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# SPINOFF REPORT



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*“Don't always walk on the smooth roads, walk ways that no one has travelled before, so as to leave behind traces and not only dust”*

*Antoine de Saint-Exupéry*



# ABOUT SPINOFF.COM LTD

SPINOFF.COM is the Investment Information System (IIS) which utilizes free of cost AI-engine driven platform and off-line value-added service (VAS) with 25 in-house employees and 24 external professional syndicate members. Our goal is to create the complete portfolio of all the world's high potential scientific spinoffs in one place and provide the scientists with the fastest and the most convenient way of fundraising and identification, evaluation and signing distributors and partners. With over 5,000 publications per year, SPINOFF.COM is the largest platform that connects over 600 universities and research organizations with over 30,000 investors (venture capitals - VC, private equity companies - PE, family offices – FO, and multi-national corporations - MNC) and over 200,000 distributors globally. Also, over 2 million visitors use our multichannel platform monthly. SPINOFF.COM is incorporated as Ltd. (Limited) and is non-for-profit organization.

IIS AI engine automatically receives information and updates from over 600 universities and science organizations (e.g. NASA, European Space Agency, Indian Space Research Organisation) on daily basis as the first step. The second step - this information is classified according to the industry and is passed on to the related specialists in Science Department. Utilizing advanced AI driven engine spinoff evaluation system and in particular cases, external AI engines of SAS AI, SmartPLS, SPSS, each spinoff passes evaluation of commercial potential by our industry specialists leaving only spinoffs with the potential to be successfully commercialized. The third step: the spinoffs are passed to the team of professional journalists, which prepares the interview with the focus on information relevant for investors and distributors, sign necessary agreements (e.g. NDA), supply with additional documentation (e.g. technology due diligence, financial plan etc.). If needed, our Design Department prepares additional visual materials or upgrades the existing ones to the spinoff's portfolio (as VAS). Upon approval from spinoff founder, this information is uploaded to the IIS. In last step Investment and Syndication specialists help spinoff founder with Fundraising and Distribution Network Development.

*Sincerely yours, SPINOFF.COM Team*

## 1 – Products

- 8 Portable autorefractor measures refractive errors of the eye
- 12 eyeHand is the power in your hand
- 24 The glass changes color using light-scattering nanoparticles
- 28 The brand-new elastic silicone for future electronic devices
- 32 Live breathable material based on Japanese natto cells
- 36 Toothpaste helps to reduce sensitivity and teeth decay
- 40 SugarBeat offers affordable glucose measurement without needle
- 44 Buoy takes control of household water use
- 48 Surgical Glue was created from Arion Phosphorus Slug Slime
- 52 Animal-free dairy products
- 57 The device for weight loss
- 61 Smart Bottle gets rid of contaminants
- 65 Better meat, better world
- 70 The energy from renewable sources
- 81 Compressed Sensing: a Paradigm Shift in MRI
- 85 The Rayvolt electric bike
- 98 CMOS technology for digital dental imaging
- 103 The brand-new treatment of periodontitis
- 107 State of the art vibration monitoring system
- 111 Bridging the gap between wearables and healthcare
- 115 AbStats is the new vital sign
- 120 Hoversurf gives you the freedom to fly
- 134 Warka Water is the solution to potable water
- 148 Evoware's products
- 161 Medical Cannabis

## 2 – Technology

- 180 Nima sensor can detect gluten
- 185 Holostream tech allows high-quality wireless 3-D video calls
- 189 Optical T-sensor could be used in manufacturing and biomedicine
- 194 Building miniature optical antennas using DNA as a guide
- 198 Inexpensive nanofoam catalysts will help to receive hydrogen from water
- 203 3-D printed hair and fur
- 208 Brand-new technology for defrosting biomaterial
- 213 Carbon fibre from plants instead of petroleum
- 218 Acoustic blood test will replace tissue biopsies
- 222 A new class of metamaterials is able to shrink when heated
- 226 4D printing technology has memory
- 230 Soybean nitrogen breakthrough can help solve the hunger problem

- 234 Scientists have used modern materials to create artificial muscles
- 238 Ultrasonic diagnosis for the analysis of cancer cells and bacteria in the intestine
- 243 Cheap paper test for malaria and cancer
- 247 The subcutaneous drug dispenser activates the medication at the right time
- 252 The brand-new OpenSLS system prints vessels from biomaterials
- 256 The fastest DNA motor for diagnosing diseases
- 261 The first-ever computer chip integrated with biology on a molecular level
- 266 Scientists have printed blood vessels by 3D bioprinter
- 270 Acoustic tweezers for disease determination
- 275 The anti-obesity drug deblocks and accelerates metabolism
- 279 A sensor-capsule for measuring temperature and heart rate
- 283 Water desalination using shock waves
- 288 A vaccine, which will overcome herpes
- 293 MRI will be able to detect malignant tumors without biopsy
- 297 The drug treats a rare hereditary disease of the retina
- 302 Heal is your family doctor
- 307 Drug delivery per an hour
- 311 Reorder lenses without the doctor's visit
- 316 Monitor Varroa

### 3 – Prototypes

- 322 The heart can be 3D-printed from own cells
- 326 Cultured cell products, ingredients and clean meat
- 338 A car that flies, a plane that drives
- 352 A portable and solar energy socket is charged on the window
- 356 Cellulose fiber SCOBY is a good alternative to the skin
- 361 Stem Cell Factory to fight various diseases
- 365 CityAirbus is the brand-new and eco-friendly urban mobility
- 370 Exercise prescriptions to keep the brain sharp
- 375 Ring Garden, which desalinates water
- 379 A new type of comfort
- 383 BabelOn is synthesis of speech and language
- 387 Atacama is the new standard in moisture-controlled apparel
- 392 The first compact all-electric VTOL jet
- 404 It is fun to go fast

### 4 – Research

- 410 The millirobot is intended to transport medication
- 415 Asthma attacks research could change the lives of the 300 million people
- 419 Lyndra formulations transform the daily pill into a weekly or monthly dose
- 424 New species of bacteria from scratch in the lab
- 428 Manipulating mitochondria cells reduce developing age-related diseases
- 432 Kymriah therapy treats patients with non-Hodgkin's lymphoma

- 436 Origami Robot for removing extraneous objects from stomach
- 440 Painkillers from snail venom will become the alternative to opioids
- 444 New immunotherapy therapy for curing food allergies
- 448 The nano-drug for the liver cancer
- 452 Solar photocells which are thinner than hair and lighter than a soap bubble
- 456 Scientists have found the cause of immune diseases
- 461 PolyMOC is the gel which has a hardness of metal
- 465 Synthetic biology regulates plant characteristics using gene chains
- 469 Cold plasma cures the non-healing wounds and rejuvenates the cells
- 474 'Quantum radio' will increase the signal reception area where GPS doesn't work
- 478 Scientists have developed a vaccine against rhinovirus
- 483 Nanoparticles will stop the destruction of joints
- 488 Curing colon cancer without harmful side effects
- 492 Reducing the risk of disease and improving the health of newborns
- 496 CancerLocator determines the type and location of cancer by blood analysis
- 501 The light will solve the problems of quantum communication
- 505 The decision of the infertility problem
- 509 Reliable detection of cancer
- 514 SkinTE is the skin regeneration
- 518 The world free of age-related disease

## 5 – Others

- 524 The next generation of ultra-efficient electronic devices and batteries
- 529 Candid is the smile you want
- 533 iLet is a fully integrated bionic pancreas
- 537 Siren smart diabetic socks monitor foot temperature

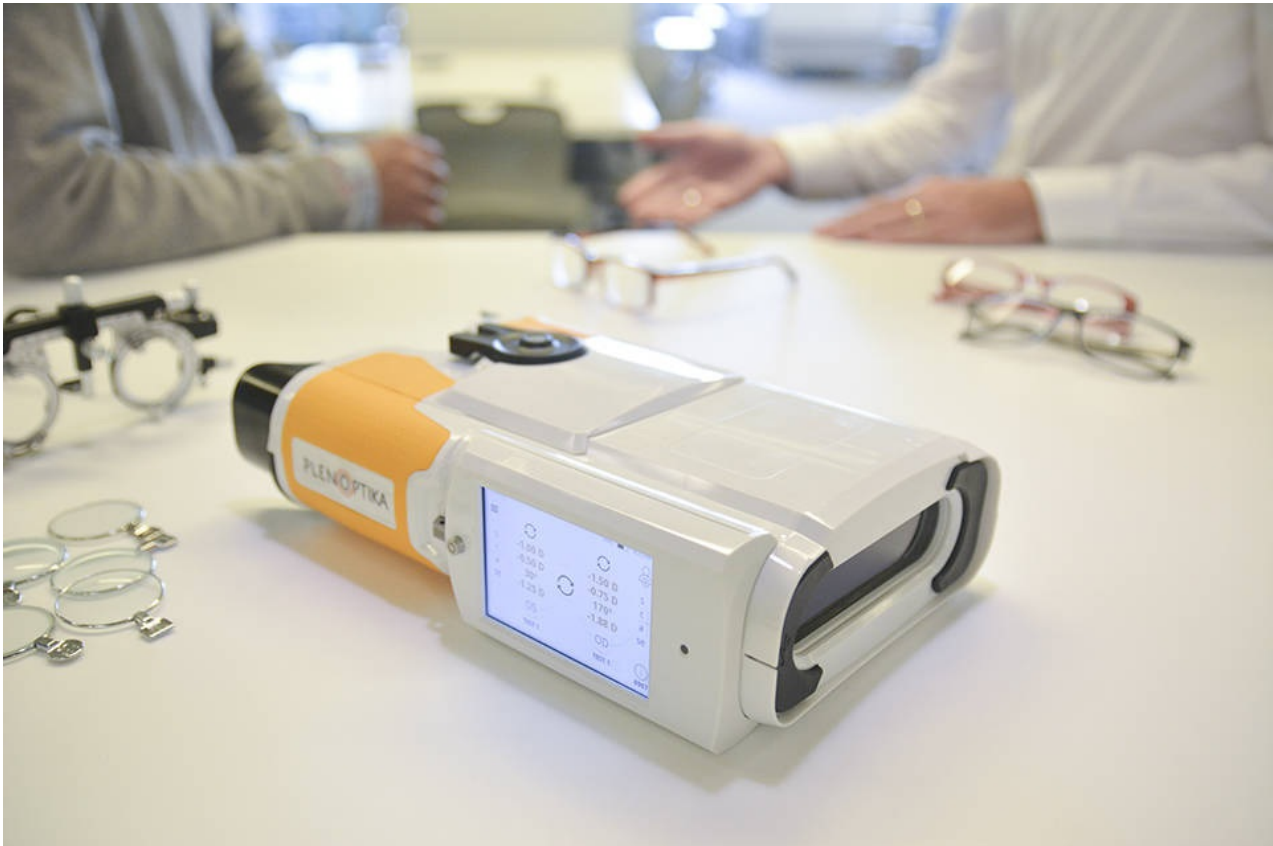
# PRODUCTS



## PORTABLE AUTOREFRACTOR MEASURES REFRACTIVE ERRORS OF THE EYE

Spinoff which provides accurate eye exams in 10 seconds was created by the MIT medtech PlenOptika. This company spun out from the Massachusetts Institute of Technology and the Madrid–MIT M+Visión Consortium. One of the main problems associated with human health is visual impairment. More than **2 billion people around the world do not have access to corrective lenses**. For example, in developing countries, it is not always possible to obtain a prescription for glasses. This is due to the fact that optometrists are in urban centers, and residents from rural areas do not always find the time to visit a doctor, so many people suffer from uncorrected violations.

According to the World Health Organization, the poor vision can lead to a deterioration in the quality of life, learning difficulties and loss of employment opportunities and finance. However, Spinoff [PlenOptika](#) from [Massachusetts Institute of Technology](#) is aimed to overcome this problem with the help of a high-precision portable autorefractor. This device measures the refractive error of the eye and gives estimated recipes after 10 seconds. In addition, it is more accessible than modern technology, with the ability to reach patients in previously inaccessible areas of developing countries.



QuickSee measures the refractive error of the eye and gives estimated recipes after 10 seconds  
source - [plenoptika.com](http://plenoptika.com)

Scientists called this device [QuickSee](#). This device passed 6 years of development, 8 iterations of products and several clinical studies, which involved about 1500 people from 5 different countries. Currently, the device appeared on the market in India.

Typically, doctors for vision testing use desktop, heavy autorefractors, which can cost up to \$ 15,000. They detect reflections from the infrared light and thus determine the size and shape of the ring in the back of the eye. [As for the QuickSee](#), it works on a modified version of the wavefront aberrometer. Light shines into the eye, is reflected from the retina, and then measured after it passes through the lens and the cornea of the eye. With

its help, it is easy to determine myopia, hyperopia, and astigmatism. In addition, this method is more accurate than the traditional technology of autorefraction and allows for more accurate eye diagnostics.



This method is more accurate than the traditional technology  
source - [plenoptika.com](http://plenoptika.com)

According to [Shivang Dave](#), Founder and CEO of PlenOptika, Inc., QuickSee looks like a binocular. Patients look at the object at a distance through binoculars. After about 10 seconds, a preliminary estimate is displayed on the display screen. The binocular model is able to measure both eyes simultaneously. The price of this device is lower by a third of the price than on traditional autorefractors. Manufacturers are going to sell it mainly in the US. For India and other developing countries, PlenOptika has developed a monocular version for measuring one eye at a time, providing equally accurate measurements, but costing less than half the price of a binocular version. [Currently, PlenOptika is focused on increasing production for its primary and secondary markets.](#)



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Patent status: +  
On market since: +  
Source links: [PlenOptika, Ink.](#)



# EYEHAND IS THE POWE IN YOUR HAND

Exclusive interview for SPINOFF.COM with Mr. Bryan Davis, eyeCam, Inc. CEO, about eyeHand, which is a handheld smartphone leading the evolution of smart devices

eyeCam is an innovation company developing early stage products for licensing and acquisition. eyeCam investors receive a combination of stock in eyeCam, Inc. and a revenue interest in the licensing and sale of all eyeCam products and companies. eyeCam believes in providing an opportunity in which everyone can participate in the innovation process. The future of human interfacing has arrived and eyeCam innovations make it natural and boundless. The technology adapts in real-time to any surface and turns your hand and fingers into a touchscreen display, 3D mouse, and controller. eyeHand™ the power is in your hand.



eyeCam is pioneering wearable computing products, applications and services that free users entirely from handheld phones beginning with eyeHand The Wearable Smartphone photo provided by eyeCam, Inc.

**SOC:** Dear Mr. Davis, we are so grateful for your generosity this day in spending time speaking with us and sharing your insights about eyeHand project.

**Mr. Davis:** [eyeCam](#) is pioneering wearable computing products, applications, and services that free users entirely from handheld phones beginning with eyeHand The Wearable Smartphone. **eyeHand turns the hand and fingers into a touchscreen display, 3D mouse, and controller, biometric key, wallet and IoT command center.**

eyeHand's adaptive display, 3D interfacing, and biometric ID systems are the building

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blocks for the future of wearables and the Internet. eyeCam is raising a Series A round of financing to build the prototype of eyeHand.

**SOC:** Our investors and we would like to learn more about a vast experience of your academic endeavors and your professional background.

**Mr. Davis:** Each of the core members of eyeCam's team has managed their own companies and collectively have brought hundreds of new products to market. eyeCam's corporate partners include leading engineering, business, marketing, finance, legal and intellectual property firms.

**SOC:** Considering your tremendous experience, we would like to know whether you had other projects? Could you please share the story of their creation and success.

**Mr. Davis:** eyeCam is developing the intellectual property for a portfolio of products from wearable smartphones to an adaptive display, 3D interfacing, biometrics, operating, networking and intelligence systems.

**SOC:** It is so interesting to know more about the process of your technology creation. Please tell on which stage of commercialization your technology currently is? Was your project funded by any state financing or grants? Has it already received any honors or awards?

**Mr. Davis:** eyeCam began developing the intellectual property for wearable smartphones in 2010 and our innovations continue to stay several generations ahead of anything else on the market. eyeCam has raised over \$3.5 million in private equity to develop our IP portfolio and eyeCam is presently raising a \$10 million round of financing to build the prototype of eyeHand and position our first product portfolio for licensing and acquisition.



eyeHand turns the hand and fingers into a touchscreen display, 3D mouse, and controller, biometric key, wallet and IoT command center

photo provided by eyeCam, Inc.

**SOC:** In the formation of every scientific spinoff, one of the most important keys to success is the team. For many potential investors, the management team is the most important element in deciding whether to invest in it or not. Could you please share some information about the team members who supported you and the project? What are the key additions to the team needed in the short term?

**Mr. Davis:** I am CEO of eyeCam, Inc., an entrepreneur, inventor, business and technology leader with 25 granted and pending patents and the co-founder of multiple companies; **Walt Maclay**, CTO, has over 30 years of management experience in custom electronics design for manufacture and has applied his leadership to many startups; **James Fisher**, Chief Product Designer, is an award winning product designer - from 3D modeling animation and patent illustration to hardware and software integration; **Tom McCullough**, Director of Business Development, has over 20 years of management and sales experience as CEO of Instant Mobile Solutions and head of sales at FS Studio; **Jonathan Salzedo**, Chief Software Engineer, is a mathematician and musician fluent in multiple computer languages and has decades of software engineering experience. These are just a few of the extraordinary team members that have partnered with us in building eyeCam



**SOC:** It is not a secret that the development of a new technology and its subsequent commercialization presupposes some problem and addresses unmet needs. Respectively, what problem did you intend to solve by creating your technology? What results did you plan to achieve?

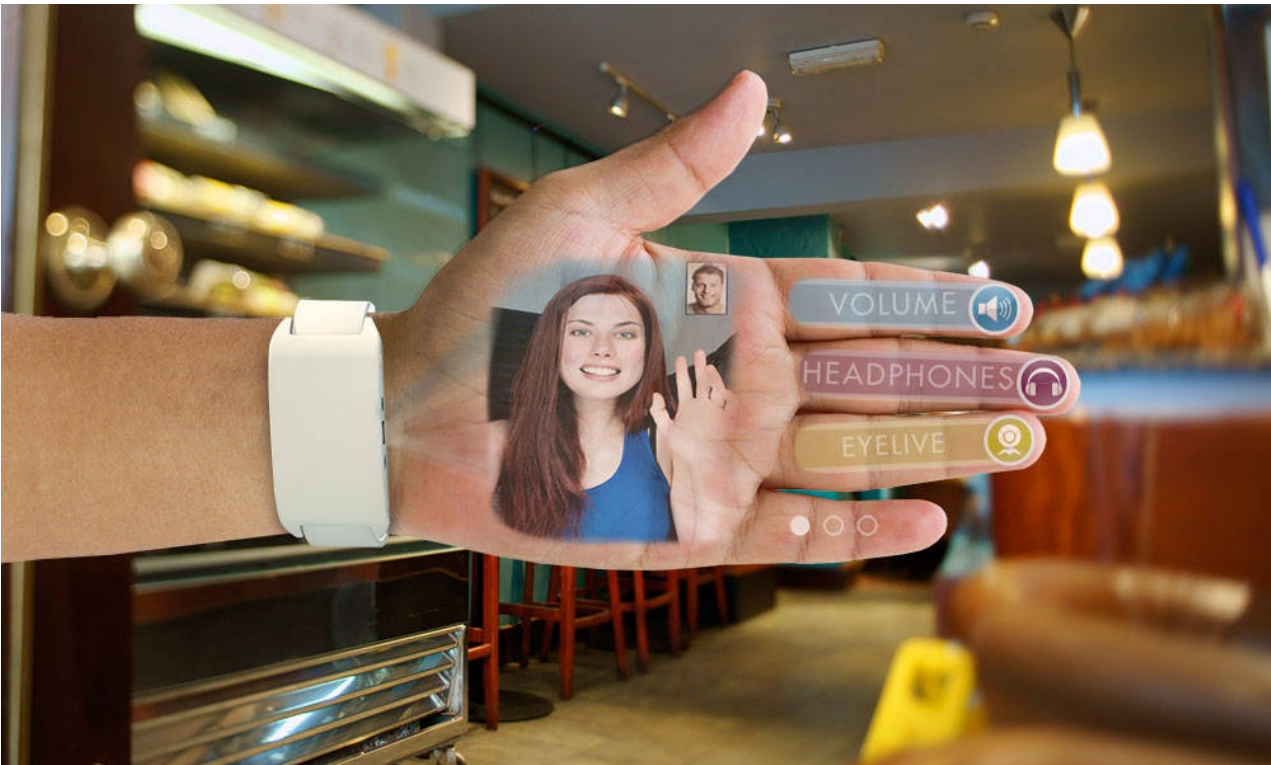
**Mr. Davis:** Today's Internet is primarily a 2-dimensional platform with websites and applications viewed on square screens and flat surfaces and controlled with a computer mouse or touchscreen interface, The future of the Internet is in three and four-dimensions where websites, interfaces, and applications are designed for AR /VR and Mixed Reality computing environments. eyeCam is designing the devices and human interfacing systems that will drive the future of the Internet and the Internet of Things.

**SOC:** The problem which you targeted to solve was actual before. Probably someone has already tried to solve it. Is it right? Understanding the unique selling points from the investor's side could make the technology N° 1 for them. What are the unique selling points of your technology and fundamental difference from other technologies that tried to solve this problem before you?

**Mr. Davis:** eyeCam has been developing our Intellectual property for almost 10 years and we were the first to file on the eyeHand Wearable Smartphone products and systems. With 20 granted patents and many more pending and in development, anyone entering the wearable smartphone and adaptive display space will need to license or acquire the intellectual property from eyeCam.

**SOC:** In order to understand the peculiarities of this particular spinoff our investors always ask what is the investment structure of the company? Do you still own the controlling stake in your spinoff?

**Mr. Davis:** eyeCam develops all of our products for licensing and acquisition. eyeCam investors receive a revenue interest in the licensing and sale of all eyeCam products. With over 50 products in the pipeline, eyeCam offers an unparalleled opportunity for investors.



eyeCam is designing multiple systems and methods for adapting a display and graphic user interface to any device, vehicle or surface

photo provided by eyeCam, Inc.

**SOC:** We wonder what is the actual addressable market currently for your invention and what are the current competitors there? Could you please share with us the results of the market studies, if there are any? What might be the barriers to entry?

**Mr. Davis:** The combined wearable market is valued at over **\$835 billion dollars**, and by **2030** wearable smartphones are projected to replace handheld phones and **grow to 70%** of the smartphone market representing a trillion dollar industry - ABI Research.

eyeCam's IP is a powerful barrier to entry – **strong IP provides strong protection for all of our developing products**. We provide other companies the building block technologies they need to introduce their own future products.

**SOC:** We always need to paint a clear picture to the potential investors of the market opportunity of the spinoff that is meaningfully large and growing. Why in your opinion your company might have a high growth potential? Could you tell us all current industries and fields of your technology/product application and where do you think it could be successfully applied in the future?

**Mr. Davis:** Wearable Markets by Industry are **Business & Finance:** \$100 billion dollar market by 2019, growing at 59% per annum (PWC); **Sports & Fitness:** \$32 billion dollar market by 2019, growing at 26% per annum (IHS & PWC); **Medical & Health:** \$58 billion dollar market by 2020, growing at 25% per annum (BCC & PWC); **Home & Living:** \$39 billion dollar market by 2022, growing at 18% per annum (Bus. Wire & PWC); **Vehicles & Transportation:** \$34 billion dollar market by 2022, growing at 55% per annum (PWC).

These are just a few of the rapidly growing markets and industries that eyeCam's products and technologies are being designed for integration.

**SOC:** The potential investors will be curious whether you already have the first clients and signed contracts? What was the feedback from your partner's markers and customers?

**Mr. Davis:** eyeCam has multiple contracts in place with our development partners and we are currently in discussion with companies interested in our products and intellectual property.

**SOC:** We both know that for you and the investor it is crucial to reach positive cash flow as soon as possible. Certainly, the market scaling cannot be achieved without proper distributors network and clients. Please tell us about your criteria of partners selection and which markets are open for spinoff activity.

**Mr. Davis:** eyeCam has built a fantastic ecosystem of corporate partnerships from design and engineering to business, finance, legal and intellectual property development.

**SOC:** It is very important to understand your particular vision about unique features of your company. Why do you consider the major market players might be interested in investing into a promotion of your technology/product on the addressable market?

**Mr. Davis:** The eyeHand Adaptive Display, 3D Interfacing, and Biometric ID Systems are boundless, not limited to a square screen or flat surface and able to customize to a users hand, fingers, body and surrounding objects and environment and freeing users entirely from handheld phones. eyeCam is designing multiple systems and methods for adapting a display and graphic user interface to any device, vehicle or surface offering unlimited



opportunities for OEM's, ISP's and application developers to increase the addressable market for their products and operating systems.



**SOC:** Now we would like to refer to the next very crucial and we would even say essential aspect for spinoff companies' as the strategy of R&D, production, distribution and marketing processes. Do you have your own unique strategy? Which of these processes do you consider your spinoff is strong at?

**Mr. Davis:** The eyeHand Wearable Smartphone systems are being developed for integration into generations of devices and applications from wearables and mobile computing, home entertainment and security to businesses, financial platforms, medical facilities, vehicles and transportation systems.

**SOC:** As a rule, the majority of spinoffs outgrow into exits. How do you determine the market for your product/technology and estimate its volume and dynamics? What is your potential share on the market? How do you think what market cap your company plans to reach at the peak of its development and why? How long might this process take?

**Mr. Davis:** All of eyeCam's products and technologies are being developed for licensing

and acquisition. [eyeCam projects our first major technology transaction in the next 18 - 24 months.](#)

**SOC:** For spinoff companies their intellectual property is a key to success. The investors pay particular attention to it. What key intellectual property does your company have (patents, patents pending, copyrights, trade secrets, trademarks, domain names)?

**Mr. Davis:** eyeCam has [20 granted patents, 15 pending, 50 in preparation](#) and much more in the pipeline across all of our product portfolios. eyeCam also has multiple copyrights, trademarks and domain names.

**SOC:** For both of us, as well as for thousands successful spinoffers, it's not a secret that a new technological breakthrough may become obsolete very fast. Respectively, patent validity period becomes shorter. It is interesting to know the perspectives and protection plan of your technological advancement and leadership in a medium- and long-term prospectives

**Mr. Davis:** [All 20 of eyeCam's patents](#) were issued [in the last 3 years](#) with a majority issued in [2017](#). We are constantly innovating, expanding our IP portfolio and introducing new products. eyeCam is an engine of innovation. We are designing the devices and systems that will drive the future of the Internet and the Internet of Things.

**SOC:** The investors will want to get a clear picture of how many rounds of investments have you completed? Are you seeking for the investments at the moment? What is the volume and time limits? What milestones will the financing get you to? What did you plan to use the invested funds for?

**Mr. Davis:** eyeCam [raised a \\$3.5 million](#) seed round of financing from private investors and [we just launched our \\$10 million Series A round of financing](#) to build the prototype of eyeHand.



The future of the Internet is in three and four-dimensions where websites, interfaces, and applications are designed for AR /VR and Mixed Reality computing environments  
photo provided by eyeCam, Inc.

**SOC:** Could you please describe your ideal investor? What aspects are important for you, for instance, is it experience, country, the amount of own private capital or maybe some personal qualities? Will existing investors participate in the round?

**Mr. Davis:** eyeCam is an early stage company developing early stage products and technologies. That is what we do. **eyeCam is seeking investors who want to invest in innovation, intellectual property and prototype development.** Our purpose is to provide everyone with the opportunity to participate and profit from innovation.

**SOC:** And the last question, could you specify the most convenient way you would like to receive inquiries from potential investors? Should it be by e-mail or personal phone call?

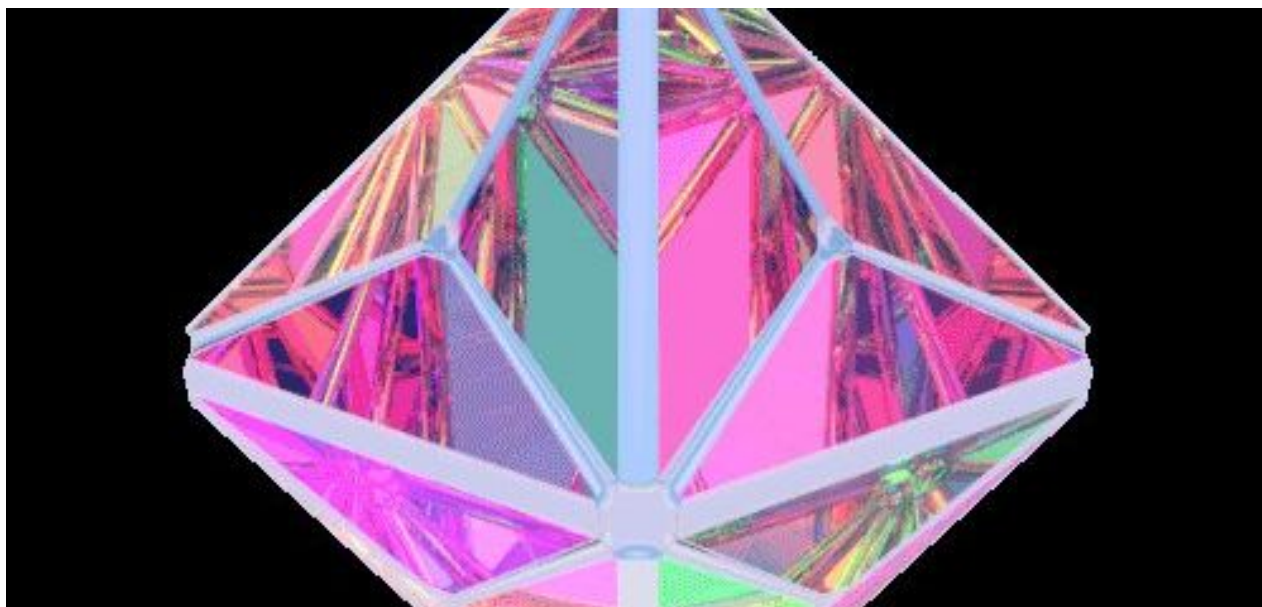
**Mr. Davis:** Investors can visit our [WeFunder campaign](#) or can reach out to us via e-mail at [investors@eyehand.com](mailto:investors@eyehand.com).

We would like to express gratitude for the time you have dedicated to this interview.

SPINOFF.COM will be pleased to support your project and to share the interview on your eyeHand with all potential partners and investors

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**Patent status:** eyeCam has 20 granted patents, 15 pendin...  
**On market since:** still in R&D  
**Regions:** United States  
**Industries:** Others  
**Source links:** [eyeCam, Inc.](#)

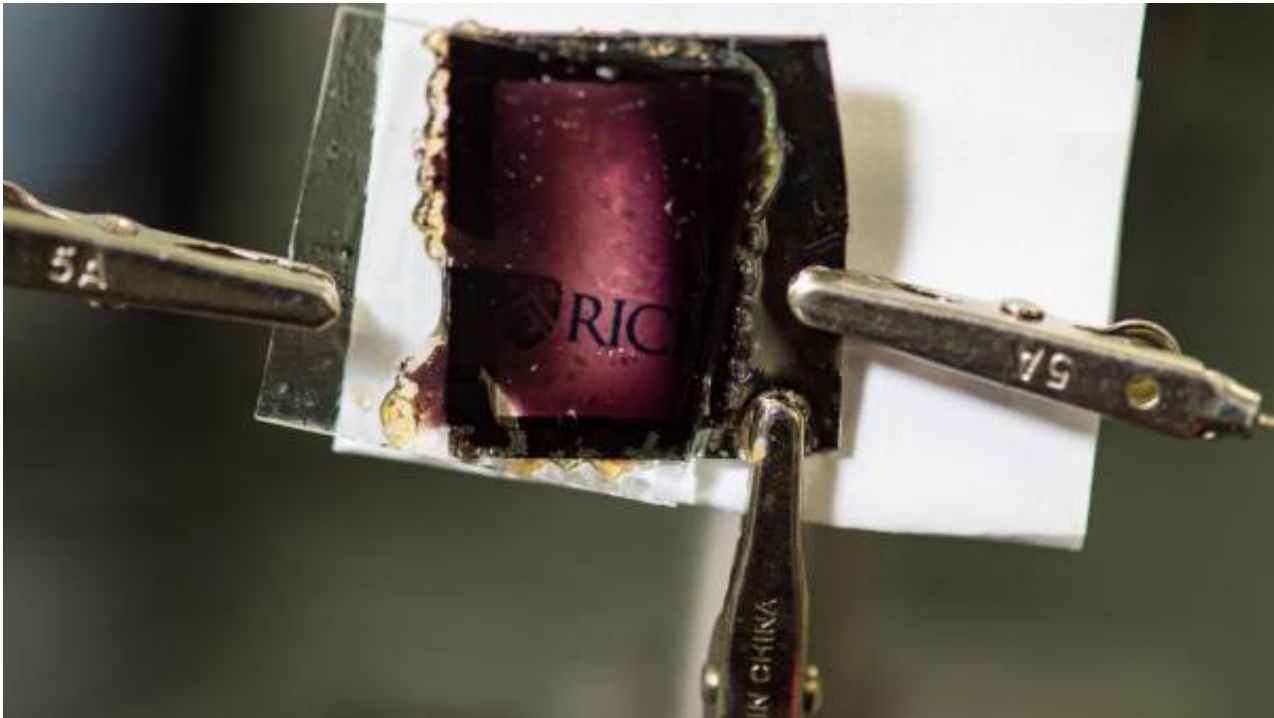




## THE GLASS CHANGES COLOR USING LIGHT-SCATTERING NANOPARTICLES

The glass, which allows the creation of full-color displays using light-scattering nanoparticles, was invented by scientists from the University of Rice. The research of Professor Christy Landes and other scientists from Rice University allows engineers to use standard switching technologies to create color screens from pairs of nanoparticles that scatter different colors of the spectrum. These studies can also expand the color palette for companies in the fast-growing market of glass windows, which change color when the electrical switch is clicked.

For centuries, manufacturers of light scattering glass used gold particles to produce a rich red color. The new Professor Christy Landes method includes metallic nanoparticles that absorb light and convert it into plasmons, waves of electrons flowing like liquid over the surface of particles. Each plasmon dissipates and absorbs a certain frequency of light, and even minute changes shift this frequency. The larger this shift is, the greater the difference between the observed colors.



The glass, which allows the creation of full-color displays

source - [chemistry.rice.edu](http://chemistry.rice.edu)

The difference between these methods is that it is now possible to create or remove chemical bridges simply by supplying or disconnecting the voltage. This is the first method that has passed the test, which creates significant and reversible color changes on objects created from radiation-activated nanoparticles.

When scientists put charges on the molecules or remove charges from them, the color begins to change from clear to very bright color. Scientists laid these molecules between the panes, and they made glass very similar to the window. However, this window has its own specifics. It changes to different types of colors depending on the voltage. Also, scientists note that the color glass LANP has colors that depend on the polarity, which means that the positive voltage produces one color, and the negative voltage creates a different color.

The addition and removal of an electron from a neutral perylene give an anion and a cation, respectively, with various electronic structures. When excited by visible light, the anion and cation form two unique molecular plasmon resonances, each of which has its own color significant voltage.

One of the obstacles in the electrochromic devices industry is the creation of a window that can be clear in one state and completely black in the other. However, [Rice University](#) scientists intended to do this and found a combination of PAHs that did not have visible light at zero voltage and almost all visible light at low voltage. The glass, which changes color due to stress, is called "electrochromic". This project took almost two years. This discovery is essential for the development of active plasmonic devices like switches and modulators, as well as an important tool for quantum theorists studying quantum plasmons.

The research was supported by [the Robert A. Welch Foundation](#). Demand for light and heat-shielding properties of such glass is growing. It is estimated that annual electrochromic glass market will be valued at more than **2.5 billion dollars in 2020**.



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**Contact person:** Christy Landes

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**Website:** <http://chemistry.rice.edu>

**Phone:** +17133484232

**Patent status:** -

**On market since:** -

**Regions:** United States

**Industries:** Manufacturing

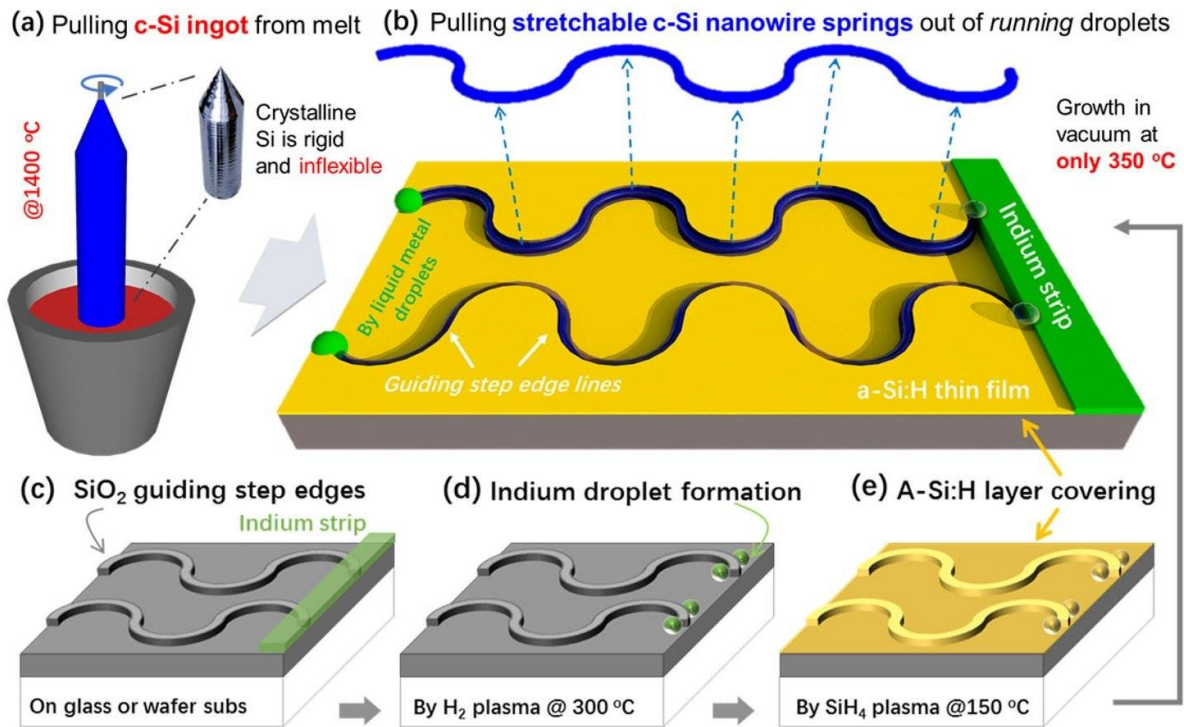
**Source links:** [Rice lab News](#)



## THE BRAND-NEW ELASTIC SILICONE FOR FUTURE ELECTRONIC DEVICES

Elastic silicon, which stretches twice its original size while maintaining electrical characteristics, was created by specialists from the University of Nanjing, Beijing and the French Polytechnic School. Generally, silicon is a hard and brittle material and it does not have a natural elasticity. Previously, scientists used electron-beam lithography to study on the production of stretching silicon. However, this method is expensive and inexpedient for large area electronics. Nevertheless, in a new study, the researchers demonstrated that amorphous silicon can be grown into superelastic nanoscopic horseshoes, which can stretch more than twice their original length while retaining their excellent electrical properties.

**Elastic silicon** can form the basis of semiconductor materials for the flexible electronics of the future, which until now has been made of polymers and organic semiconductors, inferior in their semiconductive properties to silicon. In the past, scientists have made attempts to create flexible silicon nanowires, but the method of electron-beam lithography, which they used, is too expensive and impractical for making electronics.



The growth of stretchable silicon nanowires  
source -nju.edu.cn

The new method, proposed by the French-Chinese group of scientists, resembles a **crystal hood** widely used in the silicon industry. As a rule, a seed crystal is immersed in molten silicon and slowly stretches upward, dragging along silicon ingot. Only this time the indium particles move along a trajectory covered with amorphous silicon. As a result, crystalline silicon nanowires are obtained. Thus, according to scientists, the method of stretching the crystals used to grow ingots of silicon crystals from molten silicon, in the future will be an ideal and relatively inexpensive way of creating stretchable silicon nanowires.

From the point of view of a future application, this method of production can become extremely cheap and scalable. At the output, it will be possible to obtain reliable, elastic silicon channels with good performance. **Such electronics can be used in medical and**

portable sensors, mechanical devices, field effect transistors and nanoelectromechanical systems.



Elastic silicon can form the basis of semiconductor materials  
source -nju.edu.cn

The researchers already have a definite plan for future production. In the future, they plan to investigate the methods of transferring silicon nanosprints from a growing substrate to a softer surface, more practical for use. In general, they expect that the growth method demonstrated here represents an important step towards the development of high-performance, expandable silicon electronics.

According to [Linwei Yu](#), the researcher from the Nanjing University, their vision is to identify a new technology that meets the needs of large-capacity electronics that offers mass-produced, durable and expandable crystalline silicon channels to provide good performance in emerging soft electronics. Their latest progress has demonstrated a complete autonomous network of such silicon springs. They will be placed on sensors, as well as mechanical devices, field devices, and NEMS. They hope that these new results will soon appear in the world.

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**Patent status:** -  
**On market since:** -  
**Regions:** France, China  
**Industries:** Electronics  
**Source links:** [Nanjing University](#)



## LIVE BREATHABLE MATERIAL BASED ON JAPANESE NATTO CELLS

Live breathable material based on Japanese natto cells was developed by scientists from the Tangible Group Media Massachusetts Institute of Technology. A few thousand years ago, *Bacillus Subtilis* natto was discovered. This is the microorganism lived inside the dry rice stems, which were woven into bags for transporting soybeans. Traditionally, natto is also used in bean-based dishes in Japan and has recently become part of the non-melt ice cream recipe. A few years after this discovery, a new behavior of ancient bacteria was discovered.

Scientists have established expansion and reduction of natto-cells relative to atmospheric moisture.



[BioLogic](#) has developed a new form of material that combines live materials and textile design. Ultimately, BioLogic develops live drives and reacts to a biosync. At the head of the project are a group of scientists from [Tangible Media in MIT Media Lab](#). In the course of the study, they collaborate with [the MIT Chemical Engineering department](#) and [the Royal College of Art and the New Balance](#). Team members come from all walks of life, including design, art, science, and technology.



BioLogic combines live materials and textile design  
source - [morphingmatter.cs.cmu.edu](http://morphingmatter.cs.cmu.edu)

According to the scientific team, Bio is a new interface, they imagine a world in which drives and sensors can be grown and not produced, being derived from nature, rather than by factory engineers. Thus, scientists have developed a "bioskin" that is a "living" material and it reacts to the sweat and heating of the human body. "Second skin" is made of natto cells, which are enlarged and compressed under the influence of atmospheric humidity. If a person in this "second skin" becomes hot or sweats, the material diverges and opens small holes in clothing that let in air. This is due to the specific behavior of the bacteria [Bacillus subtilis natto](#).

Thanks to this knowledge, scientists built bacteria into the tissue for ventilation of clothing.

The institute team has grown natto cells and, through biological printing, created a kind of flakes from them. The alignment of cells according to a certain scheme allows programming them for a certain "behavior" - for example, they can unfold when heated.

According to [Professor Hiroshi Ishii](#), who guided the team, they started their activity on studying the bacteria, because they knew that in nature there are many clever materials that naturally react to even minor changes in temperature and skin condition. Therefore, scientists believe that the transformable textile on the skin will become a really interesting invention.

Their main goal is to make physical materials more intelligent and more adaptive for people needs and make the physical environment the part of people life. This clothing will understand when a person sweats. Consequently, the clothes will open to release sweat or it will close to save a body warm. Scientists want to create clothes which will become like an interface that can communicate with the body.

The material can also be used for flowers (they can blossom and fade), for a "live" tea leaf, which will blossom, signaling the readiness of the tea, and for the lampshade that will move and sway from the bulb's heating. The general idea is not only how people can be inspired by nature, but also how we can cooperate with nature.

[The team of scientists continues to experiment with the application of the material.](#) For example, small heating elements can be added to it, which will control the material remotely. On the other hand, scientists will be able to add a substance that will change not only the shape of the material but also its color.



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**Patent status:** -

**On market since:** -

**Regions:** Japan

**Industries:** Biotechnology

**Source links:** [The Tangible Group Media Massachusetts Institute of Technology](#)  
[Morphing Matter Lab](#)



## TOOTHPASTE HELPS TO REDUCE SENSITIVITY AND TEETH DECAY

Toothpaste, which contains bioactive glass in its composition and favorably affecting the restoration of damaged teeth, was developed by the Queen Mary's University of London. Scientists at the University of London have developed bioactive glass, which, when disintegrating, releases fluoride, forming a chemical that mimics the mineral composition of teeth and bones.

Most people believe that glass is a chemically stable and inert substance. This opinion is quite true for those types of glass that are used to make windows - they obviously do not dissolve during the rain. However, a group of scientists has developed a "bioactive" glass, which they plan to add to the toothpaste to protect damaged teeth from damage.

Researchers have already created such a version of bioactive glass, which, dissolving, releases fluoride, forming a chemical that mimics the mineral composition of teeth and bones. Putting this glass in the toothpaste and fillings, they were able to make up for the lack of minerals in the damaged teeth.



Toothpaste, which contains bioactive glass

The study gave the opportunity to the scientists explained in detail the advantages of using chlorine, instead of fluorine, in the "bioactive" glass. The atoms and ions of chlorine are much larger, which allows placing a much more active substance in the glass composition.

[BioMin Technologies Ltd](#) was founded to commercialize research conducted at [the University of Queen Mary in London](#) and [Imperial College in London](#) to develop biologically active materials, as well as to reduce tooth sensitivity.

The company has already launched the first line of products created using the technology of chlorine-containing glass - the remineralized toothpaste BioMinC. It is intended for people who do not want to use toothpaste with fluoride, or for residents of those regions where water is already sufficiently fluorinated.

Currently, the company created two kinds of toothpaste. This is **BioMin F and BioMin C**. The first toothpaste provides Lower Fluoride content with Long Lasting performance. The action lasts up to 12 hours. The paste slowly opens up ions of calcium, phosphate, and fluoride. These ions combine with the formation of fluorapatite. As a result, they help to reduce the risk of tooth decay, sensitivity, and acid erosion. The second paste appeared relatively recently on the market, namely in the fall of 2017. It is a daily paste Fluoride free. This paste slowly opens up the mineral ions, but there are no fluorides in this paste. BioMin C protects teeth leaving the mouth clean and fresh.

According to Professor Robert Hill of the Queen Mary's Dentistry Institute, this toothpaste is unique in that it can compensate for the loss of minerals after a person drank a drink with a high acid content without using fluoride. This is useful not only for people with aching teeth. Everyone can feel the benefits of a new toothpaste.

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**On market since:** 2015

**Regions:** United Kingdom

**Industries:** Healthcare

**Source links:** [BioMin Technologies Ltd](#)

[Queen Mary University of London](#)



## SUGARBEAT OFFERS AFFORDABLE GLUCOSE MEASUREMENT WITHOUT NEEDLE

SugarBEAT is the clever patch, which continuously measures blood glucose level was developed by Nemaura Medical. The main goal of Nemaura Medical is to gain control over the acutest health problems. The founder of this company is Dr. Faz Chowdhury. He is Masters of Microsystems and Nanotechnology from Cranfield University, UK, and a Ph.D. from Oxford University for the delivery of nano-drugs. According to Dr. Faz Chowdhury, their technology is convenient for the patient, as it works without needles and monitors health status, providing individual feedback on glucose, lactate and other indicators. The company conducted research with the participation of 160 patients to confirm the effectiveness of this device.



The British spinoff [Nemaura Medical](#) received official permission from the European Union to sell SugarBEAT, a blood glucose monitoring system in patients with diabetes. The kit includes a disposable patch for each day and a special sensor that attaches to the plaster. Along with the wireless sensor device SugarBEAT, Nemaura also successfully developed and tested the corresponding application for the mobile phone SugarBEAT. This application is connected via Bluetooth to the glucose sensor and continuously displays the glucose readings, and also reflects the trends in the level of sugar in the blood.



SugarBEAT measures blood glucose  
source - [sugarbeat.com](http://sugarbeat.com)

SugarBEAT determines the level of sugar in the blood 3 times better than other existing devices. This will allow diabetics who use this device to detect even small fluctuations in the level of glucose in the blood. The device will provide a non-invasive and flexible way to effectively manage blood sugar levels for diabetics.

The patch can be glued to the arm, leg or stomach. It consists of a disposable glue patch skin that is connected to a rechargeable transmitter, while the application displays glucose readings. Each subsequent patch requires conducting a blood test on the finger to

calibrate the system and then the patch warms up for half an hour. After that, the electronic sensor will collect glucose data every 5 minutes for 24 hours and send them to the phone. Information can be sent to the doctor or family members.



SugarBEAT will be sold at affordable prices  
source - [sugarbeat.com](http://sugarbeat.com)

According to [Dr. Faz Chowdhury](#), CEO of Nemaura Medical, Ink. SugarBEAT technology is a more flexible way for people who suffer from diabetes to control glucose levels. Because users can choose which days to wear the patch. A person can continuously wear it for 7 to 14 days.

According to the company, the device will be sold at affordable prices, as it has a non-invasive design and inexpensive consumables. The low cost of the device will make non-invasive glucose monitoring more accessible, especially for patients with diabetes who do not use insulin. The appearance of this device on the market is expected in early 2018 in the UK. Sales in the US will begin somewhat later after the certification process is completed with the FDA.

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**On market since:** -  
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**Industries:** Healthcare  
**Source links:** [The Cranfield University](#)  
[The Oxford University](#)  
[SugarBEAT](#)  
[Nemauro Medical Inc.](#)



## BUOY TAKES CONTROL OF HOUSEHOLD WATER USE

The Buoy device which monitors water flow and instantly signals about broken pipes have been developed by Buoy Labs, Ink. Buoy Labs is located in California. The team of this company consists of technologists, innovators, and scientists. They are sure that they can not improve, that they can not measure. However, their new device can measure the amount of water consumption, so they can have a real and measurable impact on how we use and think about water.

The company [Buoy Labs](#) has created a device, which will help control how much water person spend daily. This device is an intelligent keg, which provides monitoring domestic water. It connects to the water line and captures the data, calculating how much water flows through them. Then transmits this data to the user in real time, showing the amount of water, which was spent on taking the shower, washing dishes, sink drain, and washing.



