly catalytic tridentate ligand complexes

This invention describes the development of novel methodology for the synthesis of a new class of pincer ligands. Pincer ligands exhibit unusual thermal stability and have been found to be extraordinarily useful in a variety of transition metal-catalyzed processes, as well as in coordination, mechanistic, synthetic and supramolecular chemistry, nanoscience, and the development of sensors and molecular switches. The usefulness of this technique and the resulting ligands have been demonstrated with extraordinary catalysis in the Heck reaction, a common reaction in many commercial chemical synthesis processes.

CHM-1129

Novel hypergolic fuel

Hypergolic propellant and oxidizer combinations ignite spontaneously upon contact with each other. This reaction is used in rocket engines allowing for a great deal of control and for engine restarts while eliminating the need for heavy and complex ignition systems necessary for liquid propellants. However, most conventional hypergolic fuels are highly toxic, carcinogenic, dangerous for the environment and extremely reactive. This invention offers a solution for the manufacture of environmentally friendly hypergolic fuels that are safe, non-toxic, have a higher specific impulse and are less likely to leak while in storage.

CHM-1159

Calixurenes – novel binding molecules

There are four main known families of macrocyclic host molecules based on specific host-guest reversible binding that are employed in a wide range of applications in chemistry, biology, food industry, electronics or printing. Despite this, for more than a decade, no new family of macrocyclic host molecules has been discovered and each of the known macrocycles is usually limited to specific applications according to its chemical nature and binding properties. These new molecules called Calixurenes are the first binding macrocycles that contain thiourea combined with aromatic fragments and phenolic functions. This unique combination of functional groups in the same molecule is expected to produce unprecedented binding strength with high selectivity to almost any metal in any oxidation state as well as binding properties expected to be independent of the environment.

CHM-1202

Low-cost aerocellulose production; All-cellulose reinforced aerocellulose composite

Aerogels are a class of highly porous materials which are characterized by their low solid content. Amongst this class of materials is aerocellulose which is produced from cellulose. Cellulose constitutes 70% of Earth's biomass and is therefore a key player in the pursuit to replace oil-based products with products made from sustainable raw materials. Applications for aerocellulose products range from acoustic or thermal insulation to audio membranes.

TECHNION PATENT	DESCRIPTION
<hr/> Chemistry and Materials Science <hr/>	
CHM-1236	Liquid droplet elastomer <p>A liquid droplet elastomer is a novel, liquid-filled rubbery polymer which combines an elastomer with individually encapsulated micron-scale droplets of liquid or gel. This low-cost and scalable process based on Pickering emulsions and polyHIPEs produces liquid-filled capsules with capsule walls capable of withstanding repeated mechanical and thermal stresses without failure. This innovative technology is highly customizable and lends itself to a wide range of applications including thermal and mechanical insulation, antibacterial medical equipment and fire-resistant cladding.</p>
CHM-1251	Production of iodides from carboxylic acids <p>This is a practical innovative method for the preparation of organic iodides from alkyl or aryl carboxylic acids. This novel environmentally-friendly process utilizes commercially available iodination agent in a simple, one-step process that produces high yields of high-purity organic iodides. The clean reaction and simple workup allow for use of the iodine products as an intermediate in subsequent transformations immediately after reaction without any isolation or purification procedures. Process summary: R-COOH → R-I, when R = alkyl, aryl.</p>
CHM-1272	Novel transparent conducting electrodes (TCOs) <p>Transparent conducting electrodes are crucial components in any optoelectronic device like photovoltaic cells or flat-panel display screens. Organic solar panels or organic displays have many advantages over traditional versions. They are thinner, lighter, more flexible, and can more easily be produced in a wider range of sizes. Additionally, organic displays are brighter and more energy-efficient and have a wider field of view than traditional displays. This transparent electrode created through a meticulously controlled process affords a higher performance, more energy-efficient coupling between the organic and inorganic components of these products and is an optimal choice for incorporation into organic photovoltaic cells, organic displays or OLEDs.</p>
CHM-0496	Ultra-rapid texturing of silicon for solar panel production <p><i>See 'Energy', page 10</i></p>
CHM-0565	Voltage and light induced strains in porous crystalline materials <p><i>See 'Optics and Lasers', page 59</i></p>
CHM-0665	Copper CMP slurry composition <p><i>See 'VLSI and Semiconductors', page 70</i></p>

TECHNION PATENT

DESCRIPTION

Chemistry and Materials Science

CHM-0708	Negative fullerene ion beams generation - method and apparatus <i>See 'Nanotechnology', page 54</i>
CHM-0755	Printable materials <i>See 'Nanotechnology', page 55</i>
CHM-0809	Exploitation of the ordering effect in liquids adjacent or confined by crystals to achieve novel structures during liquid phase epitaxial growth <i>See 'VLSI and Semiconductors', page 70</i>
CHM-1054	Novel p-dopant for organic semiconductors <i>See 'Nanotechnology', page 55</i>
CHM-1075	Seedless copper electroplating for Damascene process <i>See 'VLSI and Semiconductors', page 70</i>
CHM-1097	Microstructure control of ceramic matrix nanocomposites <i>See 'Nanotechnology', page 55</i>
CHM-1101	Novel fast and simple method of carving silicon down to the sub-micron scale <i>See 'Nanotechnology', page 56</i>
CHM-1307	Electrospun metal and composite carbon-metal nanofibers <i>See 'Nanotechnology', page 56</i>
COM-0619	Gamma ray detector <i>See 'Sensors', page 67</i>
ENE-1167	Autonomous natural gas reformer for on-demand and on-site hydrogen generation <i>See 'Energy', page 12</i>
MAE-1033	Electrophiles and nucleophiles sensor <i>See 'Sensors', page 68</i>

TECHNION PATENT	DESCRIPTION
Measurement Methods and Systems	
CHM-0676	<p>Determination of thin film topography</p> <p>Thin film metrology is extremely important in QA, inspection and process control procedures (e.g. in the semiconductors industry). Our three-beam interferometry compact system allows a low-cost, non-destructive, highly accurate measurement of thin film thickness and topography, with depths as thin as 2nm and without any limitation on substrate opacity.</p>
CHM-0804	<p>Seamless dual-mode ACPD non-destructive testing (NDT)</p> <p>In many industries, structural integrity is paramount and inspections are a must. Therefore, non-destructive testing or inspection (NDT) is an important part of many production processes and critical for structures and vehicles during their service life. This ACPD (alternating current potential drop) technology is a low-cost NDT method, which improves upon existing ACPD tests that are limited to locating emerging surface cracks, without providing information on their depth. By using the ACPD method in a tomographic-like mode, one can quickly and efficiently map the size and location of cracks anywhere in a conducting structure, based on a seamless integration of thick and thin skin testing configurations.</p>
COM-0884	<p>Object distance and brightness estimation</p> <p>Optical imaging and ranging technologies are used to acquire the depth and brightness of each object point in a given field of view. Such technologies are used in numerous applications, from home digital cameras to microscopy systems. Existing methods exhibit depth of focus resolution for range estimation. Our technology achieves higher distance accuracy in a wide field of view.</p>
COM-1157	<p>Novel and powerful enhancement of measurement systems' resolution</p> <p>This invention is a revolutionary and powerful method which enables the enhancement of measurement equipment resolution beyond its physical limits in cases where the signal being measured is sparse in a known basis. Most measured objects (natural and artificial) are sparse, i.e., they contain many coefficients close or equal to zero when represented in some basis. This is the first time this approach has been employed to tackle this problem. The method has been demonstrated to enhance the resolution of an optical microscope by a factor of ~10 beyond the fundamental diffraction limit. Similar resolution enhancement capabilities have been shown, where a laser pulse consisting of three 150 ps subpulses has been successfully and accurately reconstructed following acquisition by a "slow" photodiode with a 1000 ps rise time. This technique is very general, and can be utilized in any sensing/ detection/ data acquisition scheme.</p>

TECHNION PATENT

DESCRIPTION

Measurement Methods and Systems

COM-1299

A CMOS (ISFET) pH sensor for medical applications

Medical applications use ISFET sensor technology with MOSFET structure which measure pH levels in solutions with the aid of reference electrode and extensive calibration at each ISFET. Measuring pH without these hurdles is now possible due to our invention.

