Stem Cells and Tissue Engineering

- Using tissue from pigs, Prof. Marcelle Machluf created a "scaffold" that preserves the infrastructure of natural blood vessels and supports human stem cells. The result a rebuilt heart that could be used as a post-heart attack implant. (11/12)

- Prof. Shulamit Levenberg is researching building pancreatic tissue with insulin-secreting cells, surrounded by a three-dimensional network of blood vessels. The engineered tissue could pave the way for improved tissue transplants to treat diabetes. (08/12)

- Prof. Joseph Itskovitz-Eldor and Dr. Ayalet Dar-Oaknin program embryonic and adult stem cells to produce and multiply cells called pericytes, crucial to the formation of healthy blood vessels. The breakthrough could benefit patients struggling to recover from cardiovascular disease, or serious circulatory damage from conditions such as diabetes. (06/12)

- Prof. Lior Gepstein takes skin cells from heart failure patients and reprograms them to transform into healthy, new heart muscle cells capable of integrating with existing heart tissue. The research opens up the prospect of treating heart failure patients with their own, human-induced pluripotent stem cells (hiPSCs) to repair their damaged hearts. (05/12)

- Using skin cells from a patient with an inherited heart disease to help test treatments for that disease, Prof. Lior Gepstein also offers a glimpse at the future of personalized medicine, where a person’s own cells can be used to determine which treatments might work best—or should be avoided—for a particular condition. (01/11)

- The National Institutes of Health (NIH) re-approves for federally funded research four stem cell lines that originated from cells "born" at the Technion-Israel Institute of Technology. The H7, H9, H13 and H14 stem cell lines were derived in collaboration with Prof. Joseph Itskovitz-Eldor of the Faculty of Medicine and Rambam Health Care Campus. (05/10)

- Prof. Lior Gepstein has discovered a way to create beating heart cells using human skin cells reprogrammed to become stem cells. The discovery could make it possible to clinically repair damaged human hearts. (10/09)

- Using cancer cells from an ovarian cancer patient and human embryonic stem cells, Prof. Karl Skorecki and Dr. Mati Tzukerman have created a cancerous tumor in a mouse that mimics the way the tumor would develop in the patient's body. The result is a pre-clinical experimental model for cancer research that could facilitate the development of personalized cancer therapies. (01/09)

- Prof. Shulamit Levenberg and Lior Gepstein use embryonic stem cells to create new heart muscle with a built-in network of blood vessels. According to the researchers, such vascularization would greatly improve the survival of the tissue when transplanted in a human heart. (01/07)
- Prof. Shulamit Levenberg, together with a team from MIT, grew **new muscle complete with its own network of blood vessels in the laboratory, and implanted the new muscle in a living mouse**. The accomplishment is a first for tissue engineering, and could make possible the repair and replacement of damaged muscle tissue when needed. (06/05)

- Dr. Lior Gepstein and colleagues coax embryonic stem cells to develop into heart cells and subsequently into beating heart muscle. They have also demonstrated that heart cells grown from human embryonic stem cells can integrate into the host heart and help regulate its activity, a breakthrough that may lead to the development of a **biological pacemaker** and to using heart cells to repair heart tissue destroyed by heart attacks. (09/04)

- Researchers led by Prof. Joseph Itskovitz-Eldor **induce stem cells to form into blood vessels**. (12/03)

- Prof. Joseph Itzkovitz-Eldor and his team demonstrated the creation of **tendons from stem cells**. These tendons have been successfully implanted in mice. The researchers are learning how to control the length, width and other options in the process, before beginning clinical tests. (04/06)

- Profs. Karl Skorecki and Joseph Itskovitz-Eldor **have grown insulin-secreting cells**, the first step toward a new approach to treating diabetes. (08/01)

- Prof. Joseph Itskovitz-Eldor of the Faculty of Medicine was on the international team that **first discovered the potential of stem cells to form any kind of tissue and pioneered in stem-cell technology**. The breakthrough garnered headlines around the world. (1998)

**Cancer**

- Dr. Maty Tzukerman finds that cancer cells are much more diverse than previously believed, and that they grow and proliferate more robustly in the presence of human cells. The findings could someday lead to the development of **new methods for controlling the growth of cancer**, and perhaps lead to treatments that will **transform cancer from a lethal disease to a chronic, manageable one**, similar to AIDS. (03/12)