Buoy monitors water flow  
source - buoy.ai

The device not only analyzes the use of water, it also warns of water leakage, allowing remote shutdown of water. According to the report of [the US Environmental Protection Agency](#), even because of small leaks, **10% of water is lost**. In addition, if earlier this item of expenditure was not the most significant, then **since 2010**, water tariffs have increased by **41%**. A study by the [University of Michigan](#) said that **36%** of the population would soon be billed for water. Buoy helps to reduce its use to **20%**.

Tracking how much water you used per day, the device sends data to the company's servers. There, with the help of machine learning, this information is processed and displayed in the application. Moreover, if the pipe burst, the device sends a notification to the owners, and with it, you can immediately cut off the water. This makes Buoy especially useful for those who have several properties at once.

This device is very easy to use the device. It is enough to perform three steps. The first stage is installation and connecting. When the buoy is connected to the water supply line, its sensors begin to search for even the smallest water use. The second stage is analysis. The buoy automatically classifies the use of water so that the user can analyze the data with ease. The device will inform you of the water used via Wi-Fi. The last stage is a remote water control system. It is easy to control the use of water being away from home.

This device has received several awards. The first award is the Fast Company Design Award. Buoy's device was recognized as the most innovative design solution for complex business tasks and received an honorable mention in the nomination "[Innovation by Design Awards](#)". The device also won gold at the [Edison Design Awards](#) in New York in 2017. Buoy was recognized as the best new product in this highly competitive class. Buoy just went on sale and costs \$ 799. The device is suitable for any private house and for those multi-apartment, where water is served separately in each apartment.



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**On market since:** 2017  
**Regions:** United States  
**Industries:** Electronics, Water  
**Source links:** [Buoy Labs, Inc.](#)



## **SURGICAL GLUE WAS CREATED FROM ARION PHOSPHORUS SLUG SLIME**

Elastic surgical glue, which capable of tightening a wound on the skin or organs without seams and staples was developed by [the](#) Wyss Institute for Biologically Inspired Engineering and the Harvard John A. Paulson School of Engineering and Applied Sciences.

Surgeons have been already applying seams and staples to wounds and incisions for decades, but these methods have drawbacks. Firstly, the seams, especially on internal organs, are a long and expensive procedure. Secondly, staples cannot be used everywhere, and they cause tissue damage, which can lead to infection. Thirdly, both these methods are not waterproof and create a scar that is more rigid than the fabric, which in time can cause a repeated call to the doctor.

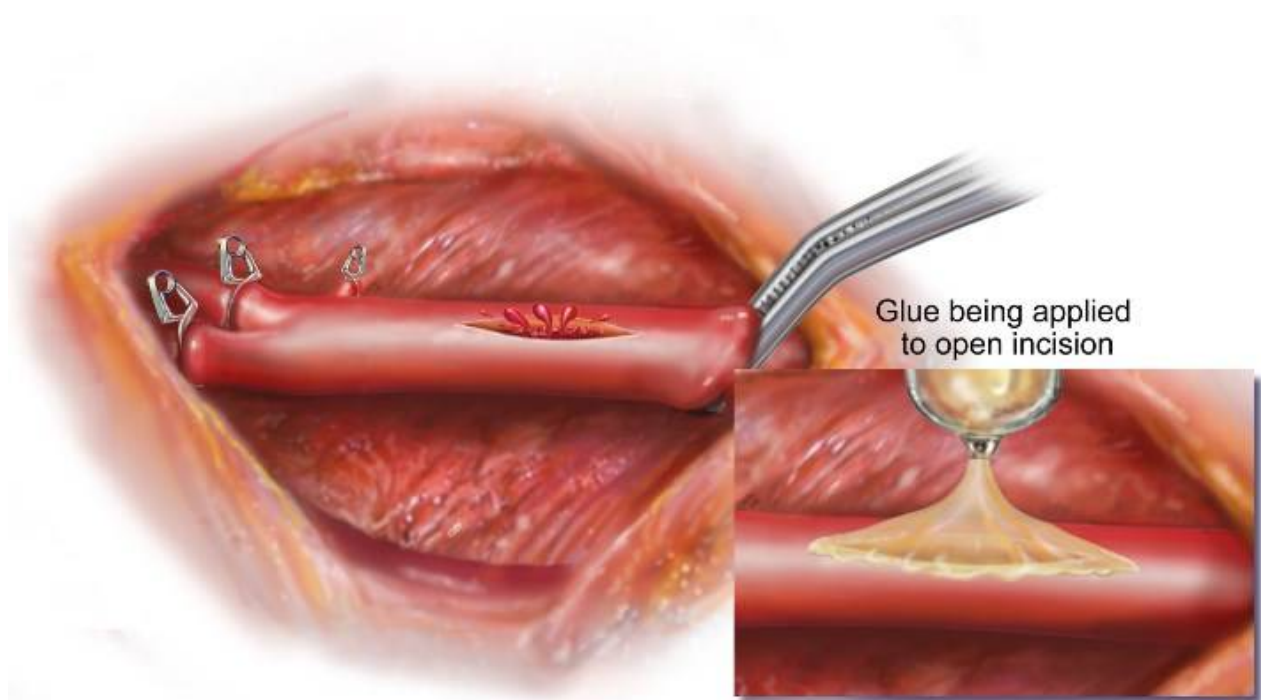


Medical bio-glue inspired by slugs  
source - [mooneylab.seas.harvard.edu/](http://mooneylab.seas.harvard.edu/)

Researchers hoping to find the best solution that's why they turned to nature, in particular, to the dark slugs *Arion Phosphorus* and their elastic protective mucus. This substance, a multicomponent musk glue that allows the animal to adhere to the surface and retain it on it, is 97% water and contains two interrelated polymers with the total positively and negatively charged groups of proteins. Taking this slime for the sample, the scientists created a dissipative hydrogel with polymers bound both ionically and covalently, with the total negative charge and a connecting polymer that contains the binding reagents with the total positive charge.

As a result, the researchers obtained an adhesive substance that provides a strong contact of surfaces and is able to stretch without breaks. Having tested the glue, they found that the new material adapts and firmly adheres to the skin, cartilage and arteries,

closes openings in the tissues of the heart and stops bleeding in the damaged liver.



Elastic surgical glue

source - [mooneylab.seas.harvard.edu/](http://mooneylab.seas.harvard.edu/)

A team of scientists has already conducted a series of studies on pigs. The results obtained were positive, the glue is effective not only for gluing pig's skin but also for cartilage, heart, artery and liver tissue. Its effectiveness is much higher than that of a number of currently available adhesives. Unlike commonly used medical superglues or cyanoacrylates, they did not form strong bonds immediately but instead showed a rapid increase in adhesion over time. According to the team, this glue will prove useful when it comes to handling and repositioning. During the study, on the heart of an injured pig that was covered with blood, it was found that the glue works even on a damp, curved, moving surface. Moreover, based on the results of the study, scientists confidently state that the adhesives were not harmful or toxic to cells.

According to [Dave Mooney, Ph.D.](#), the author of the study, the development of new adhesives was exciting. Since research has shown that, the properties of mucus inspire the development of new adhesives. In addition, most importantly, these adhesives have significantly superior properties for currently available medical adhesives.

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On market since: -  
Regions: United States  
Industries: Others

Source links:

[the Harvard John A. Paulson School of Engineering and Applied Sciences](#)

[the Wyss Institute for Biologically Inspired Engineering](#)

[Mooney Lab](#)



## ANIMAL-FREE DAIRY PRODUCTS

Perfect Day spinoff strives to offer the buyer an imitation of livestock products. This company was created by bioengineers Ryan Pandya and Perumal Gandhi.



The company came up with a completely new way of making milk proteins that contain nutritious proteins like in cow's milk, but without using animal milk. The founders of the company called the company [Perfect Day, Ink.](#), not by chance. According to scientists, cows that give milk and listen to soothing music, such as Lou Reed's "Perfect Day" song, are calmer, happier and produce more milk.

The idea of synthetic milk from the creators of the company has appeared for a long time. They had a common passion for cheese and this passion quickly evolved into a company that aims to produce the most delicious non-alcoholic dairy products. In 2014, we decided to assemble a diverse team of chefs, food designers, nutritionists, scientists, engineers.



Perfect Day milk

source - [perfectdayfoods.com](http://perfectdayfoods.com)

Scientists use such method of preparation as much the method of making beer. The recipe is based on the yeast strain, which the creators call Buttercup. Yeast is fed with sugars. During the cooking of the Perfect Day, lactose-free vitamins, minerals, and proteins such as casein and whey proteins are added, which are no different from those found in cow's milk. And, as result, the production of such milk does not pollute the environment.

Food yeast was genetically modified so that microorganisms began producing milk proteins, including casein, lactoglobulin, and lactalbumin. The resulting product,

according to company representatives, has the most properties of cow's milk.

According to the company's founders, a minor gene modification of yeast DNA makes it possible to make "milk" for people with an allergy to lactose, casein and other proteins. The company believes that its technology can be the basis for creating imitations of many dairy products. Thus, Perfect Day, Ink does not plan to stop only on milk. The company plans to produce its own lactose-free yogurts and cheeses.



Production of Perfect Day milk  
source - [perfectdayfoods.com](http://perfectdayfoods.com)

According to Ryan Pandey, there are popular types of cheeses, such as mozzarella and cheddar, and there are expensive refined cheeses that are served with wine. Therefore, they aim to produce both kinds of cheese, and they are confident that they can do it.

Crafting dairy proteins without cows means they can do more with less energy consumption, land usage, greenhouse gas emissions, and water consumption. Perfect Day, Ink. is interested in cooperation with food giants and they have the optimistic attitude about their future production. The first aim of this company is to force out substitutes for dairy products based on vegetable proteins.

The company also intends to compete with farmers. They want to change the system and stop relying on industrial farming. The company has already raised \$ 4 million in financing. Perfect Day, Ink. is planning to present the first product by the end of 2017.

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Regions: United States  
Industries: Others

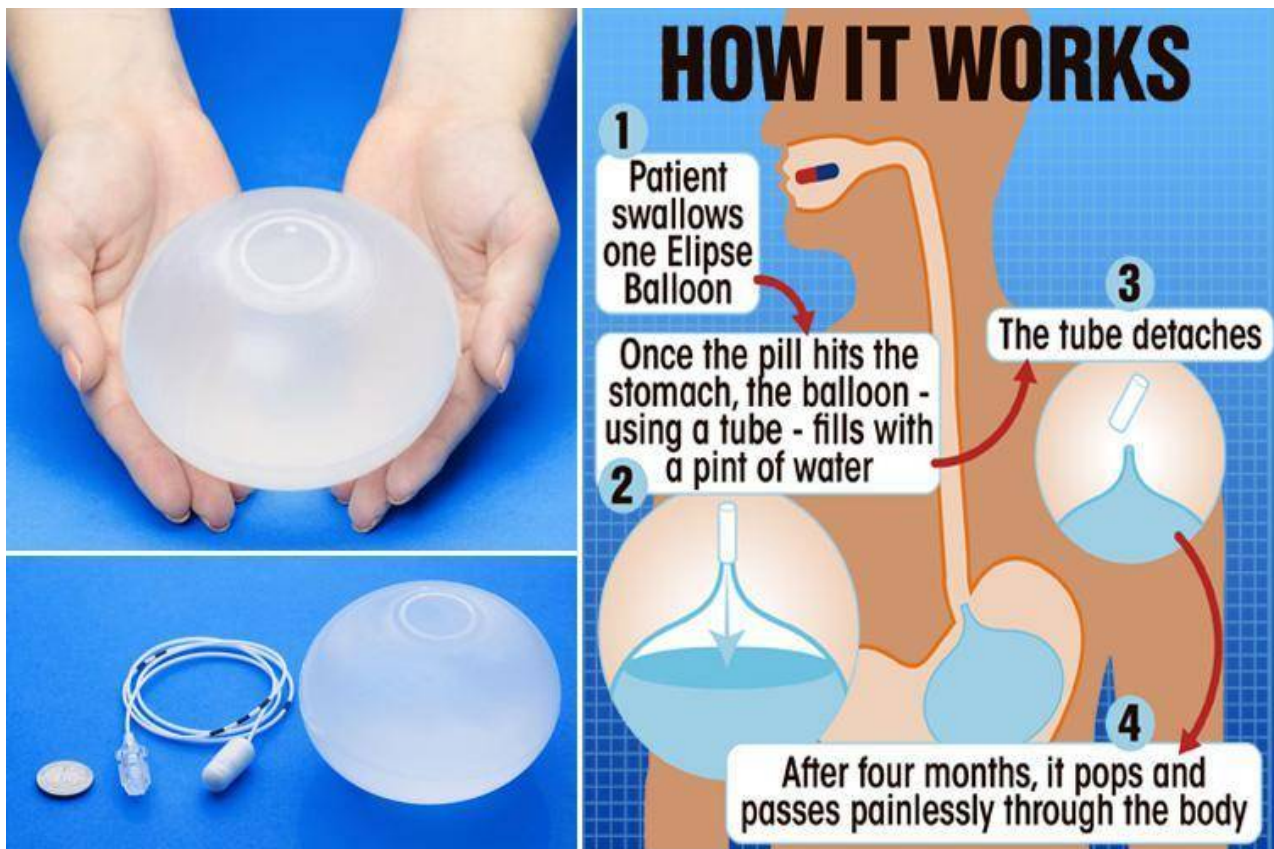


## THE DEVICE FOR WEIGHT LOSS

The pill Elipse Balloon, which fills the inside of the stomach and reduces the feeling of hunger in obese people. This pill was developed by the Boston company Allurion.

The pill in the stomach has the form of an unstructured gastric bladder. [The Elipse](#) fills the stomach and helps a person to feel full, so a person uses less food. According to scientists, this ball is swallowed by the patient during a visit to the doctor and through the months he goes out into the toilet. This balloon is able to prevent gastric bypass surgery and surgery.

Therefore, the pill is used for people suffering from overweight and obesity. It is considered to be a safe and effective tool for weight loss.



How The Elipse Balloon works  
source - allurion.com

As is known, intragastric balloons are already used in medicine, but the procedure for inserting a silicone bubble usually requires anesthesia and qualified medical staff. Endoscopic balloons are effective, but they have limitations. Restrictions are that the endoscopic procedure is expensive. They also require special endoscopic preparation and anesthesia. And after a few months, the patient needs to return and pull out this balloon. If the ball is not pulled out from the patient's stomach then it can sink into the intestines and create inflammation of the intestine.



Therefore, according to scientists, the pill Allurion is much more convenient, because this pill has the advantage. The balloon that forms in the stomach from the Elipse Balloon pill does not require endoscopy or anesthesia. In addition, the Elipse balloon is able to inflate in 15 minutes in the stomach and it will be kept there for 6 months or as long as it takes to get rid of excess weight. The balloon is designed for self-emptying and safe passage through the gastrointestinal tract.

A randomized trial was recently conducted. After 6 months of balloon therapy in combination with diet and exercise counseling, obese people lost 14.4 kg. Thus, gastric balloons are a revolutionary new method for treating overweight and obese people with a body mass index of more than 27 kg / m<sup>2</sup>.

Simplicity in use reduces the risk of postoperative complications and the cost of the procedure itself. The price of half a year of treatment using Allurion technology is about \$ 5000.

According to Shantan Gaur, one of the founders of the pill Elipse Balloon, obesity is one of the biggest problems facing our healthcare. Therefore, there are not so many ways to deal with it, it's either diet and exercise, or surgery. Therefore, they decided that it would be beneficial for consumers to have a product that would serve as something middle between proper nutrition with training and surgical intervention.

Elipse tablets are already sold in Europe, where it is easier to get permission to use pills than in the US. But the company hopes to get approval from the FDA and plans to undergo clinical trials next year to enter the US market. The company has already received \$ 56 M of the investments.

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On market since: 2016  
Regions: United States  
Industries: Healthcare, Others  
Source links: [Allurion](#)



## SMART BOTTLE GETS RID OF CONTAMINANTS

The bottle that analyzes the quality of water and instantly cleans it due to built-in filters. Spinoff was developed by the American company Ecomo. The Ecomo team consists of environmental engineers, electrical engineers, mechanical engineering specialists, software development specialists, business development specialists.

Smart Bottle is the first smart bottle, analyzes the water poured into it for analyzing contaminants, after which the water turns into a perfectly clean and safe drink. The bottle has three sectors. The first is a water storage tank. The second sector is a filter that is built into the reservoir. In addition, the third sector is an indicator of water quality and a wearable device. The indicator shows the results of testing and monitors the amount of liquid drunk by its owner.

The "smart bottle" filter has an Activated Carbon Fiber, Ion Exchange Fiber, and Nanofiber Membrane. Thanks to them, the filter is able to remove most of the obscuring substances, such as chlorine, pharmaceuticals, pesticides, oil, lead, mercury, copper, cadmium, as well as bacteria and cysts.



The bottle that analyzes the quality of water  
source - [ecomio.io](http://ecomio.io)

Use this bottle is very simple. Firstly, you need to pour water into the bottle and shake it. Then the water gets to the test device. This device determines the quality of water, and then the result is displayed on the screen. If the water is contaminated, then you need to turn the filter, which will clear it of harmful impurities, and then water can be drunk.

The company's main goal is to make clean water affordable for everyone and reduce the use of plastic bottles. This will lead to the protection of public health and the environment.

According to the Ecomo company, a person can save about 228 plastic bottles for 3 months.

Together with the bottle, you can use the activity tracker. It will help to calculate the user's needs for hydration and warn about poor water quality. A person can also track the result of filtering using Apple Watch and FitBit. The additional advantage of this bottle is that it notifies the user when it is time to change the filter. According to Eric Li, CEO of Ecomo, the weight of a bottle is 13 ounces, its volume is 20 oz. The filter can be used for 2-3 months. Filter price 10 \$.

The company has several patents for their product. These are the patents for a water quality analysis system, a 3-in-1 filtration system, an invention for water safety warnings, as well bottle design.

On the company's website, it is already possible to pre-order a "smart bottle". Currently, the site presents nine color options, including white, golden, pink, blue and purple. The price of pre-order is \$ 129. The company launched a campaign to raise funds for the platform Kickstarter and Indiegogo in autumn 2016. The company raised \$ 453,107 on the first platform, and \$ 638,871 on the second one.

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**Regions:** United States  
**Industries:** Creative Industries, Others  
**Source links:** [Indiegogo](#)  
[Kickstarter](#)  
<http://www.ecomio.io/>



## BETTER MEAT, BETTER WORLD

The world's first technology to create chicken and duck meat in the laboratory was developed by the American spinoff Memphis Meats. This company is founded by Uma Valeti, a researcher of stem cells.



Memphis Meats is in San Francisco, its history began with the idea of taking care of the environment. Since today's way of producing meat causes problems, which link with the environment, and also causes damage to animal health and human health.

Their goal was to create a bioproduct that could feed the world. According to statistics date, world consumers spend about \$ 1 trillion on meat in a year, and demand for meat continues growing. It is expected to grow in 2 times in the coming decades. Therefore, Memphis Meats decided to develop a completely new way of producing meat, which bypasses the need to breed and kill real animals. **They began to grow meat from animal cells.**



Memphis Meats  
source - [memphismeats.com](http://memphismeats.com)

As a result, they received, on the one hand, very tasty meat, and on the other - a product that is better suited to the environment, animals and people, and will reduce the amount of greenhouse gas, land and water emissions. Growing chicken and duck meat in laboratory conditions require several processes. First of all, Memphis Meats team put the bird cells in the bioreactor, through which the cells receive oxygen, sugar, minerals and other nutrients. Then begins the process of cell division and growth, which eventually leads to the formation of the meat structure.

According to Nicholas Genovese, one of the founders of the company, which is a vegetarian for several years, when he first tried a piece of laboratory meat, he was amazed. Because the taste and texture of laboratory meat do not differ from ordinary meat. The only difference is that it is more porous and elastic.



Memphis Meats  
source - memphismeats.com

At the moment, the main problem of laboratory production is its cost. According to the company, the cost price of 500 g of laboratory meat is \$ 9,000. Memphis Meats is not only involved in the production of chicken and duck meat. They also make meatballs in laboratory condition. The cost of a laboratory meatball is \$ 18,000 per pound.

According to forecasts for 2011, there will appear more free place on the land due to the cultivation of meat in laboratories. Because places, which currently uses for the production steaks, sausages, and other this kind of products, will be unclaimed. In addition, this will lead to a decrease in water consumption by 90%. The most important thing is that a pound of laboratory meat will produce several times less polluting emissions than that meat, which is produced by poultry, cows, and pigs. However, now the products from the test tube can not appear on the market because of their cost. Despite that, the company is looking for a way to reduce the cost of artificial meat. The Memphis Meats company plans to significantly reduce production costs and launch the product on the market in 2021.

Memphis Meats attracted \$ 17 M in round A, the other round brought them \$ 22 M. The company is promising to arrange a revolution in the meat market, which in the US is estimated at \$ 48 billion per year.

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**Regions:** United States  
**Industries:** Food and Drink, Others  
**Source links:** [Memphis Meats](#)  
[Indiegogo](#)



# THE ENERGY FROM RENEWABLE SOURCES

Exclusive interview for [SPINOFF.COM](https://www.spinoff.com) with Mr. Atanas Hristov, Hydrosyst Ltd, CEO&Founder, about Biomass Power Plant, which uses biomass sources for producing electricity from renewable sources

Biomass Power Plant 500 kW produces electricity from renewable sources. It was developed by Professor Nenkov and Professor Ivanov of the Technical University of Sofia. Biomass Power Plant belongs to Atanas Hristov, Hydrosyst Ltd, CEO&Founder. This project is responsible for saving the environment and future generations. Therefore this company has been engaged in the scheduling and engineering of renewable energy. The only way to protect our living environment and our general living conditions is a sustainable energy awareness and the use of an innovative technology. Biomass Power Plant of Hydrosyst Ltd focusses on these problems and offers the vision of renewable energy.

SOC: Dear Mr. Hristov, we are so grateful for your generosity this day in spending time speaking with us and sharing your insights about Biomass Power Plant 500 kW project.

Mr. Hristov: We are the earliest explorers in the production of generators with permanent magnets. They used for the production of energy from renewable sources. Our main aim is wind and hydro energy, geothermal sources, and some industrial applications such as cogeneration, reciprocating engine and combustion turbines powered by natural gas and bioethanol.

SOC: Our investors and we would like to learn more about a vast experience of your academic endeavors and your professional/scientific background.

Mr. Hristov: My education is connected with the economic sphere. However, my main professional education is the sphere of biotechnology. I started my first company in 1994. I have been running my own companies for 23 years. Currently, I am the owner of Humidist company. In addition, I also have extensive experience in building power plants from wind and water.

SOC: Considering your tremendous experience, we would like to know whether you had other projects? Could you please share the story of their creation and success.

Mr. Hristov: Currently, we do not have other projects. All our attention focuses on the Biomass Power Plant 500 kW that will work entirely on rapeseed oil. This project was has been started by [Hydrosyst Ltd.](#)

SOC: It is so interesting to know more about the process of your technology/product creation. Please tell at which stage of commercialization your technology/product currently is?

SOC: In the formation of every scientific spinoff, one of the most important keys to success is the team. For many potential investors, the management team is the most important element in deciding whether to invest in it or not. Could you please share some information about the team members who supported you and



the project? What are the key additions to the team needed in the short term?

**Mr. Hristov:** The Biomass Power Plant is in the prototype stage. We need investment to launch our project in the life. We have not received any funding for the project yet. However, we offer the investment opportunity to investors. Through investing in Biomass Power Plant, investors will receive a well-provided-for bond with ownership over the already built Biomass Power Plant. Meanwhile, investors will receive the annual interest rate of 8,0% over investment.



Hydosyst Ltd. products  
photo provided - Atanas Hristov

**Mr. Hristov:** For the realization of the project are engaged Professor Nenkov and Professor Ivanov of [the Technical University of Sofia](#).

**Professor Nenkov** graduated from the Faculty of Mechanical Engineering in the town of VIMMESS - Rousse (now - [Angel Kanchev University of Ruse](#)), being a high school graduate in 1964. Since 1966 he has been an assistant in machine drawing and machine elements in the University of Sofia. In 1975 he defended a dissertation at the Moscow Stanco-Instrumental Institute. Since 1976 he has been an associate professor of machine elements in the University of Sofia, and in 1996 he has been elected professor on the basis of 140 scientific papers - an asset that is unusually high for technical circles. As a professor at the [Technical University of Sofia](#), Prof. P. Nenkov has read lectures and exercises on machine drawing, machine elements, lifting machines and engineering. He was the scientific supervisor of six Ph.D. students. For 2 mandates (8 years) he is a member of the SNA on



mechanical technologies and transport. Prof. P. Nenov has published more than 180 scientific papers, including a monograph on gears and more than 30 teaching and methodological tools. He has participated in numerous scientific conferences in Bulgaria and abroad (Germany, Denmark, Belarus, Russia, France, Serbia, USA, etc.). Prof. P. Nenov is continuously involved in the construction of new machinery and equipment in the industry.

Prof. Ivanov is the author of about 150 scientific publications, leader, and participant in more than 90 research and engineering contracts in the country. Participates in international research projects of [UNIDO](#), [NATO](#), [CEEPUS](#), [TEMPUS](#), [EU](#), and others. on topics in the field of technologies for utilization of solid fuels, reduction of emissions of sulfur and nitrogen oxides, improvement of the quality of the educational process for energy engineering specialties, etc. His inventions are "Automatic Control System for Dripping Systems". Issued specialized school literature on Combustion of Energy Fuels (2002) and Burning of Organic Fuels and Ecology (2006). Member of the Advisory Council on Nuclear Safety Issues at the NRA (2003); Chairperson of the NTS of the Energy Efficiency in Bulgaria (2012), Art Cor. of the International Academy of the Cold in St. Petersburg, Member of the Management Board of Bulgaria at the World Energy Council. Occupied administrative positions at the Technical University of Sofia: Head of the branch of the Ministry of Economy and Energy in Radnevo (1984-1991), Head of the Department of Heat and Nuclear Energy (2000 - 2010), Dean of the Faculty of Power Engineering, 2010 until now.

**SOC:** It is not a secret that the development of a new technology and its subsequent commercialization presupposes some problem and addresses unmet needs. Respectively, what problem did you intend to solve by creating your technology/product? What results did you plan to achieve?

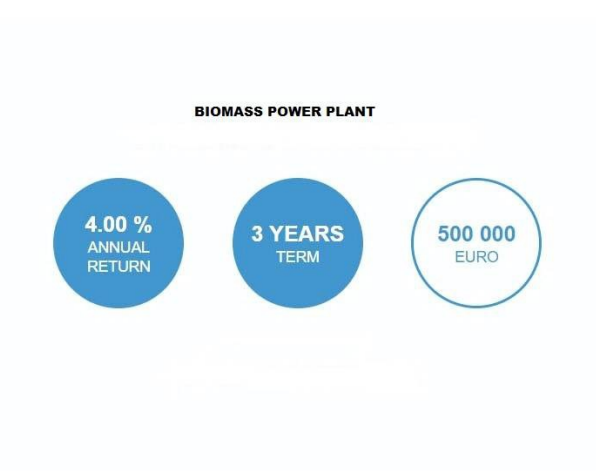
Mr. Hristov: The main problem is the lack of investment.

**SOC:** As far as we understand from the video on your product and its USP/ technology, the problem which you targeted to solve was actual before.

Probably someone has already tried to solve it. Is it right? Understanding the USP from the investor's side could make the technology/product #1 for them. What are the USP of your technology/product and fundamental difference from

other technologies/products that tried to solve this problem before you?

Mr. Hristov: As I mentioned, we are pioneers in this field. Because the Biomass power plant will use a permanent magnet generator that is more efficient than conventional generators. Our main difference from others is that the power plant will run on biogas. This gas is obtained from stalks of rape, corn, and other crops. The resulting gas is mixed with hydrogen from a hydrogenerator. The finished mixture is used for fuel from an internal combustion engine that drives a generator with permanent magnets. Using hydrogen improves burning. Significantly increases productivity with the same amount of biogas.



Biomass Power Plant 500 kW  
photo provided - Atanas Hristov

SOC: In order to understand the peculiarities of this particular spinoff our investors always ask what is the investment structure of the company? Do you still own the controlling stake in your spinoff?

Mr. Hristov: Yes, I own 100% the controlling stake.

SOC: We wonder what is the actual addressable market currently for your invention and what are the current competitors there? Could you please share with us the results of the market studies, if there are any? What might be the barriers to entry?

Mr. Hristov: So far we plan to open biomass power plan only in Bulgaria. In this country, we are leaders in the market. Since we alone are developing this field of activity in our country. Therefore, we have no competitors. Speaking of the world market, other existing

companies in this field use different resources as biofuel. Only our company uses rape, corn, and other crops as renewable sources.

**SOC:** We always need to paint a clear picture to the potential investors of the market opportunity of the spinoff that is meaningfully large and growing. Why in your opinion your company might have a high growth potential? Could you tell us all current industries and fields of your technology/product application and where do you think it could be successfully applied in the future?

**Mr. Hristov:** The company plans to build five biomass power plants that will produce electricity to be sold in the national electricity grid. Currently, I do not plan to build this type of power plant in other countries in Europe. The selling price of biomass electricity is the highest in Bulgaria.

**SOC:** The potential investors will be curious whether you already have the first clients and signed contracts? What was the feedback from your partner's markers and customers?

**Mr. Hristov:** No, we have not signed any contracts yet. Because we are on the prototype stage. Currently, we are looking investors for our project.

**SOC:** Dear Mr. Hristov, we both know that for you and the investor it is crucial to reach positive cash flow as soon as possible. Certainly, the market scaling cannot be achieved without proper distributors network and clients. Please tell us about your criteria of partners selection and which markets are open for spinoff activity.

**Mr. Hristov:** Now we are not going to entry out in the international market. We would like to open biomass power plants in Bulgaria.

**SOC:** It is very important to understand your particular vision about unique features of your company. Why do you consider the major market players might be interested in investing into a promotion of your technology/product on the addressable market?

**Mr. Hristov:** We offer an annual interest rate of 8% or equity interest in the plant's

ownership. As well the cost of one-megawatt electricity from biogas is bought at 280 euros.

Each year the plant will produce **4500 megawatts of electricity**.

**Expected annual revenue:** Revenue from the sale of electricity is 1 260 000 euro. Costs of raw materials and salaries are 380 000 euro. **Profit** is 880 000 euro.



Biomass Power Plant 500 kW helps reduce electricity consumption costs  
photo provided - Atanas Hristov

**SOC:** Now we would like to refer to the next very crucial and we would even say essential aspect for spinoff companies' as the strategy of R&D, production, distribution, and marketing processes. Do you have your own unique strategy? Which of these processes do you consider your spinoff is strong at?

**Mr. Hristov:** We are planning to build Biomass Power Plant on own land purchased specifically for this project in Rousse, Bulgaria. The term of the building is one year. The electricity produced will be sold at subsidized prices in the national grid.

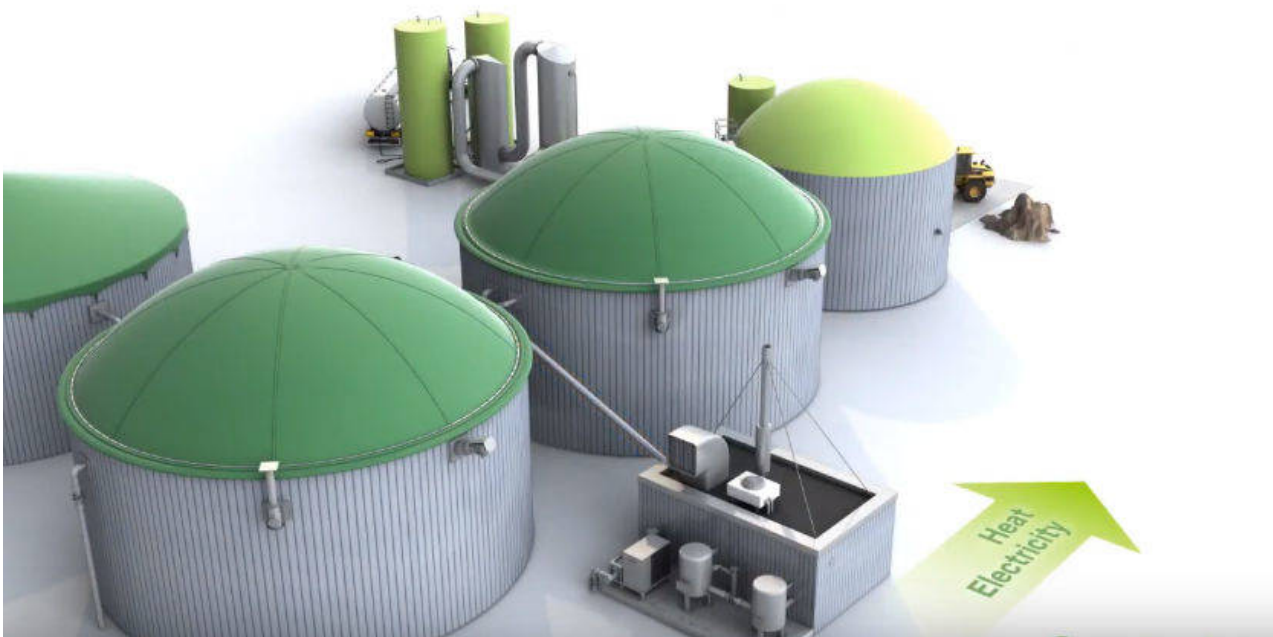
**SOC:** As a rule, the majority of spinoffs outgrow into exits. How do you determine the market for your product/technology and estimate its volume and dynamics? What is your potential share on the market? How do you think what market cap your company plans to reach the peak of its development and why? How long

might this process take?

**Mr. Hristov:** The terms of the loan are drafted in two copies in English. The maturity of the issued bond is **3 years**. The principal loan will be returned when the loan expires. The annual interest rate on the bond is **8.0%** and will be paid at the end of each calendar year. The minimum price per bond is **200€**. After buying bonds, investor become co-owners of Biomass Power Plant. The loan is secured. No interest taxes are due

**SOC:** For spinoff companies, their intellectual property is a key to success. The investors pay particular attention to it. What key intellectual property does your company have (patents, patents pending, copyrights, trade secrets, trademarks, domain names)?

**Mr. Hristov:** Yes, we have the patent for our Power plant project.



Biomass Power Plant 500 kW safes the environment  
photo provided - Atanas Hristov

**SOC:** For both of us, as well as for thousands of successful spinoffers, it's not a secret that a new technological breakthrough may become obsolete very fast. Respectively, patent validity period becomes shorter. It is interesting to know the perspectives and protection plan of your technological advancement and leadership in a medium- and long-term perspectives.



**Mr. Hristov:** The team of **HIDROSYST** strongly believes in the future of renewable energy sources as the main source for supply of the growing demand for energy. The only way for success is to guarantee low costs for production and high quality of the electro energy.

**SOC:** The investors will want to get a clear picture of the volume and time limits of the investment? What milestones will the financing get you to? What did you plan to use the invested funds for?

**Mr. Hristov:** Hydrosyst started building of **Biomass Power Plant 500 kW** the project that will work entirely on rapeseed oil. The total value of the investment is 980 000€. The equity of the company is **480 000€**. The remaining amount will be raised by issuing bonds to investors for a period of 3 years.

We start a project to build a **Tidal Water Power Plant in the UK**. We look for investors. Hydrosyst Ltd sells **30%** of the ownership of a **1.6 MW Tidal Water Power Plant** that will be installed in Dover, UK. The power plant's value is **£ 3,800,000**. We have our own capital of **£ 2,660,000**. Capital recruitment by investors **£ 1,140,000**.

Investors receive 30% of the ownership of a **1.6 MW Tidal Water Power Plant**. Investors will receive **30%** of the profit each month. The electricity produced is purchased at preferential prices. Expected monthly earnings of **96,000** pounds. Profit **2.53% every month**.

**SOC:** Could you please describe your ideal investor? What aspects are important for you, for instance, is it experience, country, the amount of own private capital or maybe some personal qualities? Will existing investors participate in the round?

**Mr. Hristov:** I consider we do not have any requirement for investors. It is more important for us to get support for our project. Since our project is a little bit different from other projects. **Consultants advise us to raise the interest rate to 7%** per annum or to sell units from the power plant. Anyone who will buy units from the power plant will receive a percentage of monthly earnings. **A yield of 12 percent** per annum is obtained. We also believe that this is a technology of the future that will be able to safe the environment and help reduce electricity consumption costs.

SOC: And the last question, could you specify the most convenient way you would like to receive inquiries from potential investors? Should it be by e-mail or personal phone call?

Mr. Hristov: E-mail is a more convenient way. Next step, after email, should be the call.

We would like to express gratitude for the time you have dedicated to this interview. SPINOFF.COM will be pleased to support your project and to share the interview on your Electric Visionary Aircrafts with all potential partners and investors



**Company name:** HydroSyst Inc.

**Contact person:** Atanas Hristov

**E-mail:** info@hydrosyst.eu

**Website:** <http://www.hydrosyst.eu>

**Phone:** +359877230399

**Patent status:** +

**On market since:** 2016

**Regions:** Bulgaria

**Industries:** Energy

**Source links:** [HydroSyst Inc.](#)

[Biomass Power Plant 500 kW project](#)

["Angel Kanchev" University of Ruse](#)

[The Technical University of Sofia](#)

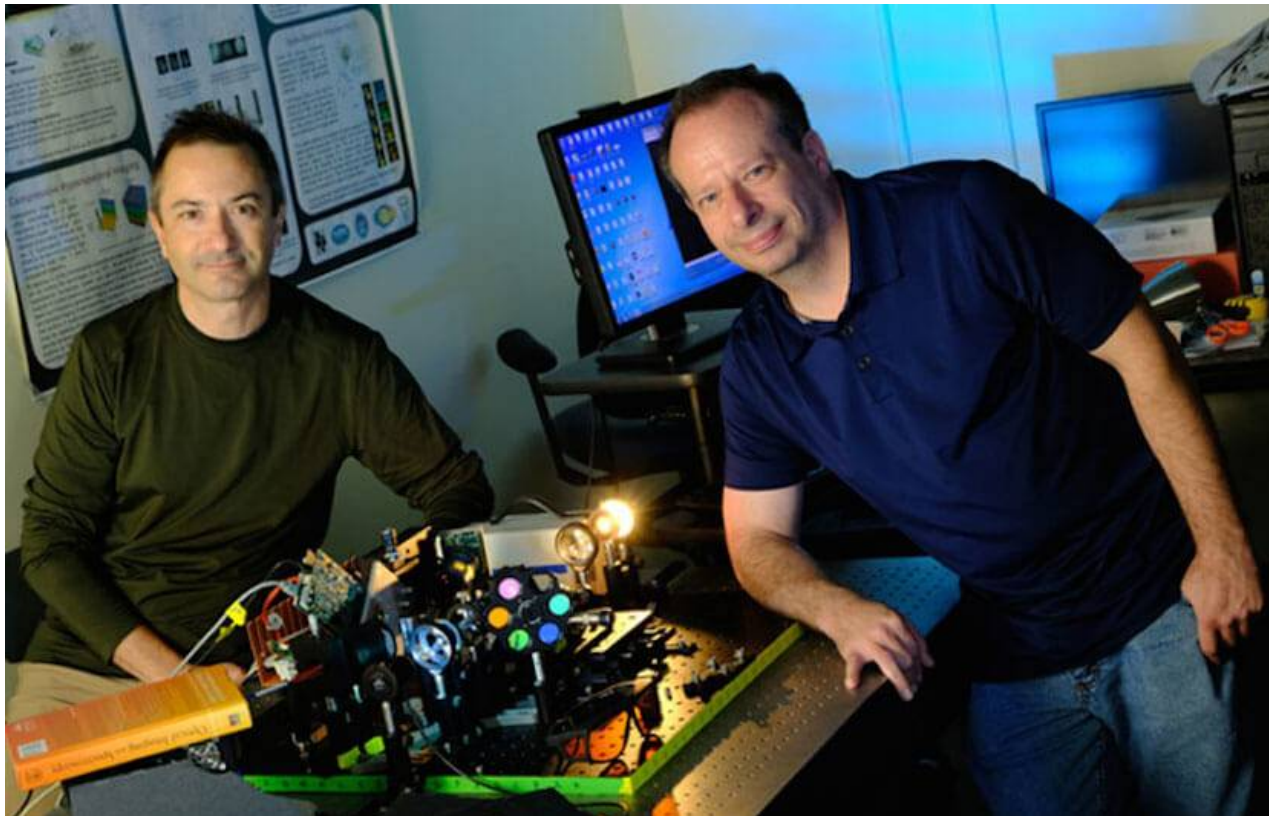
[Startup project for installation to mobile hydro power plant](#)



# COMPRESSED SENSING: A PARADIGM SHIFT IN MRI

The method of compressed sensing is a brand-new technology that can reduce the time of passage of magnetic resonance imaging from 45 minutes to several seconds. This technology was developed and patented at the University of Rice in Texas. Later the license for compressed sensing was acquired by Siemens Healthcare.

MRI scanners, equipped with new compression method, which work much faster than currently used MRI scanners. This was proved by Siemens Healthcare. This company conducted a clinical trial of compressed sensing technology for vitalization of the cardiovascular system.

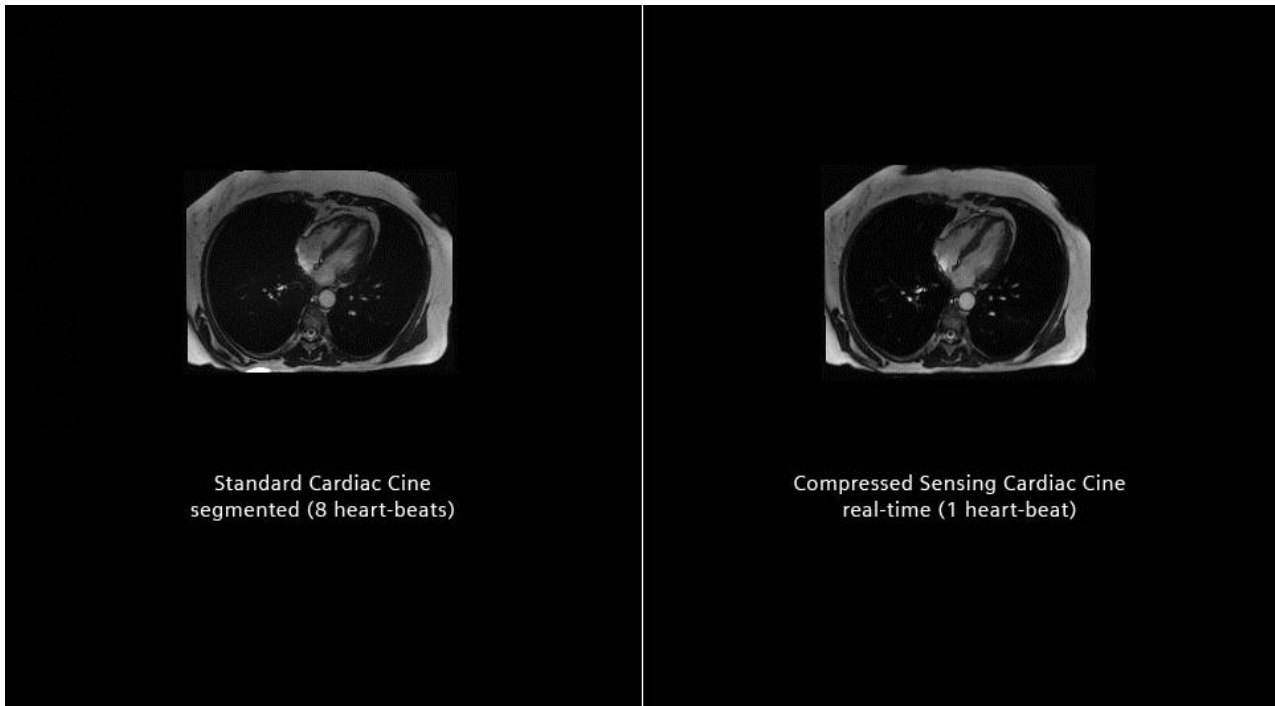


Compressed sensing technology of the Rice University  
source - rice.edu

According to the results of the clinical study, it was revealed that the cardiac scan could be completed in just 25 seconds without breathing delay. That was the amazing result because nowadays the patients should lie still for 4 minutes and hold their breath from 7 to 12 times throughout the procedure.

Consequently, this method was approved for practical use by the US Food and Drug Administration.

According to Richard Baranyuk, the professor at Rice University. Compressed sensing is a revolutionary branch of signal processing and optimization that allows engineers to collect useful information from a much smaller number of data samples than is normally required. The MRI scanners that are used today apply mathematical technologies developed in the 1930s.



Compressed sensing Cardiac Cine  
source - [healthcare.siemens.com](http://healthcare.siemens.com)

In the future, a new method can change the way that the MRI of the abdominal cavity is performed. Today, children or patients with pulmonary insufficiency can not be admitted to the study because of the inability to perform long-term breath retardation. The compressed sensing method reduces the amount of data required for high-resolution images that can be recorded without delaying the patient's breathing.

The technology of compressed sensing was presented by Siemens Healthcare in 2016. According to Kevin Kelly, Associate Professor of Electrical and Computer Engineering at Rice University, the new technology can be used not only in MRI scanners. It is also suitable for radar and security systems because of fast processing information and creating quality images due to fewer data.

**Company name:** Siemens Healthcare GmbH  
**Contact person:** Margarita Gosheva  
**E-mail:** margarita.gosheva@siemens.com  
**Website:** <http://www.healthcare.siemens.com>  
**Phone:** +1496966826602  
**Patent status:** +  
**On market since:** 2016  
**Regions:** United States  
**Industries:** Healthcare  
**Source links:** [the Rice University](#)  
[Siemens Healthcare GmbH](#)



## THE RAYVOLT ELECTRIC BIKE

Exclusive interview for [SPINOFF.COM](https://www.spinoff.com) with Mr. Mat Rauzier, Rayvolt Bike, Founder&Brand Manager, about Cruiser, which promotes alternative transportation by offering clean, high tech and stylish way to commute

Rayvolt Bike is a Premium E-bike Brand focussing on alternative commuting developed by Mat Rauzier, Founder&Brand Manager. As the environment takes the first place for Rayvolt Bike. The company offers Cruiser e-bike, which is 100% clean vehicle as it produces 0 emissions. General bikes very effort on pollution, because use PVC which is the most common plastic used in the most bike parts and Cadmium, which is a very polluting chemical used in many batteries. Rayvolt e-bike consists Lithium on all batteries as it is the best clean energy available today for the performance application. Lithium is a natural resource that is 100% recyclable.



**SOC:** Dear Mr. Rauzier, we are so grateful for your generosity this day in spending time speaking with us and sharing your insights about [Rayvolt](#) e-bike .

**Mr. Rauzier:** My Pleasure, thanks for the opportunity to reach out. [The Rayvolt Philosophy](#) is to promote alternative transportation by offering our customers a clean, high tech and stylish way to commute. The name comes from the Sun's Ray and the electrical unit Volt and put together sounds like its homonym "Ravolt". The Sun's rays, Voltage, and the revolutionary spirit are the fundamentals of our brand.

**SOC:** Our investors and we would like to learn more about a vast experience of your academic endeavors and your professional/scientific background.

**Mr. Rauzier:** My background is a bit atypical, I have always been a bit of a school hacker. I basically lost interest in general schooling as a teenager and decided to quit school at 16. Moved to San Francisco CA at 18 and worked there as a photographer, web designer. Spent my early 20s as a yacht captain delivering boats across the Atlantic, Caribbean, and Pacific. At this point, I realized that I did not want to age as a Skipper and wanted to ally my passion for Art, Physics and Sailing Boats and decided to Study Naval Architecture.

**SOC:** Considering your tremendous experience, we would like to know whether you had other projects? Could you please share the story of their creation and success.

**Mr. Rauzier:** I can not recall any moment of my life without a project. Started super early as a Kid, trying to build a sailing car with my Dad windsurfing gears using the wheels of my little brother trolley, at 11 we used to put [Solex engine on our BMX](#), then got really keen on [Moped Mechanic](#) and did many builds, Shaped and laminated my own surfboards. As an adult, I have designed some very large sailing catamaran and I had my own watersport Brand "[eXXite](#)".



Ever Since I have never stopped absorbing as much intel as I could about Sail Boats which were the only real sustainable vehicles at the time, and very soon **got interested by Solar Power and electric motors for all kind of application.**



Rayvolt e-Bike is 100% clean vehicle  
photo provided by Rayvolt Bike S.L .

**SOC:** It is so interesting to know more about the process of your technology/product creation. Please tell at which stage of commercialization your technology/product currently is? Was your project funded by any state financing or grants? Has it already received any honors or awards?

**SOC:** In the formation of every scientific spinoff, one of the most important keys to success is the team. For many potential investors, the management team is the most important element in deciding whether to invest in it or not. Could you please share some information about the team members who supported you and the project? What are the key additions to the team needed in the short term?

**Mr. Rauzier:** We are probably the only company in the bike industry that develops every single part of our bikes including Motor, Batteries, and Controller.

**We consider our self as a Technology Company.** We started to commercialized early pre-production units since **August 2016** in order to be able to finance the operation. **The final version of our first model the Cruiser is now being produced and be released in February 2018.** So far are a self-financed company, but in order to grow the way we want and develop the rest of our line, we are opening our capital to investors.



Rayvolt e-Bike is the mix of vintage style and the modern art technology  
photo provided by Rayvolt Bike S.L .

**Mr. Rauzier:** Being very impulsive and bored by day to day management, a bit of a fire character, I needed to surround myself with Water. **My Wife Ying is COO** from the beginning. Right away we also recruited a CTO. There are many engineers in the Market, but a CTO that sees the big pictures is very rare. We met with **Jaime Pla, a Technology Entrepreneur** with very vast experience and knowledge in many fields. Together we form a very complementary team at the Board of the company.

Then we used all our budget in R&D, maybe the wrong choice compare to other startups that invested all in a render and marketing, but I believe in long-term business only, and at the end, Product must speak for itself, therefore should be the focus.

So I would say, we have a very strong team of engineers, but lacking in marketing and sales. We will recruit a Marketing person in short term. Currently, I do it along with our Graphic designer.

Next Recruit is an International Sales Manager. At the moment, our limit is not sales, but production capacity, we sell everything we produce.

**SOC:** It is not a secret that the development of a new technology and its subsequent commercialization presupposes some problem and addresses unmet needs. Respectively, what problem did you intend to solve by creating your technology/product? What results did you plan to achieve?

**Mr. Rauzier:** Every single change comes with its problem to solve. For us, the result to achieve is to have **the smartest state of the art Technology on an e-bike** without losing the genuine and unique vintage look of our products. Yesterday's Charm, Tomorrow's Technology, Today's Solution. **The Problem we wanted to solve** was the gap between all the Horrific bikes with wires everywhere and battery on the saddle with very little autonomy and the super expensive Custom bikes at **7000 Euro and Up**.