MAE-1038

Acoustic particle focusing

This device enables acoustic focusing of micron and submicron particles in air. It can be used separately or in combination with aerodynamic lens arrays as an inlet to on-line single-particle analyzers including aerosol time-of-flight mass spectrometers, which are widely used in analytical chemistry, atmospheric dust analysis, biological detection, pharmaceutical manufacturing, and engine exhaust-gas analysis. The device allows for the supply of a concentrated (low gas volume, highly loaded) aerosol stream to on-line single-particle analyzers, allowing for a reduction in the required pumping power normally needed to sustain vacuum conditions.

CHM-0620

Variable lenslet array

See 'Optics and Lasers', page 59

CHM-0802

Single sided probe for ESR imaging of semiconductors

See 'VLSI and Semiconductors', page 70

CHM-1173

Direct and nondestructive chemical analysis of solid and liquid samples

See 'Sensors', page 67

MAE-0730

Active detection of asymmetry in turbomachinery via asynchronous excitation

See 'Mechanical Systems', page 52

TECHNION PATENT

DESCRIPTION

Mechanical Systems

COM-0995

Ferroelectric stack actuator and shape control algorithm

Piezoelectric stack actuators are a common choice for micro- and nano-positioning systems. However, they are limited in terms of travel range (stroke). Our advanced piezoelectric-ferroelectric actuator design suggests a travel range-to-length ratio up to six times greater than traditional piezoelectric stack actuators. Furthermore, the active layers in the advanced stack are controlled separately or in groups and are assigned with either a de-poled or a fully polarized domain state. This feature minimizes vibrations, allows for a controllable and extended travel range, and ensures that the nano-scale positioning accuracy is maintained. Applications vary from microscopy to fuel injectors or from digital cameras to structural systems.

MAE-0632

Increased life for gas filters using acoustic fields

Gas filters clog over time: the captured particles gradually build up in layers and clog the filter. This leads to a pressure drop across the filter, which results in increased energy consumption. Common methods of filter cleaning require mechanical vibration, air jets or reverse flow. However, vibration increases filter material wear, and reverse flow methods add complexity and significantly increase price. Our method uses sound waves, in a simple and low cost setup, to extend the service life of gas filters by up to threefold.

MAE-0682

Electrostatic modulation of surface roughness

The roughness of surfaces is an important parameter, affecting many issues. For example, smooth planar surfaces may be used to reflect and redirect a beam of light. In contrast, rough surfaces may be used to disperse a light beam. This innovative technology uses electrostatic forces to change the roughness properties of a surface creating a mechanism for on and off switching of surface roughness creating a desirable enabling technology that can be used in many fields for optical applications, drag reduction applications and many more. This technology can be used to make a micro-mechanical switch with nanosecond response times and no moving parts.

MAE-0730

Active detection of asymmetry in turbomachinery via asynchronous excitation

High-speed rotors are sensitive to cracks and small deformations which can cause billions of dollars in damages and injuries every year. This invention is the first to accurately identify small cracks and similar deformations in rotating bodies while the machine is running and without requiring disassembly of the machine.

TECHNION PATENT

DESCRIPTION

Mechanical Systems

MAE-0862	<p>Highly sensitive, real-time structural monitoring</p> <p>Structures such as aircraft, ships and bridges rely on rivets and joints which are constantly undergoing wear and therefore must be continuously examined. Our technology aims at monitoring the health of critical joints by utilizing wave components previously considered unusable noise.</p>
MAE-0935	<p>Miniature Cryogenic Compressor</p> <p>Thermal imaging devices, mobile sensing platforms and other advanced equipment require miniature compressors. Piezoelectric actuators have many favorable properties, but have not yet been successfully used in miniature compressors, mainly due to small stroke length. Our technology utilizes the piezoelectric phenomenon together with hydraulics to produce an efficient and reliable miniature-sized gas compressor for various uses, including cryogenics.</p>
CHM-0804	<p>Seamless dual-mode ACPD non-destructive testing (NDT)</p> <p><i>See 'Measurement Methods and Systems', page 50</i></p>
MAE-0664	<p>Actuation drive for laser video projection</p> <p><i>See 'MEMS and NEMS', page 54</i></p>
MAE-1029	<p>Simplified fuel atomization</p> <p><i>See 'Energy', page 14</i></p>
MAE-1038	<p>Acoustic particle focusing</p> <p><i>See 'Measurement Methods and Systems', page 51</i></p>

TECHNION PATENT

DESCRIPTION

MEMS and NEMS

MAE-0664

Actuation drive for laser video projection

Scanning micro-mirrors play a vital role in the future of miniature projectors. Current laser projection devices suffer from reduced brightness and distortions due to limitations of the micro-mirror actuator. Our actuator technology overcomes the major limitations of these devices, and enables applications like full-motion video laser projection on portable devices.

MAE-0918

Low-friction molecular rotary motors

Nanomotors are becoming increasingly important as nano-mechanical systems are continuing to develop. Molecular rotors can be attached to a solid support and used in a variety of applications such as energy converters (motors) biochips and biosensors. The most important traits for a molecular rotary motor are unidirectional motion and high speed rotation with low friction. This nanomotor is able to achieve high-speed motion with minimal friction minimizing dissipation of energy by creating rotation with a very low energy barrier using a rotator-stator couple with repulsive interactions between them. A device of this type is unprecedented in the micro level but has already been applied in the macro scale in maglev suspension systems.

COM-0636

Low cost CMOS thermal/IR imaging sensor

See 'Sensors', page 68

MAE-0682

Electrostatic modulation of surface roughness

See 'Mechanical Systems', page 52

Nanotechnology

CHM-0708

Negative fullerene ion beams generation - method and apparatus

The production of neutral and negative molecular ion beams is of considerable importance in diverse areas of physics, in the production of nano-electro-mechanical and nanophotonics systems, synthesis of new materials, electric propulsion devices, fundamental science areas as surface chemistry and catalysis, organic chemistry, biology and other fields. This system ionizes neutral C₆₀ molecules as they pass through a ceramic capillary giving a very pure, bright and focused fullerene ion beam with a narrow energy spread.

TECHNION PATENT

DESCRIPTION

Nanotechnology

CHM-0755

Printable materials

The development of printable electronics will allow for low-cost volume fabrication of many popular commercial products. Circuit boards can be quickly and simply printed onto a variety of substrates including flexible substrates utilizing a low-cost, versatile and facile production process. This technology constitutes a few steps forward towards the binding of organic electronic materials with an organic electronic "ink" widening the possibilities for electronic devices and increasing their availability.

CHM-1034

Optical tweezers

New devices and technologies rely on "micro pumps" to transport fluids. Our technology allows beams of light to manipulate the local density of particles suspended in liquids or gases. It can be used to control the physical and chemical properties of the fluid, and to manipulate particles of various sizes, ranging from micrometers to nanometers. At the micro and nano scale, the optical pump has a higher efficiency as compared to rotating mechanical pumps, while having no moving parts. This technology has applications in nanotechnology, micro-chemistry, holography, and many other fields.

CHM-1054

Novel p-dopant for organic semiconductors

Hole transporting organic semiconductors (OSCs) are necessary for the realization of low voltage and efficient organic light-emitting diodes (OLEDs) whose advantages over LCD displays are widely recognized. P-doping enhances such hole transporting properties. Halogenated C₆₀ derivatives, previously unexploited in organic electronics, act as highly effective electron acceptors, or p-type dopants, for OSCs. In addition to facilitating high hole conductivity, these dopants were found to be stable and avoid the toxicity problems connected with usual organic acceptor dopants.

CHM-1097

Microstructure control of ceramic matrix nanocomposites

A method facilitating a way to obtain ceramic nanocomposites via a safe and very low cost process yielding ceramics with improved strengths and with a significantly improved Weibull modulus. The material also shows remarkable wear properties. Example applications include ceramic cutting tools, ballistic armor, car brake pads, parts for textile fabrication, advanced ceramics for a multitude of applications in the semiconductor manufacturing industry (e.g. capillaries for wire-bonding), and electronic components.