- A team led by Prof. Ari Admon and Dr. Michael Bassini Sternberg identified a **new source of blood-derived biomarkers** that could help doctors determine whether a recovering cancer patient has relapsed, and may someday aid in the early detection of a variety of cancers. The technique might also provide a large enough source of information to enable personalized treatment for the disease. (10/10)

- Combining nature and Greek mythology, Prof. Yoav Livney has developed a **tiny “Trojan Horse” system for delivering cancer-fighting drugs**. With this system, the drugs are delivered only once they are inside the cancerous cells, so there is no damage to the healthy cells in the surrounding area. (07/10)

- The use of **bisphosphonates** – drugs already taken by millions of healthy women to prevent bone loss – **for more than one year has been associated with a 29 percent reduction in the risk of postmenopausal breast cancer**, according to a study led by Dr. Gad Rennert. The data helps shed light on a possible new pathway for breast cancer prevention. (12/09)

- An encapsulation breakthrough by Prof. Marcelle Machluf may enable doctors to **deliver anti-cancer drugs directly to tumors over extended periods of time**, while preventing the systemic side effects of chemotherapy and other current cancer treatments. (11/09)
Technion researchers led by Prof. Yoram Reiter have developed a technique that could produce a more effective blend of tumor-fighting immune cells used to treat cancers such as metastatic melanoma. By delving deeper into the underlying properties of these cell blends, called tumor-infiltrating lymphocytes, the researchers developed a technique that could produce a more effective blend of tumor-fighting immune cells used to treat cancers such as metastatic melanoma. (05/09)

Prof. Emeritus Yoram Palti develops NovoTTF, a treatment for the deadly form of brain cancer glioblastoma multiforme. Using 4 electrodes placed on the surface of the patient’s shaved scalp, the system delivers low-intensity, electrical fields called tumor treatment fields (TTFs) to the tumor site. Tumor cells that are dividing and multiplying have unique shapes and electrical characteristics. These make them susceptible to damage when exposed to TTF, which then stops the tumor’s growth. Novocure’s NovoTTF is approved by the FDA, and available for sale in the United States. (04/11)

A team of researchers led by Prof. Yehuda Assaraf discovered new mechanisms developed by cancer cells to become resistant to various chemotherapy drugs. The findings could point the way to new approaches for fighting drug-resistant tumors. (12/05)

Distinguished Profs. Avram Hershko and Aaron Ciechanover were awarded the 2004 Nobel Prize in Chemistry for their discovery of the Ubiquitin system, the body’s process for marking unnecessary proteins for destruction. The anti-cancer drug Velcade that has proven effective against multiple myeloma, is based upon their work, and several other drugs are also in development.

Prof. Israel Vlodavsky and his team have identified an enzyme called heparanase, which is secreted by tumors to attract blood vessels. This process, called angiogenesis, allows the cancer to infiltrate the blood and metastasize around the body. The researchers are working to inhibit the gene responsible for producing heparanse; shutting down that lifeline could be another way to shut down cancer once it begins. (2004)

Technion research has dramatically illustrated how the chemicals in tobacco smoke destroy the protective substances in human saliva – and in fact combine with the saliva to create a corrosive cancer-causing mix. (06/04)

Dr. Yoram Reiter and colleagues test a novel new cancer treatment to eliminate or shrink tumors in laboratory mice. The treatment causes anti-viral T cells – white blood cells that play a large role in the body’s immune response – to recognize tumors as virus-infected cells, and thus attack them. (06/04)

Researchers led by Dr. Gera Neufeld pinpointed the specific protein that makes breast cancer cells invade other tissues. The LOR-1 protein (for lysyl-oxidase-related), causes tumors to spread and also induces the large amounts of collagen fibers that are a hallmark of deadly breast cancers. The team believes that chemicals to inhibit LOR-1 could be developed as possible treatments. (07/03)

Parkinson’s Disease, Alzheimer’s Disease and ALS

Researchers led by Dr. Silvia Mandel identify a biomarker comprised of five genes shown to predict Parkinson's disease with high accuracy. This could help identify high-risk individuals before symptoms develop – a stage where prevention treatment efforts might be expected to have their greatest impact. (06/12)

Ladostigil – a novel compound designed to provide comprehensive medical treatment for Alzheimer's disease – is licensed. Born in the minds and labs of the Technion's Prof. Moussa B.H. Youdim and Hebrew
University Prof. Marta Weinstock-Rosin, the drug in animal studies provided symptomatic anti-Alzheimer's, anti-Parkinson's and anti-depressant activities. (04/10)