**Our Solution** was to create a motor that is more efficient, with more torque at given power with connected technology and smart features such as gyroscope sensors to detect hills and an adjustable regenerative brake system similar to **formula one Kers**.





Founder of Rayvolt e-Bike  
photo provided by Rayvolt Bike S.L .

**SOC:** As far as we understand from the video on your product and its USP/ technology, the problem which you targeted to solve was actual before.

Probably someone has already tried to solve it. Is it right? Understanding the USP from the investor's side could make the technology/product #1 for them. What are the USP of your technology/product and fundamental difference from other technologies/products that tried to solve this problem before you?

**Mr. Rauzier:** This technology is seen on Electric automobile such as [Tesla](#) but unseen in the Bike industry. Brands compete on marketing really, they all buy components from same suppliers, motors from the same supplier so are only left to compete on their frame, and the huge marketing budget. As a startup, the only way to get into the market was to re-invent everything.

**SOC:** In order to understand the peculiarities of this particular spinoff our investors always ask what is the investment structure of the company? Do you still own the controlling stake in your spinoff?

**Mr. Rauzier:** At present, 100% shares of the company are still owned by our management  
**Trío:** Ying, Jaime and myself. We are willing to sell from 5% to 25% shares.



Rayvolt e-Bike produces 0 % emissions  
photo provided by Rayvolt Bike S.L .

**SOC:** We wonder what is the actual addressable market currently for your invention and what are the current competitors there? Could you please share with us the results of the market studies, if there are any? What might be the barriers to entry?

**Mr. Rauzier:** Our Market is really the product lovers. A typical customer is **Male 30 to 50 years**. None of our customers were thinking of buying a bike before discovering **Rayvolt**. We really sit right in between the motorcycle and the Bicycle, so it is really a new market that we created. Our business model, however, is B2B, we sell to an Importer in a country that sells to dealers that will finally sell to his customers. This is old school compared to all the online sales, but in my opinion, the only way to create a brand. We need physical points of sale.

**SOC:** We always need to paint a clear picture to the potential investors of the market opportunity of the spinoff that is meaningfully large and growing. Why in

your opinion your company might have a high growth potential? Could you tell us all current industries and fields of your technolog/product application and where do you think it could be successfully applied in the future?

**Mr. Rauzier:** Our business can be scaled to any dimension due to the business model we have. **We stick to Brand Management, Engineering, and Marketing.** We use 3rd party suppliers for production and 3rd party Distributors in each country. This way we can absorb unlimited amount of growth without much change in our core structure. All the products on our planned range do not compete with each other, so all products are creating a new market, therefore added sales.

**SOC:** The potential investors will be curious whether you already have the first clients and signed contracts? What was the feedback from your partner's markers and customers?

**Mr. Rauzier:** Even the company is very young, we already created some very good alliances. We have bikes at [Harley Davidson](#), dealers, in Tesla Showroom. We have agreement with [Rip Curl Europe](#), some of the best concept stores in UK and Paris ([Le bon marché](#), [Conran Shop](#) etc...) **Art Gallery** in Madisson Ave NYC. I do not think this has been achieved by any other Bike brand ever. This really shows the potential of our Brand.

**SOC:** Dear Mr. Rauzier, we both know that for you and the investor it is crucial to reach positive cash flow as soon as possible. Certainly, the market scaling cannot be achieved without proper distributors network and clients. Please tell us about your criteria of partners selection and which markets are open for spinoff activity.



Mr. Rauzier: At present, we have distributors in the US, Canada, most EU countries, but looking for distributors in South America, Asia, and Oceania.



Rayvolt e-Bike consists Lithium on all batteries  
photo provided by Rayvolt Bike S.L .

**SOC:** It is very important to understand your particular vision about unique features of your company. Why do you consider the major market players might be interested in investing into a promotion of your technology/product on the addressable market?

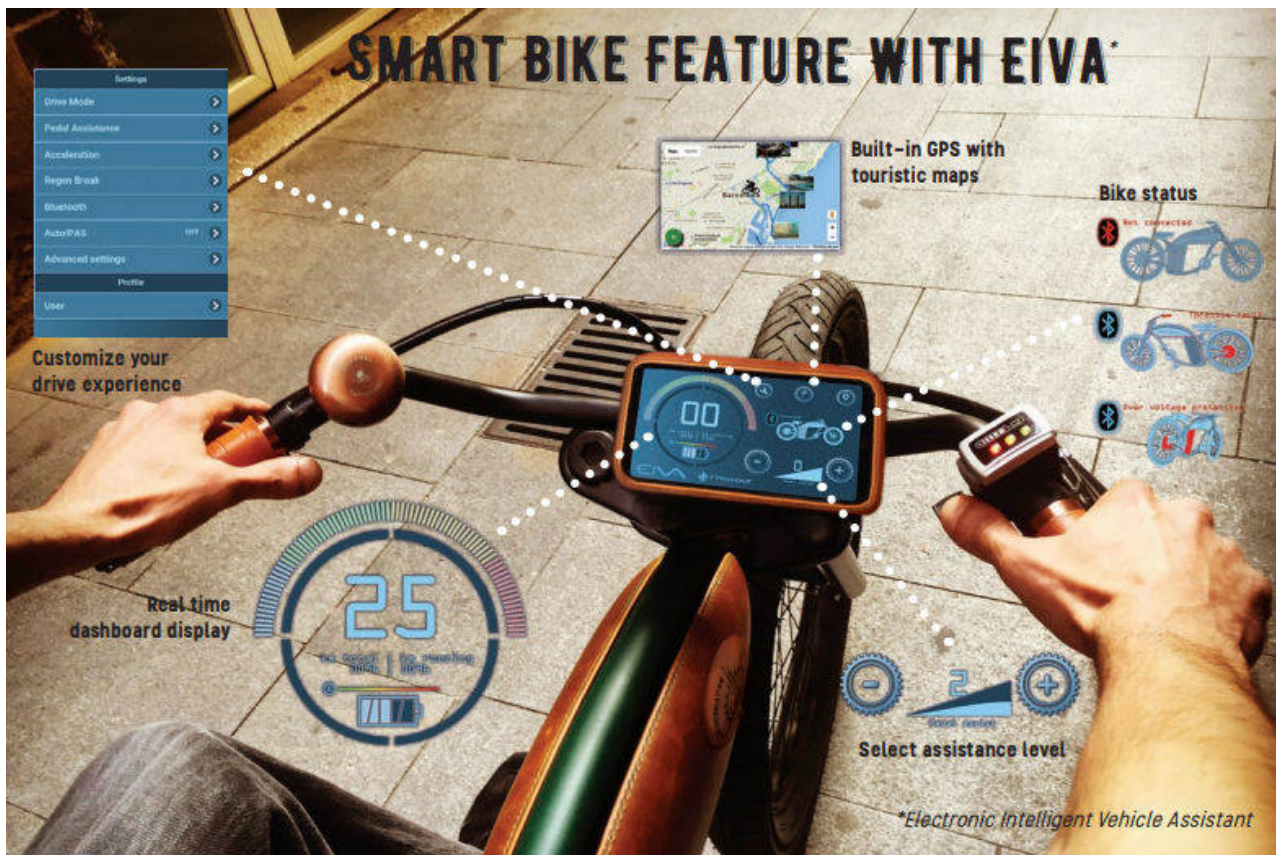
**Mr. Rauzier:** Well, e-bike market is a 2 digit growth market that lacks innovation. Most companies tend to look alike with very little product differentiation. I believe our company is very unique halfway between a technology company and a lifestyle company. We are not following trend, but leading our market and creating our opportunities.

**SOC:** Now we would like to refer to the next very crucial and we would even say essential aspect for spinoff companies' as the strategy of R&D, production, distribution, and marketing processes. Do you have your own unique strategy? Which of these processes do you consider your spinoff is strong at?



Mr. Rauzier: Our Unique strength is the flexibility and possibility to scale our business.[] We focus 100% of our energy in R&D and marketing of our product without the heavy manufacturing and distribution weight on our shoulder.

We control our product by owning every bit of intellectual properties, we have over 80 suppliers making each a small portion of the bike, we then send all the components to the assembling factory that is 3rd party, but we control it with 3 employees there full time.[] Basically, we focus on the vital elements of the brand outsourcing all the rest.[]



Electronic Intelligent Vehicle Assistance can control all the parameters of Rayvolt bike photo provided by Rayvolt Bike S.L .

SOC: As a rule, the majority of spinoffs outgrow into exits. How do you determine the market for your product/technology and estimate its volume and dynamics? What is your potential share on the market? How do you think what market cap your company plans to reach the peak of its development and why? How long might this process take?

Mr. Rauzier: Our market within the e-bike market is at the High end. Our first product, the Cruiser, of course, will fit in a Niche of the market but was vital to create the brand and the

marketing around it. The next models coming are of course suitable for a much bigger portion of the market, but it was necessary to hold them off until the brand is stronger. We think we will reach **50,000 Units /year within 5 years.**

**SOC:** For spinoff companies, their intellectual property is a key to success. The investors pay particular attention to it. What key intellectual property does your company have (patents, patents pending, copyrights, trade secrets, trademarks, domain names)?

**Mr. Rauzier:** We have the patent for our Software, our smart features, copyright of designs, Brands, and domains.

**SOC:** For both of us, as well as for thousands of successful spinoffers, it's not a secret that a new technological breakthrough may become obsolete very fast. Respectively, patent validity period becomes shorter. It is interesting to know the perspectives and protection plan of your technological advancement and leadership in a medium- and long-term prospectives.

**Mr. Rauzier:** Our biggest strength is the pace of the company, we move very fast. I m not to worry about patent validity, the key is to stay innovating year after year. If someone wants to copy, he will always be 2/3 years behind.



Rayvolt e-Bike can reach up to 80 km battery range and 45 km/h maximum speed  
photo provided by Rayvolt Bike S.L .

**SOC:** The investors will want to get a clear picture of how many rounds of investments have you completed? Are you seeking for the investments at the moment? What is the volume and time limits? What milestones will the financing get you to? What did you plan to use the invested funds for?

**Mr. Rauzier:** So far, we haven't done any round of investment. We need to do our first round in order to release our next models. We are designing an electric scooter and 2 other electric vehicles to complement the Cruiser. Our first round will allow us to make all the tooling necessary and some cash flow to produce efficiently.

**SOC:** Could you please describe your ideal investor? What aspects are important for you, for instance, is it experience, country, the amount of own private capital or maybe some personal qualities? Will existing investors participate in the round?

**Mr. Rauzier:** In my team recruiting, I have always favor people character rather than skills. One can learn anything if he is willing, but you can never change people. For an investor, I believe the most important thing is to have the same core values. We refused various offers due to different goals. We are looking for somebody as passionate as us about our brand and product and very important with a long plan, we are not looking for quick cash and run, we wish to establish a legendary brand.

**SOC:** And the last question, could you specify the most convenient way you would like to receive inquiries from potential investors? Should it be by e-mail or personal phone call?

**Mr. Rauzier:** E-mail seems to be the best way to make the first introduction. I normally like to follow up with face to face or at least by Skype video call.

We would like to express gratitude for the time you have dedicated to this interview. SPINOFF.COM will be pleased to support your project and to share the interview on your Rayvolt Bike with all potential partners and investors

**Company name:** Rayvolt Bike S.L .  
**Contact person:** Mat Rauzier  
**E-mail:** mat@rayvoltbike.com  
**Website:** <http://www.rayvoltbike.com>  
**Phone:** +34654664706  
**Patent status:** pending  
**On market since:** 2016  
**Regions:** Spain  
**Industries:** Transport Systems and Vehicles  
**Source links:** [Rayvolt User's Manual](#)  
[EIVA Manual](#)  
[Rayvolt presentation](#)  
[Rayvolt Bike S.L .](#)



# CMOS TECHNOLOGY FOR DIGITAL DENTAL IMAGING

CMOS imagers take a leading position in dental X-ray devices. It was developed by the engineer Eric Fossum at Jet Propulsion Laboratory of the NASA. Since then, CMOS images are a leading technology in the sphere of digital portrayal processing. CMOS technology was licensed by Schick Technologies.



Currently, portrayal sensors based on the technology of CMOS are located in the cell phone chamber and on the X-ray unit of the dentist. However, initially, they were used by NASA and were aimed at capture all kinds of portrayals, in the visible spectrum and beyond.

Scientists sought to invent inexpensive compact imaging systems needed to be created for use in spacecraft. So there they invented cameras that have the size of the computer microchip. This modern technology includes a wide variety of applications, including video conferencing, digital cameras, medical instruments, toys and automotive applications. Eric R. Fossum with his team could integrate virtually all camera electronics into one chip. The camera on a chip was capable of providing smaller, but more efficient imaging devices.



Intraoral Digital X-Ray Sensors  
source - [schickbysirona.com](http://schickbysirona.com)

According to Fossum, he signed JPL's agreements for cooperation with Shick in order to

turn this experimental CMOS-APS technology into a successful product. The CMOS technology became the starting point for the creation cell phone camera and handheld digital camera. According to Stan Mandelkern, vice president of engineering, they were looking at CMOS as next-generation technology specific to dental imagery, and specifically, radiology.

The CMOS device converts light in a digital signal using photosensitive pixels and embedded circuits. CMOS has several advantages. The first, it requires low power for operation; the second, it has a high-speed readout: the third, it is able to integrate an electronic circuit on a chip and produce digital signals.

The CMOS device reduces exposure to potentially dangerous X-rays, and it gives quality images to dentists that they are able to manipulate in order to make accurate diagnoses, and visually inform patients. The company's latest creation in CMOS is three-dimensional imaging.

Thanks to the CMOS APS (active-pixel sensor) technology, high-quality portrayals with high resolution are achieved, which allows you to see even the smallest details, with which help experts will be able to establish a more accurate diagnosis.

Currently, only Sirona has an exclusive license to use CMOS-APS technology for dental treatment. However, despite this, other companies can sublicense, in order to be able to use this technology.





Optimize images

source - schickbysirona.com

Schick and the parent company [Sirona](#) have made the devices more compact and energy efficient, which is based on CMOS imaging sensors. Currently, Schick WiFi from Schick Technologies is a new product for dental digital radiography.

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**Patent status:** +

**On market since:** 2017

**Regions:** United States

**Industries:** Healthcare

**Source links:** [NASA Spinoff](#)

[Sirona Dental, Inc.](#)

[The Office of Entrepreneurship and Technology Transfer](#)



## THE BRAND-NEW TREATMENT OF PERIODONTITIS

The LANAP is the first-ever patented periodontal laser procedure and the real breakthrough in patient care. It is created by Dr. Robert Gregg. LANAP technology can treat periodontitis by removing damaged tissue between teeth and gums with a laser, without surgical intervention.

LANAP is a dental laser cutter, which uniquely interacts between the tissues in the mouth and the variable pulse wavelength of the dental laser. The wavelength passes through water and hydroxyapatite, but is absorbed by melanin and hemoglobin. Laser light penetrates 4 mm beyond the surface of the tissue to effectively destroy bacteria. Then the device interacts with hemoglobin to create a stable clot of fibrin.



Lanap laser  
source - lanap.com

Consequently, LANAP is intended to destroy germs that cause gum infection. The main its advantage is that this technology leaves healthy tissue intact and unscathed. Despite the fact that 80% of people suffer from any degree of gum disease, only 3% will take current treatment.

This technique eliminates the need for periodontal surgery, which is a very invasive and painful procedure. Most patients who undergo LANAP surgery have a faster healing time, and even they can return home on their own after the procedure.

The technology has already received approval from the US Food and Drug Administration (FDA). While this is the only method of restoring bones and tissues in periodontitis, approved by the American regulator.

The LANAP procedure takes only 2 hours and 2 sessions to the doctor. The price of LANAP is equal to the price of traditional periodontal surgery. The cost can vary significantly

depending on the degree of inflammation of the gums.



Lanap laser  
source - lanap.com

According to Robert Gregg, in the beginning, they wanted to give patients hope for hopeless teeth, which then turned into a rescue for these teeth. After 10 years of research to prove efficacy, patients who want to keep their own teeth and abandon traditional bone surgery have another option, which is called LANAP.

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**Patent status:** +

**On market since:** 2017

**Regions:** United States

**Industries:** Healthcare

**Source links:** [Millennium Dental Technologies, Inc.](#)





## STATE OF THE ART VIBRATION MONITORING SYSTEM

Muzo device blocks extraneous noise, absorbs external vibrations and creates a private zone for communication with several people. It was developed by Celestial Tribe LCC. The framers of this device are young people, who are good at Mathematics, Electronic Engineering & Information Engineering.





Muzo

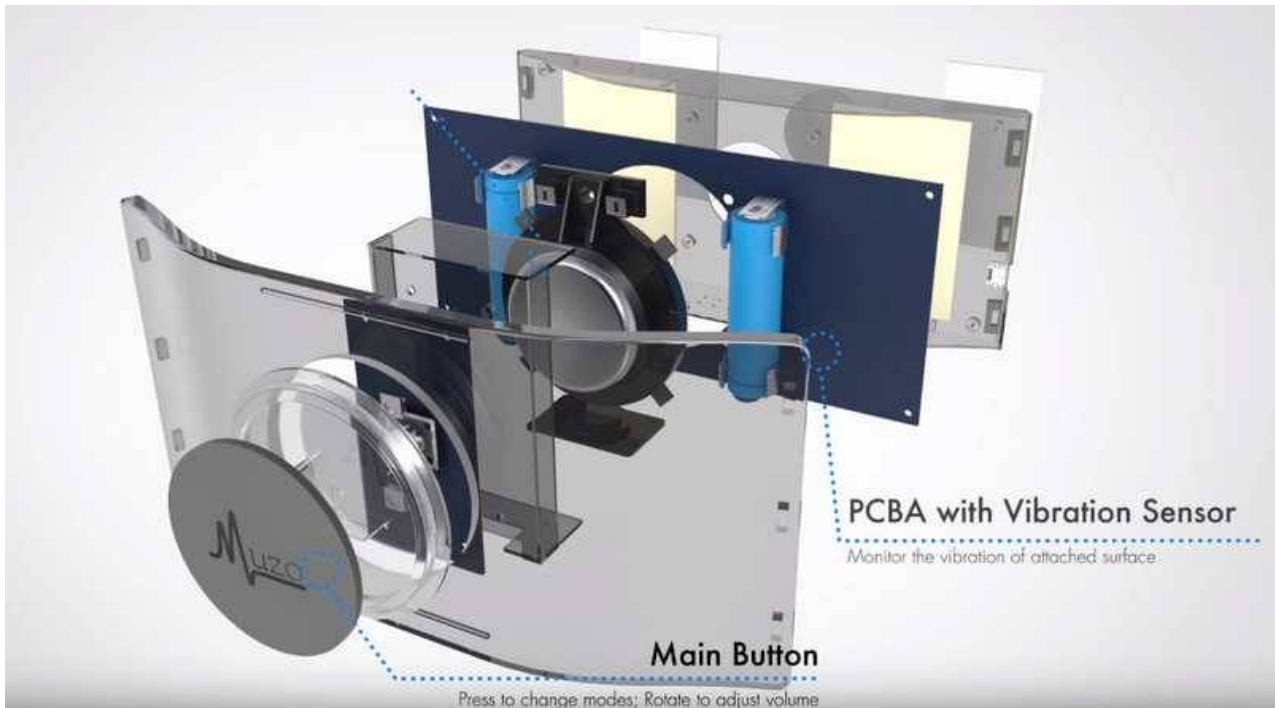
source - <https://www.kickstarter.com/projects/1280803647/muzo-your-personal-zone-creator-with-noise-blockin>

Muzo is a multifunctional device for noise suppression and creating a personal comfort zone. This device is called "a bubble of silence" and looks like a small sound column. It is attached to any flat surface, which plays the role of a resonating membrane, to obtain the desired effect. Then the device is turned on, and it starts to block extraneous noise.

This gadget has three mode. Firstly, the device has "**silence mode**". It actively suppresses extraneous noise by the same principle as acoustic headphones with noise reduction. This principle is known for a long time and its essence lies in the fact that this device fixes extraneous noise and reproduces sounds at the same frequencies, but in antiphase.

Secondly, the device has "**sleep mode**". Some people sleep poorly in silence. It often causes secret fears, nervousness, unreasonable anxiety. Therefore, many include light sleep music, relaxing melodies or simply recorded sounds of nature before going to bed. In this mode, the device not only saves its owner from extraneous noise but also reproduces soothing sounds, which helps to fall asleep.

Thirdly, Muzo has "private mode". Have you ever thought how often you want to be alone in a crowd? For example, it is necessary to urgently discuss outside the office the terms of an important costly contract. With the help of Muzo it is possible to insulate oneself, using the private conversation mode. Nobody will hear you in this mode.



Construction of Muzo

source - <https://wordlesstech.com/muzo-state-art-vibration-monitoring-system/>

The device not only blocks extraneous noise but also adds four sets of specific sounds. These sounds make absolutely impossible to understand the meaning of your conversation.

Muzo is compact and portable. It is perfect for kindergartens, college dorms, apartments, hotel rooms, office spaces, or any environment where undesirable and destructive noises are a nagging problem.

The cost of the device (according to different sources) is from 119 to 159 US dollars.

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**Patent status:** +  
**On market since:** 2017  
**Regions:** United States  
**Industries:** Creative Industries, Electronics  
**Source links:** [Celestial Tribe LCC](#)  
[Kickstarter, PBC](#)  
[Plugin magazine](#)  
[WordlessTech.](#)  
[Muzo](#)



## BRIDGING THE GAP BETWEEN WEARABLES AND HEALTHCARE

The Apple watch with KardiaBand™ application involves an FDA-cleared ECG device and analysis algorithms. It was developed by The AliveCor company and became the first Apple Watch enhancement. FDA clearance gives the opportunity to sell these watches as a medical device and users don't need doctor approval to use it. Due to KardiaBand, the watch reads the ECG indication and analyzes them in search of potentially dangerous problems, for instance, atrial fibrillation.





Apple Watch

source - <https://www.cnet.com/news/the-apple-watch-now-has-an-fda-cleared-heart-rate-band/>

If the program detects problems, it will advise a person to conduct a more accurate ECG analysis. [KardiaBand](#) has built-in voice recognition technology. It is used to diagnose disease through user-dictated symptoms. In addition, the device will be able to send the analysis to the treating doctor. Watch Apple with KardiaBand is very easy to use because it is designed more for elderly people. KardiaBand will allow them to easily check heart rhythms and fix any deviations from the norm. As a result, it will be easier for doctors to detect the problem and find ways to solve it.

**The Apple Watch** has a sensor on the underside. This sensor is designated as a photoplethysmogram. There are green and infrared LEDs there. LEDs shine onto your skin and find the slight change in the amount of light reflected back. These changes happen when arteries expand and contract with every hit of your heart. Through this sensor, the Apple Watch can show how fast your heart is beating, as well, how your heart rate changes over time.

Currently, KardiaBand costs \$200. Users should also pay \$99 per year for a subscription that provides access to all device functions and data analysis. In the meantime, Apple announced the development of the Apple Heart Study application with the Stanford Medical Center. They are going to explore and improve the detection of atrial fibrillation or

irregular heartbeat. The application uses a heart rate monitor, which are set up in Apple Watch and which analyzes the flow of blood through the vessels of the wrist.



Apple Watch

source - <http://techbakbak.com/apple-watch-predict-heart-attack/>

Scientists believe that because the ECG device can be worn as a watch, it will detect the arrhythmia in the early stages. Usually, arrhythmia begins as occasional and intermittent problems with the heart. It's very difficult to diagnose. It takes an average of 1.7 years to diagnose atrial fibrillation from the initial manifestation of symptoms. During this period, the patient is at increased risk of stroke and other serious complications.

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Patent status: -  
On market since: 2017  
Regions: United States  
Industries: Electronics, Healthcare  
Source links: [AliveCor, Inc.](#)

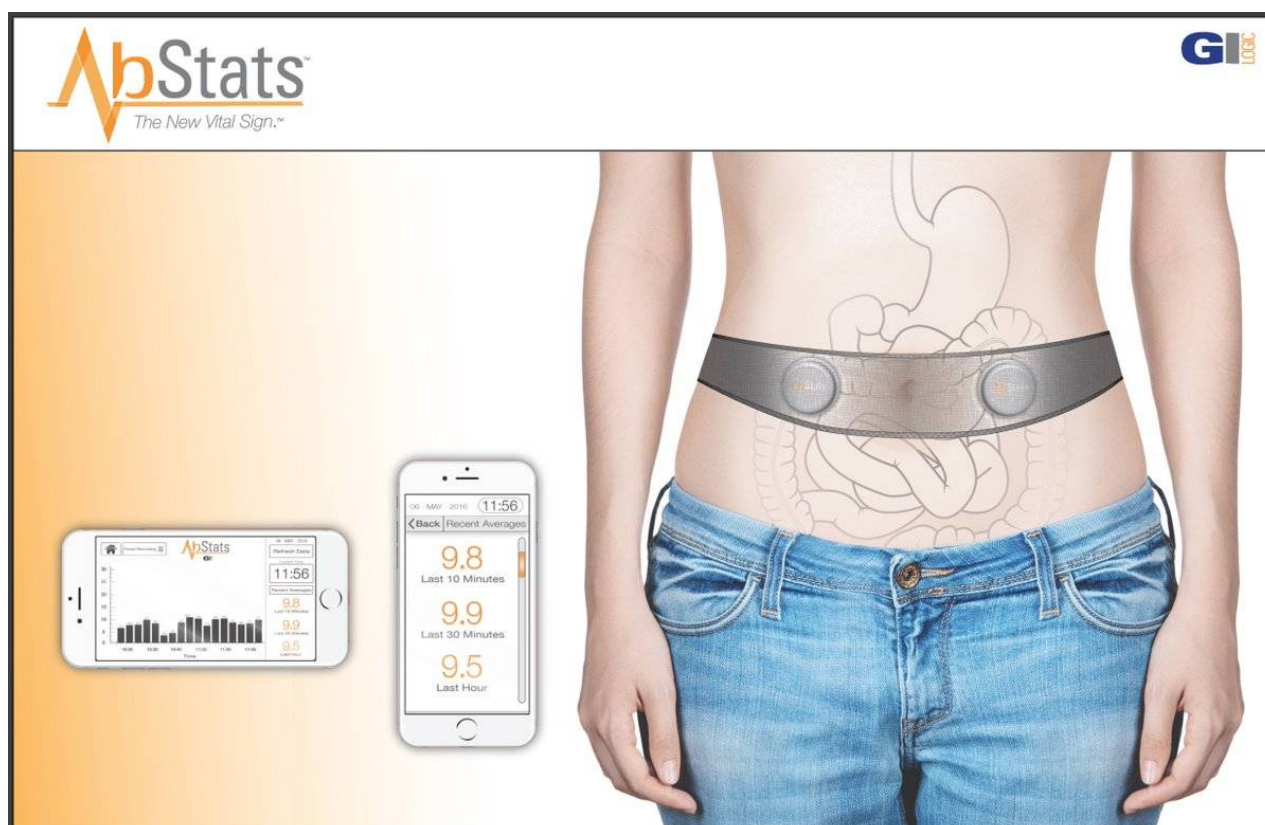




## ABSTATS IS THE NEW VITAL SIGN

The device AbStats is developed by Brennan Spiegel. It is supposed to bring great benefits to medicine, it will inform doctors about the patient's body condition.

Studies of the gastrointestinal tract show that this disease is quite common and 70 million suffer from this disease in the USA. The number of people continues increasing annually. Against this background, [GI Logic](#) has developed convenient, inexpensive sensory systems which can be used in a hospital, clinic, and home to diagnose the intestinal disorder. The device is installed on the user's stomach. It uses special sensors to record and analyze sounds that the intestines emit during digestion of food or rest.



AbStats

source - <https://twitter.com/hashtag/abstats>

Currently, [AbStats](#) is being tested at the Cedars-Sinai Medical Center in Los Angeles under the guidance of its inventor Brennan Spiegel. The team of researchers checks how the device can help patients who are recovering from surgery.

Rehabilitation is more intuitive now. If the patient's state of health is better, doctors allow the patient to start eating liquid and solid food. More severe patients have to do the esophagus manometry. It involves the insertion of a tube into the patient's stomach. This procedure is expensive and invasive. AbStats will be able to bring about a radical change in the gastrointestinal tract treatment. It will provide accurate data. Doctors will be able to establish the right time to resume mealtime, avoid complications and help the patient to

go back home quickly.



AbStats

source - <https://twitter.com/search?q=%23AbStats>

AbStats will be used not only by people who need medical help. And also those who have problems with overweight. This device will help people who want to keep their weight under control or lose few pounds. According to the inventor of this device, the main reason for weight gain is that people start a new meal before the previous one is fully digested. AbStats will notify the user every time about a suitable time for eating.

Understand the operation of this device will not be difficult. It will flash green, yellow or red. Light stimulation will make the process of losing weight even more effective by synchronizing the work of the brain and stomach.

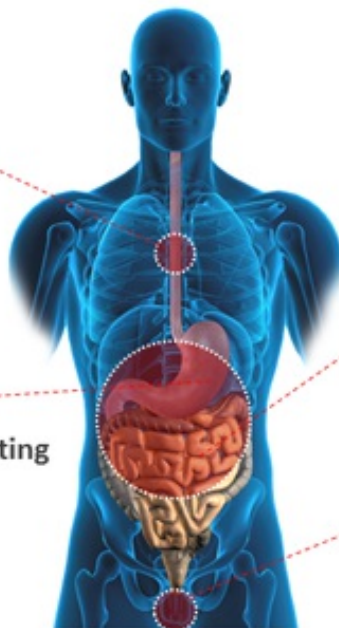
## If sounds from within matter... then AbStats is indicated

### Swallowing sounds

- Use as a food diary
- Use for dietary training

### Stomach sounds

- To evaluate nausea and vomiting
- To diagnose slow emptying



### Intestinal sounds

- To manage post-op feeding
- To track food digestion
- To manage obesity
- To diagnose motility disorders

### Emptying sounds

- Use as bowel habit diary
- "My baby pooped" indicator

AbStats functions

source - <http://gi-logic.com/products/abstats/gi-market/>

GI Logic will launch the device in the United States in 2016 and plans to move to other markets in the future. Their mission is to constantly innovate and develop medical devices that contribute to the well-being of people and promote the field of gastroenterology.

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Phone: +16269932772  
Patent status: -  
On market since: -  
Regions: United States  
Industries: Healthcare  
Source links: [GI-LOGIC](#)  
[CNBS](#)





# HOVERSURF GIVES YOU THE FREEDOM TO FLY

Exclusive interview for [SPINOFF.COM](https://spinoff.com) with Mr. Andrew Solovyev, Hoversurf Inc. Co-founder&Commercial Director, about Hoversurf, which is a developer of technologies and software for flying vehicles



The Hoversurf is a human-carrying drone developed by Alexander Atamanov, CEO of the Hoversurf technology. The Hoversurf is a tried and true addition to any futuristic science fiction arsenal. This project is a system of transport of the future. The Hoversurf is expected to solve the problem in cities with traffic jams and help to save on the construction of infrastructure. According to the company, The Hoversurf is a unique electric-powered vessel, bringing speed agility and stability of flight to the hands of amateur and professional navigators



Team of the Hoversurf and Hoverbike Scorpion 3  
photo provided by Hoversurf Inc.

**SOC:** Dear Mr. Solovyev, we are so grateful for your generosity this day in spending time speaking with us and sharing your insights about Hoversurf project. Our investors and we would like to learn more about a vast experience of your academic endeavors and your professional background.

**Mr. Solovyev:** The first development of a flying helicopter motorcycle was begun in 2015. Our aim is wanted to create more compact and affordable flying vehicle than a helicopter, which overcomes urban traffic jams easily. This was achieved in early 2016. We have two companies - OKB "Cargo drones" in Russia and [Hoversurf Inc.](#) in the USA, CA. Hoversurf

Trademark is registered in USA #5028042 USPO.

I am Co-founder and Commercial Director of The Hoversurf Inc. Hoversurf is flying vehicles of the future .

**SOC:** Considering your tremendous experience, we would like to know whether you had other projects? Could you please share the story of their creation and success.

**Mr. Solovyev:** All our attention is focused on the Hoversurf project. It has different functions, among them are is transport infrastructure, passenger transportation, freight transportation, search & rescue, sports & entertainment.



Hoverbike Scorpion 3  
photo provided by Hoversurf Inc.

**SOC:** It is so interesting to know more about the process of your technology creation. Please tell on which stage of commercialization your technology currently is? Was your project funded by any state financing or grants? Has it already received any honors or awards?

**Mr. Solovyev:** The company started in 2014. For the first time, the flying vehicle took off, with a person on it, in the summer of 2016. This presentation was held in Skolkovo, within the framework of [Startup Village 2016](#). The news had the largest coverage of the audience in the history of Skolkovo. However, Hoversurf is not the Skolkovo project.

The project was originally conceived as a non-profit and was intended primarily to inspire people. However, Airbus presented the concept of the unmanned aerial taxi in October 2016, stating that the full-size prototype would be ready by the end of 2017. The company Uber also was interested in passenger transportation of aircraft on the basis of drones. Alexander Atamanov appreciated the prospects of the market and realized that flying bicycles could do business.

Since 2013, [HoverSurf](#) has been developing various flying aids, including [cargo drones](#).

[HoverBike S3](#) is a hybrid of a quadcopter and a motorcycle, running on electric motors. The seat and bend of the car resembles an ordinary motorcycle, but instead of wheels - four valves. The first public test flight of a Russian hoverbike or a flying motorcycle was held on [September 2](#) in the framework of the international competitions in road and ring motorcycle racing. This event took place in the Volokolamsk district of Moscow region at the Moscow Raceway.

The company is also launching a new project [Formula](#). This is a 5-seat aircraft with folding wings. It is driven by [52 small engines](#). As a result, it combines the advantages and efficiency of [VTOL aviation](#) with the speed and economy of aircraft with a solid wing.

Now our work includes next aspects: technology development for the future of flying vehicles; development of software for flying computers, flight safety, control system aircraft in the air; development of the drone-mobile, cargo-drone, taxi system; the formation of the intellectual property portfolio relating to transport of the future.

**SOC:** In the formation of every scientific spinoff, one of the most important keys to success is the team. For many potential investors, the management team is the most important element in deciding whether to invest in it or not. Could you please share some information about the team members who supported you and the project? What are the key additions to the team needed in the short term?

**Mr. Solovyev:** The founder of the project and CEO of Hoversurf Inc. is [Alex Atamanov](#) (Moscow, RU) has competence in implementing successful projects. He has three higher educations, the first is technical, The Bonch-Bruevich Saint-Petersburg State University of Telecommunications, the second is the legal one, the State Academy of Investment Specialists, and the third is management, master's program at the Higher School of Economics under the "Innovation Management" program. He teaches at the Graduate School of Economics at the Department of "Innovation Management" course "KFS" - Key Factors in the Success of a startup. His interests are connected with aviation, IT and intellectual property. It has already implemented "Onlinepatent" project that automates the reception of the patent and uses a neural network to search. His father - an engineer and aviator since childhood taught to fly and collect the aircraft. This is a lifelong dream - to take a step into the future.

The second founder - high-end programmer & electronic engineer with experience in solving the most complex problems - [Joseph Segura Conn](#) (San Jose, USA). He is a man of technical mindset and for which there are no barriers in IT.

The company employs are the best specialists from the [Moscow Aviation Institute](#), [Bauman Moscow State Technical University](#), [Moscow Institute of Physics and Technology](#) as well as from the USA, Latvia, Ukraine, China. As you can see we have the international team.

**SOC:** It is not a secret that the development of a new technology and its subsequent commercialization presupposes some problem and addresses unmet needs. Respectively, what problem did you intend to solve by creating your technology? What results did you plan to achieve?

**Mr. Solovyev:** The development level of science and technology has reached such a limit that the use of the flying computers became possible to transport a human. The explosive growth of the drones & quadcopters market demonstrated the convenience and efficiency of the use of flying machines. The use of computers and flying systems controlling their movement can achieve incredible safety and efficiency of traffic. This year has shown how promising this market - the largest VC funds, including Intel Capital invested in E-Volo, E-Hang. E-Hang got the Grand Prix at the CES'2016. Uber and Google announced the creation of a system of a flying taxi.



The main problems we faced were problems which have relative to the security and the autorotation possible in modern helicopters. Flying motorcycle Scorpion-1 is the transport for the extreme. It has a programmed limited flight altitude - no more than 5 m. In addition, the pilot is always in the most perfect at the moment protection. In this case, when falling from a five-meter height, he will not get serious injuries.

The problem is also the legislation, the infrastructure and seats, and routes of the landing. But all these questions can be solved. All this will develop itself in an evolutionary way. If we consider the example of cars, the rules of the road appeared when there were many cars. Similarly, the aviation codex will appear. All will change with appearing a mass of flying motorcycles and cars

We are going to be the leader of the market of VTOL.



Hoverbike Scorpion 3  
photo provided by Hoversurf Inc.

**SOC:** The problem which you targeted to solve was actual before. Probably someone has already tried to solve it. Is it right? Understanding the unique selling points from the investor's side could make the technology N° 1 for them.

**What are the unique selling points of your technology and fundamental difference from other technologies that tried to solve this problem before you?**

**Mr. Solovyev:** For more load-lifting and less extreme drones, there are two ways. E-Hang and E-Volo use the first way to increase the number of propellers. This solution has a lot of flaws. For example, the huge size, the increase in the number of propellers leads to a decrease in the overall system efficiency. The engine and the propeller are the most reliable parts of the Copter. And the weakest ones are electronics and software. And that's where the maximum number of risks and failures is hidden. Therefore, security systems must be autonomous from flight systems, and the increase in the number of propellers does not solve the problem. In order for the quadcopter to fly safely, Hoversurf developed an electronic X-BI system to prevent an accident when one propeller is destroyed or the motor breaks at low altitudes (below the parachute zone).

When the system is activated, it gently sinks the drone to the ground, but the control is lost. In addition to X-BI, a "drone-pilot" connection has been designed to exclude uncontrolled actions and abnormal situations related to the pilot's shift from the main position or loss of control. Sonar and computer vision systems help to avoid collisions with other objects, including duplicating the barometer of the main computer to keep safe height. We also came up with additional security measures. The pilot on his hand has a check, which ensures his connection with the computer. For example, it allows you to disable the whole system. The legs of the pilot are protected by an aluminum plate. Model S3 is equipped with even greater safety. Propellers are tightened with a special mesh so that no foreign objects are terrible for propellers.

**SOC:** In order to understand the peculiarities of this particular spinoff our investors always ask what is the investment structure of the company? Do you still own the controlling stake in your spinoff?

**Mr. Solovyev:** The founder has 65% controlling stake approximately.

**SOC:** We wonder what is the actual addressable market currently for your invention and what are the current competitors there? Could you please share with us the results of the market studies, if there are any? What might be the barriers to entry?



**Mr. Solovyev:** Yes, we have competitors. These are [Evolo](#), [Lilium](#), [Nasa-Uber](#), [E-Hang](#). But we have the only development that is really applicable to the existing urban infrastructure. The most often the devices of our competitors occupy 4 times more space and they need a landing site, like for a helicopter. And many of them exist only in the form of a concept. And we already have experience in manned flights.



Formula Project  
photo provided by Hoversurf Inc.

**SOC:** We always need to paint a clear picture to the potential investors of the market opportunity of the spinoff that is meaningfully large and growing. Why in your opinion your company might have a high growth potential? Could you tell us all current industries and fields of your technology/product application and where do you think it could be successfully applied in the future?

**Mr. Solovyev:** Why do our company have a high growth potential? Because there are those who offer the idea of flying transport, but no one is engaged in development. We are the only ones who at the moment could realize this concept in reality.

**SOC:** The potential investors will be curious whether you already have the first clients and signed contracts? What was the feedback from your partner's markers and customers?

**Mr. Solovyev:** We test the market until we sell nothing. The site specifically made a pre-order form to understand how many ordinary people are willing to pay for such a device. So we have more than **1700 pre-orders** for our main model Scorpion 3. The company already has the first orders. Our potential buyers are large corporations, including Russian, various ministries, the police of the American state of Massachusetts, the Dubai police. This transport can be useful, for example, to search and rescue people in virtually any country.



Formula Specs  
photo provided by Hoversurf Inc.

**SOC:** We both know that for you and the investor it is crucial to reach positive cash flow as soon as possible. Certainly, the market scaling cannot be achieved without proper distributors network and clients. Please tell us about your criteria of partners selection and which markets are open for spinoff activity.

**Mr. Solovyev:** As I mentioned our international team consists of engineers from many countries - **the US, Europe, Russia, China**. To work on a project, we applied **crowdsourcing technology**. To attract specialist we have used social networks and our [YouTube](#) channel. So we were able to assemble a team of high quality and enthusiastic professionals from aviation, IT, mechanical engineering, chemistry, electronics.

**SOC:** It is very important to understand your particular vision about unique features of your company. Why do you consider the major market players might be interested in investing into a promotion of your technology/product on the addressable market?

**Mr. Solovyev:** We consider we can be interesting to logistic companies, for instance, **BMW** or **VW**, **Boeing** or **Airbus**. Because Hoversurf is the transport of the future. Our eco-friendly flying transport will be able to solve the problems of urban traffic jams.

**SOC:** Now we would like to refer to the next very crucial and we would even say essential aspect for spinoff companies' as the strategy of R&D, production, distribution and marketing processes. Do you have your own unique strategy? Which of these processes do you consider your spinoff is strong at?

**Mr. Solovyev:** Our strengths of the project are the level of our technologies that ahead of competitors. We have the most advanced proprietary technology. While E-HANG shows the flightless prototype, we are undergoing flight testing with a man. We have the ability to assess and analyze patents and technology level by own patent platform. We have carried out the World's first manned flight to the electric quadcopters in **2016**. We have decided to issue the flight duration through the use of hybrid FPE proprietary technology. We have the best team of professionals from around the World to solve these problems.

**SOC:** As a rule, the majority of spinoffs outgrow into exits. How do you determine the market for your product/technology and estimate its volume and dynamics? What is your potential share on the market? How do you think what market cap your company plans to reach at the peak of its development and why? How long might this process take?

**Mr. Solovyev:** I think the max cost of the company is probably **\$1B** (it will take 3 years), the market is **\$900B**.



Hoverbike Scorpion 3  
photo provided by Hoversurf Inc.

**SOC:** For spinoff companies their intellectual property is a key to success. The investors pay particular attention to it. What key intellectual property does your company have (patents, patents pending, copyrights, trade secrets, trademarks, domain names)?

**Mr. Solovyev:** We have registered trade mark Hoversurf (US SF) and 4 patents, You can find all patents on our [website](#). The VTOL market is very hot, we have developed financial and production models, there are patents for all processes, engines and design.

**SOC:** For both of us, as well as for thousands successful spinoffers, it's not a secret that a new technological breakthrough may become obsolete very fast. Respectively, patent validity period becomes shorter. It is interesting to know the perspectives and protection plan of your technological advancement and leadership in a medium- and long-term perspectives

**Mr. Solovyev:** Here's how we see the market evolution for the next 8 years:

**2017** - first contracts with those who need special transport, like emergency services and manufacturers, their employees who operate in very specific conditions. Software fee \$1k/month. Device cost is \$100k/unit.



**2018** - first contracts with transport companies. Software fee \$5k/month. Device cost is \$150k/unit.

**2019** - gov. regulations will support VTOL transport with additional interest from transporting organizations.

**2025** - drone-taxi will be presented in all big cities, around 5% of people may use it as main transport.

**SOC:** The investors will want to get a clear picture of how many rounds of investments have you completed? Are you seeking for the investments at the moment? What is the volume and time limits? What milestones will the financing get you to? What did you plan to use the invested funds for?

**Mr. Solovyev:** Recently, we have closed the Round A at the amount of \$2M at \$20M pre-money valuation. Now we are at the stage of Round B, all money is needed to start the production. At the moment we are raising from \$3M to \$12M at \$36M pre-money valuation.

**SOC:** Could you please describe your ideal investor? What aspects are important for you, for instance, is it experience, country, the amount of own private capital or maybe some personal qualities? Will existing investors participate in the round?

**Mr. Solovyev:** Currently, we are looking the **investor(s) from the US or the EU**, better if it is the professional investment fund, but not excepting the privat capital.

**SOC:** And the last question, could you specify the most convenient way you would like to receive inquiries from potential investors? Should it be by e-mail or personal phone call?

**Mr. Solovyev:** It should be by **e-mail** (invest@hoversurf.com for Andrey Solovyev, Co-founder&Commercial Director).

**Company name:** Hoversurf Inc.

**Contact person:** Andrew Solovyev

**E-mail:** invest@hoversurf.com

**Website:** <https://www.hoversurf.com/>

**Phone:** +79031308113

**Patent status:** +

**On market since:** 2017

**Regions:** United States

**Industries:** Others

**Source links:**

[World's first rideable hoverbike](#)

[Hoverbike Scorpion 3](#)

[The human-carrying drone manufacturer Hoversurf](#)

[Hoversurf's Scorpion 3 is the world's first fully-manned hoverbike](#)

[Scorpion S3 electric hoverbike looks terrifyingly fun](#)

[This flying motorcycle is straight out of Star Wars](#)

[Hoverbikes are now real](#)

[Hoversurf resembles our sci-fi dreams](#)

[The world's first manned Hoverbike is here, and the future is officially lit](#)

[Watch the World's First Rideable Hoverbike in Flight](#)

[Your hoverbike dreams have come true](#)

[Scorpion hoverbike - the scariest thing on wings](#)

[Just in time for Metro's collapse: the hoverbike](#)

[Singapore in talks with firms to try out 'flying taxis'](#)

[Bike of the future](#)

[The Russian superbike](#)

[Bank invests millions in FLYING motorbikes](#)

[Hoverbike-riding police to patrol the streets of Dubai](#)

[La Policía de Dubái prueba con éxito una innovadora aeromoto rusa](#)

[It flies: Dubai Police unveil new hoverbike](#)



**Files:**

[Dubai police will soon zoom around the sky on hoverbikes](#)

["Star Wars" - Style Police Hoverbikes Will Soon Be on Patrol](#)

[Project Formula: Russian hoverbike creators take aim at VTOL flying car](#)

[Hoversurf plans to 3D print 5-seater project formula VTOL flying car](#)

[Flying car: the Russian company Hoversurf is already working on its new challenge](#)

[Russian firm behind Dubai's police hoverbike reveals 'Project Formula' five seater flying](#)

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[Пресс-релиз Hoversurf](#)

[Связист из Санкт-Петербурга создал летающий мотоцикл](#)

[Российский ховербайк летал под крышей ангара на испытаниях в Москве](#)

[Российский стартап Hoversurf представил готовый летающий мотоцикл Scorpion 3](#)

[Новый проект российской компании Hoversurf](#)

[Российский ховербайк Scorpion-3 готов к показам?](#)

[Российский ховербайк стал устойчивее и получил новые органы управления](#)

[Полиция Дубая пересядет на российские ховербайки](#)

[В Москве разрабатывают аэротакси и летающие мотоциклы](#)

[Москвичи смогут воспользоваться первыми летающими такси в 2018 году](#)

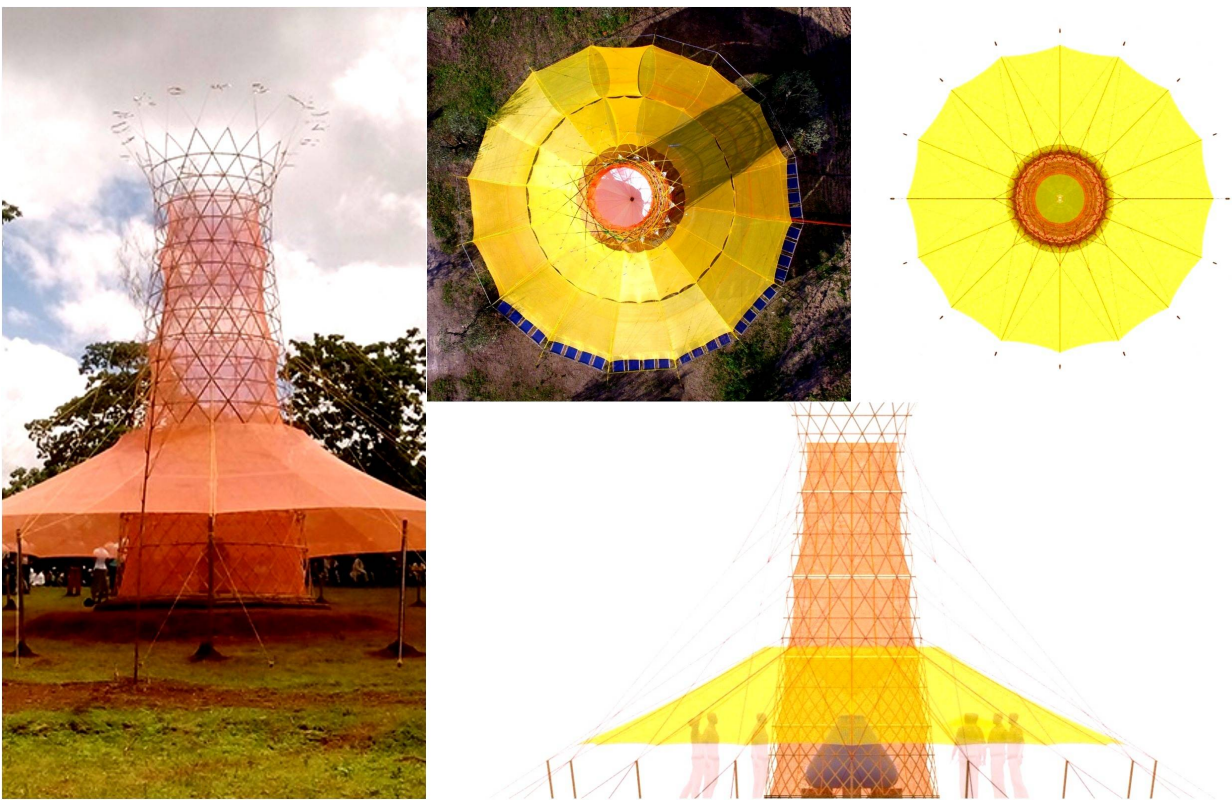
[Hoversurf: создать транспорт будущего \(и взлететь на хайпе\)](#)



# WARKA WATER IS THE SOLUTION TO POTABLE WATER

Exclusive interview for [SPINOFF.COM](https://www.spinoff.com) with Mr. Arturo Vittori, Warka Water Inc. Founder & CEO, about Warka Water, which captures potable water from the air by collecting rain, harvesting fog and dew for rural communities in Ethiopia

Water is the source of life. It is so fundamental to our lives that we take it for granted. But in some areas of the world, water shortage is an acute and a real problem. Many rural villages in Africa lack the simple water infrastructure to fulfill basic needs. Warka water is able to solve this problem. The product was developed by Arturo Vittori. Warka Water is an alternative water source to the rural population that faces challenges in accessing drinkable water. It is first and foremost an architecture project. Warka Water should be considered as a tool that can provide clean water in selected areas, particularly in mountainous regions where conventional pipelines will never reach and where water is not available from wells.