TECHNION PATENT	DESCRIPTION
Nanotechnology	
CHM-1101	<p>Novel fast and simple method of carving silicon down to the sub-micron scale</p> <p>There is a need for a cheap, reliable, efficient and rapid method for creating multiple high aspect ratio (through-film) indentations or holes on relatively thick substrates. The applications range from micro-fabrication of MEMS devices to water purification and even medical and drug applications. Currently, the accepted methods of producing these holes are slow and not adaptable to mass production. Unlike any other method of producing high aspect ratio holes this method uses broad ion plasma to charge patterned areas to induce a discharge and thereby creating multiple holes across a wide substrate without the use of any electrode or chemical. This fast and low-cost method for creating holes is highly scalable and efficient.</p>
CHM-1182	<p>Novel durable tagging agents</p> <p>Certain chemicals can be used to make explosives but are so common and sold in such large amounts that tracking sales or thefts of small amounts is quite a challenge. Adding taggants to explosives and substances used for their preparation would increase the probability of tracking them to their manufacturer and origin in case of terror attacks and other criminal uses. This technology offers microparticle taggants that are low-cost, durable, environmentally friendly and do not change the chemical properties of their host chemicals so they can still be used for their original intended use.</p>
CHM-1307	<p>Electrospun metal and composite carbon-metal nanofibers</p> <p>There has been a growing effort to manufacture nanometric fibers from polymers, carbon, ceramics and metals due to a wide range of potential applications in optics, electronics, optoelectronics, filtration and separation, catalysis, micro- and nano-sensors, and also alternative energy. Metal fibers of submicron diameter are especially interesting due to their high electrical conductivity and mechanical stability. Conventional methods allow for the production of metallic nanofibers with a short overall length and a relatively small aspect ratio. The presented innovative method provides for the manufacture of long, high-quality fibers with a large aspect ratio and enhanced mechanical stability.</p>
COM-0969	<p>Membrane computing system and method</p> <p>P-Systems are theoretical computational systems, which, when realized will be capable of solving NP-complete problems in linear or polynomial time. Our technology is currently the only existing solution for computation of P-Systems.</p>
CHM-0501	<p>Source of intense coherent high-frequency radiation</p> <p><i>See 'Optics and Lasers', page 59</i></p>

TECHNION PATENT

DESCRIPTION

Nanotechnology

CHM-0665	Copper CMP slurry composition <i>See 'VLSI and Semiconductors', page 70</i>
CHM-0989	Low cost onsite generation of high purity oxygen <i>See 'Chemistry and Materials Science', page 46</i>
CHM-1060	Chemically Sensitive field effect transistors for explosive detection <i>See 'Sensors', page 67</i>
CHM-1084	Silicon air batteries <i>See 'Energy', page 10</i>
CHM-1202	Low-cost aerocellulose production; All-cellulose reinforced aerocellulose composite <i>See 'Chemistry and Materials Science', page 47</i>
CHM-1272	Novel transparent conducting electrodes (TCOs) <i>See 'Chemistry and Materials Science', page 48</i>
MAE-0918	Low-friction molecular rotary motors <i>See 'MEMS and NEMS', page 54</i>
MAE-1033	Electrophiles and nucleophiles sensor <i>See 'Sensors', page 68</i>
RES-0870	Electrical control over antibody-antigen binding <i>See 'Research equipment', page 37</i>

Networks and Communication

COM-0954	Polarization-multiplexing based passive optical networks Passive Optical Networks (PON) are used for high speed digital communication such as video, data and voice. Currently, massive deployment of optical fiber infrastructure is underway to enable this technology. This creates problems of inflexibility to future adjustment of the network due to the growing number of users and massive data. Our technology provides a cost effective solution that works on the existing infrastructure.
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TECHNION PATENT	DESCRIPTION
Networks and Communication	
COM-0966	<p>Blind reconstruction of multi-band analog signals</p> <p>Reconstruction of multi-band signals is a challenge in the field of signal processing. Some of today's methods require a high sampling rate, and obtaining such a rate requires expensive systems. Other methods require prior knowledge, which is not always available. Our technology enables perfect reconstruction of multi-band analog signals at a minimal sample rate and with no need for prior information.</p>
COM-0970	<p>Distorted signal recovery</p> <p>Reconstruction of a signal from its distorted samples is a common scenario in acquisition devices such as sensors and detectors. Current methods developed for these situations are based on idealized assumptions or are limited in application. Our technology is practical and applicable to numerous systems.</p>
COM-0987	<p>BENoC - Bus enhancement NoC</p> <p>Network on Chip (NoC) is the future of VLSI interconnects. The technology enables improved chip performance in numerous aspects such as power consumption and data transfer rate. Several drawbacks are to be worked out to accelerate its acceptance as an industry standard. Our technology solves some of these issues and increases system operation efficiency at a low cost.</p>
COM-1106	<p>Compact and wideband tapered slot antenna for WPAN applications</p> <p>The communication industry is growing at phenomenal rate. A clear trend is the future development of Wireless Personal Area Networks (WPAN) operating in the 60 GHz millimeter-wave band. WPAN devices require low-cost antennas that are not only compact and integrable with RF modules, but also efficient and wideband. Current technologies are expensive and exhibit poor performance rendering them unsuitable for many applications. Our technology provides a generic and efficient solution to this growing need.</p>
COM-1122	<p>Wideband analog to digital conversion and low rate baseband processing</p> <p>Radio frequency (RF) technology enables the modulation of narrowband signals through high carrier frequencies. Conventional Analog to Digital Converters (ADC's) have inherent bandwidth and maximal frequency limitations. Our novel technology enables the design of an ADC device for input in the wideband regime of over 20 GHz and for generation of a baseband sequence which corresponds to any specific region of the spectrum without the need for prior reconstruction.</p>

TECHNION PATENT

DESCRIPTION

Networks and Communication

- COM-0500 **Wavelength-selectable laser**
See 'Optics and Lasers,' page 60
- COM-1139 **Single photon detector for long IR range**
See 'Sensors,' page 68

Optics and Lasers

- CHM-0501 **Source of intense coherent high-frequency radiation**
Laser X-ray beams can be used for CT scanning, micro-devices fabrication and even for industrial cutting and CNC applications. A laser X-ray beam differs from a regular X-ray beam in that it is coherent and focused. Our technology involves a method for producing high-frequency (e.g. soft X-ray) coherent radiation using a compact device the likes of which are not currently available on the market. A laser X-ray emitting system can replace conventional X-ray emitting systems in all of its functions while using less power and creating far less exposure to ionizing radiation.
- CHM-0565 **Voltage and light induced strains in porous crystalline materials**
Despite large efforts made in the last few decades, progress in deformable mirrors has been slow, and there are only a few available kinds. The high price of these mirrors is an indicator of the problems in their manufacture, such as complex construction, non-repeatability and non-uniformity. However, a simple silicon wafer, on the back of which porous silicon is etched, can serve as such an agile mirror. Because porous silicon can induce stress or strain using electrical or optical signals it could have many uses in technologies beyond deformable mirrors in fiber optics maneuvering, fiber optic bending, spatial light modulation (electro-optical and opto-optical modulation), tunneling devices, scanning microscopy and optical or magnetic disc readers. In addition, because porous silicon is piezooptic and optostrictive it can replace existing elements with these properties along with piezoelectric and electrostrictive elements.
- CHM-0620 **Variable lenslet array**
Measuring wave front distortions is widely practiced in optics and is essential for adaptive optics, optical shop testing, wafer measurements and other fields. Conventional wave front sensors have difficulty measuring wave fronts under severe conditions such as low light level, fast scale variations, large aberrations, wide dynamic range, both lateral and in depth and discontinuities in the wave front. This unique invention uses a variable lenslet array to sense wave fronts even under these severe conditions and meets this need in a simple and effective way without any mechanical motion.