- A study by Teva Pharmaceuticals demonstrates that the drug Azilect (which first received FDA approval in 2006) – first developed by Profs. Moussa Youdim and John Finberg – can slow down the progression of Parkinson's disease. The drug first received FDA approval in 2006. (06/08)

- Prof. Yoram Baram has created a virtual reality device that combines auditory and visual feedback to improve walking speed and stride length in patients suffering from Multiple Sclerosis (MS) and Parkinson's. (04/07)

- Prof. Moussa Youdim and colleagues receive patents for three new drugs to treat and perhaps prevent neurodegenerative diseases including Alzheimer's, Parkinson's and ALS. The trio of drugs mop up excess iron before it can trigger a "brain rust" chemical reaction, a hallmark of many neurodegenerative diseases. (11/04)

**Food, Vitamins and Other Nutrients**

- According to a study by Prof. Michael Aviram, combining low-dose statin therapy with pomegranate concentrate in patients with high blood cholesterol may significantly reduce cholesterol levels and hinder oxidation of cholesterol in blood and cells. This helps delay risk factors affecting the onset of atherosclerosis, heart attack and stroke. (01/14)

- Using a natural milk protein called casein, Prof. Yoav Livney creates nanocapsules so tiny that they solve the longstanding problem of how to add nutrients to clear beverages without clouding or effects on taste or appearance. (03/12)

- Dr. Batya Kristal and graduate student Lilach Shema find that pomegranate juice that has safe and monitored potassium content could help prevent complications among kidney disease patients on dialysis. (11/10)

- Prof. Michael Aviram finds that eating dates daily could improve the quality of lipids (fats) in the blood without raising blood sugar levels. (09/09)

- Prof. Andrew Levy demonstrated that dual therapy with vitamin E and statins is shown to be more effective than statin therapy alone (01/08)

- Research by Prof. Andrew Levy identifies 40% of diabetics who would benefit from vitamin E. (11/07)

- Dr. Yoav Livney and colleagues have engineered a way to deliver health-promoting nutrients using protein particles naturally present in milk as carriers. The breakthrough could lead to low fat or non-fat foods that contain nutrients now present only in fat-containing foods, and could be used to enrich foods with other important nutraceuticals like vitamins and antioxidants. (02/07)

- Research by Prof. Michael Aviram shows that pomegranate juice may provide important health benefits for diabetic patients. (08/06)
Biomechanical Engineering

- PillCam – created by Technion graduate-led Given Imaging Company Ltd. – receives **FDA approval as an alternative for patients who are unable to have a complete colonoscopy.** (02/14)

- Using facial recognition software, Prof. Ron Kimmel, a specialist in computer vision, and Prof. Israel Amirav from Bar-Ilan University, have created **an FDA-approved, infant-specific inhalation mask.** The mask even contains a small valve chamber that allows for a pacifier to be suck in the child’s mouth while it is wearing the mask. (08/13)

- Using tiny gold particles and a kind of resin, a team led by Prof. Hossam Haick has discovered how to make **a new kind of flexible sensor that one day could be integrated into electronic skin,** or e-skin. If scientists learn how to attach e-skin to prosthetic limbs, people with amputations might once again be able to feel changes in their environments. (07/13)

- Insightec’s ExAblate, which uses magnetic resonance-guided focused ultrasound **technology to treat uterine fibroids and some forms of painful bone metastases without the need for incisions,** receives FDA post marketing approval. InSightec was founded by Technion alum Jackob (Kobi) Vortman in 1999. (11/12)

- Professor Shy Shoham is testing **the power of holography to artificially stimulate cells in the eye,** with hopes of developing a new strategy for **bionic vision restoration.** (02/13)

- Prof. Dvir Yelin developed **an optical microscope for viewing blood cells that could do away with conventional blood tests.** The device would make it possible to collect vital blood information by simply shining a light through the skin to look directly at the blood. (05/12)

- Dr. Danny Waisman and Prof. Amir Landesberg developed **a device to continuously and systematically monitor the dynamics of premature babies' breathing.** The small, noninvasive device dubbed "Pneumonitor," makes possible the early detection of respiratory problems, allowing for preventative care before the onset of complications. (04/12)

- Technion alumnus Amit Goffer creates **ReWalk, a lightweight, robotic exoskeleton that allows paraplegics to stand, walk, and take stairs themselves.** Worn around the legs and torso, the device works using a combination of motion sensors, electric motors, and a computerized backpack - controlled by a wristband. (12/10)