Front View & Top View - Warka Water

photo provided by Arturo Vittori, Warka Water Inc. Founder & CEO

**SOC:** Dear Mr. Vittori, we are so grateful for your generosity this day in spending time speaking with us and sharing your insights about Warka Water Inc.

**Mr. Vittori:** **Warka Water** is a vertical structure designed to collect harvest potable water from the air. It offers an alternative water source to rural populations that face challenges in accessing drinkable water.

The name “**Warka Water**” comes from the Warka Tree (Ficus Vasta), a giant wild fig tree

native to Ethiopia. The tree's fruit provides nourishment for the people and animals, and its shade is traditionally used for public gatherings and school classes. The Warka tree constitutes a very important part of the Ethiopian culture and ecosystem. The project draws inspiration from various sources. In nature, we observed and studied the Namib Beetle, spider webs, termite hives, and cactus spines to learn how natural organisms and structures collect and retain water from their surroundings. Culturally, we were inspired by the social significance of the Warka tree, Ethiopian craftsmanship, and basket weaving techniques as well as the traditional Mediterranean fish traps called "Nassi di Giunco".

[Warka Water Inc.](#) is American nonprofit organization and it is developing different products. It focuses on innovative and sustainable solutions to some of the humanity's most enduring problems through the fusion of local knowledge and resources, visionary design, and ancient traditions.

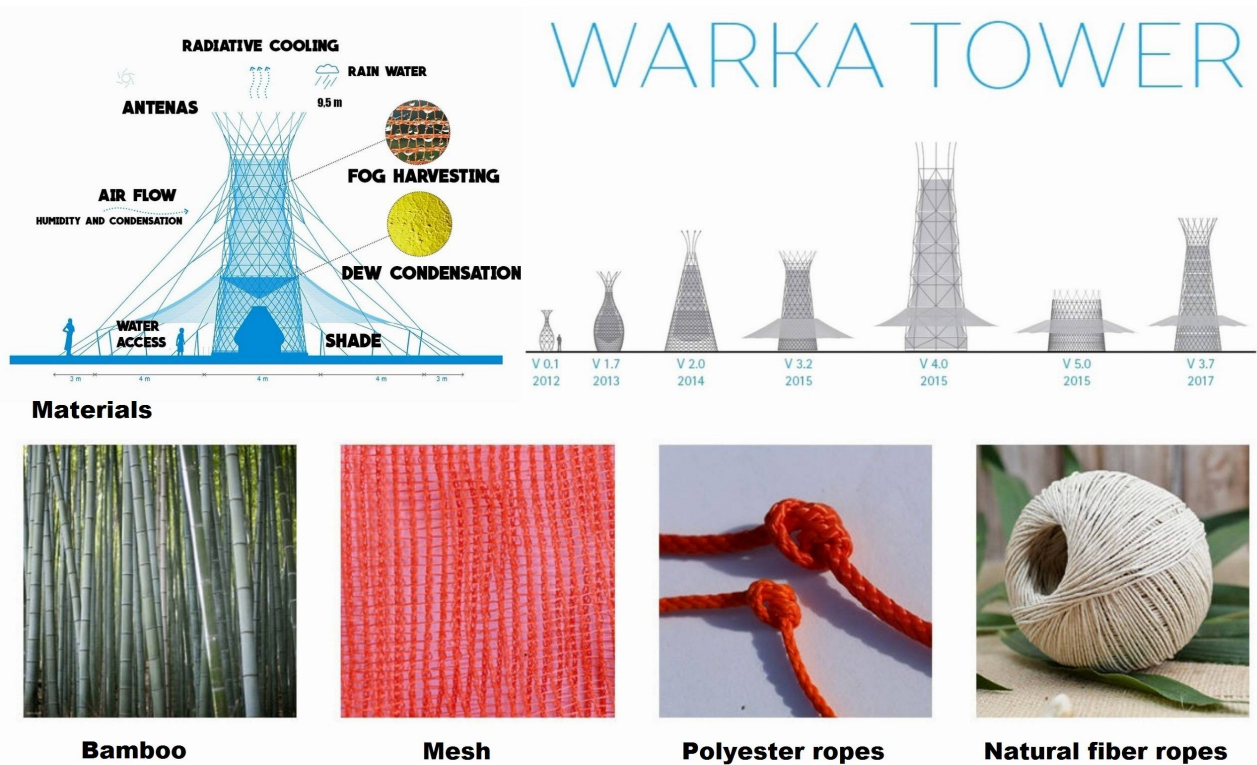
**SOC:** Our investors and we would like to learn more about a vast experience of your academic endeavors and your professional background.

**Mr. Vittori:** I am an Italian architect and industrial designer. I was studying in Italy and Germany. After graduating from the University of Florence, I collaborated with Santiago Calatrava, Jean Nouvel and Francis Design on a variety of architectural projects and with Future Systems and Anish Kapoor on the subway station in Naples. I have been teaching Industrial Design and Architecture at universities in Italy, Switzerland and the United States. I am a member of the Order of Architects of Viterbo Province, and the American Institute of Aeronautics and Astronautics (AIAA). I worked on aircraft, yacht and ship design in Toulouse and London, including designs for the interior of the first Airbus A380.

Now I am co-founder and director of the research and design studio [Architecture and Vision](#) and CEO of the American non-profit Warka Water Inc. and founder the fashion brand Culture a Porter.

The Warka Water project is the product of architecture. It is producing the energy and water and it is developing such projects as [Warka Tower](#), [Warka House](#), [Warka Drone](#), [Warka Garden](#) and [Warka Solar](#).





Functional diagram, main project versions and materias - Warka Water photo provided by Arturo Vittori, Warka Water Inc. Founder & CEO

**SOC:** Considering your tremendous experience, we would like to know whether you had other projects? Could you please share the story of their creation and success.

**Mr. Vittori:** Yes, as I mentioned, I am co-founder and director of the research and design studio **Architecture and Vision**. Architecture and Vision (AV) is an international and multidisciplinary team working in architecture and design, engaged in the development of innovative solutions and technology transfer between diverse fields for aerospace and terrestrial applications. Since AV was established in 2002 we have worked with prestigious organizations such as ESA, European Space Agency, Asiana Airlines, The Bird House Foundation, etc. AV is based in Bomarzo (Viterbo, Italy) and Munich (Germany). AV projects have received international recognition.

Concerning the **Warka Water** project, it was started in 2012. We visited small isolated villages up on a high plateau in the North East region of Ethiopia. There we witnessed a dramatic reality: the lack of potable water. The villagers live in a beautiful natural environment but often without running water, electricity, a toilet or shower. To survive here, women and children walk every day for miles to shallow, unprotected ponds where

the water is often contaminated with human and animal waste, parasites, and diseases. It was imperative to take action and create a solution to mitigate this water shortage issue.

A number of prototypes are installed in Italy in order to run experiments and tests. Our pilot field project was successfully installed in Dorze, Ethiopia in 2015. Currently, we are undertaking the first steps to bring help to different isolated communities in places such as Haiti, Madagascar, Colombia, India, Sumba, Nepal, among others.

**SOC:** It is so interesting to know more about the process of your technology creation. Please tell on which stage of commercialization your technology currently is? Was your project funded by any state financing or grants? Has it already received any honors or awards?

**Mr. Vittori:** The Warka Water has been already tested and installed. It is not commercialized yet. We scale functional prototypes. We are planning to distribute it all around the world in a few years.

We have won different awards, for instance, they are Zumtobel Group Award (2017), [The World Design Impact Prize](#) (2016), [The National Geographic Expeditions Council Grant](#) (2015). We also have Nominations, among them are [Imagina](#) (2009) and [VisionWorks Award](#) (2009).

**SOC:** In the formation of every scientific spinoff, one of the most important keys to success is the team. For many potential investors, the management team is the most important element in deciding whether to invest in it or not. Could you please share some information about the team members who supported you and the project? What are the key additions to the team needed in the short term?

**Mr. Vittori:** The project is really much focused on my person. Therefore, I am the founder of the developing and creating the project. There is the team of people with whom we collaborate time to time on different bases. The main design developments are based on offices of the Architecture and Vision. The team consists of international workers. Different people from all around the world collaborate on this project. Nevertheless, they are not fixed in the definite team. The most part of work I do by myself.



SOC: It is not a secret that the development of a new technology and its subsequent commercialization presupposes some problem and addresses unmet needs. Respectively, what problem did you intend to solve by creating your technology? What results did you plan to achieve?

Mr. Vittori: Power from the **Warka Tower** brings many resources to the remote and isolated communities all around the world. We want to bring potable water and electricity in order to give people a chance to better life, to give possibility not to search water every single day that will allow children to go to school and ensure people ordinary life.

It provides an alternative water source for rural populations that face challenges accessing drinkable water. The Tower serves as a charging station, allowing villagers to power mobile phones and laptop computers, and offers an illuminated place to study and socialize after the sun goes down. We recognized that there were other important issues to be solved, so additional projects such as Warka Drone, Warka Toilet, and Warka House have evolved and are well into development.



International team of Warka Water  
photo provided by Arturo Vittori, Warka Water Inc.

SOC: The problem which you targeted to solve was actual before. Probably someone has already tried to solve it. Is it right? Understanding the unique selling points from the investor's side could make the technology N° 1 for them. What are the unique selling points of your technology and fundamental difference from other technologies that tried to solve this problem before you?

**Mr. Vittori:** It is very difficult to answer this question. There are many ways to get water from the atmosphere in nature. In addition, these ways were known in the ancient times how to collect water on the daily basis. People used peculiar construction for this. There is nothing new in this method.

**SOC:** In order to understand the peculiarities of this particular spinoff our investors always ask what is the investment structure of the company? Do you still own the controlling stake in your spinoff?

**Mr. Vittori:** Yes, I still own the controlling stake in this product.

**SOC:** We wonder what is the actual addressable market currently for your invention and what are the current competitors there? Could you please share with us the results of the market studies, if there are any? What might be the barriers to entry?

**Mr. Vittori:** We do not have any competitors in the market. Our goal is to first pilot the towers in Ethiopia and study the possibility of installing them in other geographical contexts that present similar meteorological and topological characteristics at the pilot site.



Warka Water

photo provided by Arturo Vittori, Warka Water Inc.

**SOC:** We always need to paint a clear picture to the potential investors of the market opportunity of the spinoff that is meaningfully large and growing. Why in your opinion your company might have a high growth potential? Could you tell us all current industries and fields of your technolog/product application and where do you think it could be successfully applied in the future?

**Mr. Vittori:** Once the prototype development and testing phases are completed, we hope to manufacture the Warka on a large-scale, which will bring the cost down. For Ethiopia, our estimated cost per tower is about **\$1000**—significantly less than other water relief options available. The exact cost will depend on where it will be manufactured.

It will be useful for everyone to use new ways of extracting energy from our planet. I am sure it will use for building cities in the future. I can say for sure that this is the future technologies and they will in demand in the future.

**SOC:** The potential investors will be curious whether you already have the first clients and signed contracts? What was the feedback from your partner's markers

and customers?

**Mr. Vittori:** We have different clients from government to private clients. So far, every client and partner are happy and appreciate our work. The project is going to grow.

**SOC:** We both know that for you and the investor it is crucial to reach positive cash flow as soon as possible. Certainly, the market scaling cannot be achieved without proper distributors network and clients. Please tell us about your criteria of partners selection and which markets are open for spinoff activity.

**Mr. Vittori:** We do not have the financial support yet to help us complete the study and bring it to production. Investors' help and generosity will help us bring the towers to the communities.





Details of Warka Water  
photo provided by Arturo Vittori, Warka Water Inc.

**SOC:** It is very important to understand your particular vision about unique features of your company. Why do you consider the major market players might be interested in investing into a promotion of your technology/product on the addressable market?

**Mr. Vittori:** I think this project should be supported. We reached good results independently with no specific assistance from other organizations. In my opinion, if something is useful it will affect to grow the economy.

**SOC:** Now we would like to refer to the next very crucial and we would even say essential aspect for spinoff companies' as the strategy of R&D, production, distribution and marketing processes. Do you have your own unique strategy? Which of these processes do you consider your spinoff is strong at?

**Mr. Vittori:** Do we have our own unique strategy? I think we do not have, but we have the goal to change people's lives for better. We are professionals in what we do and believe in our success.

**SOC:** As a rule, the majority of spinoffs outgrow into exits. How do you determine the market for your product/technology and estimate its volume and dynamics? What is your potential share on the market? How do you think what market cap your company plans to reach at the peak of its development and why? How long might this process take?

**Mr. Vittori:** We need to complete the development phase, test the prototypes by launching and monitoring at various pilot locations, and then proceed with the large-scale production. During the pilot phase, we will survey the local surroundings to source materials and determine production sites and requirements.

**SOC:** For spinoff companies their intellectual property is a key to success. The investors pay particular attention to it. What key intellectual property does your company have (patents, patents pending, copyrights, trade secrets, trademarks, domain names)?

**Mr. Vittori:** No, we do not have it yet.

**SOC:** For both of us, as well as for thousands successful spinoffers, it's not a secret that a new technological breakthrough may become obsolete very fast. Respectively, patent validity period becomes shorter. It is interesting to know the perspectives and protection plan of your technological advancement and leadership in a medium- and long-term prospectives

**Mr. Vittori:** We are going to go to the Austrian and German market **in 2019 or 2020**.





Collecting fog water

photo provided by Arturo Vittori, Warka Water Inc.

**SOC:** The investors will want to get a clear picture of how many rounds of investments have you completed? Are you seeking for the investments at the moment? What is the volume and time limits? What milestones will the financing get you to? What did you plan to use the invested funds for?

**Mr. Vittori:** We are planning to use the invested funds for developing products and technologies, supporting R&D, improving functions of the Warka Tower. Invested funds will be able to grow of productions and reach more performance.

**SOC:** Could you please describe your ideal investor? What aspects are important for you, for instance, is it experience, country, the amount of own private capital or maybe some personal qualities? Will existing investors participate in the round?

**Mr. Vittori:** I do not know exactly, maybe social capital investors. I expect products support from investors and funding of the government.

**SOC:** And the last question, could you specify the most convenient way you

would like to receive inquiries from potential investors? Should it be by e-mail or personal phone call?

Mr. Vittori: It should be by e-mail.

Company name: Warka Water Inc.  
Contact person: Arturo Vittori  
E-mail: [arturo@arturovittori.com](mailto:arturo@arturovittori.com)  
Website: <http://www.warkawater.org/>  
Phone: +393270214946  
Patent status: -  
On market since: 2012  
Regions: United States  
Industries: Others  
Files: [Biography Arturo Vittori](#)



## EVOWARE'S PRODUCTS

Exclusive interview for [SPINOFF.COM](https://www.spinoff.com) with Mr. Aldrin, Evoware Co-founder & Business and Financial Advisor, about Evoware's products which are eco-friendly, biodegradable or even edible and healthy for the body



Evoware is a socially responsible enterprise that elevates an environmentally friendly lifestyle and provides innovative value to urban society. Evoware's team has invented and developed the Seaweed-Based Packaging. This seaweed-based packaging has already been patented and received halal and safety guarantee certificate. Evoware tries to be the eco-solution for plastic waste problems. Evoware's team mission is to create innovative solutions from seaweed to solve the plastic waste issue while increasing the livelihood of Indonesia's seaweed farmers. Through Evoware's products, people evolve to be closer to nature and live more responsible and sustainable life.



Evoware's team  
photo provided by Evoware

**SOC:** Dear Mr. Aldrin, we are so grateful for your generosity this day in spending time speaking with us and sharing your insights about Evoware's products.

**Mr. Aldrin:** Our company is [Evoware](#). Currently, we have two kinds of products in **Evoware**. Our first product is **Ello Jello** edible cup that has been commercialized since **April 2016**. Our new product is **Seaweed-Based Packaging** that has been commercialized since **September 2017**. Both products are made from seaweed and local sources.

**SOC:** Our investors and we would like to learn more about a vast experience of your academic endeavors and your professional background.



**Mr. Aldrin:** I am **Evoware's co-founder**, responsible for business, finance and investment in the company. I have more than **10 years of depth experience** in entrepreneurial, investment, finance management, organization structuring and operational improvement areas. I advised and co-founded social impact businesses and ensured them to achieve their best value and impact. I served as the **Vice President** of the Investment in a Hongkong Private Equity House based in Jakarta. I have managed many major M&A transactions and operational turnover, value creation portfolios of companies, including ESG planning and implementation. I was also a **Manager in KPMG Deal Advisory**, advising many M&A deals, including due diligence, financial modeling and valuations. I was a **Head of Asia Pacific Internal Audit in Kordsa Global** managing operational improvement projects in Turkey, China, Thailand and Indonesia. I started my career as external audit and **Corporate Finance in PwC**. I am a **CFA Level III Candidate**.

**SOC:** Considering your tremendous experience, we would like to know whether you had other projects? Could you please share the story of their creation and success.

**Mr. Aldrin:** Our current **Evoware** project is focused on **seaweed-based packaging**. We use packaging for dry product application (for food and non-food) and next year we will launch the packaging for liquid and semi liquid product. We have received the patent for both. Together with this, I have some special myself to the impact businesses.



Bioplastic Application  
photo provided by Evoware

**SOC:** It is so interesting to know more about the process of your technology creation. Please tell on which stage of commercialization your technology currently is? Was your project funded by any state financing or grants? Has it already received any honors or awards?

**Mr. Aldrin:** Currently, we are in manual stage/small quantity. We sold our products locally and internationally. Currently, we fund our projects from grants and bootstrapping. We won two competitions and received awards in early **October**. The first is the [Social Venture Challenge Asia from DBS and NUS](#). The second one is the [Circular Design Challenge from Ellen MacArthur Foundation](#). In addition, **our company has received many awards** such as [Semifinalist of Green Sustainable Chemistry Challenge](#), Elsevier (Berlin), [National Intellectual Property Award](#) (Inventor Category) from Indonesia Kemenkumham, [Runner-up winner of Wismilak](#) and [Finalist of Sankalp Forum](#). Evoware has been featured in many local and international offline and online media.

**SOC:** In the formation of every scientific spinoff, one of the most important keys to success is the team. For many potential investors, the management team is the most important element in deciding whether to invest in it or not. Could you please share some information about the team members who supported you and

**the project? What are the key additions to the team needed in the short term?**

**Mr. Aldrin:** There are five people in our management team and there is one professional manager.

**David Christian** is Chief of Sales, Marketing and Impact. He has 3 years of experience in leading B2B sales team. He is Bachelor of International Business in Canada, Head of Micro Business and Creative Industry, Head of Natural Resources, Energy & Environment in Indonesian Young Entrepreneur Organization.

**Noryawati Mulyono** is Chief of R&D. She is Bachelor of Chemistry and Doctoral of Food Science with the persistent research interest in Bioplastic since 2010.

**Edwin Aldrin** is Business and Financial Advisor. He has 10 years of experience in Business, Investment & Finance. He is CFA Level III Candidate, Business and Financial Advisor for many impact businesses, Vice President of Business and Investment in a Private equity firm, Business and Advisory Manager in PwC and KPMG.

**Benyamin Gunawan** is Chief of Production. He has 15 years of experience in System and Production. He is Bachelor of Management Informatics, Electronic Data Processing Manager and Production and G&A Manager, and Bioplastic Researcher Assistant from 2010-2014.

**Surianto** is Chief of Purchasing & Maintenance. He has 22 years of experience in Supply Chain System, Business and Mechanical.

**Sizigia Pikhansa** is Marketing and Communication Manager. She has 3 years of experience in Digital Agencies as a Creative Communications Specialist, Bachelor of Communication Science in University of Indonesia.

**SOC:** It is not a secret that the development of a new technology and its subsequent commercialization presupposes some problem and addresses unmet needs. Respectively, what problem did you intend to solve by creating your technology? What results did you plan to achieve?

**Mr. Aldrin:** We are very concerned about the fact that Indonesian contributions to plastic waste in the ocean is the largest after China. About 90 % of the amount of plastic waste that goes into the ocean, 70 % comes from F&B Packaging. 25 % of fish in the market is contaminated with this plastic waste. We intend to solve this problem by using the eco-packaging. The development of this seaweed-based packaging actually have been started since 2011 but this is the right time to launch it and we can't wait any longer, we will scale up our production as the demand increasing. We wish to see a cleaner world by providing sustainable packaging.

**SOC:** The problem which you targeted to solve was actual before. Probably someone has already tried to solve it. Is it right? Understanding the unique selling points from the investor's side could make the technology N° 1 for them. What are the unique selling points of your technology and fundamental difference from other technologies that tried to solve this problem before you?

**Mr. Aldrin:** We offer a small format of sustainable packaging. Our product has 2 years of shelf life. It can be customized in colour, logo and taste upon request. It dissolves in water. The customer can eat the food without waste. It is not just sustainable, but also nutritious. It has a huge positive impact on the environment. As it is the biodegradable product, people can just throw it away and it will become hummus. We use renewable sources from the ocean such as seaweeds for its production, we don't take up land spaces and we don't use any petroleum products. The cultivation of seaweeds itself can absorb CO2. I think this is the only technology in the world that has such unique selling point.

**SOC:** In order to understand the peculiarities of this particular spinoff our investors always ask what is the investment structure of the company? Do you still own the controlling stake in your spinoff?

**Mr. Aldrin:** Yes, we still own the controlling stake.



Coffee Instant with Bioplastic  
photo provided by Evoware

**SOC:** We wonder what is the actual addressable market currently for your invention and what are the current competitors there? Could you please share with us the results of the market studies, if there are any? What might be the barriers to entry?

**Mr. Aldrin:** Our current market is bioplastics market. In 2015 the Global bioplastics market size was USD 9.2bn and it will grow next 5 years by 29.3% CAGR that is USD 33.3bn.

Currently, we have such indirect competitors in the market as:

**Oxodegradable plastic** which is made of 98% conventional plastic and up to 2% oxidator. It is not fully biodegraded, it is even more dangerous because it cannot be recycled and will turn to micro- and nano plastics that can be inhaled by soil and sea animals. **Starch-based biodegradable plastic** causes land and food crisis and takes a long time to grow.

The barrier to entry is the technology and the relationship. But we offer the source of raw



material that is the seaweed.

**SOC:** We always need to paint a clear picture to the potential investors of the market opportunity of the spinoff that is meaningfully large and growing. Why in your opinion your company might have a high growth potential? Could you tell us all current industries and fields of your technolog/product application and where do you think it could be successfully applied in the future?

**Mr. Aldrin:** Currently, we have two kinds of applications: **non-food** and **food packaging**. Our current customers for food packaging among others are waffles, cookies, energy bars, ice cream and coffee packaging. For non-food packaging, our current customers are toiletries such as for example soap and other personal-care products. When we get production to larger scale we are planning to supply different food and non-food producers from instant noodles to sanitary napkins. We see the huge potential of our packaging and other application as well.



Noesa Soap with Bioplastic  
photo provided by Evoware

**SOC:** The potential investors will be curious whether you already have the first

clients and signed contracts? What was the feedback from your partner's markers and customers?

**Mr. Aldrin:** Generally, our current customers are **small businesses** since our minimum capacity. However, we are in the process of collaboration with a **big international company**, the global company that focused on the consumer products and **F&B sector**. We are sending the samples to them. We see that the feedback from the market is very good and we have recurring customers.

**SOC:** We both know that for you and the investor it is crucial to reach positive cash flow as soon as possible. Certainly, the market scaling cannot be achieved without proper distributors network and clients. Please tell us about your criteria for partners selection and which markets are open for spinoff activity.

**Mr. Aldrin:** We have received many requests from the time we launched our packaging in **September 2017**. Currently, what we do is direct sales approach. There is a possibility that we use distributor when we enter mass. We are quite selective in picking distributor.

**SOC:** It is very important to understand your particular vision about unique features of your company. Why do you consider the major market players might be interested in investing in a promotion of your technology/product on the addressable market?

**Mr. Aldrin:** The major market players are interested in us. We are targeting a big player from **Australia** and start to do the collaboration together. We believe that we may provide the win-win solution to the industry.

**SOC:** Now we would like to refer to the next very crucial and we would even say essential aspect for spinoff companies' as the strategy of R&D, production, distribution and marketing processes. Do you have your own unique strategy? Which of these processes do you consider your spinoff is strong at?

**Mr. Aldrin:** We aim for a strong fundamental in the entire value chain. We make sure that the product achieves the international standard. We have the real mission to build networks, developing marketing and keep working on R&D. We never stop to innovate.



Energy Bar with Bioplastic  
photo provided by Evoware

**SOC:** As a rule, the majority of spinoffs outgrow into exits. How do you determine the market for your product/technology and estimate its volume and dynamics? What is your potential share of the market? How do you think what market cap your company plans to reach the peak of its development and why? How long might this process take?

**Mr. Aldrin:** We aim to be the main player in bioplastic market **in 2023**. It can be achieved by entering the mass market and securing the orders for the big/well-known player in the industry. We believe this will happen soon as we are the only provider of the complete solution in packaging at the competitive price of the mass production level.

**SOC:** For spinoff companies their intellectual property is a key to success. The investors pay particular attention to it. What key intellectual property does your company have (patents, patents pending, copyrights, trade secrets, trademarks, domain names)?

**Mr. Aldrin:** We have the **trademark, patent** and **domain name**.

**SOC:** For both of us, as well as for thousands successful spinoffers, it's not a secret that a new technological breakthrough may become obsolete very fast. Respectively, patent validity period becomes shorter. It is interesting to know the perspectives and protection plan of your technological advancement and leadership in a medium- and long-term prospectives

**Mr. Aldrin:** We will keep innovating with the new product and observe what is happening in the market. We will be able to mitigate any patent risk.



Bioplastic  
photo provided by Evoware

**SOC:** The investors will want to get a clear picture of how many rounds of investments have you completed? Are you seeking for the investments at the moment? What is the volume and time limits? What milestones will the financing get you to? What did you plan to use the invested funds for?

**Mr. Aldrin:** We are planning to get the investment to bring the product to the mass market ideally at end of 2018. We are opened to any interest and can start building the connection from now. The first overseas country that we are planning to export our products will be Australia.

SOC: Could you please describe your ideal investor? What aspects are important for you, for instance, is it experience, country, the amount of own private capital or maybe some personal qualities? Will existing investors participate in the round?

Mr. Aldrin: The ideal investor is patient impact investor that has strong network and pipelines in global trade and logistics networks worldwide.

SOC: And the last question, could you specify the most convenient way you would like to receive inquiries from potential investors? Should it be by e-mail or personal phone call?

Mr. Aldrin: It should be by e-mail.



**Company name:** Evoware  
**Contact person:** Edwin Aldrin Tan  
**E-mail:** edwin.evoware@gmail.com  
**Website:** <http://www.evoware.id>  
**Phone:** +62817868696  
**Patent status:** patented  
**On market since:** 2017  
**Regions:** United States  
**Industries:** Others  
**Source links:** [Evoware](#)  
**Files:** [Evoware - Fact Sheet](#)  
[Evoware - Bioplastic FAQ](#)  
[Evoware Company Profile](#)



## MEDICAL CANNABIS

Exclusive interview for [SPINOFF.COM](https://www.spinoff.com) with Mr. Meir Haber, Biota Ltd. Founder & CEO, about Biota AlgiFilm™ technology and drug delivery through the oral mucosa using adhesive films (about the size of a small postage stamp)

Biota's proprietary AlgiFilm™ oral mucoadhesive filmstrips are versatile, exact and robust, simple-to-administer drug delivery system. The technology was developed by Biota Ltd. as one of the outcomes from the company multinational collaboration during the European Research Consortium studying algal bioadhesion. The technology is based on alginates, biopolymers extracted from algae, processed into filmstrips containing active ingredients, using a unique method, and used to administer the active ingredients through the oral mucosa into the bloodstream. Oral mucoadhesive filmstrips' patient-friendly drug delivery systems are especially required for treatment of children and the elderly population, as well as treatment of pain and disabling CNS diseases.



Meir Haber, Founder & CEO Biota Ltd and Mr. Claus Philippin, Biota Ltd. Director  
Photo provided by Biota Ltd

**SOC: Dear Mr. Haber, we are so grateful for your generosity this day in spending time speaking with us and sharing your insights about **Biota AlgiFilm™** technology. We would like to hear more about it.**

Mr. Haber: Thank you very much for your interview. Biota adhesive technology is so-called drug delivery technology. By drug delivery, it means that every pharmaceutical ingredient needs a vehicle for delivery into the body. The special aspects of **Biota AlgiFilm™** technology that the delivery of the active ingredients is being made by small filmstrips

similar to small stamp and the filmstrips when they are placed in the mouth they adhere to the oral surface and then they provide the active ingredient directly to the bladder through the oral mucosa. So they are not absorbed like the regular pill that is swallowed. And this technology has a lot of advantages because it's so-called bypass deliver, it reaches the drug very fast to the blood and it can improve the bioavailability. The advantages of that technology are quite significant for pharmaceutical companies and for other companies. Now we are mainly focused on delivery of cannabinoids for the medical support of patients which are suffering from pain or other illnesses.

**SOC: Our investors and we would like to learn more about a vast experience of your academic endeavours and your professional/scientific background.**

Mr. Haber: I was born in Israel sixty years ago. I graduated from the [Technion, Israel Institute of Technology](#). On 1982 I have graduated with a BSc *cum laude* in food engineering and biotechnology. I worked for many years in the Israeli food industry holding positions from R&D and quality assurance to technological management. About 20 years ago I started to study the broad spectrum of algal bioadhesives, i.e., biochemistry of adhesives and process of for adhesion to surfaces in the natural environment. That was quite a coincidence when I was wondering about the remarkable adhesion of marine algae to rocks in wet environment. It's quite a long story because I started doing research together with quite a few Israeli academic researchers, especially Dr. Michael Friedlander from [Israeli Oceanic and Limnologic Institute \(IOLR\)](#), and Prof. Ofer Lider (RIP) from [Witzmann Institute of Science](#), who supported my preliminary studies of the adhesive proteins biochemistry. I applied for a US Patent that was granted on January 1999, and eventually on December 1999 established [Biota Ltd.](#) at the [Technion Incubator](#). Since then, together with partners and collaborations, [Biota Ltd.](#) developed innovative adhesives products such as surgical adhesives and sealants. From 2003 onwards [Biota Ltd.](#) focus has been shifted to development of mucoadhesive filmstrips for oral drug delivery. So it's a very long story and I will elaborate later.

**SOC: Yes sure Mr. Haber it will be very interesting for us as well as for prospective investors. Considering your tremendous experience, we would like to know whether you had other projects? Could you please share the story of their creation and success.**

Mr. Haber: This is quite broad because as I mentioned when [Biota Ltd.](#) was established it planned to develop the tissue adhesives and sealants from the adhesives that marine seaweeds use to adhere to the rocks by a specialized section of the seaweeds named holdfast. For over three years from [November 2001 Biota Ltd.](#) was one of eight [Algal Bioadhesives Consortium \(AB\)](#) partner. AB budget was over two million euros, and all partners have made a significant progress. Each of AB partners, including [the Technion, Biota Ltd.](#) and [the Icelandic Startup partner, IOLR](#), and academic partners from [France, England](#) and [Sweden](#) continued to some extent their AB work. AB work in the field of surgical adhesives and sealants is being developed by other companies, partly supported by [Biota Ltd.](#) consultation. One of the companies is Technion spinoff [Sealantis](#), and the other is [LifeBond](#), established by Technion graduates. These two companies develop tissue adhesives and sealants for various medical needs and by different technologies, but they both apply [Biota Ltd.](#) methodology of using natural polymers for surgical applications. [Sealantis](#) utilize alginates and [LifeBond](#) utilize gelatin, and they are both quite successful. For example, [Life Bond](#) raised about 60 million dollars. Both [Sealantis](#) and [Life Bond](#) received European approval for marketing (CE). Few of AB partners are currently involved in EU network of [COST](#) Action [ENBA](#), targeting broad scope of bioadhesion basic and applied research. [Sealantis founder, Technion's Prof. Havazelt Bianco-Peld](#), and I represent [Israel at ENBA](#) management committee. We expect that collaborative research will continue, and be even more successful in the future.





Medical cannabis filmstrip  
Photo provided by Biota Ltd

**SOC:** It is so interesting to know more about the process of your technology/product creation. Please tell on which stage of commercialization your technology/product currently is? Was your project funded by any state financing or grants? Has it already received any honors or awards?

Mr. Haber: The **AlgiFilm™** technology was created as a result of AB collaboration with Icelandic partner, [Bio-Gels Pharmaceuticals \(Bio-Gels\)](#), than developing gels oral delivery system intended for local treatment of oral cavity wounds. **Biota Ltd.** developed films to close the skin incisions. The films were very effective but from the point of view of marketing, they were less relevant. During the collaboration with a **Bio-Gels**, we started to develop Biota films for oral drug delivery because the developed films adhered very well to the oral mucosa. We applied for a **US Patent**, but until the patent was granted, **Bio-Gels** was not operational due to financial difficulties. **Biota Ltd.** continued development of **AlgiFilm™** technology and collaborated with an Israeli company towards co-development of few products. We have done a lot of formulation studies with few APIs and natural active ingredients. Curently **Biota** is not yet in the market but it's very near because we have a lot of experience and now we seek for pharmaceutical partners and other partners especially in the medical cannabis field, because we have during the last two years developed prototypes of medical cannabis again with another Israeli company.

Unfortunately, I cannot disclose the detail of the company. We received a lot of funding from our collaboration, from the Israeli Incubator framework, from private investors. We have published quite a lot to our findings in scientific publications, including a book chapter, journals articles, and conference abstracts and posters.

**SOC: In the formation of every scientific spinoff, one of the most important keys to success is the team. For many potential investors, the management team is the most important element in deciding whether to invest in it or not. Could you please share some information about the team members who supported you and the project? What are the key additions to the team needed in the short term?**

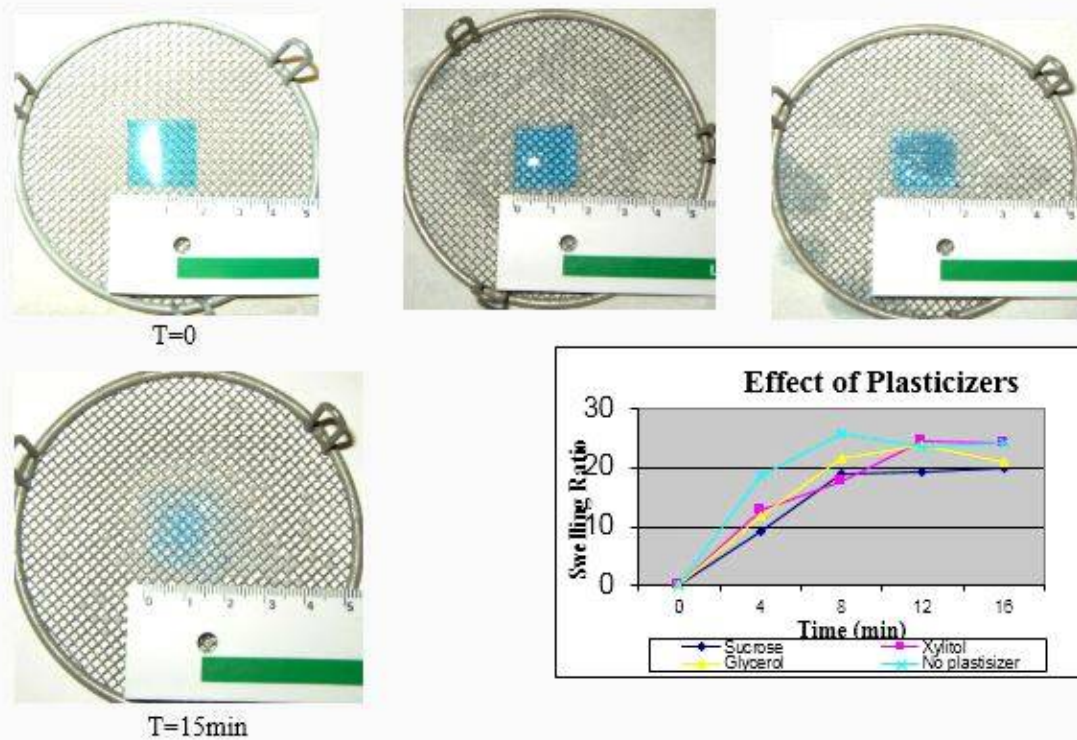
Mr. Haber: As I mentioned at the beginning of the researches **Biota Ltd.** collaborated with several Israeli companies as well as with the **Bio-Gels** from Iceland and all the companies that were partnering with had the strong background in the pharmaceutical industry. Some of them had been previously working at Teva, or other leading companies, providing their expertise as part of collaboration with **Biota Ltd.** At the beginning **Biota Ltd. R&D** of tissue adhesives it was managed by **Dr. Irina Lir**, who had many years of experience in developing surgical adhesives especially bone adhesives. **Dr. Lir** provided insights on how to develop adhesive, what are the important elements and the most of the idea to develop films instead of liquid adhesives that greatly help to develop the technology. At this stage, we will seek mainly experts in the short term who are well familiar with cannabis, its analyses and delivery and of course the clinical aspects are very important as well as eventually a manufacturing partner.

**SOC: It is not a secret that the development of a new technology and its subsequent commercialization presupposes some problem and addresses unmet needs. Respectively, what problem did you intend to solve by creating your technology/product? What results did you plan to achieve?**

Mr. Haber: There is a problem of drug delivery, especially the pharmaceutically active ingredients, that **API's** are not water soluble and have low bioavailability and are extensively metabolized. This is a huge challenge to the pharmaceutical industry. By using filmstrips that adhere oral mucosa, via oral mucosa it would be possible to deliver **APIs** that are difficult to deliver effectively by swallowed pills. For example, cannabinoids are not soluble in water, and are heavily metabolized, so it is very difficult to provide effective

doses in any other way than smoking which is the most frequently medical cannabis current delivery form. Of course, smoking is not acceptable as a pharmaceutical delivery form. So there is a need to develop and market pharmaceutically acceptable dosage forms. We expect that the delivery of cannabinoids and other active ingredients via oral mucosa will be better than smoking. **AlgiFilm™** technology can even be applicable for injected **APIs** that are not available through swallowed pills, for example insulin or growth factors. It is anticipated that eventually **Biota AlgiFilm™** technology will be used for delivery of many **APIs**. At the beginning, of course, we will focus on medical cannabis, but then we will target also delivery of other **APIs** for treatment of **Parkinson's disease** and **Alzheimer's disease** and many other diseases. On the long run will we believe that the technology will be even applicable, as non-invasive alternative for injected **APIs**.

## Alginate Films: Swelling & Dissolution



Biota and Bio-Gels  
Photo provided by Biota

**SOC:** As far as we understand from the video on your product and its USP/ technology, the problem which you targeted to solve was actual before.

Probably someone has already tried to solve it. Is it right? Understanding the USP from the investor's side could make the technology/product #1 for them.

What are the USP of your technology/product and fundamental difference from

**other technologies/products that tried to solve this problem before you?**

Mr. Haber: The problem that **Biota Ltd.** tries to solve is always important. Resolving bioavailability aspects of **APIs** is very common challenge of the pharmaceutical industry. Contrary the food industry, which I am a veteran of, the main concept of the food product is that it should be first of all tasty. For the pharma industry, the formulation itself is the key to success. This is not straightforward. The development is more art than science, but of course, science and technology are very important for innovative pharma products development. This development work is like an art in which how materials are combined, which process to use and improve, and how to make the entire delivery system effective and valued by patients, and in particularly how to mask unpleasant tastes of **APIs** providing a drug dosage form that is not unpleasant in the mouth - combined this is very difficult to achieve. Of course many other companies the successfully developed filmstrips, and the flagship product of sublingual filmstrips is **Suboxone®**. Most of the current market players utilize synthetic polymers, and use different formulation concepts that that of **Biota Ltd.** The formulation concepts of **Biota Ltd.**, and using alginates as major film former, should enable **Biota Ltd.** to develop improved **USP** product, having strong patent protection, as compared to a competitive.

**SOC: In order to understand the peculiarities of this particular spinoff our investors always ask what is the investment structure of the company? Do you still own the controlling stake in your spinoff?**

Mr. Haber: As I mentioned, **Biota Ltd.** was established at the Technion Incubator in **Israel, Haifa**. When it was established, as a founder, I was granted 50 percent of the shares of the company. I still own over **50 percent of Biota Ltd.** shares. **Biota Ltd.** obtained funding from private investors, initially from **Germany** and then from **Israel**. We have good personal relations with the German investors that has supported the company until today, and a **German Director, Mr. Claus Phillipin**, and myself are the directors of the company. The **Technion Incubator** still own about ten percent of **Biota Ltd.** shares. Private investors own the rest of the shares supported **Biota Ltd.** almost from the start, because the technology is very interesting and has very high the potential. Of course, we are considering the new investment, and it is quite clear that the shareholders will be diluted when there will be an investment. With the right investor, we expect to make significant progress and success for the company and its shareholders..

## Trans-mucosal Drug Delivery

- Administration of active ingredients via oral mucosa
- Advantages -
  - rapid onset of action
  - low first pass effect
  - lower doses
  - lower side effects
  - convenient



**Biota**

Trans-mucosal Drug Delivery  
Photo provided by Biota Ltd.

**SOC:** We wonder what is the actual addressable market currently for your invention and what are the current competitors there? Could you please share with us the results of the market studies, if there are any? What might be the barriers to entry?

**Mr. Meir Haber:** **Medical cannabis** is just emerging. **Israel** is regarded as the most advanced country in the world. Because first of all medical cannabis is not a medication because cannabis itself is regarded as a dangerous and illegal drug. And the use of cannabis for medical treatment is something which has to consider the limitation of the law, therefore not many companies have developed **medical cannabis products**. The delivery systems these companies are mostly related to inhalation of cannabis vapors, mostly similar to electronic cigarettes. Other more conventional dosages under development, such as, pills and transmucosal patches and gels do not provide fast activity and/or high bioavailability. Very few small companies also develop cannabis filmstrips. As



compared to competitors, **Biota medical cannabis** filmstrips have significant advantages. The medical cannabis market is large and growing rapidly. Assuming export from Israel will be possible according to the **Israeli** government decision, there are lot of opportunities. Recent approval of **Germany**, and other countries, to allow medical cannabis use market potential of exported medical cannabis products from Israel annually is estimated at 4 billion dollars. The global market potential of medical cannabis is estimated at **40 billion dollars**. Of course, at the current legal status of medical cannabis export is forbidden, so production and marketing is limited to each individual country, and because **the USA** federal law cannabis regard cannabis as illegal drug in the USA to state by state, even though **medical cannabis is legal in many states**, including California, Nevada, New Mexico, Alaska, and other. So cannabis can't be exported from state to state. Eventually, it is clear that medical cannabis will be legalized worldwide, and thane market potential could be even **60 billion dollars annually**.

**SOC:** We always need to paint a clear picture to the potential investors of the market opportunity of the spinoff that is meaningfully large and growing. Why in your opinion your company might have a high growth potential? Could you tell us all current industries and fields of your technolog/product application and where do you think it could be successfully applied in the future?

**Mr. Meir Haber:** **Biota Ltd.** is a specialty drug delivery company. The pharma industry have many diverse needs for drug delivery technologies, and potential applications of technology for delivery **API** is substantial. Biota medical cannabis filmstrips eventually will evolve to pharmaceutical cannabis, the product like **Sativex®**. **Biota Ltd.** initiated development of nicotine filmstrips as OTC smoking cessation aid product, i.e., nicotine replacement therapy. Together with pharmaceutical companies, drug delivery systems for **Alzheimer's** and **Parkinson's APIs** is one of **Biota Ltd.** forthcoming product portfolio candidates. **AlgiFilm™** technology is also applicable for improving innovative drugs efficacy, and more importantly enable pharmaceutical products lifecycle management (LCM). Innovative pharmaceutical companies face many patent expiration and generic completion. Patented improved delivery system, such as Biota's filmstrips, can extend patent protection by additional 10 years or more. **LSM** modifies delivery system strategy is common for all blockbuster drugs, such as **Teva's Copaxone®**. Similarly Indivior's **Suboxone®** sublingual filmstrips is LCM product of the sublingual tablets.

## Cannabis/Hemp Extracts mucoadhesives-transmucosal films

- Cannabis extracts : hemp oil/cbd, other
- Mucoadhesive-transmucosal films
- Sublingual and buccal delivery
- Pharma and food approved excipients
- Strong IP
- High loading capacity
- Scalable and versatile technology
- Rx, OTC and suplamentation
- Convenient, standardized and good costumer compliance



Medical cannabis transmucosal filmstrips USP  
Photo provided by Biota Ltd.

**SOC:** The potential investors will be curious whether you already have the first clients and signed contracts? What was the feedback from your partner's markers and customers?

**Mr. Meir Haber:** **Biota Ltd.** don't have yet a marketed product. Currently **Biota Ltd.** negotiate a license arrangement with a nutritional supplement company for delivery of few natural active ingredients possessing low bioavailability. Confidential pharmaceutical companies' inquiries are also discussed. For example, pain treatment is very interesting field, because very fast acute pain relief is required, and transmucosal filmstrips, delivering **APIs** directly to the blood stream, provide fasted activity, as compared to swallowed tablets, that are slowly absorbed thus less effective.

**SOC:** We both know that for you and the investor it is crucial to reach positive cash flow as soon as possible. Certainly, the market scaling cannot be achieved without proper distributors network and clients. Please tell us about your criteria of partners selection and which markets are open for spinoff activity.

**Mr. Meir Haber:** The market of the activity is global. It can be in the western world and as well in **China, India** or **South America**. Each market has its own characteristics and needs.

Distribution and partnering agreements are expected to be customized according to specific product and market. Multinational companies that has presence and interest in emerging market and also in the Western world are likely to have other considerations that local or specialty companies. **Medical cannabis** particularly is quite different from other products due to legal aspects mentioned before. Eventually synthetic cannabis and Cannabis analog APIs are very interesting to multinational pharma companies, and few such companies have developed such products, unfortunately possessing severe side effects. When medical cannabis will be established and legal aspects resolved, successful globally available products in most markets will become dominant pain treatment. I assume that many companies large and small would be interested in **Biota AlgiFilm™ medical cannabis filmstrips**.

**SOC:** It is very important to understand your particular vision about unique features of your company. Why do you consider the major market players might be interested in investing into a promotion of your technology/product on the addressable market?

**Mr. Meir Haber:** **Biota Ltd.** was granted a key US patent covering **AlgiFilm™ platform technology**, and the patent is pivotal for US market protection. **Transmucosal** delivery filmstrips are not yet well-established pharma dosage form. Several companies manufacture and develop oral fast dissolving filmstrips. **AlgiFilm™** platform technology is unique, and **Biota Ltd.** capabilities, background and expertise, especially taste masking, provide unmatched USP. **Filmstrips' taste** is very important and filmstrips development know-how is unlike know-how required for development of swallowed tablets or pills. That's because swallowed APIs tastes is un-noticed. On the contrary, when filmstrips are dissolved and release the API is the oral cavity adverse sensory effects of API flavor, especially very unpleasant flavor such as bitterness, become dominant, and taste masking is critical for patients' product acceptance and compliance.

# Commercial CBD Filmstrips



Commercial CBD Filmstrips  
Photo provided by Biota Ltd

SOC: Now we would like to refer to the next very crucial and we would even say essential aspect for spinoff companies' as the strategy of R&D, production, distribution and marketing processes. Do you have your own unique strategy? Which of these processes do you consider your spinoff is strong at?

Mr. Meir Haber: **Biota Ltd.** doesn't have a unique strategy in this regard. Biota R&D capabilities are unique. Filmstrips production capacity of manufacturing subcontractors, is available **all over the world**, including in Germany, France, UK, USA, Canada, Japan, and India. **Biota Ltd.** has already contacts with several manufacturing partners capable for manufacture medical cannabis and other products in their GMP facilities. Marketing will be also partnered with pharmaceutical companies or with nutritional supplements or consumer products companies. Communications with Israeli companies and global companies are ongoing. The chain of development-production-marketing strategy combining strengths and providing benefits to all involved.

**SOC:** As a rule, the majority of spinoffs outgrow into exits. How do you determine the market for your product/technology and estimate its volume and dynamics? What is your potential share on the market? How do you think what market cap your company plans to reach at the peak of its development and why? How long might this process take?

**Mr. Meir Haber:** Medical cannabis is emerging rapidly, and the market is expected to grow exponentially. **Biota Ltd.** intend to partner with the leading companies in Israel and then in other countries, and expect that our medical cannabis partnerships to become a leading market player, with strong presence in all countries that regulate medical cannabis. on the long term medical cannabis will become mature market, and **Biota Ltd.** long term vision become a cannabis pharmaceutical company similar to **GW Pharma**, and commercialize filmstrips versions of products similar to **Sativex®**, and a range of cannabinoids based blockbuster products. For the short term, because the medical cannabis is not regulated as a pharmaceutic product, development time and cost of medical cannabis filmstrips is relatively very fast, requiring substantially lower budget, as compared to development of pharmaceutical products. Estimated time to market is about one year. So **within two years, Biota Ltd. expect** significant revenues, and be on the path of pharmaceutical products development that may takes about five years to commercialization. Anyway the market potential is huge, so at pharmaceutical cannabis commercialization stage **Biota Ltd.** could reach over one billion dollar market cap.

**SOC:** For spinoff companies their intellectual property is a key to success. The investors pay particular attention to it. What key intellectual property does your company have (patents, patents pending, copyrights, trade secrets, trademarks, domain names)?

**Mr. Meir Haber:** First of all, a **USA key** patent that covers the platform technology is already granted. **AlgiFilm™** as trade-name is also important. And of course, trade secrets play important role. **Know-how** of formulation, process, composition, properties, medical outcomes and more will be protected globally by patents and trade secrets. So together with **USA key** patent and confidential knowhow, **Biota Ltd.** will obtain a strong **IP protection**.





Cannabinoids clinical benefits  
Photo provided by Cannabis Sativa

**SOC:** For both of us, as well as for thousands successful spinoffers, it's not a secret that a new technological breakthrough may become obsolete very fast. Respectively, patent validity period becomes shorter. It is interesting to know the perspectives and protection plan of your technological advancement and leadership in a medium- and long-term prospectives.