TECHNION PATENT	DESCRIPTION
<hr/> Optics and Lasers <hr/>	
CHM-1246	<p>Improved Quantum Well Infrared Photodetector (QWIP)</p> <p>Quantum-dot (QD) based optoelectronic devices such as lasers, photodetectors and solar cells are significantly affected by electron relaxation rates and excited electrons can relax by various possible mechanisms. This invention is based on a new type of possible electron relaxation mechanism based on the long-range Coulombic inter-nanostructure electronic interaction phenomenon. This process is extremely efficient even in loosely bound atomic (molecular) clusters where the ionization of one atom (molecule) in the cluster results from the electronic relaxation of another, distant, atom (molecule). This relaxation is found to be on a femto-seconds time scale which is much faster than photon emission, occurring on the nanosecond timescale and can be used for the design of efficient, tunable, wavelength-selective, ultra-sensitive QWIP photodetectors.</p>
COM-0500	<p>Wavelength-selectable laser</p> <p>Fiber-optics is the leading technology for high-bandwidth communications such as Internet, telephones and cable TV networks. Current commercial transmission using a single fiber with a single wave-length can reach throughputs as high as 10 Gbps. Our technology overcomes this limitation by operating a laser with the ability to rapidly switch between different wavelengths. Low fabrication costs and nanosecond switching times allow for a cost-effective solution for increasing the capacity of existing fiber infrastructure.</p>
COM-0734	<p>Method for acquisition of video with enhanced resolution</p> <p>Increasing video resolutions require higher data transfer rates, which can eventually lead to bottlenecks in recording devices. Our technology enables the capture of video at higher resolutions and frame rates using low and midrange camera hardware. Using a sequence of mixed high and low resolution frames, our algorithm constructs a fully high resolution video. In cases when real-time processing is not required, there are no additional hardware requirements.</p>
COM-0753	<p>Optical noise-free microphone</p> <p>This invention is an innovative method to detect a person's voice while suppressing any background noise. The Optical Noise-Free Microphone (ONFM) is a low-cost, simple and small device that optically detects vibrations directly from the speaker's skull or from other sound-generating objects such as musical instruments.</p>

TECHNION PATENT

DESCRIPTION

Optics and Lasers

COM-0808

Efficient method of shaping a laser beam

The military industry, as well as those industries involved in the production of semiconductors, medical devices, and vehicles, need improved laser systems in order to satisfy growing customer demands. The efficiency of a laser system is determined by the laser beam power and the resolution output at each point. Existing technologies to improve these qualities are limited and only partially answer industry demands. We combine the advantages of current technologies in a simple, low cost manner to maximize systems performance by shaping its laser beam form.

COM-0945

LED-like photon pair source

Entangled photons have the potential to provide improved signal-to-noise ratio (SNR) and immunity to eavesdropping in communication applications. A source for such photons is necessary for higher quality, more secure optical communications. However, current photon source devices are impractical for industrial use. Our technology enables high performance, commercially viable entangled photon sources.

COM-1050

Optical logic gate

Future digital communication systems are expected to be faster and capable of transferring larger amounts of data. As current electronically-based systems will not be able to handle these demands, alternative solutions are required. Optical networking is expected to provide faster throughput rates and wider bandwidth, but it requires extremely fast switches, which must operate in the pico-second range. Our optical gate opens the door to a fully-integrated, all optical communications network.

COM-1100

Stable high brightness, high temperature semiconductor lasers

High-power semiconductor lasers are of great interest to many applications. Our technique has a new waveguide design, and utilizes multi-quantum wells and reduced threshold current, thereby increasing efficiency at high temperatures by delta doping. As a result, the laser has a high brightness with a low threshold (low-divergence) and a high temperature stability. Applications include optical data storage, printers, laser radars, sources for optical pumping of solid-state lasers and fiber lasers.

COM-1158

Cancer diagnostic probe

Effective diagnostics of cancerous cells during oncology surgeries is necessary for a successful treatment. Currently, treatments in these fields often result in repeated surgery which put the patient at risk and are costly. Therefore, providing the surgeon with a device which can accurately identify cancer can save repeated surgery and treatment costs while providing better healthcare. Our technology enables a breakthrough, low-cost and easy to operate device for ensuring the removal of all cancer cells during surgery.

TECHNION PATENT

DESCRIPTION

Optics and Lasers

COM-1186

Semiconductor two-photon laser

A laser based on emission of photon pairs has numerous applications. Such a device is valuable for quantum communication and cryptography, medical imaging, optical inspections and more. Currently, Two-Photon Laser (TPL) technology is expensive, bulky and suffers from low performances, which make it impractical for industrial use. Our breakthrough technology enables commercialization of TPLs.

MAE-0593

Space-variant subwavelength polarization grating

Laterally-varying polarizers have found application in a variety of fields including material processing, tight focusing, polarimetry, particle trapping, particle acceleration and development of optical computers. However, with conventional polarizers, the transmission axes vary laterally in a discontinuous manner degrading the optical efficiency of the polarizer. This invention uses computer-generated space-variant subwavelength dielectric metal wire gratings for the formation of radially and azimuthally polarized light from a polarizer whose transmission axis varies laterally in a truly continuous manner. By correctly determining the direction, period and depth of the grating, any desired continuous polarization can be obtained.

MAE-0614

Space-variant subwavelength dielectric grating

Polarization measurements are important for a large range of applications such as ellipsometry, bio-imaging, imaging polarimetry and optical communications. This method enables the use of computer-generated space-variant subwavelength dielectric gratings for the formation of radially and azimuthally polarized light. By correctly determining the direction, period and depth of the grating, any desired continuous polarization can be obtained. Furthermore the continuity of our grating ensures the continuity of the transmitted field, thus suppressing diffraction effects that may rise from discontinuity. Our gratings are compact, lightweight, flexible in design and have high transmission efficiency. The gratings have been used in the laboratory to achieve experimental measurements of polarized and partially polarized CO₂ laser radiation at a wavelength of 10.6 μm.

MAE-0634

Geometrical phase optical elements with space-variant subwavelength gratings

There has been a growing interest in helical light beams for applications like optical MEMS, optical inspection, atom or macroscopic particle trapping and other fields. Conventional systems for forming helical beams are generally cumbersome and complicated and suffer from high aberrations, low efficiency or instabilities. This technology was able to demonstrate the Pancharatnam-Berry space domain resulting from the geometrical phase that accompanies space-variant polarization manipulation using continuous computer-generated space-variant subwavelength dielectric gratings. By continuously controlling the local orientation and period of the grating, any desired phase element can be achieved.

TECHNION PATENT

DESCRIPTION

Optics and Lasers

MAE-0763

Space-variant polarization manipulation of a thermal emission

This technology offers a method for space-variant polarization manipulation of enhanced non-directional thermal emission in a narrow spectral peak. This can be used to create thermal sources, for decoding thermal coding or for thermal management. The polarization is accomplished by irradiating non-directional thermal emission on a sub-wavelength grating supporting surface phonon-polariton or surface plasmon-polariton and discretely controlling the local orientation of the grating.

MAE-0867

Vectorial vortex mode transformation for a hollow waveguide using subwavelength structures

Hollow waveguides present an alternative to solid core fibers in the IR regime where suitable optical materials are scarce. Due to their air core, they can also be used for broad-spectrum high power transmission due to small insertion losses. This makes them suitable for use in industrial or medical applications or for spectroscopic and radiometric measurements. Conventional hollow waveguides rely on multimode operation; however, this technology allows for the excitation of only a single waveguide mode making it well-suited for certain devices like hollow waveguide lasers.

MAE-1112

Dilute nitride-based Quantum Well Infrared Photodetector (QWIP)

Optoelectronic devices operating in the near infrared (NIR) to mid infrared (MIR) spectral range offer a diversity of applications ranging from telecommunications to chemical sensors for pollution detection, chemical forensics, chemical and biological warfare, industrial process monitoring, night vision and even medical diagnostics. However, conventional material systems and IR-detectors do not effectively meet these optical range needs. This invention offers a new type of IR-device in the NIR to MIR range, based on optical transitions to foreign atoms which, when inserted into standard active layers in QWIP devices, affect electronic states. Single element devices operating at $\sim 1.5 \mu\text{m}$ at RT, that were fabricated and tested in our lab, demonstrate high responsivity of $\sim 20 \text{ A/W}$, and signal gain of ~ 1000 (which is not relevant for the dark current and dark current noise). This new type of device may potentially enable single photon detection at the NIR range.

TECHNION PATENT

DESCRIPTION

Optics and Lasers

MAE-1140

Nitrogen incorporation in atomic layer epitaxy growth of InAsN/GaAs quantum wells

In recent years, the dilute nitride alloys (III-V-N) have been the subject of intense theoretical and experimental research effort because of their ability for band gap and band-offset engineering, and thus have potential for a wide range of optoelectronic device applications. By optimizing the nitrogen content, the lattice constant and band-gap energy can be varied over a wide range tailoring the material's properties to a specific application, such as near-infrared (IR) lasers and quantum-well IR photodetector (QWIP) devices. However, the growth of high-indium-content dilute nitrides using metal organic chemical vapor deposition (MOCVD), which is important for such applications, is not straightforward. This laboratory-tested method overcomes this difficulty and allows for the manufacture of high-quality structures tailor-made for specific optical communication devices.