- Prof. Moshe Shoham develops **a micro robot that can crawl through the human body.** (07/09)

- Prof. Noah Lotan develops **“smart” stents,** used to open blocked blood vessels, that release – based on natural cues – medications **to prevent tissue from growing around stents.** (09/06)

- **A miniature robot for fail-proof spinal surgery** received FDA approval. The brainchild of Mechanical Engineering Professor Moshe Shoham, it offers surgeons improved accuracy while minimizing risks. (FDA-approved 09/04)

- **PillCam, a pill-sized swallowable camera** used around the world, was developed by Technion graduate-led Given Imaging Company Ltd. as a diagnostic tool for the digestive system. (first available in 2001)
Sleep Disorders

- Assistant Prof. Asya Rolls is a pioneer in neuroimmunology, the study of how one’s state of mind impacts the body’s ability to heal itself. She is currently studying the medical impact of sleep deprivation on the immune system. (03/14)

- A study by Dr. Lena Lavie suggests that some heart attack patients may actually benefit if they also suffer from mild to moderate sleep-disordered breathing. (01/13)

- Prof. Peretz Lavie and Dr. Lena Lavie show that elderly patients with moderate sleep apnea live longer than their counterparts in the general population. (03/10)

- Research by Prof. Peretz Lavie suggests that sleep apnea sufferers in their 20s are more likely to die than other age groups. (02/05)

- Renowned sleep disorder expert Prof. Peretz Lavie creates the Sleep Strip disposable sleep apnea/hypoapnea screening device for home use. (12/00)

- Prof. Peretz Lavie and Itamar Medical Ltd. President (and Technion graduate) Israel Schreiber create the Watch-PAT device for monitoring the blood pressure – and identifying cardiovascular problems – of patients with sleep disorders. (04/00)

Miscellaneous

- Sealantis, Ltd., founded in 2010 by Prof. Havazelet Bianco-Peled and the Alfred Mann Institute at the Technion (AMIT), announces positive results from the first clinical trials of Seal-V, a vascular sealant that helps rapidly control bleeding during vascular surgery. (03/14)

- Work by Profs. Eitan Kimmel and Shy Shoham could advance the use of ultrasound to noninvasively unlock the brain’s secrets. This could make possible the creation of new treatments for illnesses, such as epileptic seizures. (01/14)

- Prof. Amit Miller and a team of researchers at the Technion and Boston University have discovered a simple way to control the passage of DNA molecules through nanopore sensors. The breakthrough could lead to low-cost, ultra-fast DNA sequencing that would revolutionize healthcare and biomedical research, and spark major advances in drug development, preventative medicine and personalized medicine. (11/13)

- Prof. Eliezer Shalev leads a team that finds that cells from the amniotic membrane part of the placenta normally discarded after a woman gives birth could one day be a source for human eggs. (01/13)

- Prof. Doron Melamed has discovered a way to reverse the aging process by removing old B lymphocytes (a type of white blood cell in the vertebrate immune system) from old mice, and forcing the production of young, potent cells to replace them. (01/11)

- Researchers led by Prof. Karl Skorecki new genetic data that could be used in the future to predict who will develop end-stage kidney disease (ESKD). ESKD requires dialysis or transplantation to sustain life, and is fatal in most regions of the world, where these treatments are not available. (12/10)
- By modifying the properties of the common antibiotic gentamicin, Dr. Tamar Ben-Yoseph and Prof. Timor Bassov have developed what could become an effective treatment for many human genetic diseases, including cystic fibrosis (CF), Duchenne muscular dystrophy, Usher Syndrome and numerous cancers. (04/09)

- Researchers use a common blood protein used to create a strong, flexible biomaterial to close wounds with minimal scarring and limited rejections by immune system. Prof. Eyal Zussman and Prof. Ari Admon (11/08)

- Technion Lecturer Dr. Carmit Levy, the CEO of startup company Pneumedicare, develops a device for monitoring respiration of premature babies (02/08)

- Gelrin/“Bone glue”, the brainchild of Prof. Dror Seliktar, fuses synthetic and biological materials and greatly speeds bone regeneration. (12/04)

- The research of Prof. Nathan Karin could lead to vaccines against inflammatory autoimmune diseases including rheumatoid arthritis, multiple sclerosis and Crohn’s disease. (10/02)