**Mr. Meir Haber:** This is absolutely correct because especially when a product is successful then the risk of litigation and patent invalidation is significant. To protect **Biota IP** several patent covering several aspects of the **IP** will be applied for. Such IP protection strategy is being used by the most pharmaceutical companies. For example, **Bi-layered** film providing improved bioavailability and improved taste will be patented. Patent protection of the clinical aspect of the products can also be obtained.

**SOC:** The investors will want to get a clear picture of how many rounds of investments have you completed? Are you seeking for the investments at the moment? What is the volume and time limits? What milestones will the financing get you to? What did you plan to use the invested funds for?

**Mr. Meir Haber:** **The Biota Ltd.** is significant ground for financing. As I mentioned I have over **50 percent** of the shares of the company we are kindly seeking both investments and partnering arrangements. We seek a few million dollars within the next six months. The

financing will enable Biota Ltd. to manufacture the medical cannabis filmstrips in GMP facility. Then we plan to conduct the clinical study and obtain marketing licensing in Israel, and file several patent applications to protect the technology. Due to current Israeli medical cannabis regulations, marketing license can be achieved within a year from investment.

**SOC:** Could you please describe your ideal investor? What aspects are important for you, for instance, is it experience, country, the amount of own private capital or maybe some personal qualities? Will existing investors participate in the round?

**Mr. Meir Haber:** First, existing investor will not participate in the medical cannabis investment round. We seek as investors preferably funding providing in addition knowledge in the pharmaceutical industry and even more important experienced medical cannabis investors. We prefer investors already involved in medical cannabis industry. Country of original the investors is not relevant.

**SOC:** And the last question, could you specify the most convenient way you would like to receive inquiries from potential investors? Should it be by e-mail or personal phone call?

**Mr. Meir Haber:** The best way is by e-mail followed by a text message. Because sometimes unfamiliar e-mail is regarded to spam and immediately deleted. So the best will be by text message or phone call, before the e-mail contact.

**Company name:** Biota Ltd

**Contact person:** Meir Haber, Founder & CEO

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**Phone:** +972-522-991-736

**Patent status:** Patent granted

**On market since:** forecast Q4 2018

**Regions:** United States

**Industries:** Others

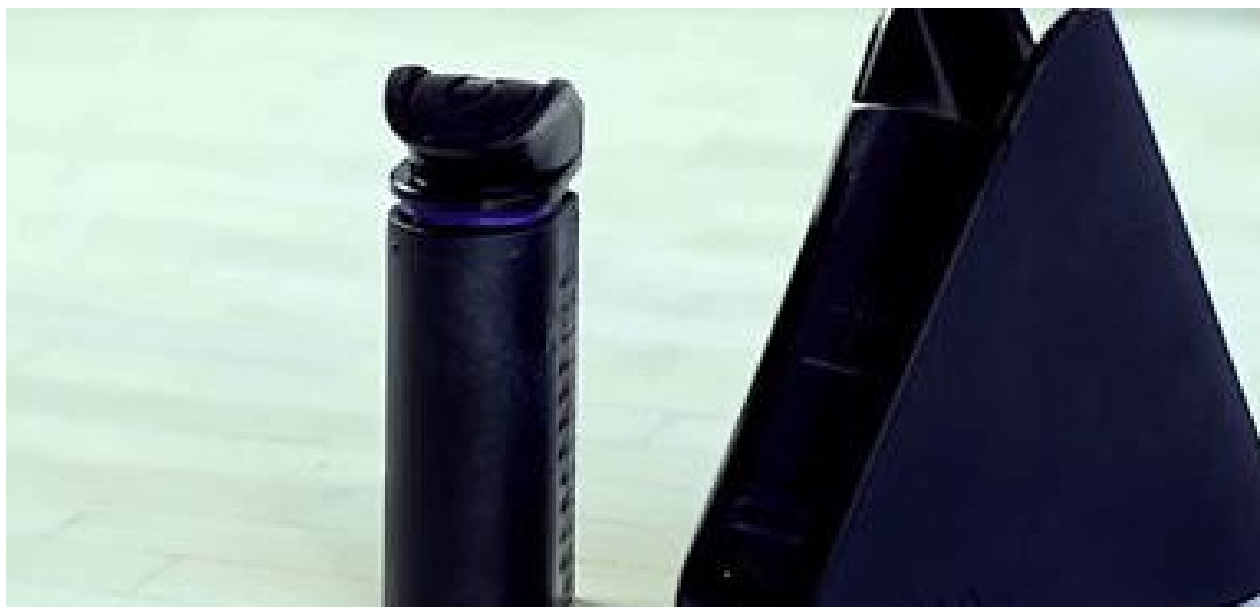
**Source links:** [Biota webpage](#)  
[Medical cannabis market perspectives](#)  
[Medical cannabis](#)

**Files:** [Biota-ENBA](#)  
[Evaluation of polymeric films for buccal drug delivery](#)  
[US patent](#)



**TECHNOLOGY**





## NIMA SENSOR CAN DETECT GLUTEN

Nima technology which determines the presence of gluten in food has been developed by scientists from the Massachusetts Institute of Technology. People who suffer from celiac or intolerant to gluten can be very picky in food since even a small amount of protein contained in wheat, barley and rye can cause serious side effects.

The co-founders of [Nima Labs, Inc.](#) are CEO [Shireen Yates](#) and Chief Product Officer [Scott Sundvor](#). Now MIT Nima Spinoff offers a portable sensitive sensor that allows checking if the food consists of gluten. It has only one function - the definition of the presence of gluten in any product. The fact is that a relatively large number of people on the planet have allergic to gluten. These are special proteins, which are found primarily in seeds of cereal plants. A person who suffers from celiac is undesirable to eat foods even with minimal gluten content. Moreover, if everything is simple with regard to any baking, then it is hardly possible to remember all the products with the content of these proteins in general.



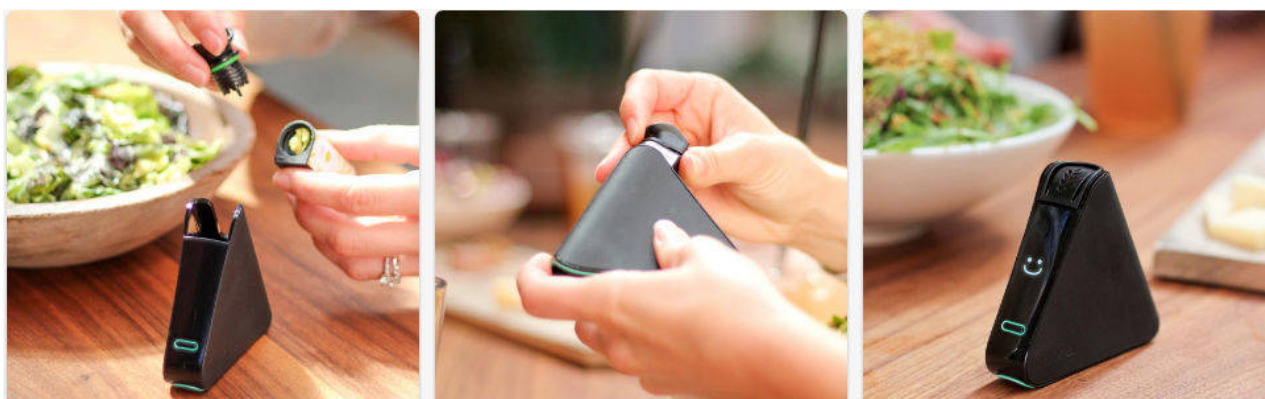
After two minutes, the result will appear on the screen, namely, a picture with 'gluten found' or a smiley if gluten is absent

source - [news.mit.edu](https://news.mit.edu)

Nima Sensor can be used to check both solid and liquid foods - soups and smoothies. It is enough to place a small piece (or ¼ teaspoon) in a special capsule and then install it into the device. After two minutes, the result will appear on the screen, namely, a picture with a wheat spikelet and the inscription 'gluten found' or a smiley if gluten is absent or its content is insignificant.

For analysis, a disposable capsule is used. After the test, it must be replaced with a new one. Nevertheless, Nima is not designed for permanent use. Undoubtedly, a man with a celiac knows most of the usual products that he does not want to use. A tester is needed when there are doubts. For example, in a restaurant or when buying something new. Dimensions of the device (88.9 x 25.4 x 78.7 mm) quite allow you to take it with you. The built-in battery is enough for more than 20 tests.

According to [Scott Sundvor](#), the goal is to create 'peace of mind with food'. The company is working to collect data on food and hopes to provide people with better information about what they eat. Usually, people do not know what food contains. It could be, for example, allergens, pesticides or other harmful chemicals. Therefore, the company wants to give people the opportunity to better understand their food and how it affects their health.



Nima Sensor can be used to check both solid and liquid foods  
source - [news.mit.edu](https://news.mit.edu)

Nima can sense gluten with 20 parts per million (ppm) or more, the maximum concentration for 'gluten-free' products, as determined by [the US Food and Drug Administration](#). The high sensitivity of Nima comes from an immunoassay inside the sensor, developed primarily by [MIT](#) chemical engineering alumnus [Jingqing Zhang](#), who is now the leading scientist in Nimes. Immunoassay contains special antibodies that are very sensitive to gluten molecules. When gluten is present, the antibody binds to gluten molecules, causing discoloration in the immunoassay, which is captured by the optical reader.

[Nima is also able to find gluten in foods that are labeled 'gluten-free'](#). Gluten could get into food accidentally during production or cooking or the steak was fried on the same grill as

gluten-based products. According to Scott Sundvor, it is like finding bread's crumb on the whole plate with food. Nima Labs, Inc. is going to **release two new sensors**, one for peanuts and one for dairy products. Scott Sundvor believes that it will be a big market because many people suffer from milk allergies.

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**Phone:** +1 844-646-2969  
**Patent status:** +  
**On market since:** +  
**Source links:** [MIT news](#)



## HOLOSTREAM TECH ALLOWS HIGH-QUALITY WIRELESS 3-D VIDEO CALLS

The holographic videophone was developed by a team of engineers at Purdue University in West Lafayette (Indiana, USA). Scientists have created a system that can use Wi-Fi for high-resolution 3D video communication on mobile devices. The developers are confident that the new holographic technology will be in demand in medicine and criminalistics. The system called Holostream converts 3D video into a 2D format and uses standard compression algorithms to render the data, which makes it possible to use it in standard Wi-Fi networks.



This platform has already been tested using standard midrange networks to simultaneously deliver high-quality 3D video to multiple mobile devices. **Holostream technology** appeared thanks to a new pipeline for 3D video recording, compression, transmission, decompression, and visualization. The team developed hardware and software for the pipeline, including a three-dimensional video capture system. A 3-D camera captures the images, using an LED light to project structured patterns of stripes onto the object being scanned. These stripes allow the system to determine the depth and shape of the object.



The platform can include applications that are particularly important in the delivery of high-precision and high-precision 3D video data in real time

source - purdue.edu

A person should first scan the object with a 3D camera in order to take advantage of the technology. Images are formed by projecting structured patterns that allow the camera to determine the shape and depth of the object. Then the system represents the scanned object as a grid of intersecting lines that form triangles. The overlay on this grid of ordinary 2D-video gives the object a texture and makes it realistic. This allows to record, compress, transfer and unpack holographic video in real time.

According to [Song Zhang](#), an associate professor in [Purdue University's School of Mechanical Engineering](#) and director of [Purdue's XYZT Lab](#), this system is the first of its kind to transmit high-resolution 3D content in real time on standard wireless networks.

[Song Zhang, the research leader](#), believes, that modern video compression methods are effective enough to use 2D video communication in standard wireless networks. If the 3D image is accurately converted to 2D, then existing video communication platforms will be able to support a three-dimensional image.

The platform can include applications that are particularly important in the delivery of high-precision and high-precision 3D video data in real time. [The accuracy of image transmission, according to the developers, will allow using Holostream for diagnosing diseases such as](#) depression and post-traumatic syndrome. In addition, the three-dimensional video will improve the technology of remote control of medical equipment for complex surgical operations.

Song Zhang is going to present his team's research at [the Imaging 2018 conference in California](#). The study was funded by [the National Science Foundation](#). The patent application was filed through [the Purdue Research Foundation's Commercialization Technologies](#).

Company name: Purdue University

Contact person: Song Zhang

E-mail: szhang15@purdue.edu

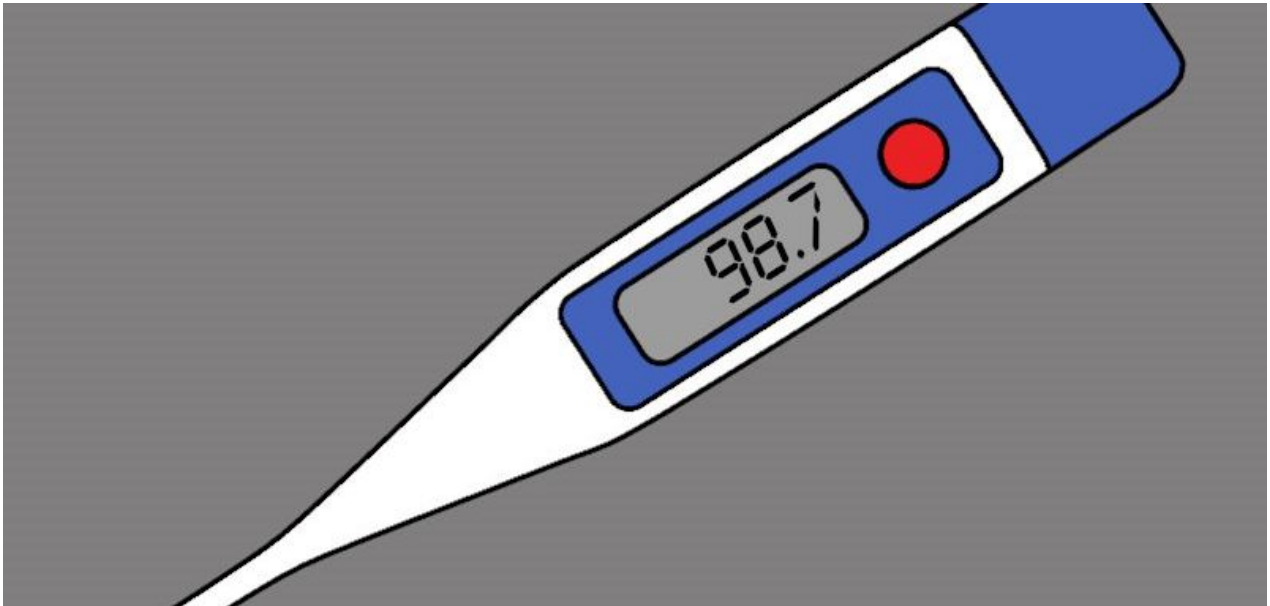
Website: <http://www.purdue.edu/>

Phone: +1 765 496 0389

Patent status: -

On market since: -

Source links: [Purdue University](#)

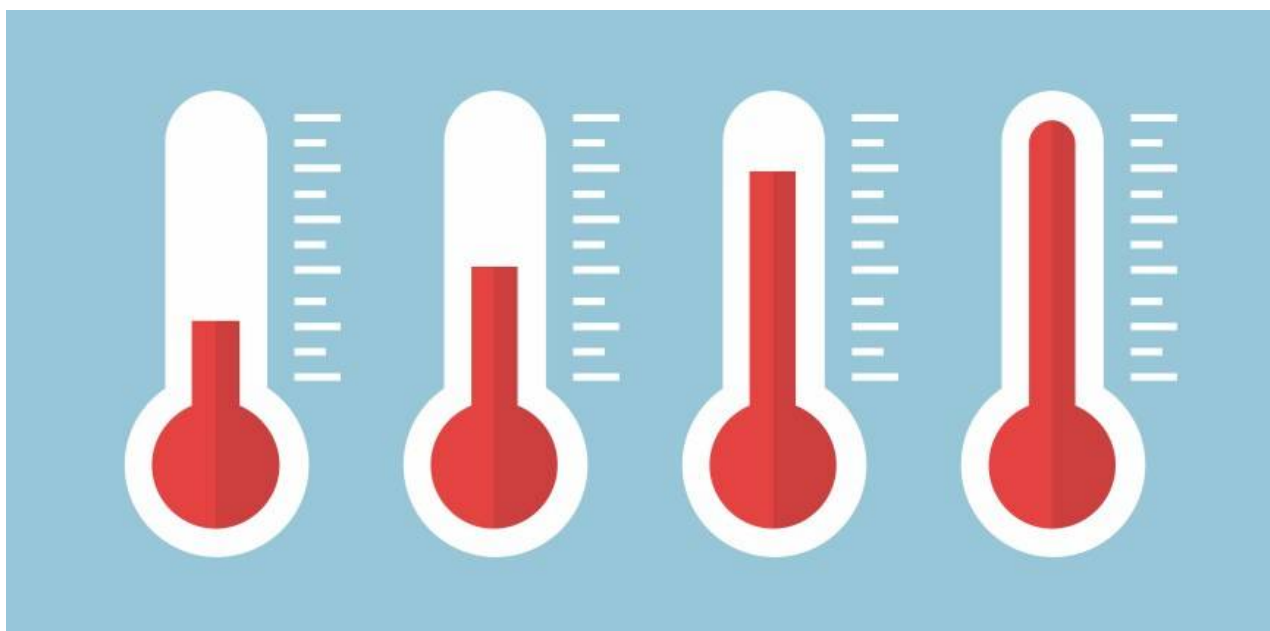


## OPTICAL T-SENSOR COULD BE USED IN MANUFACTURING AND BIOMEDICINE

The ultra-sensitive temperature sensor was created by engineers from the University of São Paulo (USP) and the University of Campinas (UNICAMP) in the State of São Paulo in Brazil. The researchers created a device in the laboratory that consists of a thin film or tiny particles, such as micrometric or nanometer scale. This temperature sensor works in real time and in very clearly defined areas with a spatial resolution from a centimeter to a micrometer. It is also capable of measuring temperatures with exceptional sensitivity in a wide band between 80 Kelvin (minus 193 ° C) and 750 Kelvin (476 ° C).

According to [Antonio Ricardo Zanatta](#), the researcher of [the San Carlos Institute of Physics USP](#) and one of the researchers of the project, the sensor is an optical device, hence the temperature of the object, can be obtained without direct physical contact between them. It is enough simply to project the laser beam onto the sensor and observe how it reacts. By measuring the wavelength of light emitted by the sensor with the detector, the temperature of the object can be determined with great accuracy.

The sensor is activated by a laser pulse, which consists of a system of titanium dioxide (TiO<sub>2</sub>), doped with thulium ions (Tm<sup>3+</sup>). It emits light at wavelengths that vary with the ambient temperature. Scientists use very accurate wavelength measurement to determine this temperature.



The sensor is an optical device, hence the temperature of the object, can be obtained without direct physical contact between them

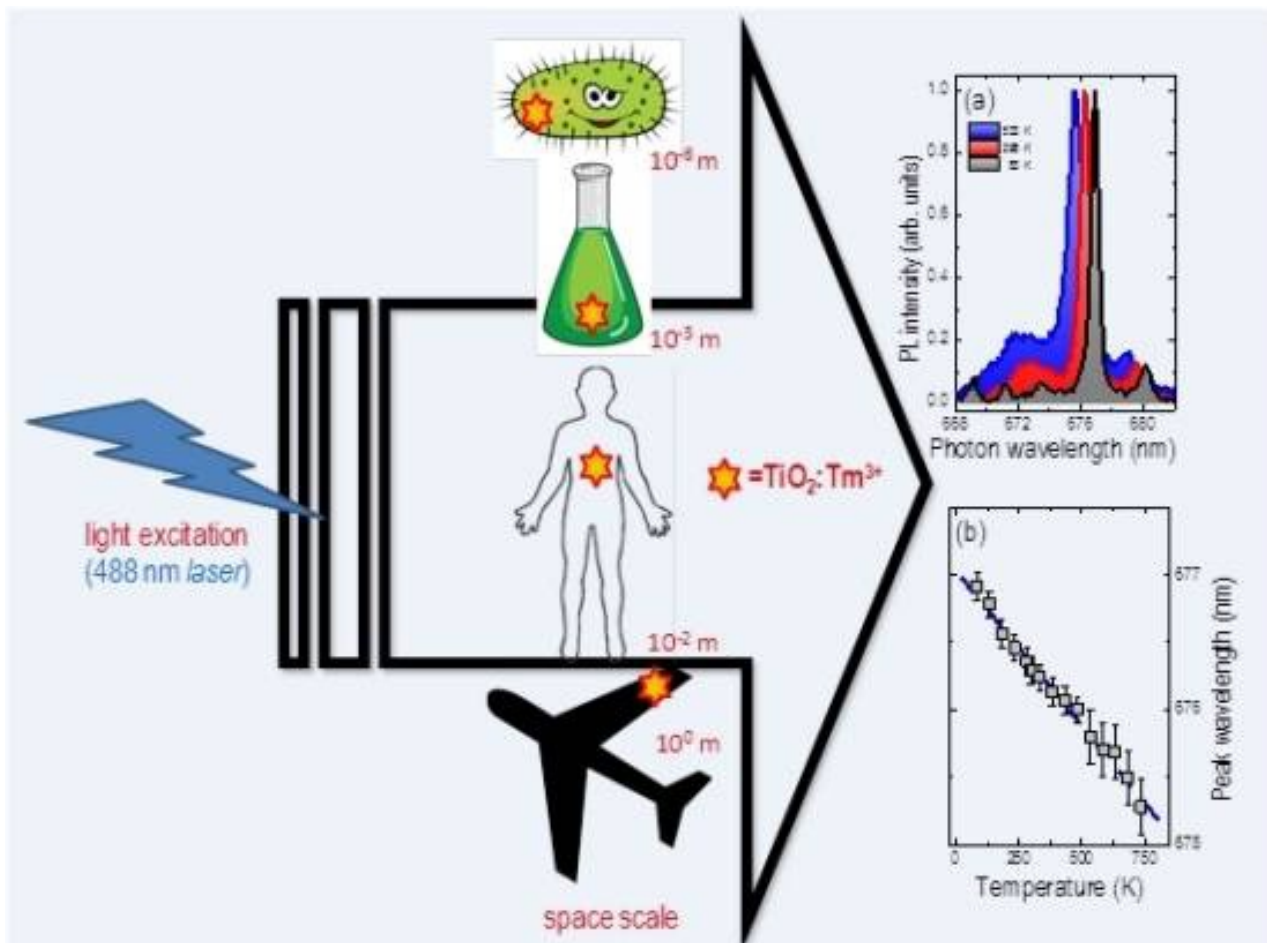
source - 5.usp.br

The wavelength changes by about **2 picometers** ( $2 \times 10^{-12}$  m) per degree of temperature. Spectroscopy can be used to detect this tiny change in wavelength. According to [Antonio Ricardo Zanatta](#), the change in the wavelength of the emitted light is absolutely linear between 80 and 750 Kelvin, and the device remains holistic and stable throughout the temperature range.

This type of sensor can be used both in identifying hot spots in electronic equipment and in detecting a viral or bacterial infection in certain regions of the body. Because it is able

to measure a very wide range of temperatures, it can be used in production where the temperature sometimes reaches very high levels, as well as when measuring biological processes that are very sensitive to the slightest temperature fluctuations.

**The sensor uses a thin film material.** Theoretically, this can be used as a coating for any surface, whether it is flat or curved, smooth or rough. The material can also be represented as microparticles or nanoparticles. In the future, scientists plan to encapsulate a laser emitter, a temperature sensor and a wavelength detector using a radio communicator inside a small pill. If swallowed with a small amount of water, the tablet sends temperature data while driving through the digestive tract before it is ejected from the body. In addition, scientists plan to cover the plastic substrate with a sensor and fix the sensor on the patient's skin. Since titanium dioxide is inexpensive and biocompatible.



In the future, scientists plan to encapsulate a laser emitter using a radio communicator inside a small pill source - 5.usp.br

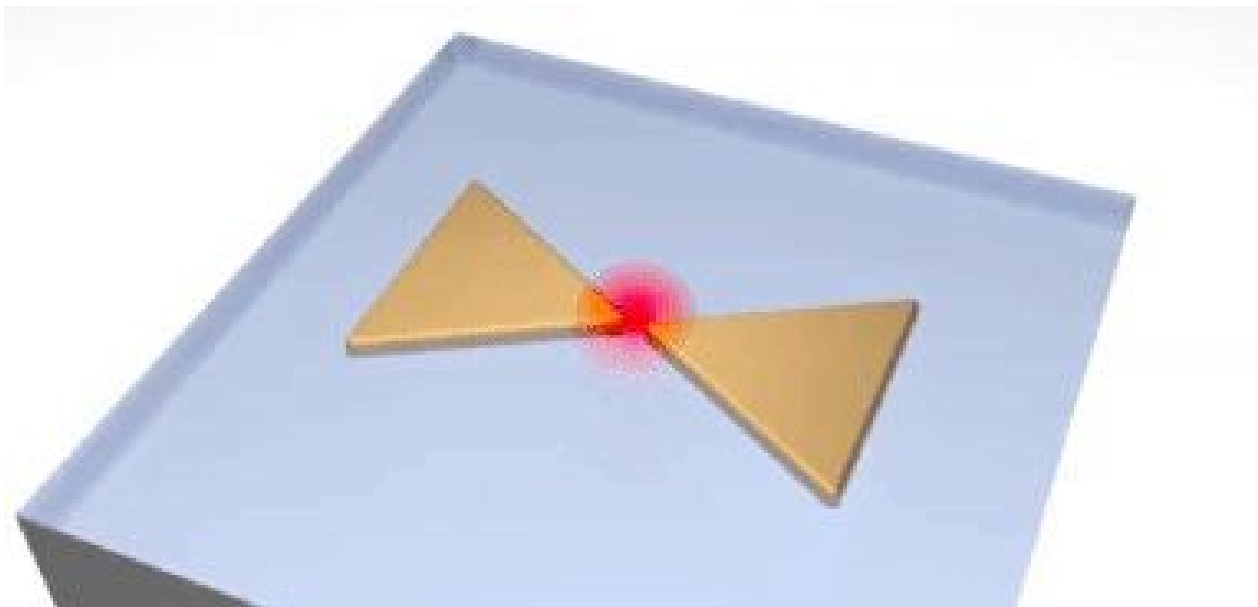
As a thin film, the material can be only a few square centimeters or can reach several square meters for use as a surface coating on the components of land vehicles, aircraft or



power transformers. As micrometric or nanometric particles, it can be dispersed in a liquid medium, remaining solid. Scientists continue to work on the sensor. Appropriate equipment today is expensive, given the need for a laser and a detector. However, scientists believe that as the technology develops, it will be possible to create an integrated device with a semiconductor laser, a temperature sensor, and a detector, and the cost can be significantly reduced when scientists move from laboratory to industrial scale.

Scientists have filed a patent application form for commercial production. This product is supported by UNICAMP's incubator, [the Inova UNICAMP](#).

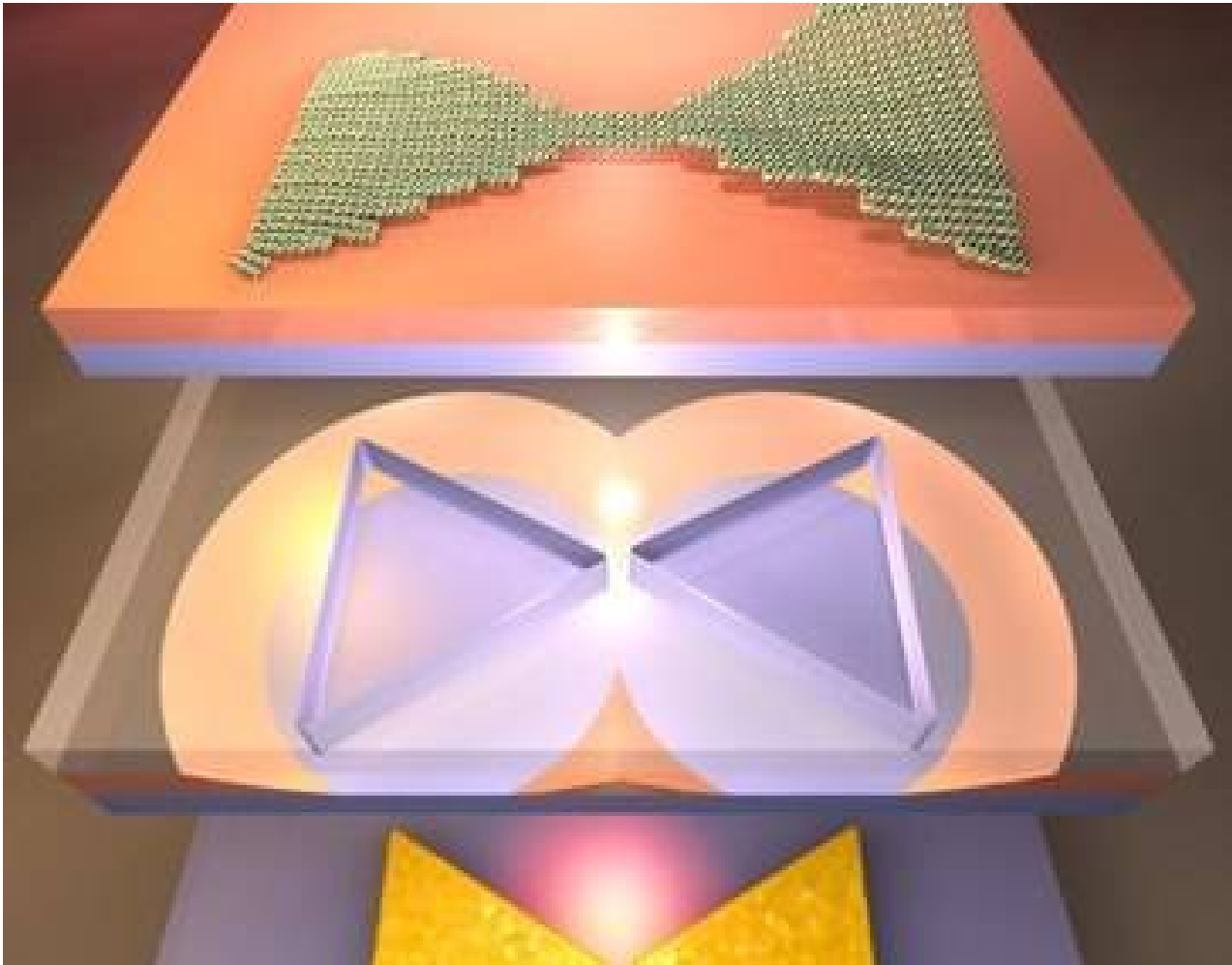
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**On market since:** -  
**Source links:** [the University of São Paulo](#)



## BUILDING MINIATURE OPTICAL ANTENNAS USING DNA AS A GUIDE

A new highly parallel technique to fabricate precise metallic nanostructures with designed plasmonic properties by means of different self-assembled DNA origami shapes was created by research groups from University of Jyväskylä and Aalto University (Finland) together with researchers from California Institute of Technology (Caltech, USA) and Aarhus University (iNANO Center, Denmark). The so-called DALI method (using DNA lithography).

According to [Adjunct Professor Veikko Linko](#) from [Aalto University](#), scientists are able to build almost any nanoscale form using the DNA origami technique. Moreover, the result of the study was able to demonstrate how to use these exact figures as 'stencils' to create a large number of completely metal nanostructures with dimensions of 10 nm, at a time. The peculiarity of [the DALI method](#) is that when DNA structures are placed on a chip that is coated with silicon, the silicon oxide can be selectively grown only on bare parts of the substrate.



Bowtie-shaped DNA origami is transformed into a metallic nanostructure  
source - [aalto.fi/en](http://aalto.fi/en)

According to [Boxuan Sheen](#) from [the Nanoscience Center of the University of Jyväskylä](#), due to controlling this process, scientists will be able to create holes on origami in the layer of reinforced silica, and this layer can be used as a mask for the next stages of lithography. Scientists also managed to achieve evaporation of the metal through these holes and create metal structures having the same shape and size as the original DNA origami on a transparent substrate, such as sapphire.

Small metal elements lie on the entire transparent substrate, and therefore these surfaces have important optical properties. The small size of the structures, which in the range of up to ten nanometers, makes it possible to additionally adjust these properties in the visible wavelength range.

States Adjunct **Professor Jussi Toppari** from Molecular Electronics and Plasmonics group at the University of Jyväskylä believes that in fact, scientists have demonstrated the entire structure, which is the smallest in the world completely metal antenna and has the shape of a bulb. This extremely small size extends the operating range of optical characteristics from infrared to visible. These antennas also can be used in dozens of optical and plasmon applications, for example, Raman spectroscopy on the surface, biosynthesis or fluorescence. In addition, the researchers conducted studies and showed that these surfaces can be used as polarizers, which create chiral structures using DALI.

**Professor Mauri Kostiainen** from the Biohybrid Materials Group at Aalto University is sure that the DALI method is highly parallel, and it is also capable of additionally providing a cheap production of microelectronics on the surface of the plates since it does not rely on costly pattern methods. This method is also envisaged for future research that deals with the provision of bioindustry surfaces and metamaterials if individual origami DNA structures can be placed on the substrate before metallization.

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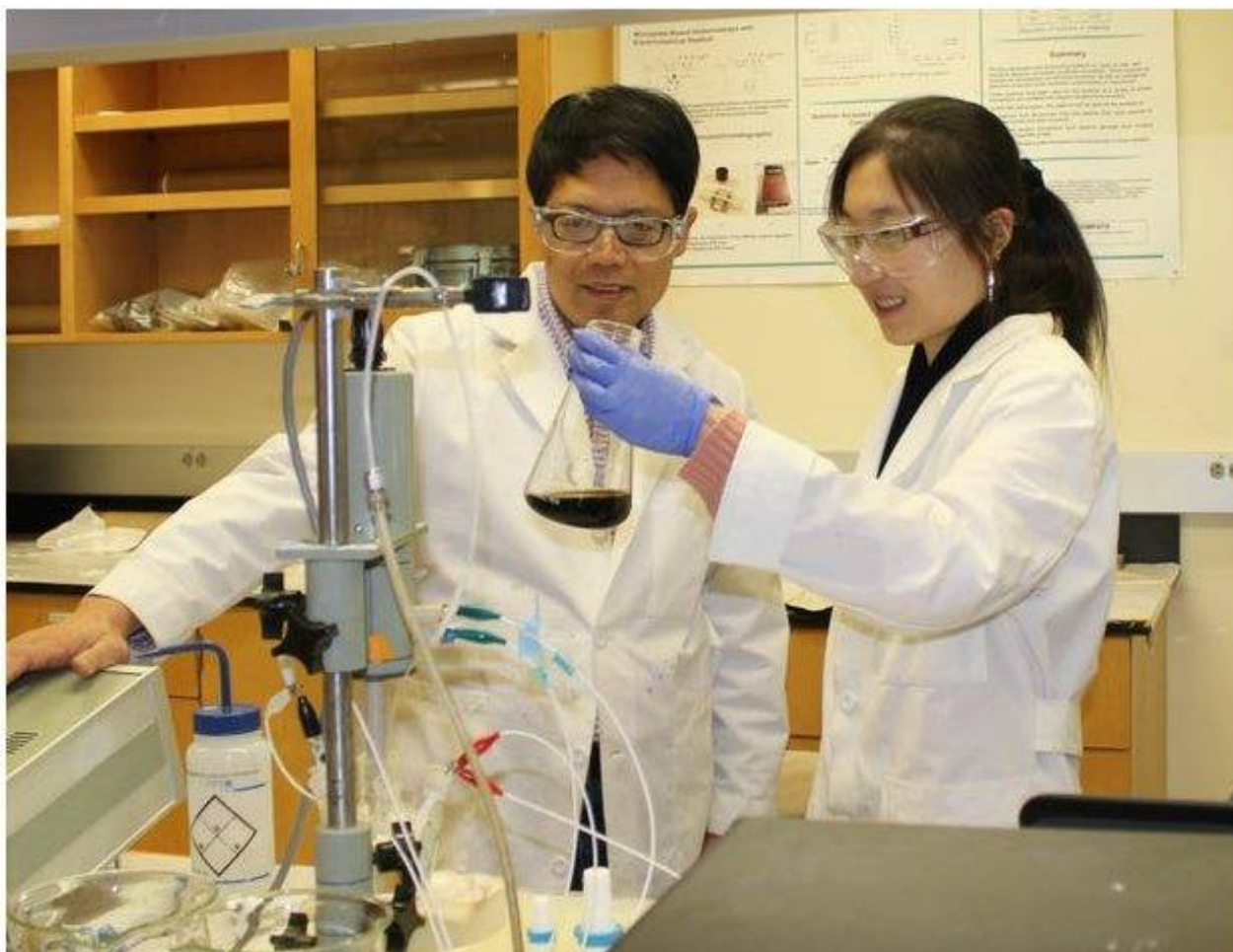




## INEXPENSIVE NANOFOAM CATALYSTS WILL HELP TO RECEIVE HYDROGEN FROM WATER

The technology that produces hydrogen from water has been developed by scientists from Washington State University. Researchers have discovered a way to more efficiently generate hydrogen from water, which can be one of the most important solutions for a viable and large-scale clean energy production system. Using relatively inexpensive metals, namely nickel, and iron, scientists have developed a very simple literally five-minute way to create large volumes of high-quality catalyst, ensuring the chemical reaction of the splitting of water molecules.

Effective ways of converting and storing energy are key areas for applications on clean energy. The urgent need for them arises from the fact that solar and wind power plants are not able to generate energy in a round-the-clock mode. **One of the most promising ideas** for the storage of renewable energy is the use of excess electricity for the splitting of water into oxygen and hydrogen. In addition to many industrial applications, the resulting hydrogen can also fuel cars, drones, trains and other fuel cell vehicles.

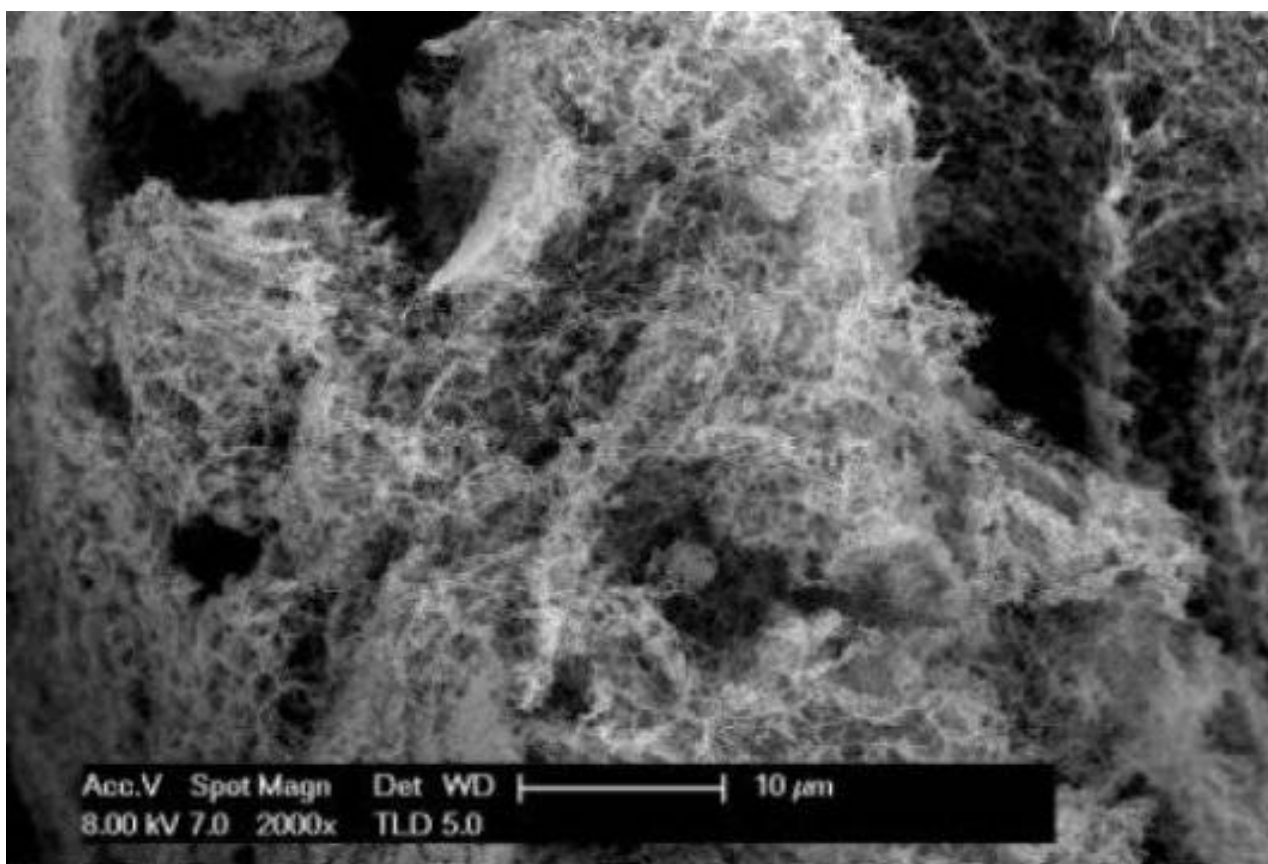


Using relatively inexpensive metals, scientists have developed a very simple way to create large volumes of high-quality catalyst, ensuring the chemical reaction of the splitting of water molecules  
source - wsu.edu

However, the processes of water electrolysis did not spread in large-scale industries, since expensive catalysts from rare metals, namely, most often platinum or ruthenium, were required for their carrying out. There are a number of other methods of splitting water, but some require too much energy, while others use unstable catalytic materials.

In their work, the researchers, led by **Professor Yuehe Lin** in [the School of Mechanical and Materials Engineering](#), used two accessible and cheap elements to create a porous

nanofilm, which worked better than most of the currently used catalysts, including precious metals. The catalyst they created got an appearance resembling a tiny sponge. Due to the unique atomic structure and a variety of open surfaces, nanofilms are able to catalyze the desired reaction with less energy than the analogs used previously. In addition, the new material showed very little loss of activity during [the 12-hour stability test](#).



The researchers used two accessible and cheap elements to create a porous nanofilm, which worked better than most of the currently used catalysts  
source - wsu.edu

According to [Shaofang Fu](#), [the Washington State University](#) Ph.D. who synthesized the catalyst and did most of the activity testing, and [Junhua Song](#), the Washington State University Ph.D. who worked on the catalyst characterization, scientists used a very simple approach that could easily be used in large-scale production. The advanced materials characterization facility at the national laboratories provided the deep understanding of the composition and structures of the catalysts. [Professor Yuehe Lin](#) also believes that this simple laboratory testing will be very promising in the future.

The Washington State University project was implemented in collaboration with

researchers from [the Argonne National Laboratory](#) and [the Pacific Northwest National Laboratory](#). After successful laboratory tests, scientists seek additional support for more extensive testing.

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Source links: [Washington State University](#)



## 3-D PRINTED HAIR AND FUR

Technology which will print of artificial fur and hair on a 3D printer has been developed by Massachusetts Institute of Technology Tangible Media Group. Today, it seems that a 3D printer can print practically everything from a sports car, an edible food to human skin. However, things like hair and fur are challenging technology. Because this is a very laborious work, which requires a huge amount of computational time and power for the first design. Scientists from the MIT media laboratory were able to take into account and solve these problems. They found a way quickly and efficiently model and print thousands of hair-like structures.



Generally, when trying to print hair, scientists used ordinary computer-aided design software that called CAD. This technology took a very long time to compute. Recently, scientists invented a new software platform. Scientists called this technology **Project Cillia**, allows to create **villi 50 microns thick**. This is about the width of a human hair. **One micron is 1/1000 millimeters**. In addition to the printing method itself, scientists have developed software that allows adjusting the thickness and length of the villi and the density of the fur cover.

In the future, this technology can be used for printing wigs and hair extensions. However, for scientists, this is not the main goal. **They want that 3-D-printed hair to perform useful functions, such as sensitivity, adhesion, and actuation.**



In the future, this technology will lead to the replacement of natural fur on technological analogs  
source - [news.mit.edu](https://news.mit.edu)

**Scientists have done a lot of research to demonstrate the adhesive function.** The team printed arrays that work like Welsh bristles. The bristles of the gasket can stick to each other with different forces. It depends on the angle of the bristles. The scientists printed a

small figure of a fluffy rabbit equipped with LED lamps to demonstrate the result of the study. Lamps light up when a person strokes a rabbit in certain directions.

A team of scientists also prepared a weight sorting table to demonstrate how 3-D-typed hair can move objects. For this, scientists made from panels of printed hair with specified angles and heights. As a result, a small source of vibration shook the panels. Thus, the hair could move the coins through the table, sorting them by the weight of coins and the frequency of the vibration.



Scientists created Cillia technology, which allows creating villi 50 microns thick  
source - [news.mit.edu](https://news.mit.edu)

**Jifei Ou**, a graduate student in media arts and sciences, and his team used Photoshop to create a color display technique. Then they created an algorithm. He contributed to the rapid transformation of the color map into a model of an array of hair. This model they submitted to a three-dimensional printer. As a result, scientists printed pads with Velcro, like bristles, and brushes with different textures and densities due to this technique.

**According to Jifei Ou**, 3D printers can change the approach to creating materials, but scientists are still using them only for printing static objects. The research team plans to create programmable materials. Fur is only one example of what they are now exploring.

In the future, this technology will lead to the replacement of natural fur on technological analogs.

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**Source links:** [MIT News](#)



## BRAND-NEW TECHNOLOGY FOR DEFROSTING BIOMATERIAL

A new way to unfreeze the biomaterial using nanoparticles was developed by scientists from the University of Minnesota. The researchers used nanoparticles to defrost the tissues without damaging the biomaterial. This technology in the long term will help to store donor organs for a long time without fear that they will be spoiled.

Currently, organs are generally frozen to cryogenic temperatures, which are usually below 320 degrees Fahrenheit. They cannot be stored for long because they are damaged when trying to unfreeze them. Because of this, **more than 60% of donor lungs or hearts have not been transplanted**. However, **the new technology of defrosting biological tissues with the help of nanoparticles can help solve the problem** of lack of donor organs and allow keeping organs longer.



As soon as the nanoparticles receive a signal from the magnetic fields, they begin to vibrate, which creates heat and thaws the tissue

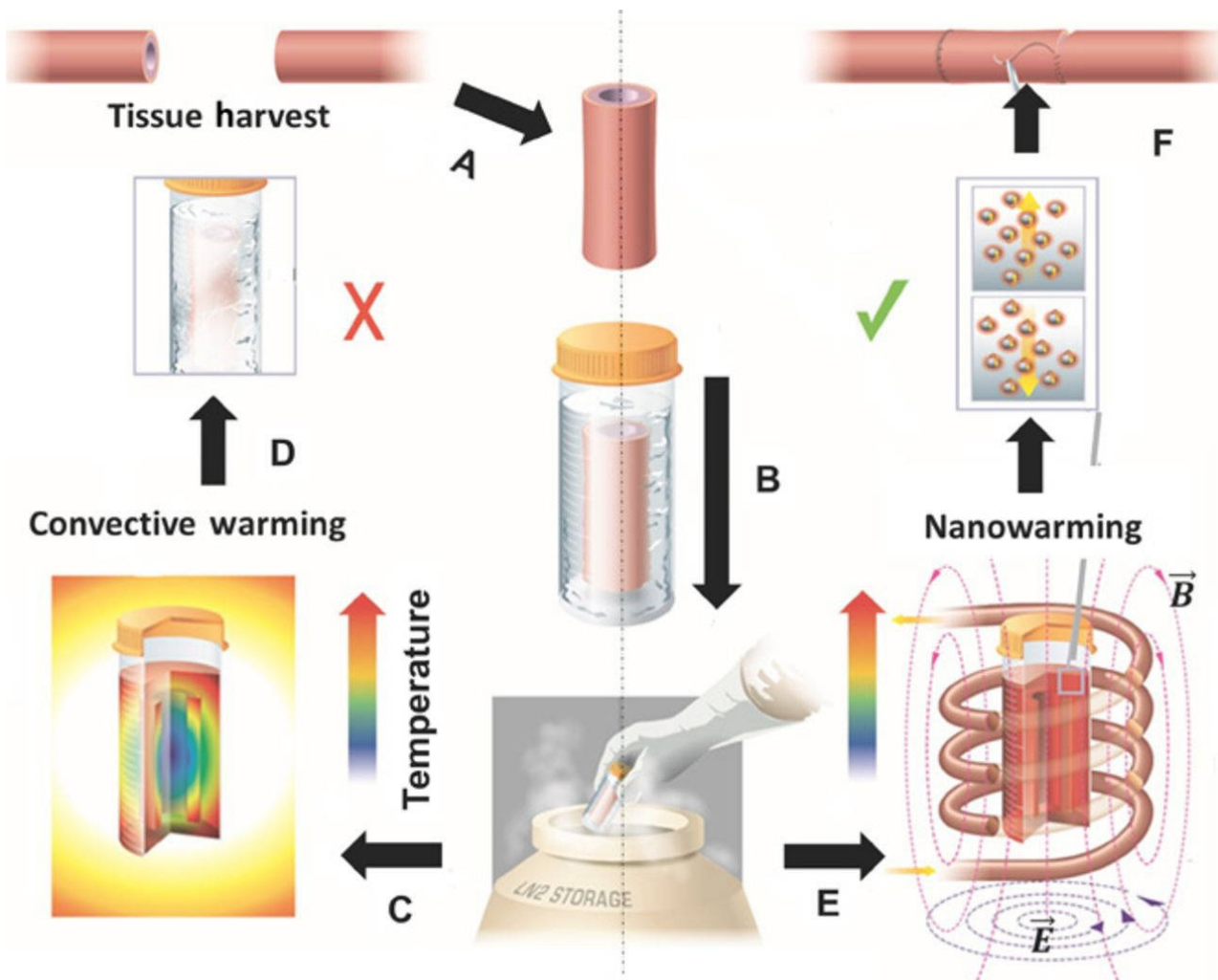
source - twin-cities.umn.edu/

Scientists recycled 50 milliliters of tissue and solution with magnetic nanoparticles in order to achieve certain results. Thus, the researchers used a solution with magnetic nanoparticles, which create heat in electromagnetic fields. Scientists introduce a special kind of nanoparticles of iron oxide coated with silicon dioxide into the tissue. Then they subject it to a magnetic field. As soon as the nanoparticles receive a signal from the magnetic fields, they begin to vibrate, which creates heat and thaws the tissue.

Cryopreservation is traditionally the best way to cool and store donor organs, but **defrosting has two big problems**. First, freezing occurs unevenly, some parts of the body are colder than others. When heated, the frozen organ becomes brittle, and this is aggravated if one part heats up faster than others. Secondly, when frozen, small ice crystals are formed in the tissue. When the body slowly heats up, the crystals can damage the cells. According to **Mehmet Toner**, a professor of bioengineering at [Harvard-MIT](https://www.harvard-mit.edu/)



[Health Sciences and Technology](#) who did not participate in the study, these ice crystals are like small atomic bombs that are ready to explode.