MAE-1216

Tuneable XBn and nBn and PV IR detectors

The ability to fine-tune the band gap of infrared detectors allows for multispectral imaging, which has many commercial military and civilian applications. However, conventional manufacturing methods are extremely limited in this field. This invention utilizes well-known and well-studied properties of dilute nitrides to utilize PV, nBn and XBn structures and their reduced working temperatures, to retain control over the band-gap energy of the III-V-N semiconductor active layer through control over its composition retaining the lattice-matching constraints. This laboratory proven method can pave the way for lattice-matched, compositionally tunable band gap active layers for infrared detectors with a cut-off wavelength between 3-5 microns or more.

MAE-1220

New active layer for GaAs-based lasers

Great efforts have been made toward achieving 1.3-1.55 μm emission from high-performance GaAs-based lasers for use in a wide range of commercial optoelectronic devices. Research has shown that controlling the band-offset and not just the band-gap is essential in order to optimize the laser performance. This lab-proven technology succeeds in creating a bi-layer structure that can be used as an active layer for a near infrared (NIR) laser. The layer demonstrates high gain, low transparency carrier density, acts as an almost equal barrier for electrons and holes and an equal lifetime for thermal escape – all necessary properties for creation of an optimized NIR GaAs laser that can outperform existing commercial devices.

CHM-1034

Optical tweezers

See 'Nanotechnology', page 55

COM-0910

Deep nanopatterning FIB technology

See 'VLSI and Semiconductors', page 71

TECHNION PATENT

DESCRIPTION

Optics and Lasers

- COM-0954 **Polarization-multiplexing based passive optical networks**
See 'Networks and Communication', page 57
- COM-1139 **Single photon detector for long IR range**
See 'Sensors, page 68
- COM-1157 **Novel and powerful enhancement of measurement systems' resolution**
See 'Measurement Methods and Systems', page 50
- MAE-0664 **Actuation drive for laser video projection**
See 'MEMS and NEMS, page 54

Security

- CIV-1108 **Automated detection of tunnel excavation**
Cross-borders smuggling tunnels pose a very serious threat to security. Recent advances in strain measurement by Fiber-based Brillouin optical time domain reflectometry (BODTR), led to the development of commercially available systems with sensitivity of less than $5\mu\text{m}$ and spatial resolution of 1m, thus enabling sufficiently sensitive device, which can detect tunnel excavation through the strains the tunnel causes near the surface.
- COM-1181 **Compact direction finding antenna**
Direction finding antennas have numerous applications; however, the complexity of the technology has its price. The size of such antennas, cost of production and maintenance inhibit the development of various applications. Solutions to these drawbacks are achieved at the cost of performance. Our technology enables high performance, small size and low cost Direction-Of-Arrival (DOA) antenna, suitable for existing as well as for new applications.
- MAE-0791 **Autonomous control scheme for unmanned aerial vehicle flocks**
The use of armed unmanned aerial vehicles (UAVs) is on the rise. When several crafts are sent on a mission, their communications bandwidth requirements make them vulnerable. Our fully-autonomous management scheme for UAV flocks can overcome this weakness.
- MAE-0877 **Highly efficient spacecraft thruster - CAMILA**
A technology which can double the efficiency of available spacecraft and satellite thrusters with minimal modifications. The unique design eliminates the common problem of "slow ions" which significantly reduces the efficiency of existing thrusters.

TECHNION PATENT	DESCRIPTION
Security	
MAE-1128	<p>Agile kill vehicle against ballistic missiles</p> <p>Targeting and destroying long-range ballistic missiles is a highly critical task. Kill Vehicles (KV), such as the Israeli Arrow and American THAAD, are designed to intercept high-velocity targets at altitudes as high as 150 km. However, new generations of ballistic missiles are able to employ evasive maneuvers to avoid being hit by KVs. Our Agile Kill Vehicle technology enables maintenance of a high kill ratio even if evasive maneuvers are performed by the target.</p>
CHM-1129	<p>Novel hypergolic fuel</p> <p><i>See 'Chemistry and Materials Science', page 47</i></p>
CHM-1173	<p>Direct and nondestructive chemical analysis of solid and liquid samples</p> <p><i>See 'Sensors', page 67</i></p>
CHM-1182	<p>Novel durable tagging agents</p> <p><i>See 'Nanotechnology', page 56</i></p>
MAE-0862	<p>Highly sensitive, real-time structural monitoring</p> <p><i>See 'Mechanical Systems', page 53</i></p>
MAE-1029	<p>Simplified fuel atomization</p> <p><i>See 'Energy', page 14</i></p>
MAE-1033	<p>Electrophiles and nucleophiles sensor</p> <p><i>See 'Sensors', page 68</i></p>

TECHNION PATENT

DESCRIPTION

Sensors

CHM-1060

Chemically Sensitive field effect transistors for explosive detection

Current methods for detecting explosives such as Gas-Chromatography and Mass Spectrometry are expensive, require a degree of expertise to operate them and are limited to the ppm level of concentrations. Our Electronic nose devices achieve an improved sensitivity for detection of explosive materials.

CHM-1173

Direct and nondestructive chemical analysis of solid and liquid samples

Chemical analysis is usually performed in solutions or in the gas phase, while direct detection of solids and liquids is much more difficult. This breakthrough spectroscopic method utilizing laser multi-photon ionization (MPI) is performed under ambient conditions and is suitable for direct analysis of solid and liquid materials providing rich spectral features that can be used for compound identification. This technology has applications in industrial process control (e.g. semiconductor wafers), in quality assurance (e.g., pharmaceuticals), in forensic applications (e.g., explosives, narcotics) and in several environmental monitoring applications. This novel method has been successfully laboratory-demonstrated and was used for the detection of various organic compounds including explosives, narcotic drugs and polycyclic aromatics.

CHM-1238

Changing the properties of mechanical resonators by the means of electron beam induced deposition

Fabrication and measuring processes involving electron beams (e-beams) in vacuum chambers are usually sensitive to organic contaminations, such as hydrocarbons. Organic molecules interacting with the e-beam form polymerized nonconductive deposits, which disrupt normal image acquisition, cause charging effects, and interfere with microlithography. Therefore, monitoring of the contamination level before and during these processes is essential. The few contamination sensors that find use in the industry are not highly selective and measure the contaminations mainly in the gas phase, e.g., mass spectrometers and gas chromatographers, while the main source of the hydrocarbon molecules is the surface organic contaminations. This invention utilizes a prominent mechanical property of the polymerized carbon deposits, namely, the high surface stress, as a direct measure of the amount of the contaminations available locally in the vacuum chamber for the polymerization process. Employing a microelectromechanical device whose resonance frequency is sensitive to changes in the surface tension, a sensor is created that is fast, works in real time, and can be calibrated.

COM-0619

Gamma ray detector

Gamma-ray detectors have wide applications in fields such as nuclear medicine, environmental monitoring and material testing. By analyzing emitted rays using a gamma ray spectrometer, diagnostically useful information can be obtained. Some of the methods used for the detection of gamma rays include Geiger counters, scintillation counters, neutron detectors, semiconductor detectors and variants including CCDs. Our invention improves the fabrication process of detectors using an acoustic wave treatment. This allows for improvements such as increased sensitivity and differentiation between energy levels of the detected rays.

TECHNION PATENT

DESCRIPTION

Sensors

COM-0636

Low cost CMOS thermal/IR imaging sensor

Today's thermal imaging devices are expensive specialized products for niche markets. Our technology, based on CMOS-SOI-MEMS, can reduce their production costs tenfold, resulting in 100\$ or less per imager, enabling widespread use for numerous applications and markets.

COM-1102

CMOS -SOI-MEMS thermal sensors for THz imagin

This invention is aimed towards achieving a focal plane array for passive OR ACTIVE imaging in a wide bandwidth of 0.6-1.5THz - by pursuing a new approach and introducing multiple innovations, one of which is based on uncooled thermally isolated CMOS SOI transistors (TeraMOS).