Unlike convective warming, the new nanowarming method prevents tissue damage by evenly reheating cryogenically preserved source - [twin-cities.umn.edu/tissues](http://twin-cities.umn.edu/tissues)

**A new defrosting method solves both these problems.** It heats all parts of the organs evenly and quickly, which prevents ice crystals from damaging them. The idea originates from the treatment of a certain type of cancer, which uses nanoparticles and infrared fields to destroy tumors. Scientists have already tested the biological material This already indicates that the technology is developing. **Previously, researchers could unfreeze only 1 milliliter of tissue, now they have positive result on 50 milliliters of tissue.** Next, scientists plan experiments on whole organs of mice, rabbits, pigs, and then a person.

According to the co-author of research [John Bischof](#), a biomedical engineer from [the University of Minnesota](#), scientists still have some unresolved issues that need to be

addressed before this technology enters the market. Another co-author of the study, [Kelvin Brockbank](#), a biologist at [Clemson University](#), believes that researchers will learn to unfreeze a whole human body without damaging its tissues, until the end of the next century. According to scientists, this research is a very serious step forward, because with the age of the population the need for organ transplantation becomes a serious problem.

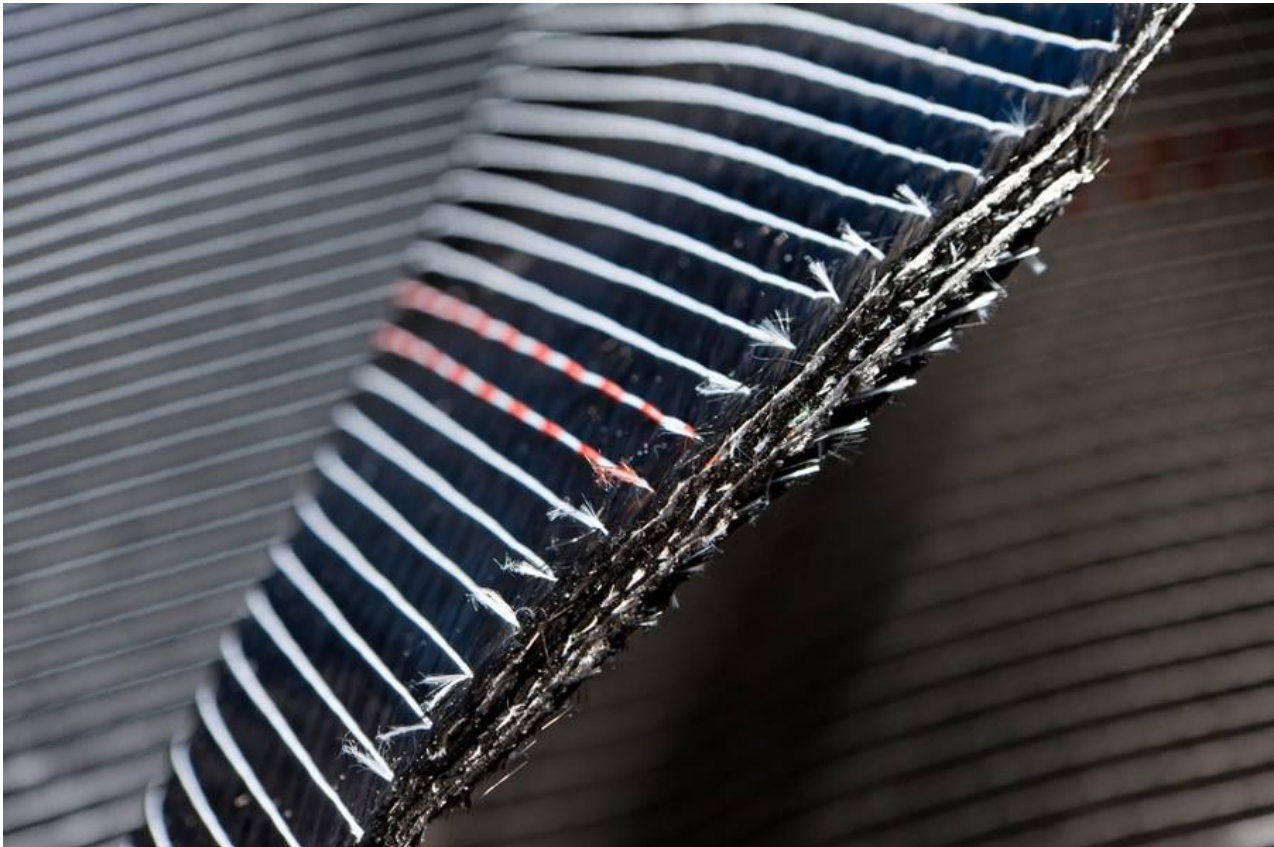
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**Patent status:** -  
**On market since:** -  
**Source links:** [the University of Minnesota](#)



## CARBON FIBRE FROM PLANTS INSTEAD OF PETROLEUM

A new process for the production of carbon fiber from straw and corn stalks was developed by a team of researchers from the US National Renewable Energy Laboratory. Scientists believe that this will give humankind the opportunity to create cheap cars and will reduce CO2 emissions.

Carbon fiber is a super metal among other materials. It is five times stronger and hundreds of times lighter than steel. Carbon plastic is used today in everything from tennis rackets and bicycles to airplanes and racing cars. There is only one minus. It is produced from petroleum, which makes the final product extremely expensive. That is why it is used in racing cars, but never in minivans.



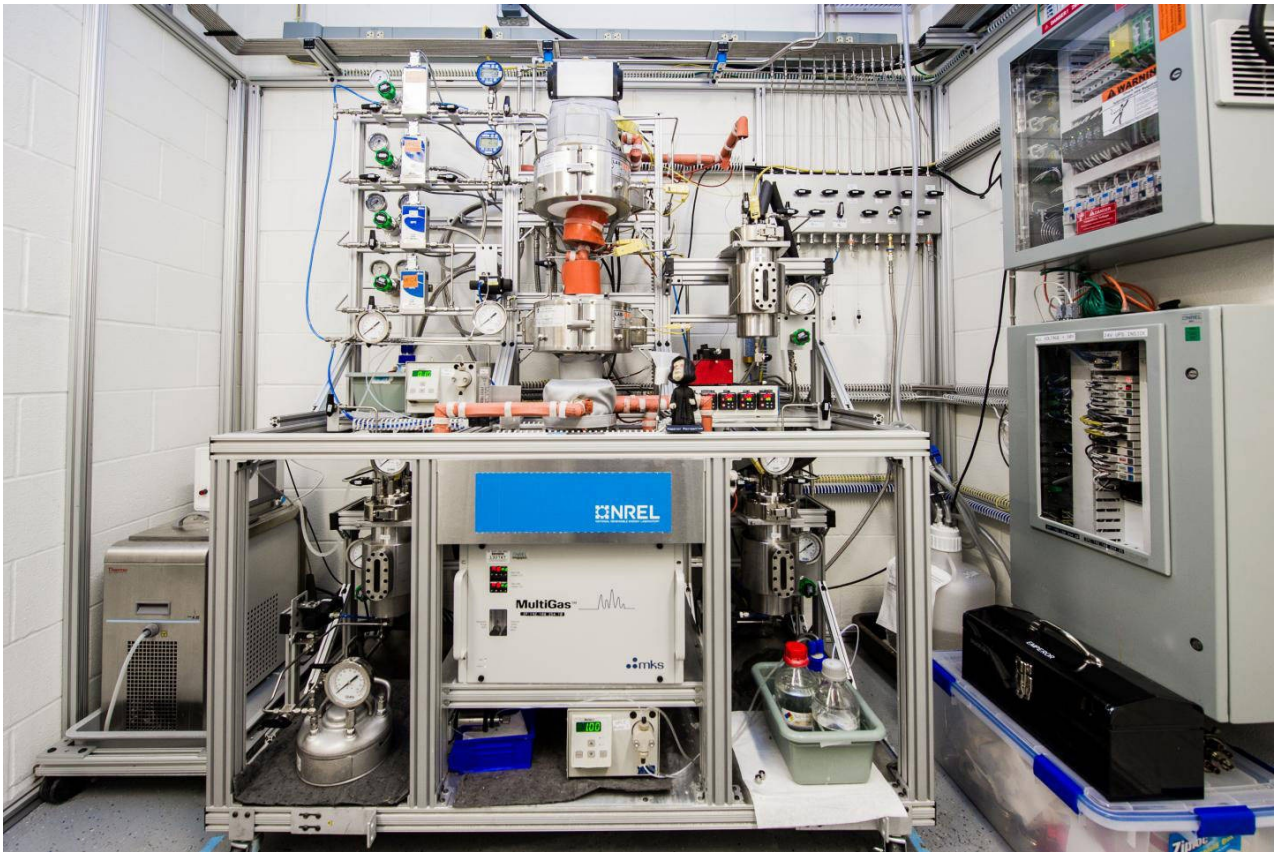
Carbon fiber  
source - nrel.gov

However, scientists from Colorado managed to produce carbon fiber from plants instead of petroleum. Researchers believe that this new technology will lead to reducing costs for carbon fiber. In addition, this discovery will lead to the fact that the material will become more accessible for use in cars, airplanes and other vehicles.

Carbon fiber is made of a chemical called acrylonitrile. Today acrylonitrile is made from petroleum, ammonia, oxygen and an expensive catalyst. This process emits a lot of heat and has toxic by-products. In addition, the cost of carbon fiber directly depends on the price of petroleum. Gregg Beckham, a group leader at [the National Renewable Energy Laboratory](#) and his team developed a new process for producing acrylonitrile that makes use of plants, namely the parts people can't eat, such as corn stalks and wheat



straw, which are cultivated on a huge scale around the world.



The scientists decomposed the plants into sugars, then turned them into acids, and after using an inexpensive catalyst, they were able to produce acrylonitrile, known to us as carbon plastic source - nrel.gov

A pre-requisite for the production of petroleum products from plants is that petroleum in nature is made from prehistoric plants that have been buried and subjected to intense heat and pressure for millions of years. Scientists are trying to do the same thing, namely to remove the necessary chemicals directly from the plants. **This will lead to the fact that in the future mankind will no longer depend on petroleum.** The scientists decomposed the plants into sugars, then turned them into acids, and after using an inexpensive catalyst, they were able to produce acrylonitrile, known to us as carbon plastic. The process did not cause excess heat and was not accompanied by the formation of toxic by-products.

Scientists believe that the process, discovered by them, can be used in large-scale production. **Now they work in cooperation with several companies to produce a large quantity of acrylonitrile that will be turned into carbon fiber.** Scientists are going to test new material in the production of cars. Since the carbon fiber body is much lighter than steel, for such machines, less fuel is required at times. Hence, owners can save on



gasoline, while reducing emissions to the atmosphere. According to [Gregg Beckham](#), scientists will carry out more fundamental research. In addition to scaling the production of acrylonitrile, they will also be able to learn how to use this technology to produce other everyday materials.

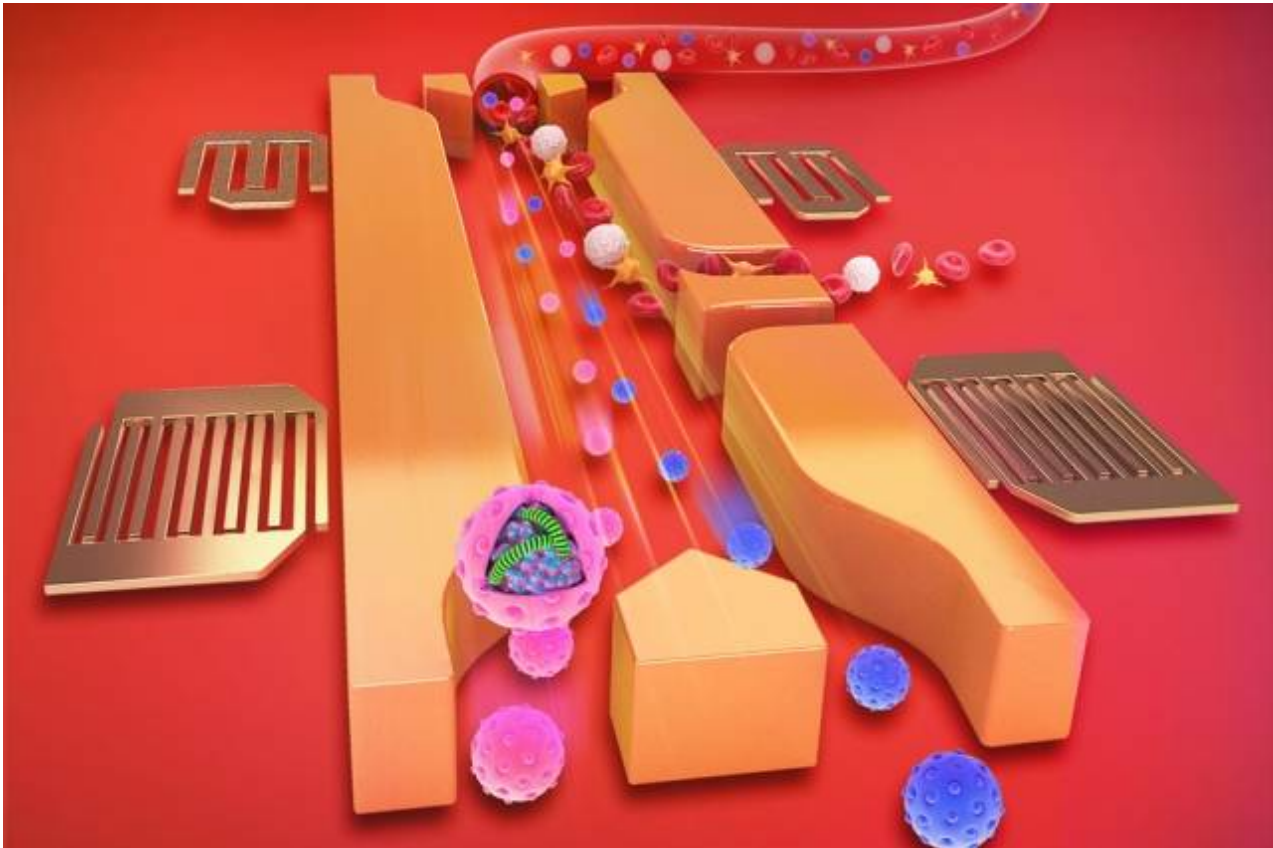
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**Patent status:** -  
**On market since:** -  
**Regions:** United States  
**Industries:** Others  
**Source links:** [National Renewable Energy Laboratory](#)



## ACOUSTIC BLOOD TEST WILL REPLACE TISSUE BIOPSIES

The analysis of blood with the help of sound waves was developed by scientists and physicians from the Massachusetts Institute of Technology. This technology will detect cancer or fetal anomalies during pregnancy. According to the researchers, the method will not only significantly accelerate the study of the blood composition for toxicity and the determination of other parameters, but will also allow the exclusion of biopsies over time as a type of medical research.

The method is based on the interception of so-called exosomes, which is microscopic vesicles. Exosomes secrete rare circulating tumor cells from a small amount of blood and transmit important information from one part of the body to another.



This schematic shows a microfluidic device that uses sound waves to separate exosomes from other components of blood

source - news.mit.edu

In 2015, the same group of scientists first reported on the possibility of separating cells under the influence of sound waves, when they pass through a narrow channel. Since then, they have proven that this technology can be used to isolate rare cancer cells. In addition, in the newest study, they use it to catch exosomes. These vesicles with a diameter of 30 to 150 nm carry proteins, RNA and other important cellular molecules that can serve as markers for cancer, kidney disease, and neurodegenerative diseases. They developed a micro-hydrodynamic device that uses sound waves to isolate these exosomes from the blood. Scientists hope to create a portable device capable of analyzing human blood in 10 minutes without a cumbersome and slow ultracentrifuge, which takes almost 24 hours to sample it.

The device consists of two microhydraulic channels with acoustic transducers, which form

standing waves, affecting the cell. The distance that the cell passes depends on its size and other properties. After two-step selection, exosomes are separated from extracellular vesicles, which are slightly larger in diameter. In total, **in order to process 100 microliters of blood samples, it takes less than 25 minutes.**

According to **Ming Dao**, a principal research scientist in [MIT's Department of Materials Science and Engineering](#) and a senior author of the study, these exosomes usually contain specific molecules, namely the signatures of certain anomalies. If scientists isolate them from blood, they can conduct a biological analysis and understand what they mean. It is expected that this technology will become a new method of applying exosomes through human fluid samples using a combination of microfluidics and acoustics with the most advanced microprocessing technologies. **This method is unique** in that it separates nanoscale vesicles without changing their biological or physical characteristics, but also provides an opportunity to develop new ways of assessing the state of human health and analyze the occurrence and progression of diseases.

Today, scientists plan to use this technology, which will help to search for biomarkers to identify disease states. Scientists have a joint grant from [the National Institutes of Health](#) to search for markers associated with abnormal pregnancy. However, the research group believes that this is not a limit to the use of the technology. It can be used to diagnose other health conditions. The study received funding from **the National Institute of Health** and [the National Science Foundation](#).

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**Regions:** United States  
**Industries:** Others  
**Source links:** [MIT news](#)





## A NEW CLASS OF METAMATERIALS IS ABLE TO SHRINK WHEN HEATED

A new class of metamaterials was created by engineers from Massachusetts Institute of Technology and the University of Southern California. As we know, all solid materials, from rubber and glass to granite and steel, inevitably expand when heated. However, there are very rare cases when some materials buck this thermodynamic trend and are compressed by heat. For example, cold water is compressed when heated from 0 to 4 degrees Celsius, before expanding. Currently, scientists have added metamaterials to this unique class.

The team, led by [Nicholas X. Fang](#), assistant professor of mechanical engineering at [the Massachusetts Institute of Technology](#), produced a metamaterial. This material is similar to star structures from intersecting rays or rafters. Their size is similar to the size of a sugar cube. It quickly shrinks when heated to about 540 degrees Fahrenheit or 282 degrees Celsius.

Each of the rafters 'stars', created by scientists from MIT and [the University of Southern California](#), is made of an ordinary material that expands during heating. However, their design makes the stars behave like the spheres of Hoberman, which is a toy ball of interconnecting lattices and joints. Scientists have applied the method of micro-stereolithography, namely 3D printing technology, in which the light of the projector prints very small structures in a liquid resin, layer by layer. Scientists have called this construction a metamaterial as [a composite material](#) that exhibits strange, often paradoxical properties that are not found in nature.



Each of the rafters 'stars' is made of an ordinary material that expands when heated  
source - [news.mit.edu](http://news.mit.edu)

In some cases, the resistance to expansion upon heating can be particularly useful. For example, in computer chips that can warp and deform if they are exposed to high

temperatures for a long time. [Nicholas X. Fang](#) tells that a working processor often heats the boards, and this can affect their performance. So really, have to take great care in accounting for this thermal stress or shock.

Nevertheless, the main significance of the discovery lies in the ability to adjust individual elements of the 'stars', namely the rays and the distance between them, the direction and degree of expansion when heated. Therefore, in addition to their experiments, the researchers developed a computational model to characterize the relationships between the connecting beams, the spaces between the beams, and the direction and extent of their expansion with the help of heat. Researchers can control how much the structure will decrease by adjusting the two main 'pens' in the model such as the dimensions of individual rays and their relative rigidity, which is directly related to the rate of thermal expansion of the material.

According to [the Professor Nicholas X. Fang](#), they have a space for experiments with other materials, for example, carbon nanotubes, which are lighter and more durable. Now they can explore these new designs in the laboratory. This study was partially supported by [the Agency for Advanced Defense Studies](#).

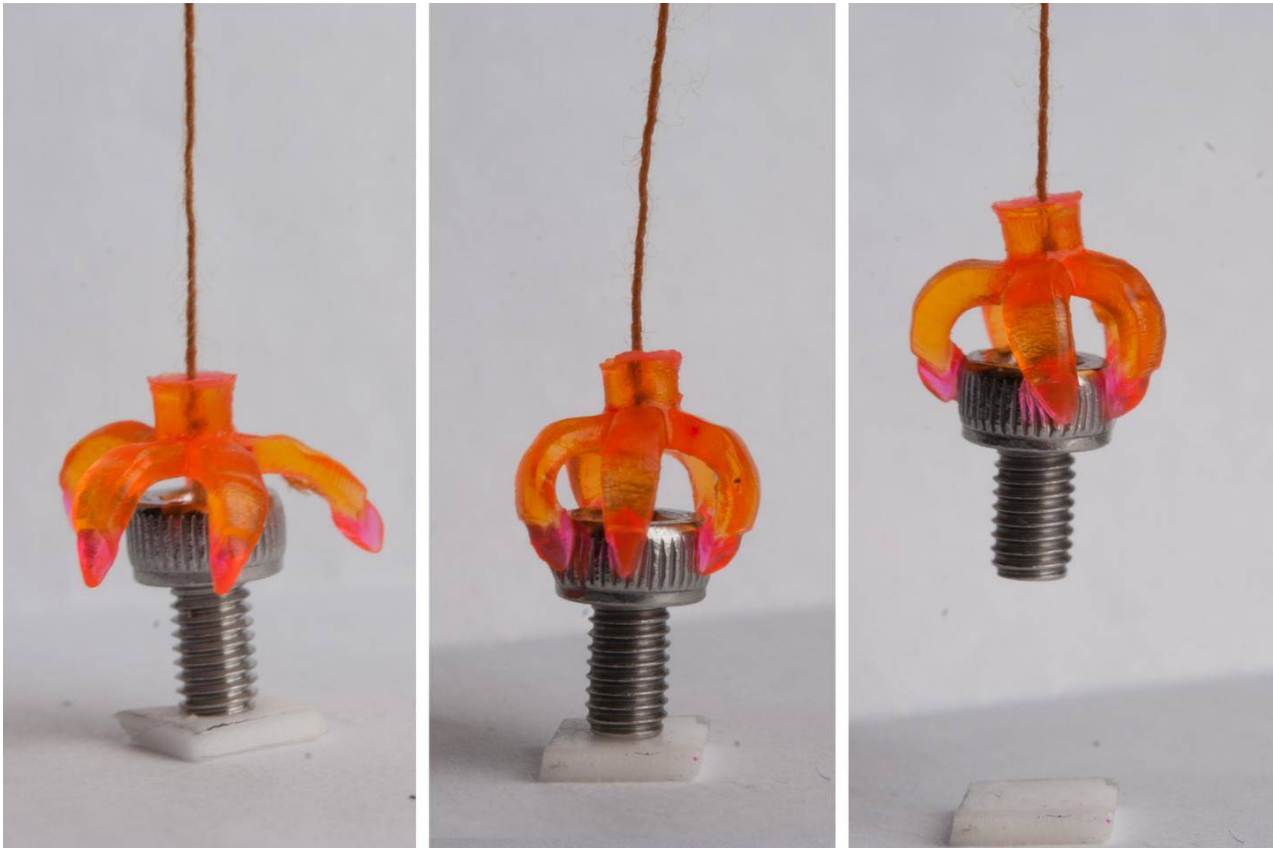
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**On market since:** -  
**Regions:** United States  
**Industries:** Manufacturing  
**Source links:** [MIT news](#)



## 4D PRINTING TECHNOLOGY HAS MEMORY

Technology 4D-printing, which remembers its original form, developed by scientists from the Massachusetts Institute of Technology and Singapore University of Technology and Design (SUTD). Three-dimensional structures remember their original form and they can be deformed and stretched, but when exposed to the temperature they return to their original form within a few seconds after heating to a certain temperature. The size of such structures ranges from small coils and multiphase colors to an inch-tall replica of the Eiffel tower. For some structures, researchers were able to print small-scale functions the size of human hair. Dimensions that are at least one-tenth as big as what others have been able to achieve with printable shape-memory materials.

According to [Nicholas H. Fang](#), associate professor of engineering at the Massachusetts Institute of Technology, such polymers with memory can be used both in solar energy and in medicine. Scientists plan to use the temperature of the human body as a trigger, then with this technology it will be possible to create tiny capsules with a drug that will be revealed at the slightest sign of a fever or infection. Scientists believe that [the creation of these structures can be considered as a 4D-printing](#) because they are intended to change after some time. Moreover, this kind of time is [the fourth dimension](#).



Technology 4D-printing, which remembers its original form can be used both in solar energy and in medicine  
source - [ews.mit.edu](http://ews.mit.edu)

However, this method not only makes it possible to use four-dimensional printing on a micron scale. This method also offers recipes for printing polymers with shape memory. These forms can be stretched 10 times compared to printed 3-D printers. Thus, [materials used for printing can be changed by the environment](#), namely heat, light, electricity. In the future, this will lead to a four-dimensional printing in a wide variety of practical applications, including biomedical devices, deployed aerospace structures, and shape-changing photovoltaic solar cells. They are examined for further use in biomedical devices, 'flexible' robots, wearable sensors and artificial muscles as well.



Polymers with shaped memory have intriguing prospects. They can switch between two states, such as a harder, low-temperature, amorphous state and a soft, high-temperature, rubber state. Besides, the smaller the size of the printed structure, the faster it will change its shape with great speed. The temperature at which the material begins to change is from 40 to 180 degrees Celsius. Bent and elongated shapes can be 'frozen' at room temperature. However, the materials remember and return to their original strong form during heating.

Scientists have printed out various structures - rings, flowers and even a miniature copy of the Eiffel Tower. The researchers found that they could be stretched three times their original length and not break. [Nicholas H. Fang and his team](#) continue to study 4D printing technology, they hope to find combinations of polymers that will be able to react to lower temperatures, such as human body temperature, to develop soft, active, controlled drug delivery capsules. They believe that the material can also be printed as a soft, responsive hinge so that the solar panels track the sun. [The Center for Digital Production and Design of SUTD](#) and [the joint doctorate of SUTD-MIT](#) support this study.

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**Regions:** United States, Singapore  
**Industries:** Environment, Healthcare, Manufacturing  
**Source links:** [MIT news](#)



# SOYBEAN NITROGEN BREAKTHROUGH CAN HELP SOLVE THE HUNGER PROBLEM

The technology that increases the yield and quality of soybeans was developed by Washington State University. Professor of Biology Mechthild Tegeder has found a way to increase the yield of soybeans, which consume twice as much nitrogen from the atmosphere, grow better and produce 36% more seeds. The professor grows his plants in greenhouses. This discovery is a major breakthrough in biology and agriculture. It is able to become a response to the problem of hunger, which increases with the growth of the world's population.

For many years scientists have tried to increase the level of nitrogen absorption in legumes by changing the functions of these bacteria or their interactions with tuber cells. Professor Mechthild Tegeder went the other way. The scientist has developed a new way to increase the flow of nitrogen, the necessary nutrient, from specialized bacteria in the soybean root nodes to the organs that produce seeds. Professor Mechthild Tegeder and Amanda Carter, a graduate student in biology, have increased the number of proteins that help to move nitrogen inside plants, from tubers and up. This increased the transport of nitrogen and its absorption. As a result, the plants began to give more seeds.



Professor Mechthild Tegeder has found a way to increase the yield of soybeans, which consume twice as much nitrogen from the atmosphere, grow better and produce 36% more seeds  
source - wsu.edu

Mechthild Tegeder suggests that their soybeans grow faster and look better than regular soybeans. Some signs indicate that in extreme conditions, for example during a drought, they will also behave extremely efficiently. According to Mechthild Tegeder, the main value of their research is that increasing the natural nitrogen distribution increases the amount of food, which the plant produces without increasing the pollution of the environment with agricultural waste. Over time, they want to transfer this knowledge to other legumes and plants that people grow into food. Legumes, namely soy, alfalfa, beans, lentils, account for 30% of the world's agricultural output. Unlike cereals that consume nitrogen from the soil, legumes contain rhizobia bacteroids that can absorb nitrogen from the atmosphere.



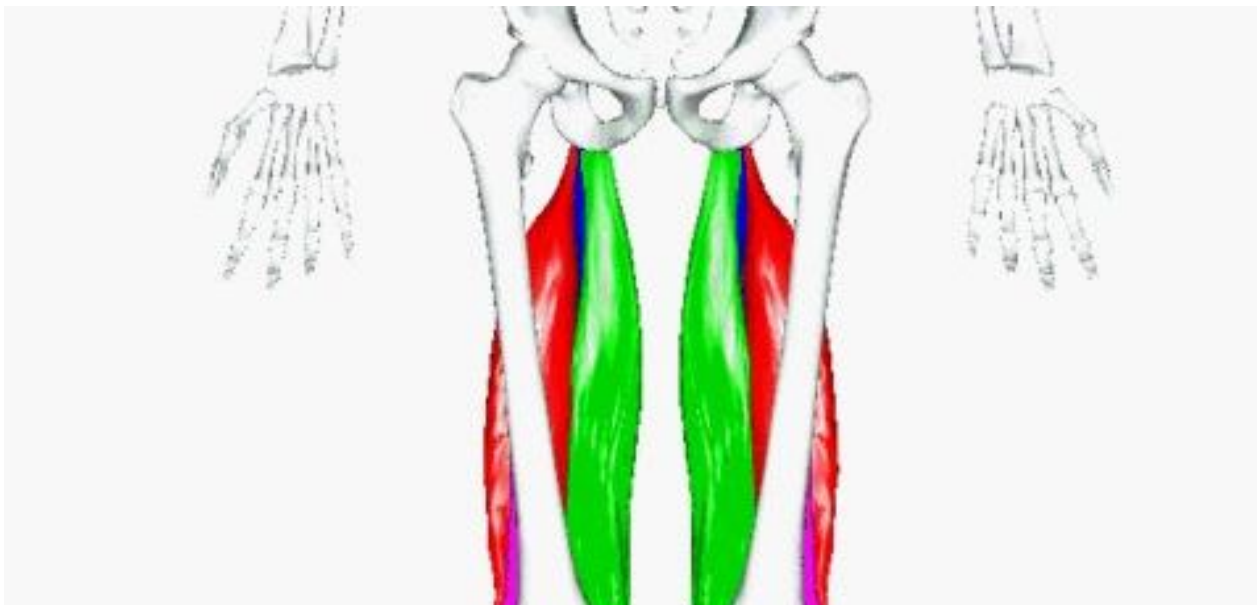
The main value of their research is that increasing the natural nitrogen distribution increases the amount of food source - wsu.edu

**The main advantage of this technology** is the protection of the environment. Since such a macronutrient as nitrogen is necessary for plant growth. Many synthetic nitrogen fertilizers are used all over the world to ensure high plant productivity. Their use is an environmental problem in industrialized countries due to high energy, increased greenhouse gas emissions. They lead to water pollution and other adverse effects on ecosystems and human health. Moreover, nitrogen fertilizer is not enough for developing countries and this leads to low crop yields and limited food supplies.

Mechthild Tegeder suggests that **her studies of soybean diseases will lead to the fact that species of legumes will be suitable for a diverse climate**. One of the main advantages of growing legumes using the new technology is that they not only can use atmospheric nitrogen for their own growth but also leave residual nitrogen in the soil for subsequent crops. Consequently, an increase in nitrogen fixation can increase the overall productivity of plants for legume producers in both industrial and developing countries, reducing or eliminating the need for nitrogen fertilizers. **The work of the scientist is aimed at solving the basic social problems**. This is especially true for the problem of sustainable resources and its topic of supplying food for future generations.

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**Industries:** Food and Drink, Biotechnology  
**Source links:** [Washington State University](#)

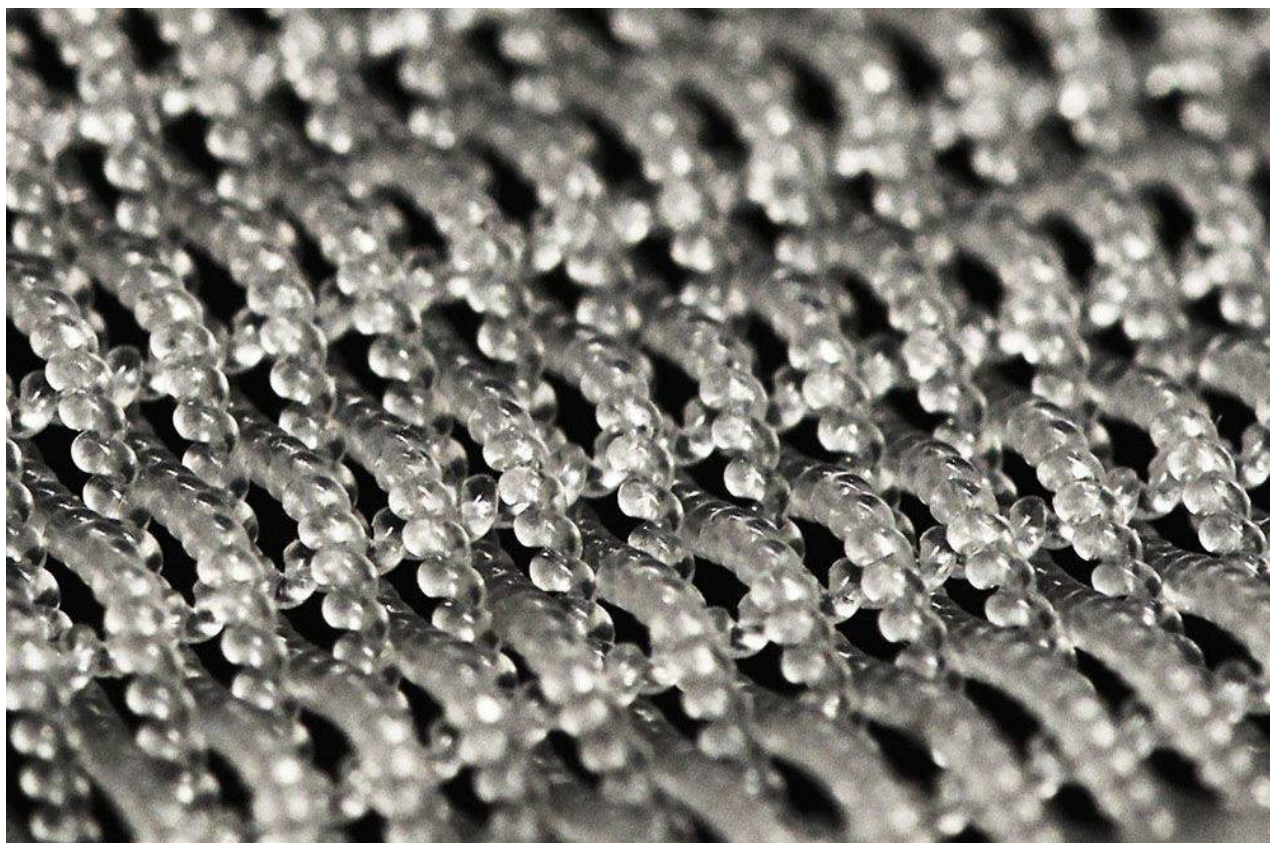




## SCIENTISTS HAVE USED MODERN MATERIALS TO CREATE ARTIFICIAL MUSCLES

Technology, due to it will be possible to 'knit' artificial muscles in the future, was invented by scientists from NanoTech Institute at the University of Texas at Dallas. Weaving from animal wool and vegetable fibers goes back to the millennial history of mankind. Scientists have added to this concept scientific achievements of the 21st century, after which it was possible to create fibers that react to temperature and resemble human muscles.

Since artificial muscles can be made in different sizes and configurations, potential applications range from robotics and prosthetics to consumer products such as smart textiles that change the porosity and shape in response to temperature. The name 'artificial muscles of artificial fibers' comes from the fact that such muscles mimic fiber, which is similar to the shape of natural muscles.



Artificial muscles can be made in different sizes and configurations  
source - nanotech.utdallas.edu

According to [Dr. Ray Baughman](#), director of [the NanoTech Institute](#) and the [Robert A. Welch Distinguished Chair in Chemistry at UT Dallas](#), the team developed a method to draw 'forests' of nanotubes out into sheets of aligned fibers. Next, they turned this method to polymer fibers such as nylon sewing thread and fishing line, which consist of many individual molecules aligned along the fiber's length. Twisting the thread or fishing line orients these molecules into helices, producing torsional or rotational artificial muscles that can spin more than 100,000 revolutions per minute. These muscles are so highly twisted that they are like an over-twisted rubber band. It helps them produce tensile. The muscles dramatically contract along its length when heated, and returns to its initial length when cooled.

The main role is played not so much by material as by technology developed by scientists in the process of knitting. Molecules are arranged along the filament in such a way that while they are increasing in diameter, they practically are not changing its length. Among the materials that can be used for weaving can be both exotic carbon nanotubes and conventional polymer threads.

Scientists believe that the success of muscles technology derives from their special geometry and the fact that scientists start with materials that are anisotropic. When these materials are heated, they expand in diameter much more than they expand along their length. This anisotropy is an intrinsic property of high-strength polymer fibers and is the same principle that drives powerful artificial muscles, which made by adding a thermally responsive material within a carbon nanotube yarn. According to scientists, when these fibers twisted and coiled, their internal geometry changes so that when they are heated, that diameter expansion results in a change in length. The fiber's diameter only has to expand by about 5 percent to drive giant changes in length.

Studies have shown that muscles woven in a similar fashion from cheap fishing lines have a hundred times greater mechanical power than human muscles. Thus, simple, low-cost muscles made from the fishing line can lift 100 times more weight and generate 100 times higher mechanical power than a human skeletal muscle of the same length and weight.

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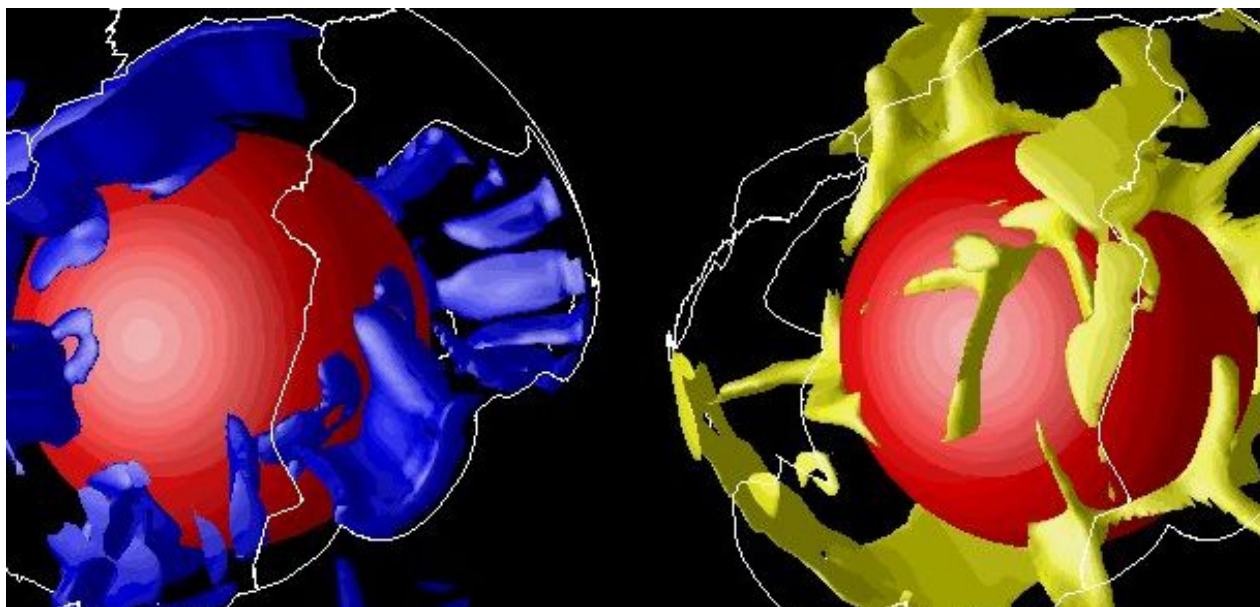
**Patent status:** -

**On market since:** -

**Regions:** United States

**Industries:** Biotechnology

**Source links:** [NanoTech Institute at the University of Texas at Dallas](#)

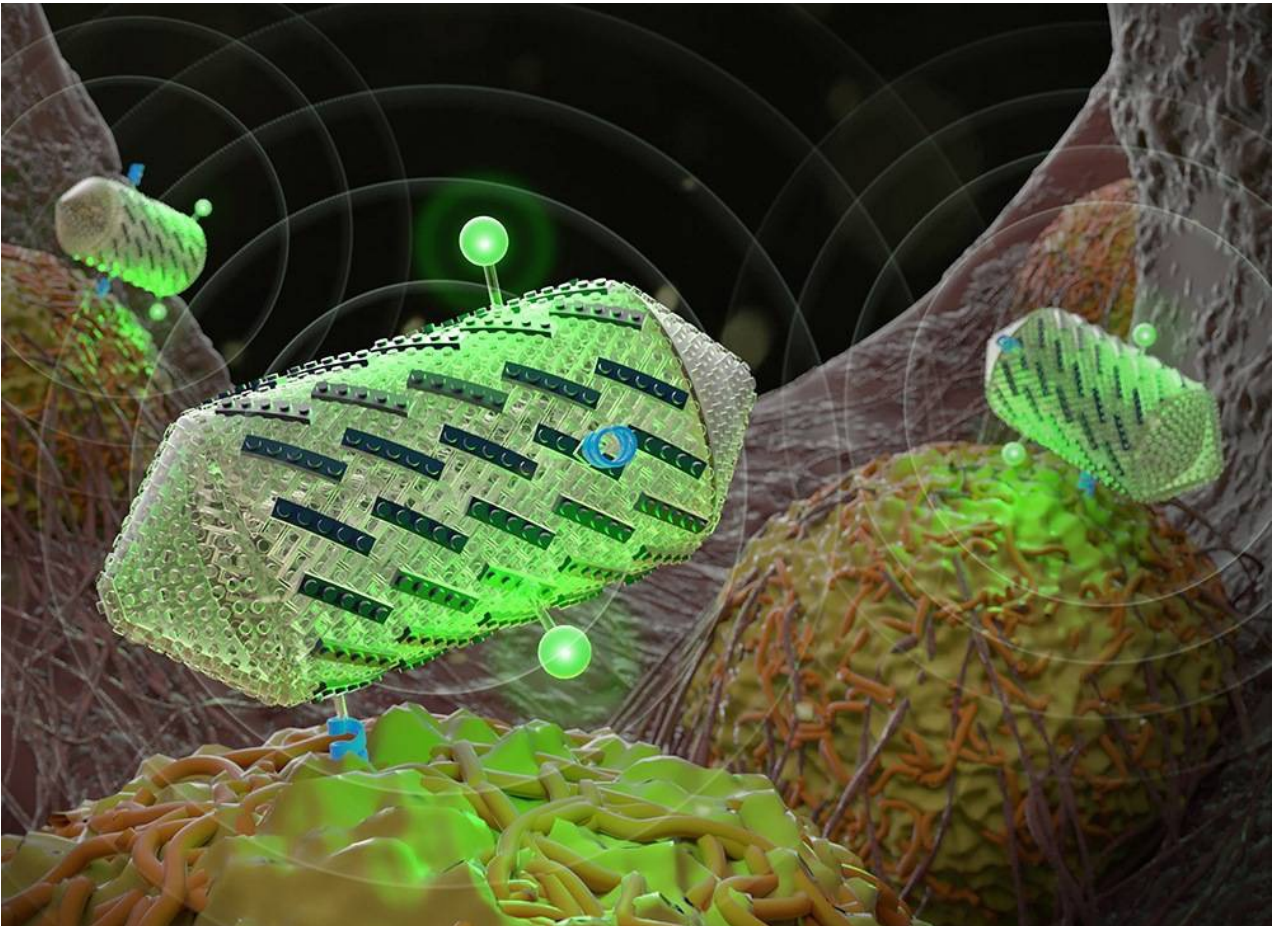


## ULTRASONIC DIAGNOSIS FOR THE ANALYSIS OF CANCER CELLS AND BACTERIA IN THE INTESTINE

Ultrasonic analysis of cells and bacteria was developed by researchers at the California Technical Institute. Ultrasonic diagnostics help to visualize not only internal organs. A person can consider cells and molecules with its help, including - cancer cells or bacteria in the intestine. A study by the California Technical Institute confirms the possibility of creating such a technology.



**Ultrasound imaging** is a widely used visualization. It shows infant development and diagnosis of diseases. Sound waves bounce off the tissues, revealing their different densities and shapes. The next step in the development of ultrasound technology, according to scientists is the image not only of anatomy but also of specific cells and molecules deeper in the body, such as those that are associated with tumors or bacteria in the intestine.



In the future, it will be possible to see how immune cells attack the tumor, personally observing the progress in treatment

source - caltech.edu

According to **Anupama Lakshmanan**, a graduate student of the Shapiro Laboratory and lead author of the study, Today ultrasound is basically anatomical and their team wants to bring it to the molecular and cellular level.

Anupama Lakshmanan firstly discovered the potential use of gas vesicles in ultrasound imaging in 2016. These gas-filled structures arise naturally in hydrogenated single-celled organisms, such as **Anabaena flos-aquae**, as cyanobacteria. They form filamentous blocks of multi-chain chains. Gas vesicles help organisms control how much they swim and are



therefore exposed to sunlight on the surface of the water. Anupama Lakshmanan realized that vesicles easily reflect sound waves during ultrasound imaging. As a result, he has demonstrated this in the research on mice in 2017.



Today ultrasound is basically anatomical, but scientists want to bring it to the molecular and cellular level  
source - caltech.edu

Researchers have modified protein nanostructures - **gas vesicles, which reflect sound waves, in order to give them new properties.** In the future, doctors will be able to manage them, target certain types of cells in order to obtain clear color ultrasound images. In one experiment, the scientists removed the strengthening protein from gas vesicles and then administered the engineered vesicles to mice and performed ultrasound imaging. In another set of experiments, the researchers demonstrated how the gas vesicles could be made to target certain tissues in the body.

According to **Mikhail Shapiro**, assistant professor of chemical engineering, this is somewhat reminiscent of the assembly of the molecular designer Lego. Scientists can rearrange individual parts of proteins on the surface of gas vesicles to change their direction and show different molecules in different colors.

Usually, the ultrasound image is black and white. The Shapiro team invented a method for displaying three different types of gas vesicles as separate 'colors', based on the

difference in their ability to resist pressure. With an increase in ultrasonic pressure, they are destroyed at different rates, allowing to display a color image on the screen. **In the future, scientists will be able to fix the color of each cell.** Mikhail Shapiro believes that in the future, it will be possible to see how immune cells attack the tumor, personally observing the progress in treatment.

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**Industries:** Healthcare  
**Source links:** [the California Technical Institute](#)



## CHEAP PAPER TEST FOR MALARIA AND CANCER

A cheap test for malaria and cancer was developed by chemists at Ohio State University. Patients need to drip blood at home on paper strips and mail it to the laboratory. A call to the doctor comes only if the results are positive. Scientists stored the strips away and re-tested them every few days to see if the signal detected by the mass spectrometer would fade over time. The signal was just as strong after 30 days as on day one. Thus, the analysis is suitable for residents of remote regions since even a month later the samples are suitable for study.

The idea belongs to Abraham Badu-Tawiah, an associate professor of the University, as a method of cheap malaria analysis for people in rural areas of Africa and South-East Asia, where this disease kills hundreds of thousands and affects hundreds of millions of people annually. The main goal was to create such a test for cancer or other diseases that can be carried out independently and as simple as testing blood sugar or conducting a home pregnancy test.



Test strip for diagnosing diseases including cancer and malaria  
source - osu.edu

However, a test developed by scientists can be used for any other disease against which antibodies are produced in the body, including certain types of cancer. According to Abraham Badu-Tawiah, they want to give people hope. If a person takes care of his health a little, and he has cause for concern, he will not want to wait until he gets sick and gets to the hospital. This kind of tests can be done as many as a person wants.

Abraham Badu-Tawiah and his colleagues demonstrated that their invention successfully identifies biomarkers of the most common malaria parasite *Plasmodium falciparum* in Africa. They also successfully detected the protein biomarker for ovarian cancer, known as cancer antigen 125, and the carcinoembryonic antigen, which is a marker for cancer of the large intestine, among other cancers.



Scientists want to create a test for cancer or other diseases that can be conducted independently as testing blood sugar or pregnancy test  
source - osu.edu

Instead of the already widespread plastic microchip for diagnostics, ordinary paper, glued with adhesive tape and passed through a conventional inkjet printer, is used. Instead of the usual ink used wax, which marks the paper channels and reservoirs. Wax penetrates into the pores and forms a waterproof barrier that allows you to pass inside and store a drop of blood. The test strip itself is no larger than a postage stamp.

Abraham Badu-Tawiah says that a person, in order to do an analysis, needs only to drip blood on paper, fold it in two layers, put it in an envelope and mail it. **The paper of this test is covered by enzymes or gold nanoparticles and positively charged ions that react with certain antibodies.** This is the main difference from other tests on a paper basis, for example, a pregnancy test. In the laboratory, the paper is dipped into a solution of ammonia and examined on a mass spectrometer.

The price for the prototype, created at [the University of Ohio](#), was **50 cents**, but with mass production, it should fall, the scientist believes. The most expensive will be the mass spectrometer for medical labs, a portable model of which is now \$ 100,000. **The team of scientists is working to make the tests more sensitive** so that people could use them with saliva or urine as the test material instead of blood.



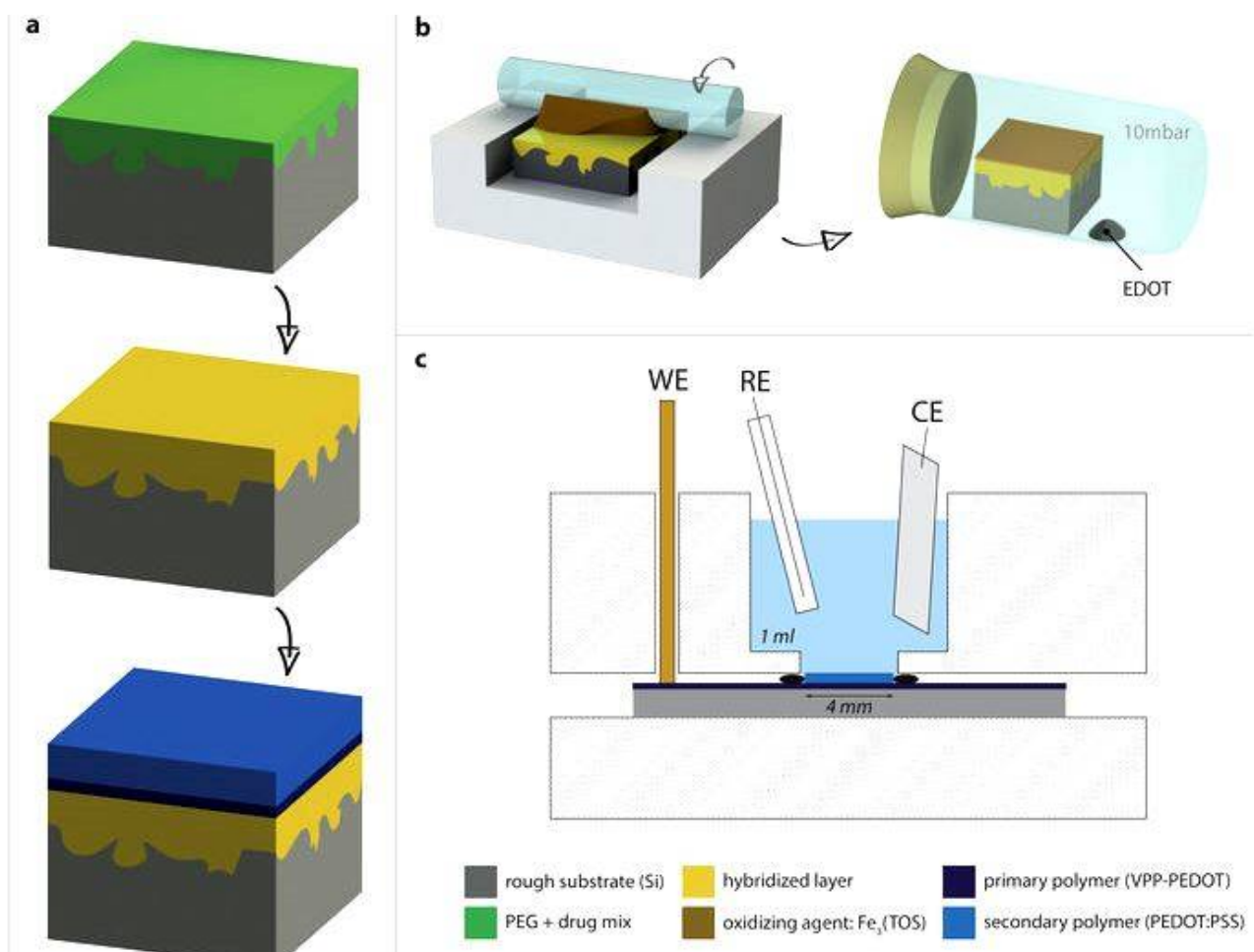
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**Patent status:** -  
**On market since:** -  
**Regions:** United States  
**Industries:** Healthcare  
**Source links:** [Ohio State University](#)



## THE SUBCUTANEOUS DRUG DISPENSER ACTIVATES THE MEDICATION AT THE RIGHT TIME

A new technology for storing molecules, which allows the introduction of drugs under the skin and activate them at the right time, was developed by scientists from the University of Freiburg in Germany. A controlled delivery of bioactive substances with local restriction is of interest in medicine and life sciences, covering a large field from basic research to practical applications. For this purpose, spatial and temporal control of release is as important as the possibility to precisely adjust the number of released substances which can be from small-sized ions to large molecules or proteins.

Different applications demand different properties of the release systems which can generally be categorized according to their functionality into passively or actively eluting systems. Furthermore, active systems can be separated into direct systems with storage and release functionality combined in one single material. Hence being small and compact, or indirect systems which only provide the control and rely on an external drug supply, namely valve-like structures in microfluidic devices. A promising approach to cover relevant requirements for an active implantable release system employing conducting polymers has recently been proposed.



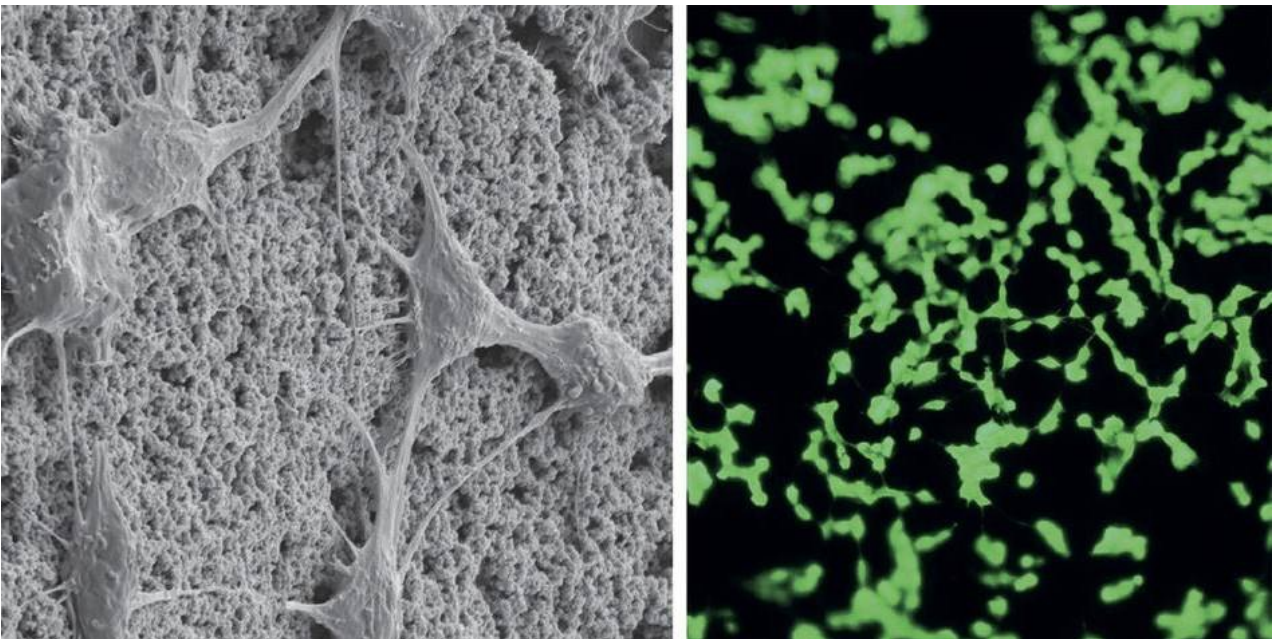
Fabrication of hybridized release samples  
source - uni-freiburg.de

Developers of microsystems, electrical engineers, and scientists worked on this project, among them [Christian Boehler](#), [Firat Güder](#), [Umut M. Küçükbayrak](#), [Margit Zacharias](#) & [Maria Asplund](#). They studied the properties of materials, created a mixture of organic and inorganic materials, which can store small doses of pharmacologically active substances.

At the beginning, scientists turned the liquid synthetic material into a solid, using a method

of atomic-layer deposition using gas. Gas, penetrating the molecular structure of the material, strengthens it from the inside.

In the tests, the researchers used polymeric polyethylene glycol. When reacting with zinc oxide during the precipitation process, it creates an organo-inorganic hybrid. The molecular structure of this hybrid is ideal for storing medicinal substances. Since the material is water soluble, it can easily act as a 'courier' for medicines and direct the necessary substances into the bloodstream.



Biocompatibility testing of the hybrid material  
source - uni-freiburg.de

Scientists used the polymer PEDOT to make the dosage clear. This polymer works as a kind of colander, the openings in which open with a negative charge and close with a positive charge. This allows the release of the necessary molecules in limited doses.

Then the scientists improved the system, made it more compact and capacious and learned how to store molecules with different charges. Experiments have shown that the development allows you to release a certain number of molecules at a certain point in a certain period of time.

The technology will be especially useful for various methods on the principle of a laboratory on a chip when the exchange and analysis of various substances take place in a confined space. For example, the technology can be used to treat cancer. Drugs from

the micro-capacity under the skin will be sent directly to the tumor area. Scientists from [the University of Freiburg](#) have already conducted experiments that prove that such implants can function in the human body.

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**Industries:** Biotechnology  
**Source links:** [the University of Freiburg](#)





## THE BRAND-NEW OPENSLS SYSTEM PRINTS VESSELS FROM BIOMATERIALS

Open source technology for printing 3D objects of complex shapes such as vessels was developed by bioengineers from the University of Rice. Selective laser sintering (SLS) is a process that is used to fuse powdered raw materials into solid three-dimensional structures. The high cost of commercial SLS systems hampers the widespread adoption of this technology in the scientific community, although they have a high potential for creating complex structures with high resolution using SLS and various source materials, namely biomaterials. Therefore, scientists set out to develop a low-cost open-source SLS system called OpenSLS. They have already demonstrated its ability to create structures in nylon with submillimeter characteristics and overhanging regions.

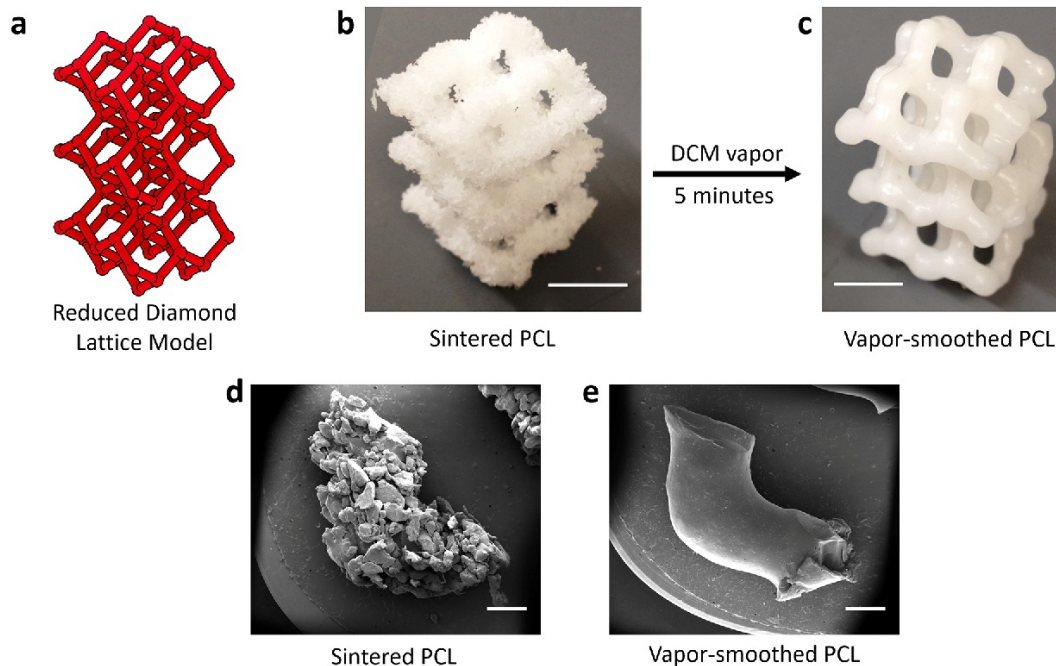
Consequently, the **OpenSLS** platform works by selective laser sintering using various powdery materials, including plastics and biomaterials. The price of this method of printing can reach \$ 1 million, but scientists managed to reduce it to \$ 10,000. Scientists have created a modified version of the OpenSLS printer, the total cost of which does not exceed **\$ 10,000**. The commercial counterparts of laser-based sintering printers usually cost from \$ 400,000 to \$ 1 million. Thus, the basis of the development is the technology of the OpenSLS laser sintering.



OpenSLS uses a laser sintering technology  
source - rice.edu

The printer uses an **extrusion method**, that is, extrudes molten plastic through a needle, creating two-dimensional structures with standard 3D printing. Gradually, layer by layer, the two-dimensional structure becomes a three-dimensional object. OpenSLS uses a laser sintering technology that melts or sinters a plastic powder, forming a dense mass. Then the laser sharpens the two-dimensional object. A new layer of powder is superimposed on top, which is also grinded. As a result, scientists get a finished object.

SLS-technology is ideal for creating complex biological structures, for example, the vascular network of the liver or other organs that can be used for research in the field of regenerative medicine.



SLS-technology is ideal for creating complex biological structures

source - rice.edu

Scientists managed to print using a modified printer several intricate objects of nylon powder and polycaprolactone. This is a polymer, which is usually used as a substrate for studying artificial bones. **Currently, the bioengineers created the arterial network of the mouse liver.** Scientists need further research, which will be necessary to determine if the printer is suitable for printing bioengineering components.

According to **Ian S. Kinstlinger**, researcher of [Rice University](#), **their purpose is** to do the OpenSLS technology affordable to most laboratories and to do it in a way that makes it easier for others to reproduce their work and help to standardize equipment and practices. This work was supported by [John S. Dunn Collaborative Research Award of the Gulf Coast Consortia](#) and [the Cancer Prevention Research Institute of Texas](#).

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**Regions:** United States  
**Industries:** Construction  
**Source links:** [the University of Rice](#)



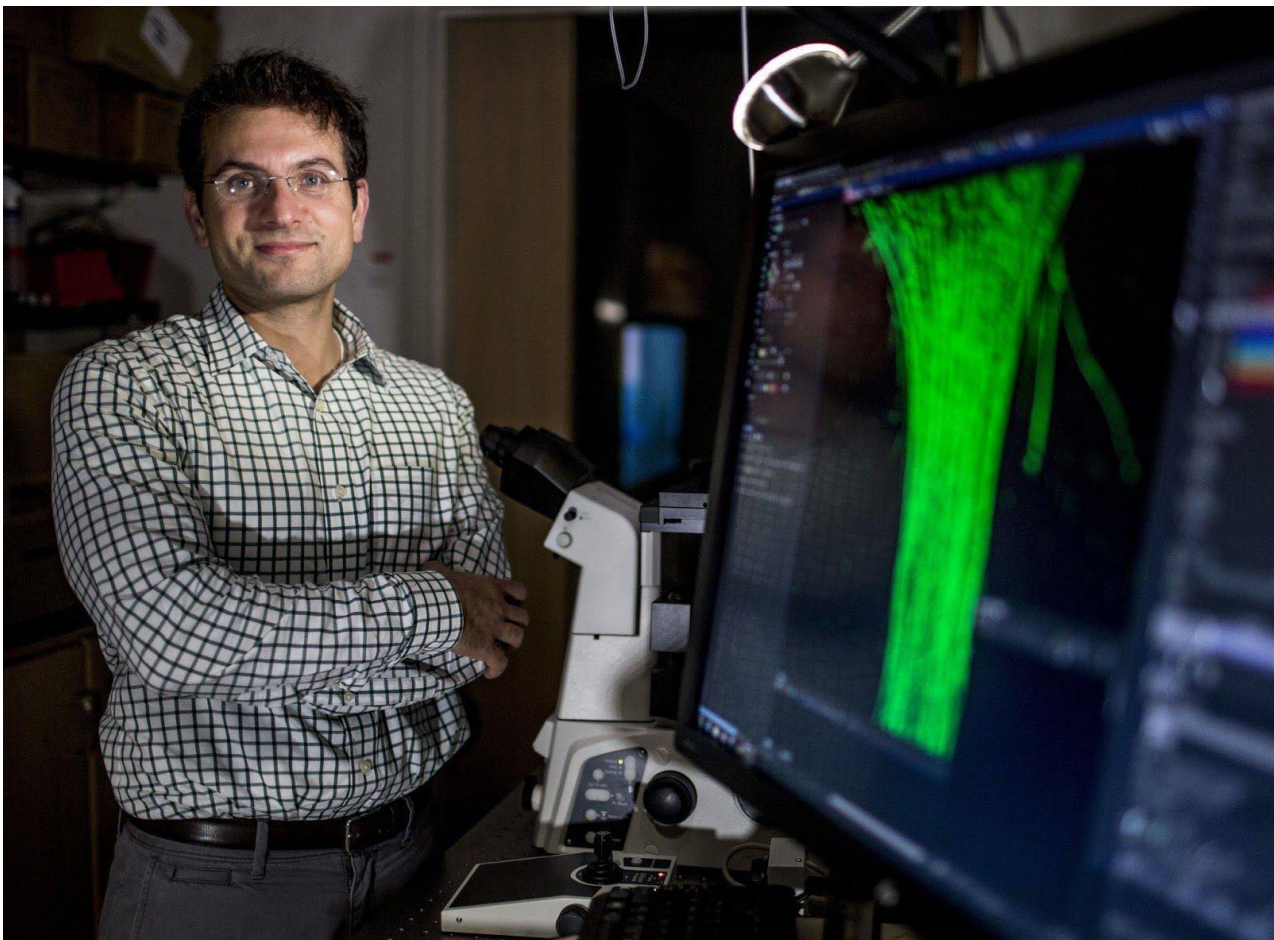
# THE FASTEST DNA MOTOR FOR DIAGNOSING DISEASES

A DNA-based motor for diagnosing diseases, which is 100 times faster than any other synthetic DNA engine, was created by scientists at Emory University, USA. The speed of a new motor running on R ribonuclease is such that a simple microscope on a smartphone can see its movement on video. This invention can be used as a sensor of any movement, from simple DNA mutation to the movement of heavy metals in water.



According to [Khalid Salaita](#), the research leader, unlike other DNA-based motors that had 'legs' like tiny robots, this motor is the world's first motor that rolls, which makes it much faster and more durable. This is the biological equivalent of the invention of the wheel.

Scientists have an invention patent for the concept of using the motion of particles of their rolling molecular engine as a sensor for everything from one DNA mutation in a biological sample to heavy metals in water. Khalid Salaita believes that their method allows performing low-cost and low-tech diagnostics in conditions of limited resources.



Khalid Salaita believes that their method allows performing low-cost and low-tech diagnostics in conditions of limited resources

source - emory.edu

Existing nano-engines most often use DNA enzymes and move on their feet. If they have one pair of 'legs', they are extremely unstable. Two or four pairs of 'legs' are better, but the speed drops noticeably. A motor with two pairs of 'legs' would take 20 years to pass 1 cm.

Kevin Yehl, a post-doctoral fellow in [the Salaita lab](#), suggested using micron-sized glass spheres to create the motor. Hundreds of DNA strands or 'legs' can communicate with the



sphere. These DNA 'legs' are placed on a glass neck covered with a reagent, which called RNA. Once the DNA 'legs' attack the sphere, they destroy it with the activity of an enzyme called RNase H. When the 'legs' are bound and then released from the substrate, they direct the sphere along, a large number of DNA 'legs' allow keeping binding.



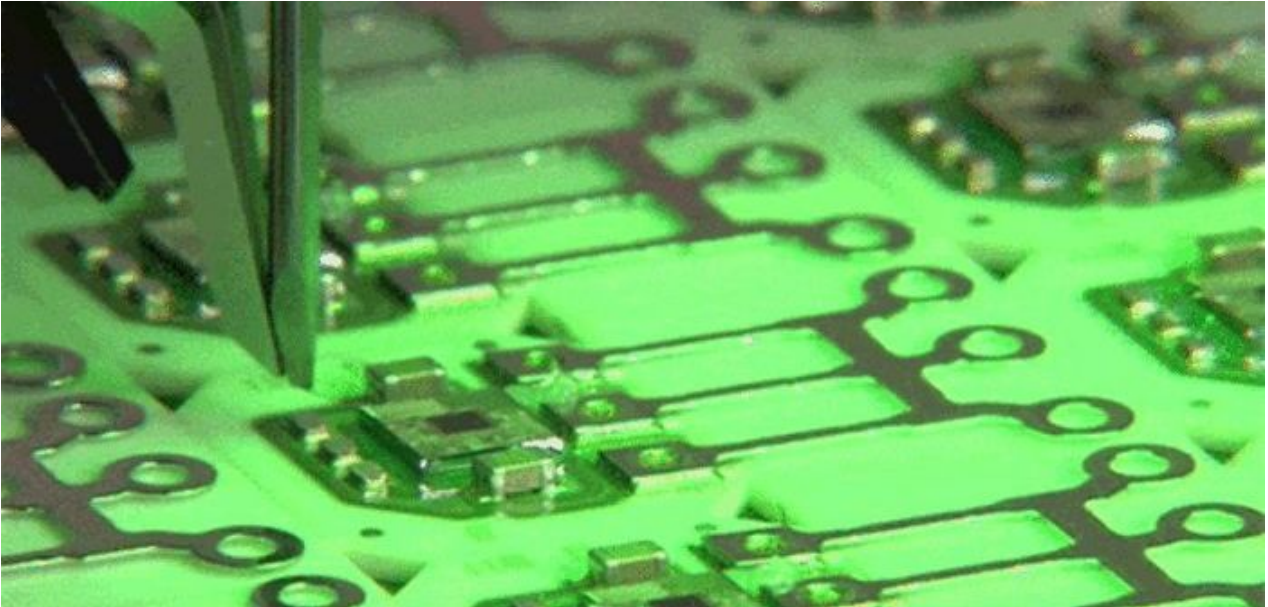
A DNA-based motor can be useful for conducting a diagnostic survey of biological samples in the field  
source - emory.edu

According to scientists, this is called the mechanism of the "burnt bridge". This means that wherever the 'legs' of DNA move, they trample and destroy the reagent. They need to move and walk to where they have not gone to find more reagent. This combination of rolling motion and rapidity of action of the reagent gives the motor stability and speed. This motor can go **1 cm in 7 days**, not in 20 years, which is **1000 times faster than old models**. In fact, natural myosin motors are only 10 times faster than ours, and evolution took billions of years to create them.

Researchers have demonstrated that their rolling motors can be used to detect a single DNA mutation by measuring the displacement of particles. They will convert the smartphone's camera into a microscope. Using a smartphone, their team of scientists can detect one mutation in the DNA chain. They believe that this simple low-tech **method can**

be useful for conducting a diagnostic survey of biological samples in the field or in any place with limited resources.

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**On market since:** -  
**Regions:** United States  
**Industries:** Electronics, Healthcare  
**Source links:** [Emory University](#)

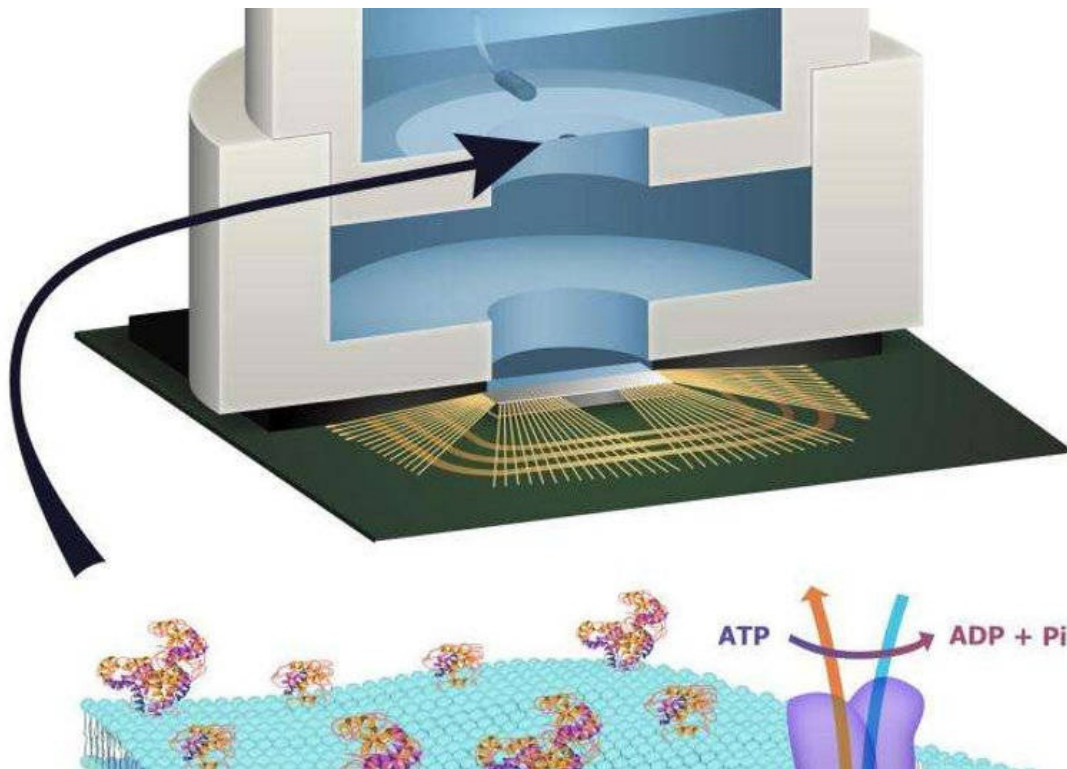


## THE FIRST-EVER COMPUTER CHIP INTEGRATED WITH BIOLOGY ON A MOLECULAR LEVEL

A new chip that allows taking away specific functions from biological systems at the molecular level and integrates them into chips was developed by engineers from Columbia

University. Researchers announced a major breakthrough in technology. The team learned how to use the molecular mechanism of living systems to power the integrated circuit. This newly created chip is powered by biological functions, which are actually part of the operating electronics, rather than a separate component in a larger system.

For the first time, scientists were able to use the molecular mechanism of the biological system to launch an electronic circuit. For this, adenosine triphosphate (ATP), the so-called **biological engine of life**, was used. As a result, a conventional complementary metal-oxide semiconductor was connected to an artificial lipid bilayer membrane. It consists of ion pumps, which work at the expense of ATP.

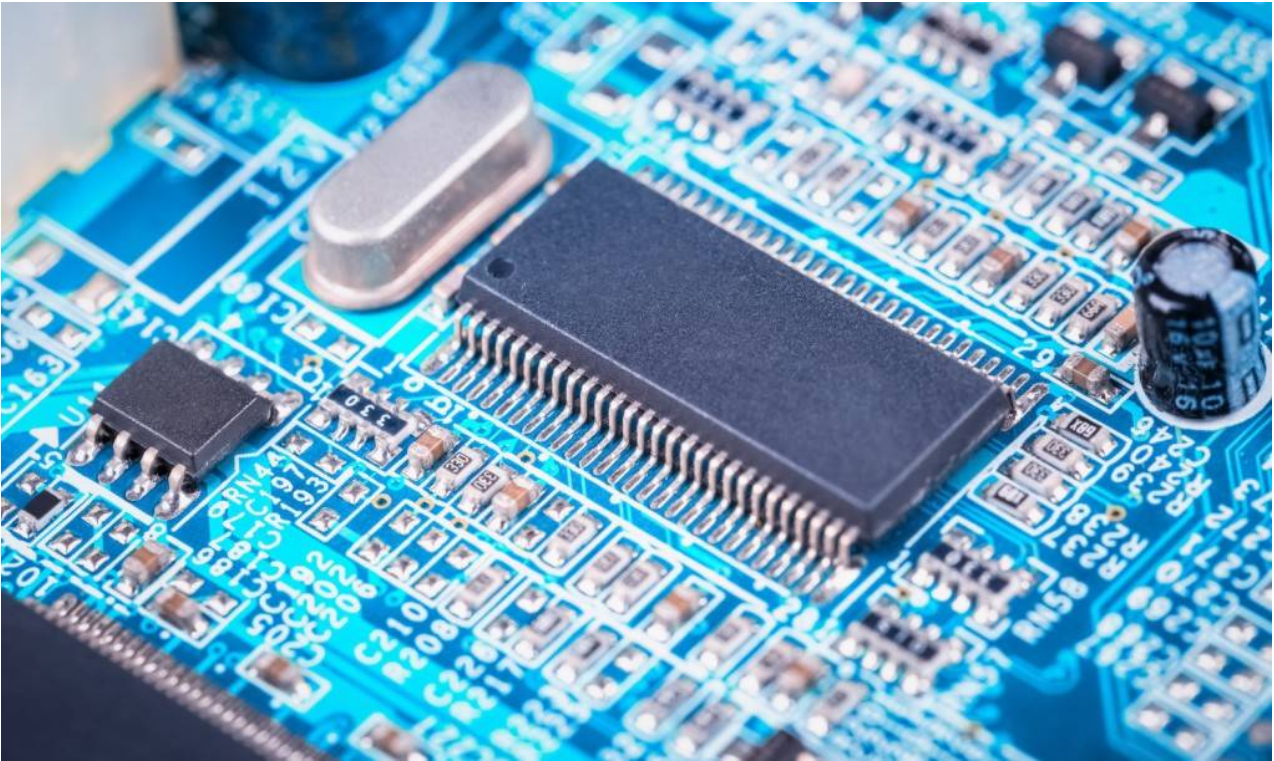


Scientists were able to use the molecular mechanism of the biological system to launch an electronic circuit  
columbia.edu

The new technique will allow creating chips that connect biological and semiconductor components and receive energy from ATP. Devices based on such chips will be able to use individual functional molecules, and in the future - to recognize tastes and smells.

However, the new system has limitations. So far, chips are not yet able to recognize smells and distinguish tastes and cannot use biochemical energy sources. Biological systems receive these functions at the expense of a kind of "organic transistor" based on lipid membranes, ion channels, and pumps. They receive a charge from ions and transfer energy and information, and ion channels control the flow of ions through the cells of the membrane. For the same purposes, semiconductors use electrons and transistors with a field effect.





The new technique will allow creating chips that connect biological and semiconductor components and receive energy from ATP  
columbia.edu

**It is ATP that allows one to collect energy from one source and direct it to another,** controlling the flow of ions through the membranes. For the study, scientists created a macro prototype in a few millimeters to study the principle of the hybrid chip. Researchers want to get energy not from the biological system as a whole, but from its molecular level.

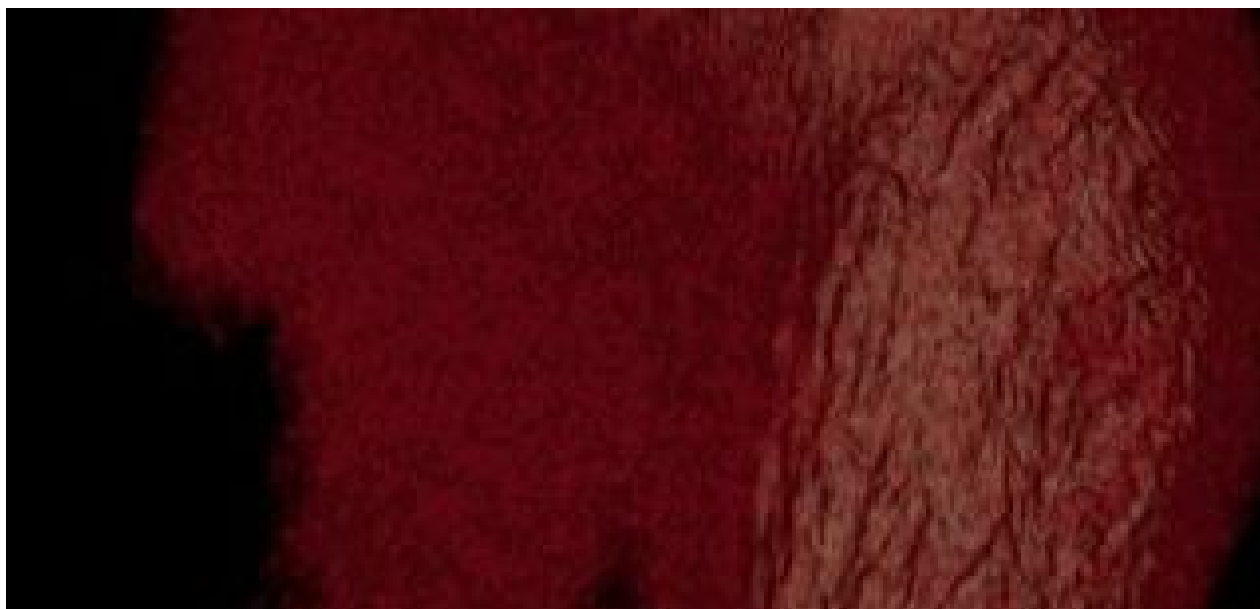
**The new technology has interesting perspectives.** For example, in order to search for explosives, a specially trained dog will be needed, but only the olfactory function of the dog. This function will be added to the chip of a device. Thus the chip will include molecules of the dog's sense of smell.

According to Ken Shepard, a research professor who leads the Bioelectronic Systems laboratory in [the Department of Electronic Engineering of Columbia University](#), in combination with a biological electronic device with CMOS, they will be able to create new systems that are not possible with any of the technologies. Previously, there were other circuits with a biomodule, usually where the energy is collected from the entire living system, for example, and algae-powered lamps. The discovery made by Columbian scientists is considered a breakthrough discovery because it focuses on energy transfer at the molecular level, rather than on the cellular level, and works to integrate the isolated



function into electronics.

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**Regions:** United States  
**Industries:** Electronics  
**Source links:** [Columbia University](#)



## SCIENTISTS HAVE PRINTED BLOOD VESSELS BY 3D BIOPRINTER

Functional blood vessels that were printed using a 3D bioprinter were developed by scientists from the Livermore National Laboratory. American scientists have printed on a 3D printer full blood vessels that look and function like real ones. For this, a 3D bioprinter was used, into which the so-called biocherial is loaded. Its the basic structural components are able to take root in the human body.

Manufacturing vascularized tissue, which contains blood vessels with a fluid with biological components, with help three-dimensional printing techniques can be used to assess medical treatments in laboratory settings. They may also have value in treating certain diseases. **The long-term and main goal of 3D bioprinting** is to engineer complete human organs or tissue replacements. Moya's team is using a bioprinter to deposit bioinks into a device that establishes a feeding system to direct the growth of a vascularized network. They have created vascularized tissue patches, and are working toward patches with hierarchical vascular networks similar to those in the human body, as a step toward developing 3D organs.



The tubular structure is created by flowing the substance through a coaxial needle  
source - llnl.gov

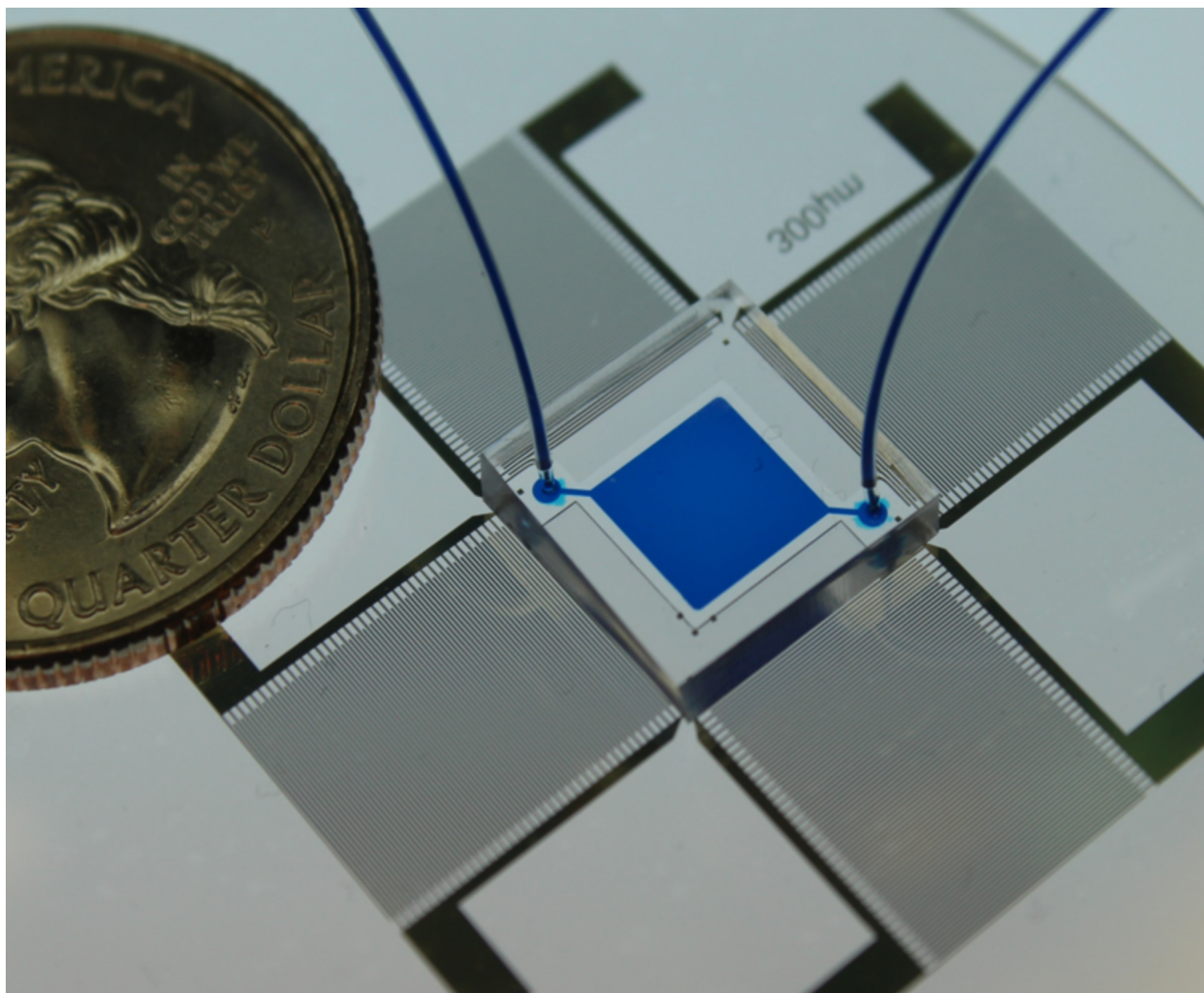
A team of scientists led by the developer **Monica Moya**, engineer-researcher and chief researcher of the project, downloaded in the printer not only the biomaterial but also living human cells in order to create blood vessels. The researchers had to reproduce the finest capillaries. On the printer were printed tube-vessels on the basis of cells and biocherrnil. They can deliver the necessary substances to the human body. As a result, capillaries are generated independently. They grow around the tubes and independently redirect nutrients to the cells. The whole system works the same way as in the human body.

According to Monica Moya, **scientists force the body to grow cells independently using modern technologies**. This approach is closest to natural physiology. Cells know when they need to create blood vessels. With the help of technology, they affect biology. The resulting blood vessels cannot be transplanted, but they can be used for toxicological studies and for testing various therapies. Thus, scientists will be less likely to use animals for experiments. This development also gives green light to create a simulation of the organs on the chips.

Scientists intend to equip [the Livermore National Laboratory](#) with more modern equipment for 3D-biopressing. It will be possible to print larger objects of higher quality with its help. **Monica Moya believes that the new technique will completely change biology**. But scientists are going to improve technology and learn to curb the growth of the circulatory network. **Scientists hope to soon achieve even greater results in this area**. They believe that bioprinting will transform medical services, including drug research, toxicology, and testing for treatment.

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**Source links:** [the Livermore National Laboratory](#)

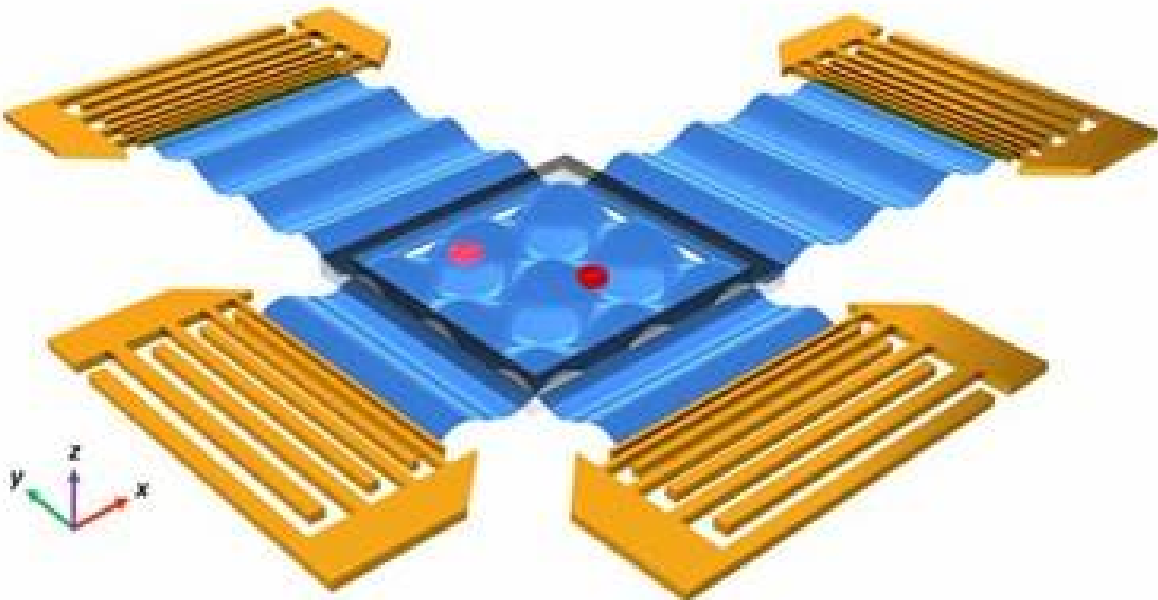




## ACOUSTIC TWEEZERS FOR DISEASE DETERMINATION

Acoustic tweezers for sorting and controlling cells and other nanoobjects was developed by scientists from the University of Pennsylvania. Sound waves can accurately position groups of cells to study without the danger of changing or damaging cells that use surface acoustic waves to manipulate the distance between cells and the contact. This microfluidic device, developed by Professor Tony Juan and his students, responds to weak acoustic vibrations.

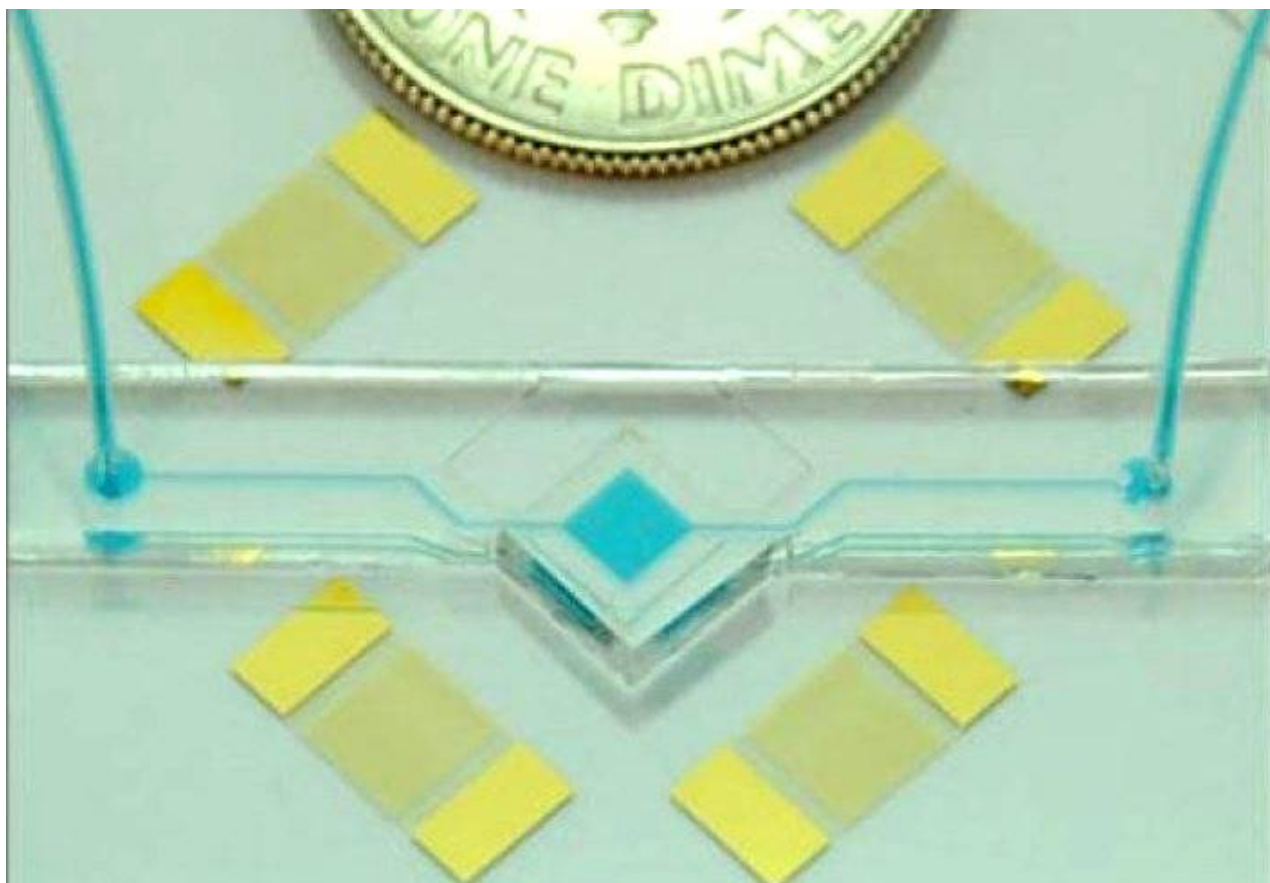
According to [Tony Jun Huang](#), acoustic tweezers have great potential, especially in diagnosis and therapy. Now the prototype works well, but when using it in the field of diagnostics it has to be disposed of after each application. Now scientists have discovered a way to separate a part of the device containing fluids from a much more expensive piezoelectric substrate producing ultrasound. This allows creating disposable acoustic tweezers. A disposable plastic part can be produced at a price of **25 cents per piece**. Even connecting electronics for diagnostics, which does not need to be further developed, the entire system will be worth, according to his calculations, a couple of dollars. And it can be used again and again, simply by replacing microfluidic channels from plastic



Schematic of an acoustic tweezers device  
source - upenn.edu

**Acoustic tweezers use small acoustic waves** as in standard ultrasonic machines, so they are gentle and can preserve the integrity of the cells. Researchers manipulate cells so they can look at direct contact between two cellular membranes or precisely control and support different distances between cells and observe how cells communicate.

Scientists believe that in the future acoustic tweezers will be able to give positive results for studying the transfer of information between cells. They will be able to separate the cells a certain distance from each other or bring them to a certain contact. Optical tweezers can also perform these functions, but their main drawback is that they suffer from the heating.



A miniaturized ultrasonic device capable of capturing and moving single cells and tiny living creatures  
source - upenn.edu

The device of acoustic tweezers is a bit smaller than a cell phone, so it can provide the capacity of thousands of cells. By changing the acoustic field, the cells can be accurately manipulated without damage. The researchers place four acoustic sources on opposite sides of the substrate. When the opposing devices send surface acoustic waves, they establish a grid of nodes where the sound pressure is canceled. The cells enter these nodes. Modulating the power and frequencies of acoustic sources, researchers can manipulate the number of cells, as well as their position. Two cells can be moved to touch one another or almost touch each other with different separation distances.

According to Tony Jun Huang, scientists want to promote this as a commercial product that will help people and benefit society. Since, watching the action of drugs, you need to know how cells react to medications. Using acoustic tweezers, you can create high throughput in one cell or in an installed cell, and see it. In addition to diagnosing diseases such as AIDS or tuberculosis, which are endemic in poor regions of the world, tweezers can be used in hospitals, clinics, bio laboratories and at home due to their low price and

ease of use.

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**Source links:** [the University of Pennsylvania](#)





## THE ANTI-OBESITY DRUG DEBLOCKS AND ACCELERATES METABOLISM

The anti-obesity drug, deblocking metabolism and accelerating metabolism, was developed by experts from The University of Texas Medical Branch at Galveston. To date, obesity is one of the main public problems in the world, which significantly worsens the quality of life. Therefore, for example, only in the USA 40% of adults are obese, and 30% are overweight. The estimated cost of obesity in the US is about \$ 150 billion a year. As the fat tissue expands, a large number of hormones and pro-inflammatory signals are released that activate chronic diseases, including type 2 diabetes and cardiovascular diseases.



However, many people want to lose weight, but it is very hard for them to give up eating their favorite food. Therefore, scientists from [the Medical Department of the University of Texas at Galveston](#) are developing a drug that has already reduced body weight in obese mice, although they continued to eat the same amount of food.



The drug has already reduced body weight in obese mice, although they continued to eat the same amount of food

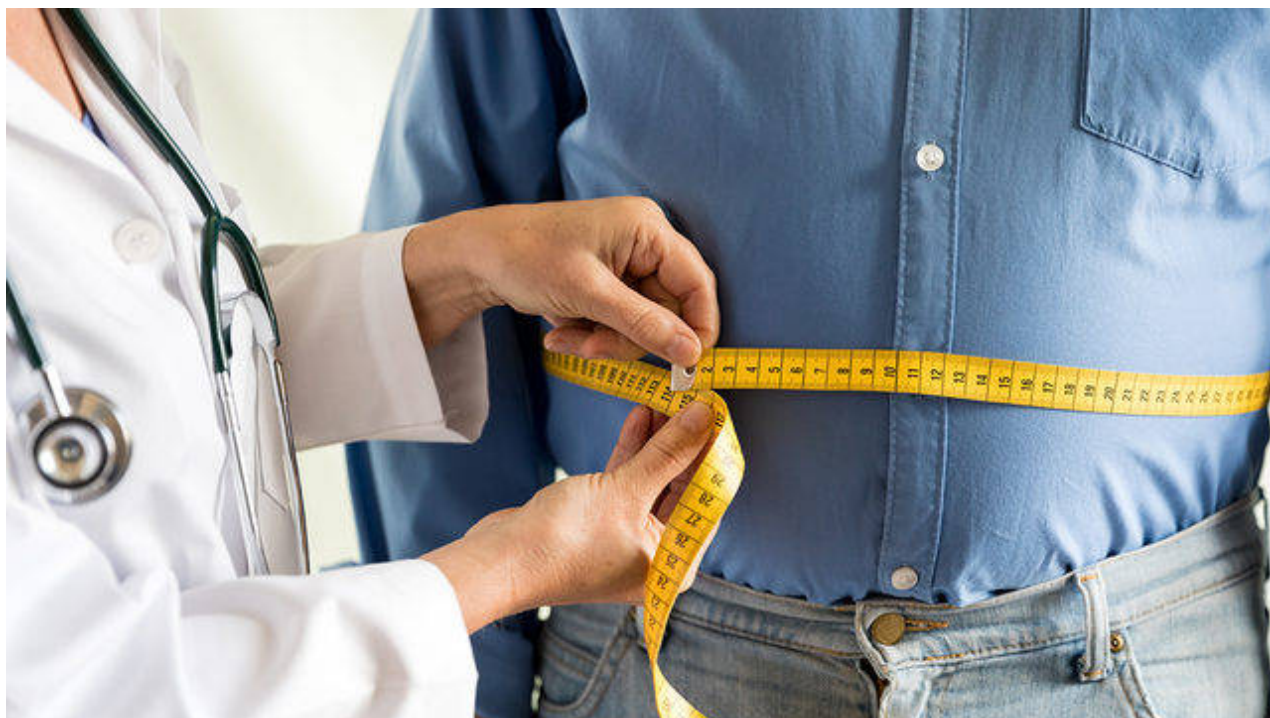
source - utmb.edu

Scientists developed a molecule using lab mice with obesity. This molecule stops the metabolic brake from working in obese white fat cells. They were able to increase 'metabolism within white fat cells' by cutting off access to them.

When lipocytes, fat cells, increase in size, they trigger the overexpression of **the protein NNMT**. This protein acts as a metabolic brake, which slows down the metabolism, so that the more of them, the more difficult it is for the cells to burn fat, consequently, a vicious circle appears. A new experimental drug blocks the action of NNMT in white fat cells, accelerating the metabolic process.