COM-1139

Single photon detector for long IR range

The demand for highly sensitive optical detectors and sensors is constantly growing. A single-photon detector has the maximum possible sensitivity and performance for optical communication networks, medical devices and other electro-optical systems. No existing technologies can detect a single photon in the mid and long infra-red (IR) spectrum. Our technology enables high performance IR detection in that range.

COM-1253

CMOS-SOI-MEMS thermal antenna for THz thermal imaging

Thermal antennas couple thermal radiation to thermal sensors by converting Electromagnetic radiation directly into heat. Applications include THz sensors where the challenge is to achieve high efficient coupling between the thermal radiation irradiating large pixels and the tiny TeraMOS sensor described above. Additional applications include IR pixels where with the present invention the thermal time constant may be reduced significantly.

MAE-1033

Electrophiles and nucleophiles sensor

This technology offers a low-cost, continuous and informative way of detecting electrophiles or nucleophiles in solution and in the gas phase. This has numerous applications like in early warning systems for nerve and mustard gas or for worker safety systems in various chemical industries. This technology works similar to the olfactory system of living organisms by using numerous chemosensors that identify electrophilic and nucleophilic molecules by chemically reacting with them. The technology was demonstrated using electrical (field effect transistors) as well as optical (luminescence) means.

TECHNION PATENT

DESCRIPTION

Sensors

MAE-1057	<p>Self balancing motorcycle</p> <p>Motorcycle riding has always been a dangerous and attention-demanding activity, especially when compared to driving cars and other enclosed vehicles. The motorcycle's unstable nature makes it vulnerable to road hazards and emergency situations, and the consequences of accidents can be harsh. Our technology enables a motorcycle to balance itself, allowing for major advances in road safety and autonomous robotics.</p>
CHM-0620	<p>Variable lenslet array</p> <p><i>See 'Optics and Lasers', page 59</i></p>
CHM-1246	<p>Improved Quantum Well Infrared Photodetector (QWIP)</p> <p><i>See 'Optics and Lasers', page 60</i></p>
COM-0753	<p>Optical noise-free microphone</p> <p><i>See 'Optics and Lasers', page 60</i></p>
COM-1181	<p>Compact direction finding antenna</p> <p><i>See 'Security', page 65</i></p>
COM-1304	<p>Blackbody as a THz emitter and a THz measurement and characterization set-up based on blackbody and THz filters</p> <p><i>See 'Signal, Audio and Image Processing', page 75</i></p>
MAE-0935	<p>Miniature Cryogenic Compressor</p> <p><i>See 'Mechanical Systems', page 53</i></p>
MAE-1112	<p>Dilute nitride-based Quantum Well Infrared Photodetector (QWIP)</p> <p><i>See 'Optics and Lasers', page 63</i></p>
MAE-1140	<p>Nitrogen incorporation in atomic layer epitaxy growth of InAsN/GaAs quantum wells</p> <p><i>See 'Optics and Lasers', page 64</i></p>
MAE-1216	<p>Tunable X_{Bn} and nBn and PV IR detectors</p> <p><i>See 'Optics and Lasers', page 64</i></p>

TECHNION PATENT	DESCRIPTION
VLSI and Semiconductors	
CHM-0665	<p>Copper CMP slurry composition</p> <p>Chemical Mechanical Planarization (CMP) is one of the processes wafers undergo during chip manufacturing. During CMP the wafer is polished by a polishing-pad, in conjunction with an abrasive and an electrolyte – the slurry – which protects the copper as well as mechanically scrapes the wafer surface. Our slurry composition improves VLSI production by preventing the corrosion of copper throughout the CMP process. The technology enables better wafer production yields.</p>
CHM-0802	<p>Single sided probe for ESR imaging of semiconductors</p> <p>Semiconductor devices have a complex 3D structure. There is a general need in the industry to have noninvasive high resolution 3D imaging of semiconductor devices. The invention relates to a unique, single sided electron spin resonance (ESR) micro-imaging probe for semiconductor imaging with a 3D resolution better than 100 nm. Such images can be used to identify the source of failure mechanisms (failure analysis, FA) in newly designed and fabricated chips, and for QA purposes of devices under production.</p>
CHM-0809	<p>Exploitation of the ordering effect in liquids adjacent or confined by crystals to achieve novel structures during liquid phase epitaxial growth</p> <p>Many modern electrical devices are manufactured through Very Large Scale Integration (VLSI) methods which integrate a large number of different electrical components on a single chip. Many of these components incorporate contact between different crystalline substances. Such contacts often contain defects due to a misalignment of the corresponding crystalline structures which introduce inefficiencies into the manufacturing process and in some cases, prevent the use of certain materials altogether. A similar phenomenon occurs in the manufacture of optical switches. This technique for the growth of true epitaxial structures creates a minimum number of defects allowing for lower operating costs and higher rates of production.</p>
CHM-1075	<p>Seedless copper electroplating for Damascene process</p> <p>Copper interconnects for silicon chips are created in a process called Damascene. To prevent silicon degradation due to interaction with the copper, a barrier layer of tantalum is required to separate the two. Before electroplating is utilized to fill the channel with copper, a seed layer of copper needs to be deposited using PVD methods. Modern integrated circuits are designed with ever smaller channel lengths. Channel lengths of 32 nm and less pose a challenge to the current Damascene process as copper seeding via PVD creates a copper overhang on each side of the channel, sometimes blocking it altogether. Subsequent copper electroplating then results with faulty interconnects. The invention provides a thorough, tested solution of an electrochemical nature to this problem, which integrates seamlessly with current equipment utilized in the Damascene process.</p>

TECHNION PATENT

DESCRIPTION

VLSI and Semiconductors

COM-0731	<p>Gate diffusion inputs (GDI) circuit design</p> <p>Our gate diffusion inputs (GDI) technology is superior when dealing with the rising challenges of digital circuits design. Current methods are based on standard logical gates and are not compatible with the increasing demands for low power designs in the electronics industry. Our technology is simple to implement, cost effective and based on multi-functional building blocks.</p>
COM-0894	<p>Improved transistor structures</p> <p>Field Effect Transistors (FETs) are devices in which an electric field created by a gate controls the flow of current along the transistor's channel from the source to the drain. Thin Film Transistors (TFTs) are a form of this device which can be used as a back-plane for non-emissive displays, like LCDs or electronic ink displays, or for emissive displays based on OLEDs or even for logic circuits. Unfortunately, most low cost TFTs (organic or amorphous silicon) are restricted in the amount of current they can provide which increases the switching time and enhances background noise – all undesirable effects for a transistor. This technology effectively shorts the channel enhancing its conductivity without doping it in any way. All of the potential problems associated with doping such as ion diffusion and charge diffusion are absent offering a thin film transistor with enhanced performance that is able to provide more current than conventional TFTs, reduced switching times and reduced background noise.</p>
COM-0910	<p>Deep nanopatterning FIB technology</p> <p>Focused ion beam (FIB) technology is widely used in the semiconductor industry. FIB etching is used to develop and modify optoelectronic and microelectronic devices. However, FIB technology is limited to large scale devices and is incompatible with the industry trend to reduce device dimensions. Our technology is unique and enables nanometric scale FIB lithography.</p>
CHM-0708	<p>Negative fullerene ion beams generation - method and apparatus</p> <p><i>See 'Nanotechnology', page 54</i></p>
COM-0945	<p>LED-like photon pair source</p> <p><i>See 'Optics and Lasers', page 61</i></p>
COM-0987	<p>BENoC - Bus enhancement NoCn</p> <p><i>See 'Networks and Communication', page 58</i></p>
COM-1050	<p>Optical logic gate</p> <p><i>See 'Optics and Lasers', page 61</i></p>
COM-1100	<p>Stable high brightness, high temperature semiconductor lasers</p> <p><i>See 'Optics and Lasers', page 61</i></p>



Computer Science

TECHNION PATENT

DESCRIPTION

Signal, Audio and Image Processing

COM-0805

Image de-hazing

Imaging in poor atmospheric conditions suffers from reduced contrast and object visibility. Image processing methods can recover these qualities by analyzing the medium polarization and background component. Current methods require complex analysis, and some methods need the presence of the sky in the image. These limitations impose conditions on the imaging medium that are not always feasible. Our technology is simpler and does not require the presence of sky in the image.

COM-0834

Recovering object visibility and structure in a scattering medium when using artificial illumination

There is a wide spectrum of uses for images taken in scattering media such as fog, water and even in biological tissue. Unfortunately, these images suffer from poor visibility due to backscattering and signal attenuation. Backscatter is especially strong when using artificial illumination. This technological approach which is instant, simple, easy to build and low-cost results in a computational visibility improvement which has already been demonstrated underwater in poor visibility conditions. It also yields a rough estimate of the 3D scene structure and may even be extended to work with multiple illumination sources.

COM-0914

Robust silhouette tracking in video streams

Video silhouette tracking is used in various fields, from homeland security to industrial automation. Our algorithm takes an innovative approach to the motion analysis process and thus enables greater flexibility in tracking. It can handle camera or object movement, rotation, zoom and even morphing with higher accuracy. Potential applications include video-based security, automation of video production tasks such as image stabilization and video effects, and the removal of inappropriate or unwanted content.

COM-0948

Efficient real-time acquisition of textured 3D video

Reproducing a live scene—such as a football game—with 3D cameras is far from being feasible. When filming in 3D, the camera's view is often obstructed by objects in the scene. For this reason multiple cameras are needed in order to capture the entire scene, which can result in unreasonable costs. Our algorithm enables the substitution of some of the 3D cameras with ordinary video cameras, and is suited for real-time operation.

TECHNION PATENT

DESCRIPTION

Signal, Audio and Image Processing

COM-0978

Super resolution with no explicit motion estimation

Many videos have unsatisfactory optical resolution. Improving the resolution requires recovery of sub-pixel details. Our method is a novel and successful super resolution algorithm, which does not rely on explicit motion estimation. Instead, a local and patch-based approach is combined with fuzzy motion estimation. Possible applications include digital cameras/camcorders, TV sets, video projectors, video editing software, video display software, media centers, video conference software, and security systems.

COM-1009

Asynchronous multi-band signal sampling

Multi-bands signals are efficient for information transfer but sampling and reconstruction of such signals is a growing challenge due to increasing carrier frequency in communication systems. Existing methods for processing such signals requires expensive hardware implementation and is dependent on signal characteristics. Our technology is a low-cost solution to these limitations.

COM-1071

Texture and image interpolation using Markov models

Image upscaling technologies are in demand due to the influx of high-definition displays and the prevalence of low-resolution content. Our algorithm allows for the restoration of textured images out of low-resolution or low-quality ones. The algorithm analyzes the image statistically to achieve superior results as compared to simple methods such as bicubic and bilinear. This also enables high-ratio compression for textures and introduces an innovative criterion for comparison of image textures, which may be used for different applications.

COM-1080

Pinpoint Microphone

The intuitive pin-point selection of an individual within a crowd to detect their voice has several important applications from highly directional hearing aids to eavesdropping on, or identifying a suspect in public. This invention detects sound at a distance with the required sub-nanometer sensitivity, surmounting the inherent difficulties of optical detection of reflections from scattering surfaces, unstable detection geometries, environmental disturbances and background interference.

COM-1103

Complex barycentric coordinates

Barycentric coordinates are heavily used in computer graphics applications to generalize a set of given data values. Traditionally, the coordinates are required to be real and positive. We relax this requirement by allowing the barycentric coordinates to be complex numbers which lead to several powerful advantages. These new coordinates are highly effective in generating conformal mappings from a given planar source region to a planar target region. Complex barycentric coordinates can be used for image manipulation, shape deformation, animation, data interpolation, color interpolation and parameterization.

TECHNION PATENT

DESCRIPTION

Signal, Audio and Image Processing

COM-1117

Texture mapping of 3D models using casual images

Texture mapping from 2D images is a method for adding detail, surface texture or color to a computer-generated graphic or three-dimensional model, commonly used in computer graphics, computer games, virtual worlds etc. In the known solutions to the problem, when a casual image is used, high distortions in the texturing occur. Our technology avoids such distortions by formulating the mapping as a camera projection matrix.

COM-1119

Saliency Algorithm: Automatic puzzle-like photo collage maker

Collages are a common way of artistically aggregating several items into one visual story. Recently, with the advance of digital cameras and digital image editing tools, automatic collages have emerged as a summarization tool. These products produce collages that are often aesthetically unsatisfactory, partly due to their failure to extract the interesting part of an image, and partly due to their limitations in extracting only rectangular regions. Our technology is significantly better at recognizing, defining and extracting regions of interest (ROIs) from images. Because it allows the use of freeform ROIs, it is better at creating collages which resemble the work of a human artist.

COM-1154

Photonic-enabled ultra-high-speed RF analog-to-digital conversion

Digital Signal Processing (DSP) has revolutionized modern communications and radar systems and is an integral part of many other industries. For broadband systems, the application of DSP systems is hindered by the difficulty in capturing (digitizing) the wideband signal in real time. Although Wideband Analog-to-Digital Converters (ADC) are in high demand, a satisfactory solution doesn't exist yet in the market. This technology utilizes a number of innovation to create systems that easily outperform existing solutions.

COM-1194

Speckle-Noise elimination in holographic projection

The demand for three-dimensional images in popular entertainment and information systems is growing quickly. Speckle noise is a major disturbance in phase-only holographic projections but current solutions for the removal of this interference have many drawbacks. They either fail to remove the interference completely or require a significantly more complex calculation method demanding more computing resources reducing the possible rate of projection and increasing the size of the holographic unit. Our method completely removes the speckle noise without excessive computation or additional optical components allowing for unadulterated high-rate holographic projections.

TECHNION PATENT

DESCRIPTION

Signal, Audio and Image Processing

COM-1304

Blackbody as a THz emitter and a THz measurement and characterization set-up based on blackbody and THz filters

THz radiation bridges the gap between mm-waves and mid/far IR. Until recently, this spectral range has received limited attention due to the lack of efficient and low/moderate cost THz sources and detectors. However, there are a number of promising applications such as THz imaging (concealed weapon and explosive detection) and THz spectroscopy (pharmaceutical, biomedical, and materials inspection applications). Successful exploitation of the potential of THz technology requires the availability of low cost, versatile and powerful THz emitters as well as highly sensitive, un-cooled and small detectors. This invention uses a blackbody apparatus to enable the manufacture of relatively low-cost THz systems to meet these needs.

MAE-1091

Video-based livestock health monitoring

Heat stress in cows is a major problem in the dairy industry, and is difficult to identify at early stages. Our technology enables early identification of such stress by monitoring the cow's breathing rate. The data is derived from an overhead video image sequence acquired from a roof-mounted camera. A unique algorithm calculates the cow's breathing rate from the movements of certain areas of its body. The cow is free to move around during measurement as long as it remains within the field of view of the camera.

COM-1086

Fast Universal Synchronizers

See 'Software and Algorithms', Page 77

TECHNION PATENT	DESCRIPTION
<hr/> Software and Algorithms <hr/>	
COM-0712	<p>GeomCore - outstanding 3D graphics</p> <p>GeomCore offers a whole framework that allows three-dimensional geometry to be presented over the World Wide Web. The geometry is presented in an efficient way and allows for a high degree of interaction and collaboration, all in real time. GeomCore's technology can serve as the basis for numerous applications such as MCAD 3D visualization over the Web, 3D icons and collaborative 3D games.</p>
COM-0892	<p>Interactive route planning</p> <p>In recent years, systems that provide access to geographic information through a mobile phone or a car-navigation unit (GPS/ PND) have become common. Typically, these systems allow Location-Based Services (LBS) such as location-aware search and point-to-point navigation. Service providers are striving to integrate more data into LBS systems in order to increase revenue and usability. This is a complicated task due to the variety of information sources which must undergo standardization. Our technology allows for both the collection of location-related data in real-time integration of the data with the LBS in a simple and accurate manner. This will help to reduce implementation costs for service providers, increase revenue from commercial promotions and enhance the user experience.</p>
COM-0921	<p>Optimal measurement technique of variable arrays</p> <p>Multiple-source illumination methods have numerous advantages in the field of computer vision and image processing. Optimization of all available light sources is a challenge to the production of a superior image. Current methods ignore the inherent difficulties in multiple-source schemes and are in most cases counter-productive. Our effective technology addresses the difficulties of image optimization and can also be applied outside these fields.</p>
COM-0992	<p>PIXSAR: Disk recluster for faster XML databases</p> <p>PIXSAR is an algorithm that is capable of efficiently rearranging an XML-based database. It does so by treating database clustering as an augmented tree partitioning problem and adjusting the data physical layout according to the dynamic workload. iPIXSAR, an extension, is able to do so in the presence of multiple-indexes over the database.</p>
COM-1030	<p>Efficient and general Voronoi diagrams algorithm</p> <p>Voronoi diagrams are a powerful computational tool. They appear in many areas in science and technology, and have diverse applications. One can find the diagrams and their applications in chemistry, computer science, geography, economics, communication, art, materials engineering and more. Our algorithm is simple and efficient, and significantly improves current calculation capabilities of existing algorithms. For example, it can compute Voronoi diagrams of general sites in general normed spaces (of any dimension), in manifolds and in other settings. In addition, it supports parallel computing.</p>

TECHNION PATENT

DESCRIPTION

Software and Algorithms

COM-1035

Decision support tool for project management

Despite the common use of project management software, many projects still fail to meet their goals on time and within budget. This is partly because these tools do not allow the project team to actively experiment with "what-if" scenarios during the course of the project. Our technology allows for the interactive simulation of stochastic events on real-world projects, enabling the management team or students to discuss, analyze and find more optimal solutions while developing better judgment.

COM-1086

Fast Universal Synchronizers

Connection of different clock domains in a VLSI design requires special treatment. A reliable connection usually employs a synchronizer module. The invention consists of a new family of synchronizers that achieves up to three-fold performance enhancement relative to the standard approach, at expense of an insignificant reliability reduction.

COM-1104

TCAM with fast error detection

Ternary Content-Addressable Memory (TCAM) devices are increasingly being used for performing high-speed classification of data packets required by networking applications such as routing, monitoring and security. The parallel-access properties of TCAM devices make them prone to errors which standard error detection schemes are not designed to handle. Our technology is a parallel error detection scheme which is optimized for TCAM. It allows an order of magnitude reduction in the number of lookups required for the error location process, thereby increasing performance and reliability.

COM-1162

Hidden 2D images in 3D models

Our algorithm allows for the creation of animatable 3D structures that present different 2D images when viewed from two different angles. The images are indiscernible except when viewed from a certain angle. The novelty of these 3D models makes them ideal for souvenirs, marketing, promotional items and displays. Small-scale personalized applications include imprinting the 3D reconstructed model on a glass cube using laser etching, or on plastic using layered manufacturing technologies. Large-scale implementations may include company logos and advertising messages in public areas.

TECHNION PATENT	DESCRIPTION
Software and Algorithms	
COM-1163	<p>Optimal inspection of multidimensional regions</p> <p>Securing a complex terrain or mold designs are examples of seemingly unrelated geometric problems that deal with region /object coverage Our novel algorithm can compute an (almost) optimal solution to the complete coverage of multidimensional region. The algorithm has two major stages. In the first, visibility is determined from a set of positions. In the second, an approximation to the set-cover problem is computed.</p>
COM-1274	<p>Online Reconstruction of 3D Objects from Arbitrary Cross-Section Data</p> <p>Use of reconstruction algorithm for surface creation of 3D-multi labeled objects is common in medical imaging applications. Generating a smooth 3D object requires a set of planar cross section slices to be fed with reliable segmented contour data. This is now feasible thanks to an intuitive reconstruction algorithm.</p>
COM-1282	<p>Mitigation of Inter-Cell Coupling Effects in NAND Flash Memory</p> <p>NAND flash memory is a popular data storage facility at various electronic devices. However, it suffers from an inter-cell coupling effect which reduces the memory functionality. An innovative method improves the NAND flash memory operations by diminish the inter-cell coupling effect.</p>
COM-1296	<p>Cryo-probes optimal placement for cryo-surgical applications</p> <p>Cryo-surgical procedures are methods for destruction of tissues by freezing. These procedures utilize inserted cryo-probes that operate in the targeted tissues with minimal damage to surrounding healthy region. Optimal cryo- probes placement and operation is now possible thanks to a novel computational method.</p>
COM-0812	<p>Monitoring multi-variate threshold functions over distributed data streams</p> <p><i>See 'Web Sites and Web Technologies', Page 79</i></p>
COM-1103	<p>Complex barycentric coordinates</p> <p><i>See 'Signal, Audio and Image Processing', Page 73</i></p>
COM-1150	<p>Monitoring threshold functions over multiple nodes in distributed data sets</p> <p><i>See 'Web Sites and Web Technologies', Page 80</i></p>

TECHNION PATENT

DESCRIPTION

Web Sites and Web Technologies

COM-0779

Enriching document representation for information retrieval tasks

Electronic information retrieval became an important part of our daily lives. However, not all of the information that exists in electronic databases is efficiently searchable for the average reader. This novel technology draws on the power of repositories of collective human knowledge and understanding (e.g. Wikipedia) to assist in retrieving documents more efficiently. It can also be used to enable answering questions asked in natural language or carry out categorization and analysis of complex texts.

COM-0812

Monitoring multi-variate threshold functions over distributed data streams

A common requirement in many emerging applications is the ability to process, in real time, a continuous high-volume stream of data. Consequently, data stream monitoring in a distributed system is the focus of much research in recent years. Examples of such applications are sensor networks, real-time analysis of financial data and intrusion detection. We present a novel geometric approach utilizing naive, centralized algorithms for efficient arbitrary threshold functions monitoring over distributed data streams without requiring the very high communication overhead common in other methods.

COM-0913

Protection of copyrighted material on the web

The internet is increasingly becoming a major source for knowledge and information. Search engines and other web sites that provide information invest extensive resources to meet the user's demands. Currently, these efforts result in limited information or may lead to legal disputes. Our technology enables a content provider to provide all information without violation of any law.

COM-0944

XPathL – logical language for integrating relational and XML databases

The joint processing of XML and relational data is of major importance in information and knowledge management. Many database management systems support XML data, which is the de facto standard for data representation and exchange over the web. Our method handles conjunctive queries, comprising relational predicates and external predicates, such as XML predicates. The language can be utilized as a target language for higher level constructs or as an embedded query language.

COM-1067

Maximizing restorable throughput in MPLS networks

MPLS recovery mechanisms algorithms are used by large network operators to assure high QoS in case of failure by pre-establishing backup network paths. Current networks use simple methods for calculating feasible primary and backup paths. However, these paths may not efficiently use the network resources and may block other traffic from being serviced, thereby reducing profitability. Our highly efficient algorithm allows network operators to maximize their revenues by allocating primary and backup paths more efficiently without compromising QoS.

TECHNION PATENT

DESCRIPTION

Web Sites and Web Technologies

COM-1094

Advanced query language for social networks

As online social networks become increasingly popular, the amount of available data is constantly on the rise. Search options for end users, however, have remained limited. Our query language opens up new possibilities for retrieving useful data from these vast databases. This language enables new features not implemented today due to resource limitations, such as retrieving the shortest “acquaintance path” between users under various constraints.

COM-1150

Monitoring threshold functions over multiple nodes in distributed data sets

Various systems and applications perform monitoring of data streams in a distributed environment. Such applications include, for example, sensor networked, distributed web-sites, etc. Existing methods for data stream monitoring require high computational costs when monitoring non-linear functions. They are also limited in the number of distributed nodes and monitored objects. This method employs a novel geometric approach to monitor the data stream at much greater efficiency and with many fewer restrictions.

COM-1197

Social networks interaction protocol

Social network interaction protocol is an automated feature involving intelligent communication between large numbers of participants in social networks. Known implanted features like allow structured communication regarding events, but they are lack a wide range of communication and dissemination options. We managed to expand social network communication opportunities by creating a new generic protocol that can be modified by participants.

COM-1204

Multi-core XML query processing

Multi-core XML processing is a method that allows better processing performance of an XML Twig Pattern query. The known processing method use sequential algorithms that deal with a single query processing, but since modern computers have multi-core processors we managed to optimize the processing performance of a twig pattern XML query by parallelizing two existing sequential algorithms and in this way create new novel and efficient algorithms.



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