In the course of the experiment, **mice fattened after a diet high in fat received a drug or a**

placebo. After 10 days, the first group had a weight loss of 7%, plus the weight of white fat and the size of the lipocytes decreased by 30% compared with the control. In addition, the drug lowered their blood cholesterol levels to normal, even though they continued to eat fatty foods, from which the mice in the placebo group continued to gain weight.



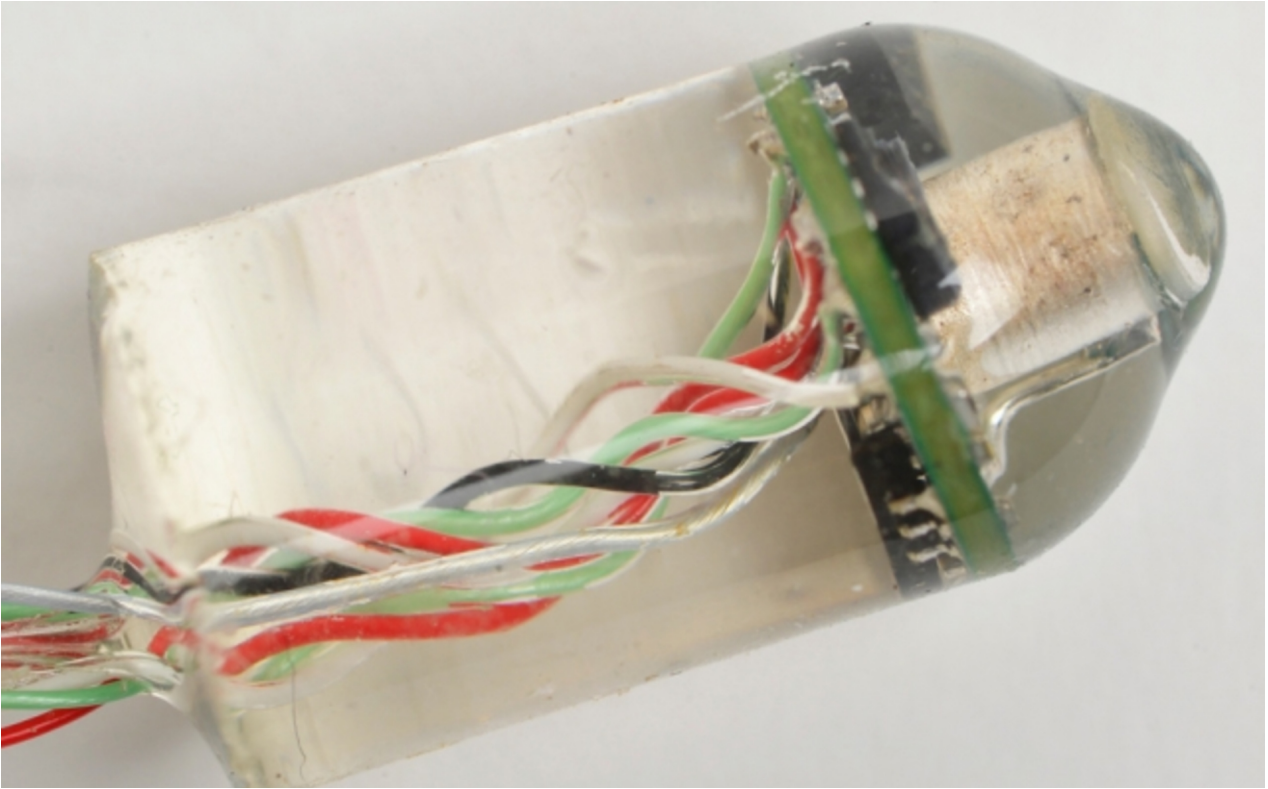
The drug lowered their blood cholesterol levels to normal, even though mice continued to eat fatty foods  
source - utmb.edu

The main author of the study is [Harshini Neelakantan](#). Other authors of the study UTMB's Virginia Vance, Michael Wetzel, Celeste Finnerty and Jonathan Hommel as well as Hua-Yu Leo Wang and Stanton McHardy from the University of Texas at San Antonio.

According to Harshini Neelakantan, the study's chief author, blocking the action of the "brake" is an innovative method of increasing the metabolism of cells and reducing the size of the deposits of white fat, affecting the cause of obesity and associated metabolic diseases. The initial results that we received are encouraging and give grounds for the further development of this technology as a new and effective approach to combating metabolic disorders.

The results of the research were positive, and they go to support the development of technology. [Scientists believe that this is the most effective approach in the fight against metabolic diseases.](#) Scientists plan to start clinical research on humans in a short time.

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**Source links:** [The University of Texas Medical Branch at Galveston](#)



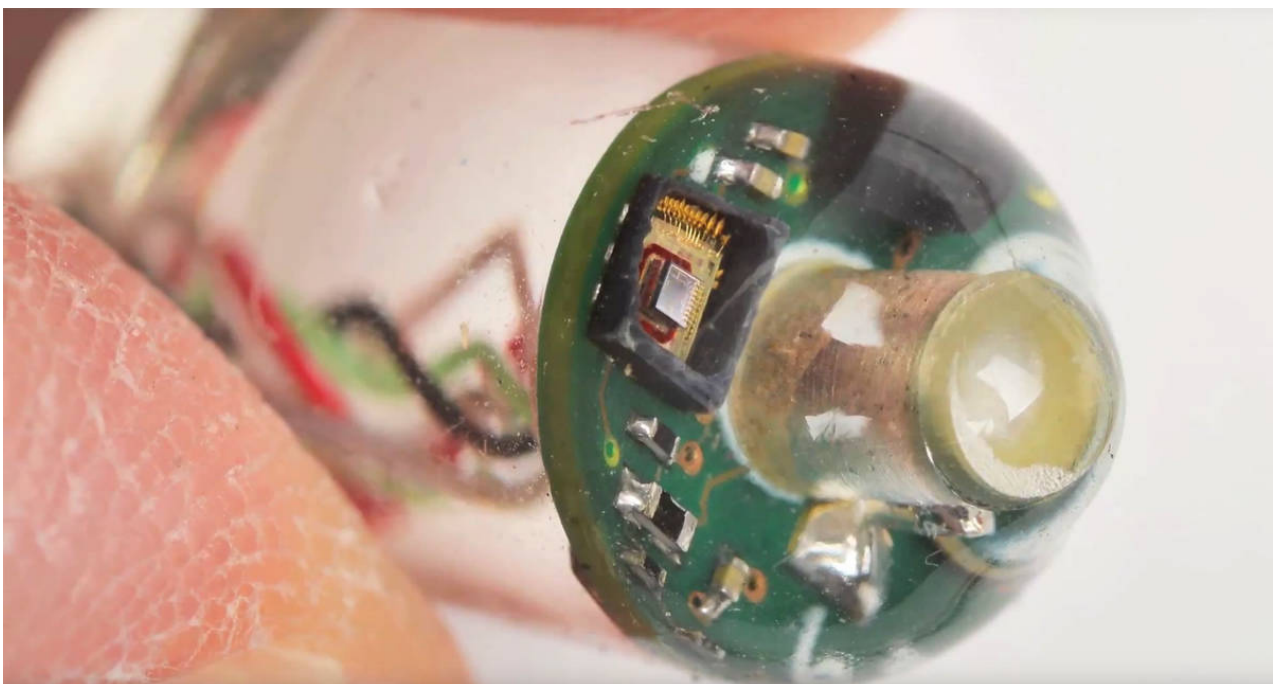
## A SENSOR-CAPSULE FOR MEASURING TEMPERATURE AND HEART RATE

The sensor-capsule, which will measure temperature, respiratory rate, and heart rate, was developed by scientists from the Massachusetts Institute of Technology. Doctors are currently measuring cardiac and respiratory rhythm, using an electrocardiogram (ECG) and pulse oximetry, which require contact with the patient's skin. These vital signs are measured using portable monitors, but they are often uncomfortable to wear.



Doctors will be able to follow the vital signs of patients with help technology invented at [the Massachusetts Institute of Technology](#). It will be enough to swallow an electronic device that enters the digestive tract and monitors the patient's health. The technology will measure the temperature, respiratory rate, and heart rate.

The small sensor is equipped with a mini-microphone and an electronic system that processes the sound and transmits it in the form of a radio signal to an external receiver. It should be located within a radius of 3 meters. The sensor is placed in a silicone capsule, which is easily swallowed.



The vital signs sensor  
source -news.mit.edu

The system is designed for patients with injuries and chronic diseases, the progress of which must be constantly monitored, as well as for athletes and soldiers during military operations. In addition, the device will be able to detect symptoms of fatigue, dehydration, overheating or hypothermia, tachycardia, fever or shock. The new sensor calculates cardiac and respiratory rhythms from the characteristic sound waves caused by beating the heart, as well as inhalation and expiration of the lungs.

According to [Giovanni Traverso](#), the research branch of [the Institute of Massachusetts Institute of Technology](#). [M. Koch](#), a gastroenterologist from the Massachusetts general hospital, using the characteristics of acoustic waves recorded from different parts of the GI

tract, scientists have found that with good accuracy they can measure the heart rate and respiratory rate.

Tests conducted on pigs showed, scientists found that the device can accurately measure the heart rate and respiration rate, even if conditions such as the amount of digested products vary. Researchers believe that the device will remain in the digestive tract for only 1-2 days, so for long-term monitoring, patients will swallow new capsules as needed.

According to scientists for military personnel, such a sensor will be useful for monitoring soldiers, namely monitoring of fatigue, dehydration, tachycardia or shock. In combination with a temperature sensor, it can also detect hypothermia or fever from infections. In the future, scientists want to create sensors that will diagnose heart disease and abnormalities, as well as monitor the breathing state of patients with emphysema and asthma. In addition, scientists plan to deliver drugs with the help of sensors directly into the digestive tract.



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**Regions:** United States

**Industries:** Electronics

**Source links:** [MIT News](#)



## WATER DESALINATION USING SCHOCK WAVES

The technology of desalination and water purification using shock waves was developed by a team from the Massachusetts Institute of Technology. Every day the availability of clean drinking water is becoming an increasingly urgent problem throughout the world. Scientists are looking for new ways of processing salt, brackish or polluted water to make it suitable for drinking. Scientists from MIT presented an innovative method of water purification and desalination. They do not need filters or boiling to do this. The process is carried out with the help of "shock electro dialysis", which separates ions and particles in an "unmembrane" way.

According to **Professor Martin Bazant**, chemical engineering and mathematics, **this approach is a fundamentally new system of separation**. In addition, unlike most other approaches to desalination or water purification, this approach adds "membrane separation" of ions and particles. Bazant believes that membranes in conventional desalination systems, such as those using reverse osmosis or electrodialysis, are "selective barriers". They allow water molecules to pass but block large atoms of sodium and chlorine salt. This process is similar with conventional electrodialysis, but it is fundamentally different, as well.



The new desalination method could be useful for cleaning the contaminated water generated by hydraulic fracturing, or fracking  
source - [news.mit.edu](https://news.mit.edu)

Water passes through a porous material, made of the smallest particles of glass, which name is frit. On each side of the frit is equipped with membranes or electrodes. Under the influence of current salt water is separated. Therefore, the concentration of salt decreases on the one hand and increases with the other. When the current reaches a certain maximum, a shock wave passes between these zones. Then it creates a physical barrier between the streams of fresh and salt water.

Despite the fact that the system can use membranes on each side of the porous material, water flows through these membranes. This means that they are not as vulnerable to contamination and formation of the filtered material, or to degradation due to water pressure, as is the case with conventional membrane-based desalination, including conventional electrodialysis. According to Professor Martin Bazant, salt should not push anything, charged particles of salt or ions simply move in one direction.

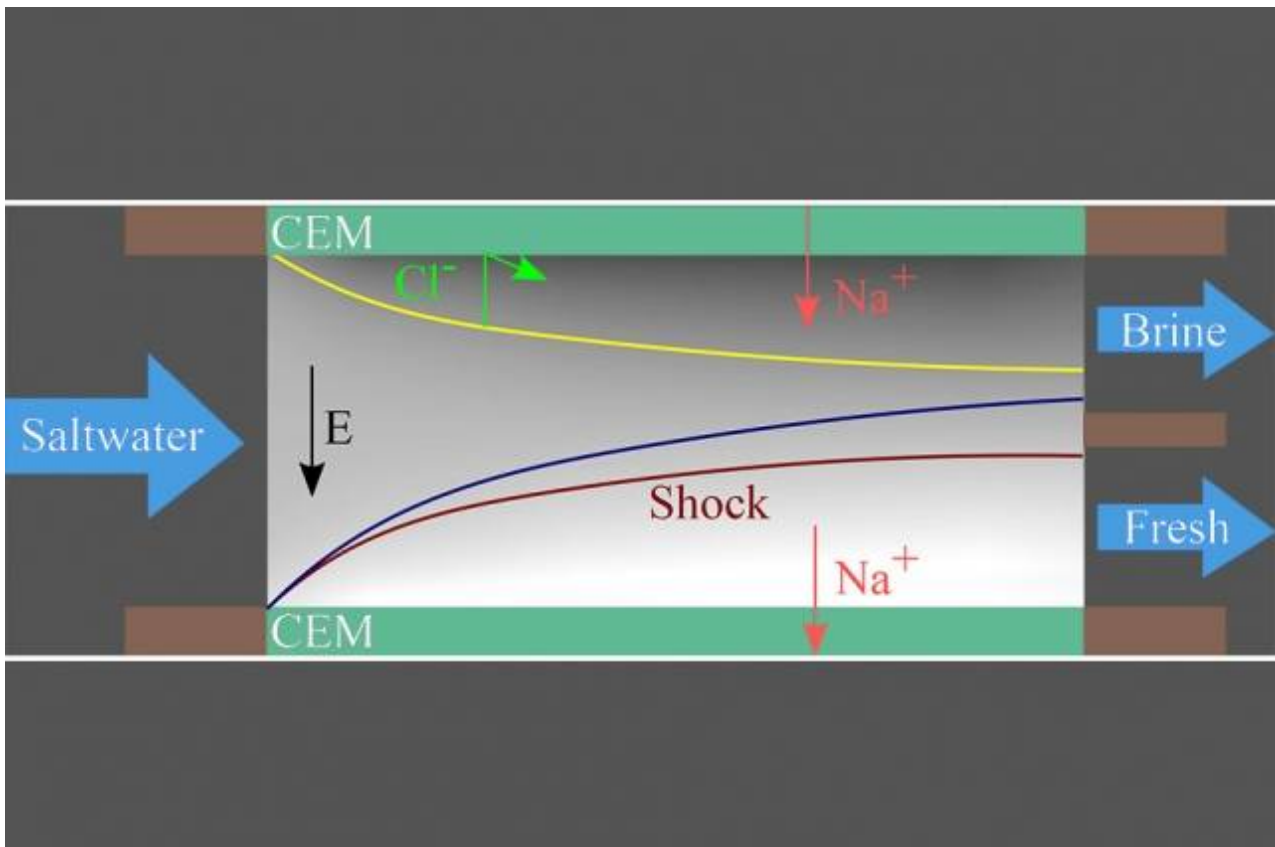


Diagram shows how a shockwave (red line) is generated in salty water flowing through a porous medium, with a voltage applied to membranes (green) at each side of the vessel  
source - news.mit.edu

According to Maarten Biesheuvel, the chief scientist from the Netherlands Institute of Aquatic Technologies, who did not participate in these studies, the work carried out by the MIT opens a whole range of new opportunities for desalination of seawater and brackish water resources. In his opinion, the team of scientists shows a fundamentally new design, where within the same channel ions are divided between different regions. He believes that this discovery will be a big "blow" in the academic field.

The system not only desalts water but also cleans it from various contaminants. With this development, it is possible to purify waste water and even sterilize water. In addition, the

system does not require a large-scale infrastructure, so it easily moves to remote areas or to areas where there is an urgent need for drinking water. The study was also supported by [the Energy Initiative of the Massachusetts Institute of Technology](#), [Weatherford International](#), [USA and Israel on binational scientific foundations](#) and [the SUTD-MIT Scholarship Program](#).

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**Regions:** United States  
**Industries:** Water  
**Source links:** [MIT News](#)





## A VACCINE, WHICH WILL OVERCOME HERPES

A vaccine which can save mankind from herpes was developed by scientists at the Perelman Medical School at the University of Pennsylvania. According to the World Health Organization, more than two-thirds of the world's population has HSV-1 of herpes form and 10% of the population has HSV-2 forms. The disease is so well able to "hide" from the human immune system, which can remain in the body throughout life. However, scientists argue that they have already come close to solving this problem.

After a person becomes infected with herpes, this disease remains with him for life. The virus lives inside the nerve cells, hiding from the immune system, and periodically makes itself felt. This disease can be dangerous. It increases the risk of contracting HIV, and can cause serious health problems in newborns if passed from mother to child during childbirth. That is why researchers want to find a remedy for both strains of herpes.



A vaccine that can save mankind from herpes  
source - med.upenn.edu

The author of the study, [Harvey Friedman](#), a professor at [Perelman Medical School of the University of Pennsylvania](#), has been working on a herpes vaccine for 10 years.

Nevertheless, before that, he spent another 20 years marveling at the mechanisms herpes uses to infect us. The scientist believes that herpes is one of those viruses which has the ability to bypass the immune system. It can not manifest himself, with people who are immunologically healthy. However, scientists constantly ask themselves how this virus can exist in a healthy immune system.

Harvey Friedman and his colleagues found that HSV produces some proteins that prevent the body from producing antibodies and hide the disease from the immune system. Scientists developed drugs that affect not only these proteins, but also molecules that help

herpes hide. This allows the body to produce antibodies that can attack the virus.



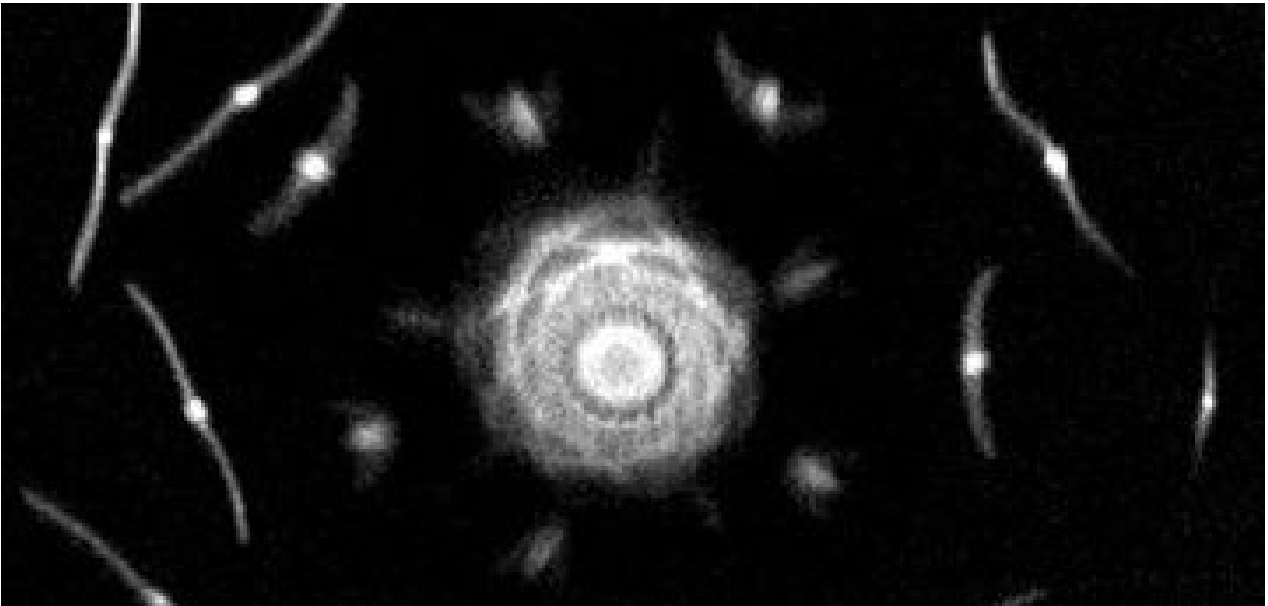
According to the World Health Organization, more than two-thirds of the world's population has HSV-1 of herpes form and 10% of the population has HSV-2 forms  
source - med.upenn.edu

Generally, scientists when creating a vaccine against herpes, made it focused on the key part of the virus, which allowed them to enter cells where they grow and multiply. However, the tests, which was conducted on humans, showed that this strategy, unfortunately, does not work very well. In a new study, Harvey Friedman and his team combined this traditional strategy with a new treatment. They attacked normal proteins with cells, but also attacked the so-called evasion molecules, which help herpes to escape.

**The vaccine was tested on macaques and guinea pigs.** In monkeys, the immune system functions almost identically to the human immune system, so if the vaccine works for them, it should work for us. Moreover, the researchers saw the immune response, which they expected, in all directions. However, in the macaques, the herpes virus does not appear as in humans. Therefore, scientists could observe the action of the vaccine only at the cellular level. Nevertheless, in guinea pigs, the reaction to the virus is almost the same as in humans - and the researchers were able to see that the vaccine is effective. According to a study by scientists, they came to eliminate the virus in the human population. However,

scientists are going to test of a new vaccine on people only in a year or two.

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**On market since:** -  
**Regions:** United States  
**Industries:** Healthcare  
**Source links:** [Perelman Medical School at the University of Pennsylvania](#)



## MRI WILL BE ABLE TO DETECT MALIGNANT TUMORS WITHOUT BIOPSY

The revolutionary method of magnetic resonance imaging, which allows determining accurately the composition and aggressiveness of a kidney tumor without a painful biopsy, was developed by experts at the University of Texas Southwestern Medical Center. It is the leading academic medical center, which focuses on the innovative biomedical research with exceptional clinical care and education.



The new technology is called multiparameter MRI and includes a standardized diagnostic algorithm that estimates images of kidney masses for several specific factors, including the presence of microscopic fat in the tumor and the intensity of the T2-weighted scan signal.

Tumors in the kidneys are usually very small. Their size is less than 1.5 inches. Doctors detect tumors by accident using a CAT scan. Because of detection of a tumor, a problem arises as to whether this tumor is malignant and whether it should be removed surgically, as it can threaten the life of the patient. The tumor can be also benign and doctors can leave it alone because this type of tumor does not a threat to a human life.



The magnetic resonance imaging, which allows determining accurately the composition and aggressiveness of a kidney tumor

source - utsouthwestern.edu

The team of doctors who developed the multiparameter protocols MRI is headed by [Ivan Pedrosa and Jeffrey Cadeddu](#). This device provides an opportunity to study and evaluate the chemical composition of the tumor without biopsy and to determine the type of cancer. This procedure is not only quick and painless but also the most effective biopsy.

[According to Jeffrey Cadeddu](#), usually, when a small tumor is detected in the kidneys, an invasive biopsy is needed, which is associated with painful sensations and discomfort. Some patients even prefer to give up a biopsy to avoid pain. However, a new method which was recently developed uses modern technology of magnetic resonance imaging to

accurately determine the composition and aggressiveness of a tumor without the biopsy. It is believed that it will be able to make the breakthrough in the treatment of kidney tumor.

It is possible to obtain different types of images of kidney masses with the help of mpMRI, and each of them will tell us something new about the tissue. This technology is not intended to replace a classical biopsy, but it can be an additional research method that will reduce the number of procedures for excising tissues or confirm the need for a biopsy for those patients who would otherwise not have done so. **The accuracy of diagnosis of advanced malignant tumors of the kidneys by the method of mpMRI is 80%.**

In the future, doctors will increase in 5 times the chances of detecting the apparent cellular cancer of the kidneys thanks to the mpMRI device. Researchers continue to study the new device and hope to learn not only determine the type of cancer in the near future but also to diagnose the level of its aggressiveness.

The developers of this device were awarded [the National Cancer Institute](#) for outstanding research achievements. Most of the work is already over, however, scientists still have to do significant work before mpMRI becomes another tool in the diagnostic arsenal of oncologists.

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**On market since:** -

**Regions:** United States

**Industries:** Healthcare

**Source links:** [UT Southwestern Medical Center](#)

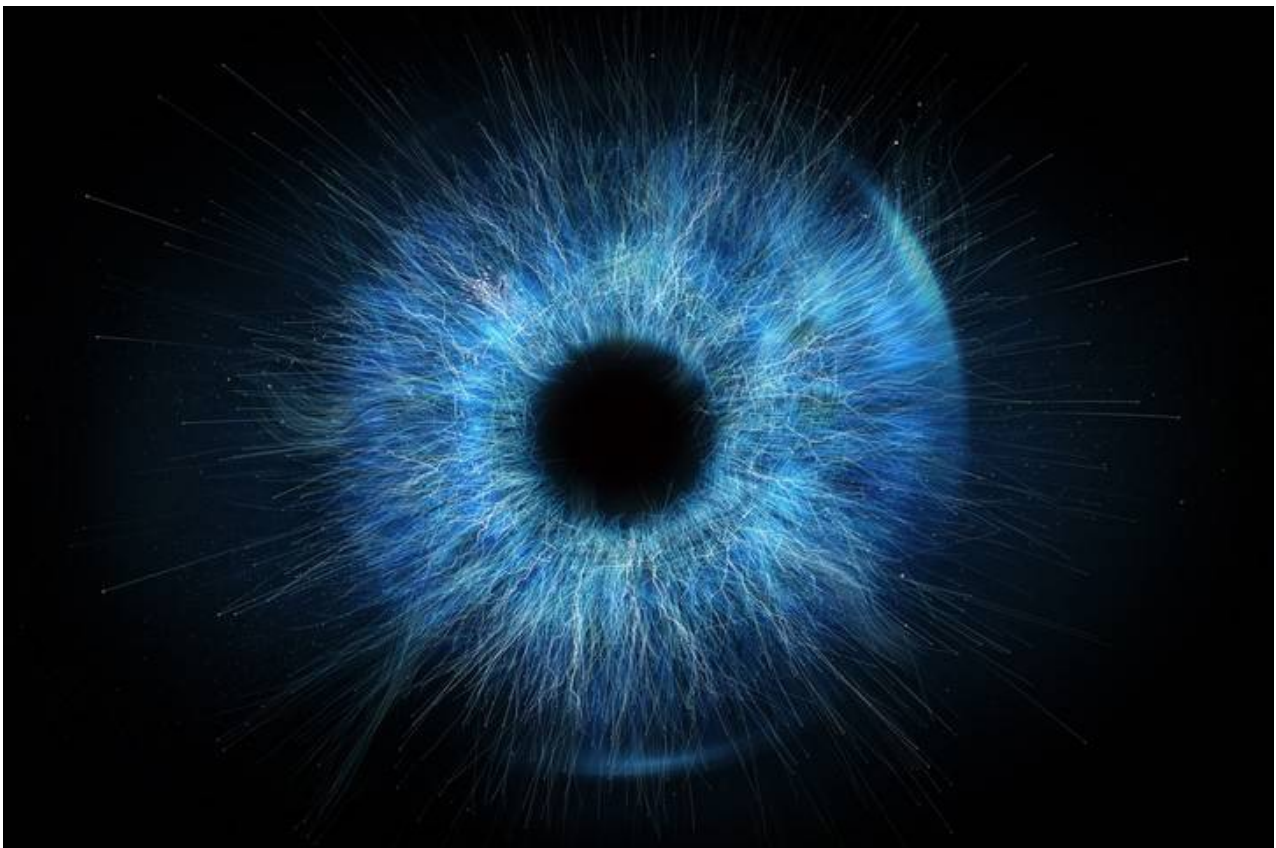


## THE DRUG TREATS A RARE HEREDITARY DISEASE OF THE RETINA

The Luxturna drug is designed to treat a rare hereditary disease of the retina, amaurosis Leber. This drug was developed by Spark Therapeutix. This drug is a drug of gene therapy and it was approved by the US Department of Health.

Spark Therapeutics Company is aimed at combating the inevitable genetic diseases. Their company is a company that unites, on the one hand, a patented adeno-associated viral therapy of gene therapy, and on the other hand, leadership in research and development, manufacturing, and commercial operations. Thus, one of the most effective results of the company in gene therapy was the Luxturna drug.

Leber's amaurosis manifests itself in the first months of life and results in weakening or complete loss of vision due to the mutation of the RPE65 gene, responsible for the production of photosensitive cells. The brand-new therapy supposes that a healthy version of the RPE65 gene will be attached to a genetically modified harmless virus, which is then injected into the patient's eye. Retinal cells begin to produce the missing protein.



The Luxturna drug is designed to treat a rare hereditary disease of the retina, amaurosis Leber

[Luxturna](#) has become the first gene therapy permitted in the US that corrects missing or mutated genes, replacing them with healthy ones. The company is not going to stop there. They will continue to try to turn genes into medicines for patients with various hereditary diseases. According to Scott Gottlieb, FDA commissioner, gene therapy in the future will be the main treatment and, possibly, rid us of most destructive and persistent diseases.



Before starting treatment, it is necessary to pass a genetic test to confirm the mutation of the gene. In addition, the treatment will occur only after confirmation that the patient has enough remaining cells in the retina such as the thin layer of tissue in the back of your eyes. As soon as the attending physician confirms that the treatment with this drug is suitable for the patient, the company immediately connects it to the treatment center. In addition, the use of this drug is prohibited for patients under 1 year of age. This is due to the fact that the retina is still growing and this will lead to a negative result of the use of the Luxturna drug. After the procedure, there may be some side effects. Nevertheless, they are easy to deal with, you just have to contact the company in time and report your condition.



Spark Therapeutix  
source -

The appearance of a new kind of treatment of a dangerous hereditary disease gave hope to patients to fight this terrible disease. However, the commercialization of this drug overshadows patients' gladness. Currently, the company Spark Therapeutics does not divulge the cost of a new drug and they will not divulge it before the beginning of 2018. According to some sources, the price of a single dose costs more than **\$ 1 million**. Therefore, the problem is that such treatment can be needed in a year to no more than ten US residents. So small a market can not recoup the costs of development and production,



even at a very high price of the drug.

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Patent status: +  
On market since: -  
Regions: United States  
Industries: Others  
Source links: [Spark Therapeotix](#)  
[The Luxturna drug](#)



# HEAL IS YOUR FAMILY DOCTOR

The Heal technology, which allows using the services of a permanent home doctor at no extra cost, was developed by Nick Desai, Co-Founder & Chief Executive Officer of Heal Company.

According to [Nick Desai](#), this spinoff is not a temporary alternative solution, when queue to the doctor is too long in the clinic. This spinoff is a permanent and long-term medical care. The main goal of this company is to become a family doctor for each patient, but not only to examine patients on weekends.

[Heal](#) technology connects patients with primary care physicians through a site or application. If you are sick or injured, you can call the doctor on the same day, or agree on a general examination, fluorography, and other procedures. Payment for services is covered by insurance, or you can pay [\\$ 99 per month](#) for a fixed fee to the doctor.



Heal provide an affordable access to a doctor on your schedule  
source - [heal.com](http://heal.com)

The Heal technology offers the patient's connection directly with a licensed pediatrician, internal medicine doctor, family doctor or general practitioner. Thus, the patient will be able to contact the doctor at any time as soon as the doctor be needed. Use this technology can be every day, including weekends and holidays from 8 am to 8 pm. Currently, this technology is available only in some US states.

The doctor's admission through the Heal platform is no different from the standard doctor's appointment. The doctor will ask questions, conduct tests, or assemble laboratories' tests as necessary. All the doctors of the Heal Company receive independent medical practice. They have a license for pediatrics, internal medicine, emergency

medicine, family practice or general practitioners. The patient has the right to look through biographies of the doctors and their photos before making the call.

In addition, Heal is a company that meets the requirements of HIPAA and complies with all applicable laws on privacy and security in the field of health. All medical records are supported by independent medical practitioners, medical doctors and stored in an electronic medical record. Patients can safely and privately view their medical data through the patient portal "Healing".



Heal is a family doctor, available to everyone  
source - heal.com

High prices for individual medical services Heal reduces due to refusing to rent medical offices and reception rooms. In this case, all doctors who come to the patient at home have the necessary licenses and work experience of three to seven years. This distinguishes Heal from many other spinoffs, which provide of medical services, because primarily engaged in the development of technical support, but which are most often employed by contractors who do not have sufficient skills.

Spinoff was launched in California. The company hired more than 60 doctors. This

technology has collected more than \$ 40 million of investment, as investors believe that individual medical services can be available to everyone not only in California. Currently, the company is going to expand to other markets. According to Nick Desai, this technology will always be in demand, because eventually, it will be necessary for every person. Everyone should sometimes go to doctors, but no one likes doing it. Thanks to the Heal technology, it will be able to be done quickly and easily.



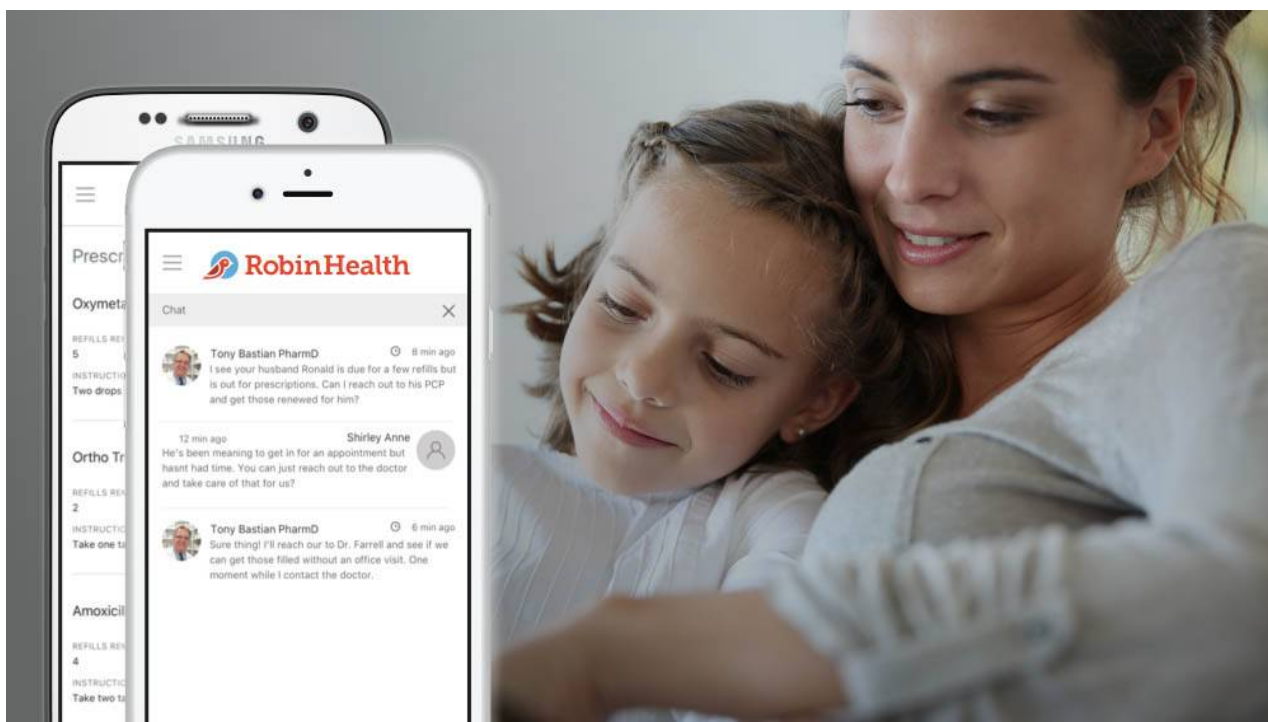
Company name: Heal Company  
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Website: <https://www.heal.com>  
Phone: -  
Patent status: +  
On market since: 2016  
Regions: United States  
Industries: Others  
Source links: [Heal Company](#)



## DRUG DELIVERY PER AN HOUR

Pharmacological RobinHealth spinoff, which collects the base of licensed drugs and delivers them to customers for an hour, was developed by Elliott Poppel, CEO & Co-founder of RobinHealth Company.

[RobinHealth](#) is a mobile pharmacy, which has a chat room with pharmacists and drug delivery on demand. In 2015, one of the co-founders of the company RobinNealth was standing in line, waiting for a prescription for an ear infection for his daughter. He waited about an hour and his sick daughter was next to him. At that moment, the idea came that there should be a better model of service for a pharmacy. Consequently, this moment has become the starting point in the development and appearance of the RobinNealth Spinoff.



RobinHealth collects the base of licensed drugs  
source - [joinrobinhealth.com](http://joinrobinhealth.com)

According to the company, RobinNealth is the world's first mobile pharmacy which uses the interactive trading interface. The company provides patients with on-demand delivery and access to their pharmacist via chat in the application every day and around the clock. The first public launch took place in early April 2016 in San Francisco. The main goal of the company is to grow, expand the market both throughout the country and beyond. The team of the company believes that the pharmacy and the pharmacist are part of the solution to health problems. They target to provide better results for patients, and not just dispensing prescription drugs.

RobinNealth's services include providing advice on the choice of medicines and their free delivery. Currently, they work with other pharmacies but plan to open their own network. According to the founder of the company, it is not so difficult to do, if the company has a

pharmacist, then the company can easily open its own pharmacy.

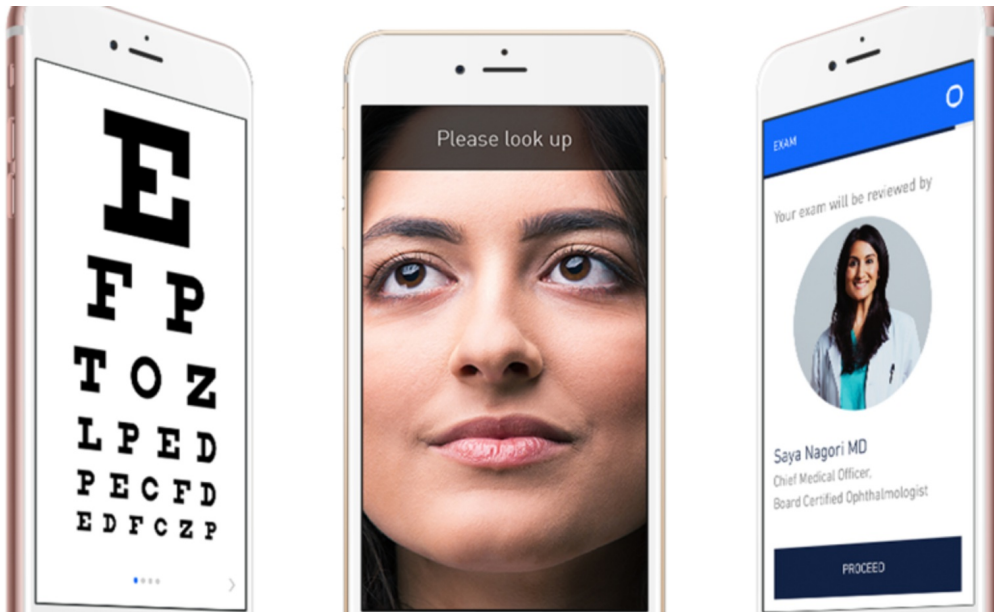


RobinHealth delivers them to customers for an hour  
source - [joinrobinhealth.com](http://joinrobinhealth.com)

RobinHealth focuses on families, in particular parents, and tries to establish a personal contact with them through the messaging interface. In general, the idea of the company is simple and very interesting. This idea is able to save the client from the unpleasant need to go to the pharmacy and stand in line, being already unhealthy. As well sometimes happens that there are no pills in the pharmacy, but people waste their time standing in line. Thus, the team of RobinHealth believes that this spinoff is the best way to solve this problem. Moreover, RobinHealth spinoff is available on iOS, Android, and via the web app.

The year of the company's foundation is 2015. At that time, she received investments, the amount of which is \$120,000. However, the market that RobinHealth is trying to exit is colossal. According to statistics, in 2014, sales of prescription drugs in the US amounted to \$ 263 billion.

Company name: RobinHealth  
Contact person: Elliott Poppel  
E-mail: team@joinrobinhealth.com  
Website: <http://www.joinrobinhealth.com/>  
Phone: +14156040015  
Patent status: +  
On market since: 2015  
Regions: United States  
Industries: Others  
Source links: [RobinHealth](#)  
[Harvard Business School](#)



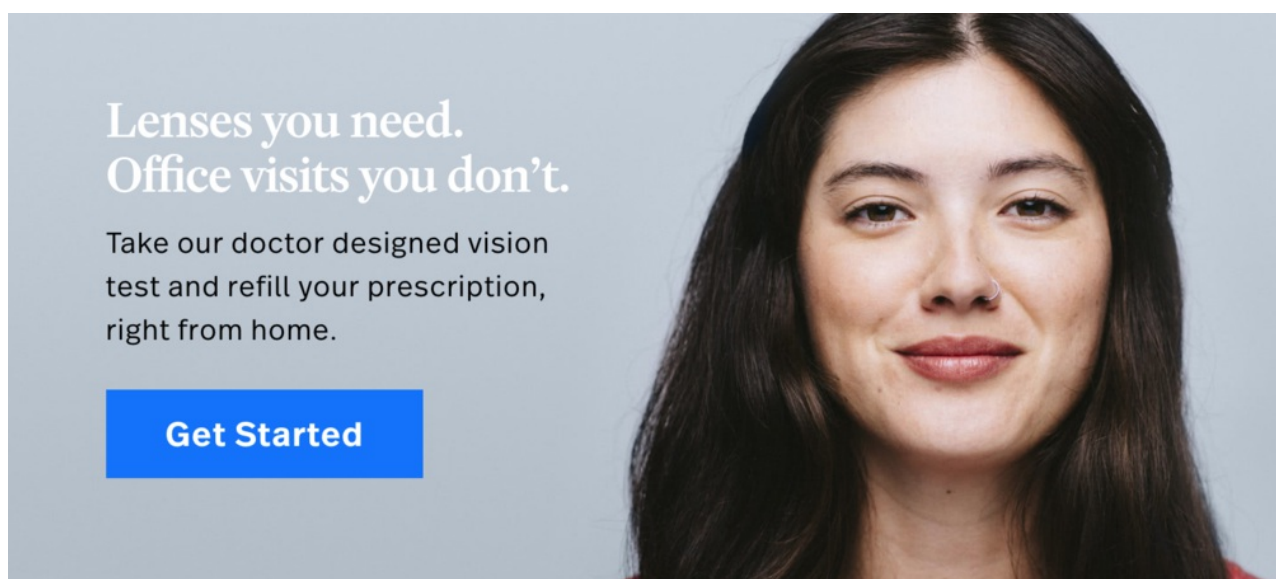
## REORDER LENSES WITHOUT THE DOCTOR'S VISIT

Technology that simplifies the process of obtaining a prescription for contact lenses was developed by Symple Contacts. This company is based New York. The Symple Contacts team includes a group of medical specialists, entrepreneurs, and engineers involved in the revolution in telemedicine.



According to Joel Wishkovsky, Founder & CEO of spinoff, he has been wearing contact lenses since childhood and he is tired every time to pay \$ 100 for repeated recipes. As it turned out, 80% of all who wear lenses face the same problem. Therefore, he decided to create a technology that simplifies the process of obtaining a prescription for contact lenses. For this, a person needs simply by passing the test in the application.

Joel Wishkovsky technology is based on a doctor-approved procedure for checking eyesight. Then he created a system for which the user can be tested. The online test is exactly such a test, which is checked by doctors. If the recipe remains the same, it is simply updated. Consequently, the user will be able to buy new lenses for only \$ 10. This technology will allow you to get a prescription and order new one remotely in a few minutes. However, if the prescription still changed, the patient will have to make an individual appointment with the doctor. In addition, the company will not renew recipes that are more than four years old.



Lenses you need.  
Office visits you don't.

Take our doctor designed vision test and refill your prescription, right from home.

[Get Started](#)

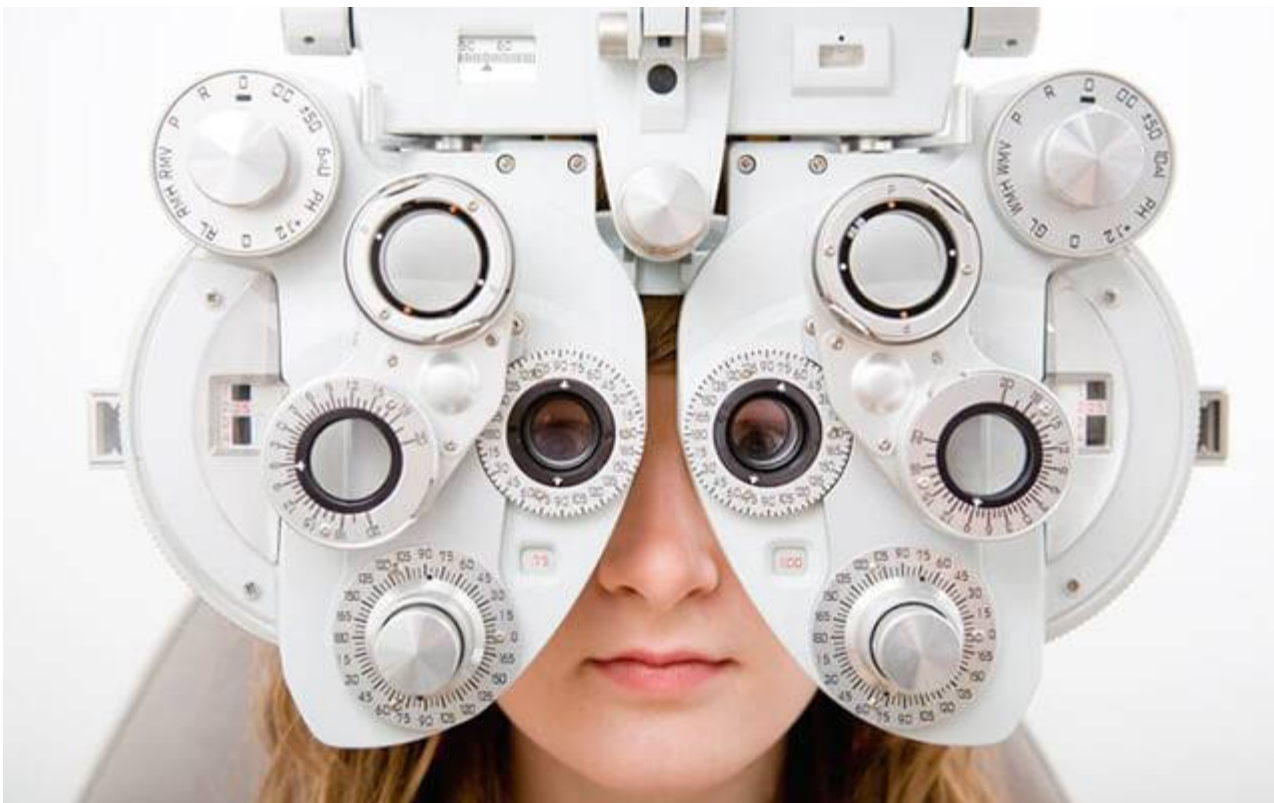
Simple Contacts  
source - [simplecontacts.com](http://simplecontacts.com)

After the user has completed the vision test. He should put the results into the application, and then select the brand of contact lenses that he usually wears. The next 24 hours one of the oculists working on the [Simple Contacts](#) Company will check the data to verify that the patient's vision has not changed. If this is the case, then the patient can wait for the delivery of lenses at home.

The company also guarantees that they have different brands of lenses that are used to

wearing. Therefore, the patients will not have to go shopping in search of their brand of lenses and at an affordable price.

According to the company, the patient will receive the lenses free of charge directly to the door of the house. The company believes that there are a million things that require our time. Moreover, lenses should not be included in this list. Because contact lenses are an everyday need and there are more important things on which people should spend their personal time.



Simple Contacts

source - simplecontacts.com

The company's main goal is to provide convenience for its patients. Therefore, **the test for getting lenses costs \$ 10, and a visit to the ophthalmologist is \$ 100.** Hence, the company takes care of its patients and saves their budget. The company offered its services in **20 US states** and **attracted \$ 2 million of investments.** Among the investors, there are many doctors, including Richard Park, the founder of the network of emergency clinics [CityMD](#). This year, the company announced that it received another **\$ 8 million of funding in round A.**

According to Joel Wishkovsky, birth control, and acne treatment prescriptions are

unnecessarily require a doctor's visit. Consequently, he is going to use funds to create a business of contact lenses. In addition, he wants to simplify other areas of medicine in the future.

**Company name:** Simple Contacts Inc.  
**Contact person:** Joel Wishkovsky  
**E-mail:** joel@simplecontacts.com  
**Website:** <https://www.simplecontacts.com>  
**Phone:** +18775087467  
**Patent status:** +  
**On market since:** 2016  
**Regions:** United States  
**Industries:** Healthcare  
**Source links:** [Simple Contacts Inc.](#)



## MONITOR VARROA

BeeScanning is a spinoff, which from the photograph of the bees colony can determine which of the insects are infected with mites. It was designed by the Swedish beekeeper Björn Lagerman.



Ticks are one of the most common causes of the death of bees. Scientists estimated that about 40% of colonies of bees died last year in the United States. In their opinion, one of the main causes of their extinction became the [Varroa](#) destructor mites. Usually, this type of ticks clings to the body of the bee and begins to damage and grow on bee's body, which leads to the death of not only one bee, but the entire colony. If the parasite clings to one bee, then other bees can also be infected.

The disappearance of bees is a big problem for mankind. One-third of our nutrition contains plants that depend on pollinators of insects. Without bees, people will face big trouble. Ticks can infect not only adult bees but also their broods. It weakens the immune system of bees, hence the viral diseases are increasing among bees.



BeeScanning  
Source - beescanning.com

The tick has a size of about 1.6 mm and it lives almost all over the world. Only Australia is the only continent not affected by this pest. This country has one of the most healthy populations of western honey bees around the world.



According to the scientist, the tick sucks the blood of honey bees and additionally transmits deadly viral diseases. Bees repeatedly come into contact with each other, even at a distance of several kilometers while searching for food. Consequently, colonies of bees that have been treated against the tick are also affected by infection of untreated colonies. Beekeepers struggle with this problem, using many ways. Some use hot hives that kill mites, and some even create robotic bees. But all this gives a very limited effect.



BeeScanning  
Source - beescanning.com

According to Björn Lagerman, his [BeeScanning](#) spinoff will be able to solve this problem. This technology is aimed at analyzing the state of the colony of bees using a smartphone. The user takes a photo, and artificial intelligence determines which of the insects are infected with the parasite. With this technology, beekeepers can easily check swarms of bees. The results of the check will signal when to start treatment for the bees, which otherwise might start too late or not start at all. The analysis process is performed lightning-fast for 100 milliseconds. It is planned that this technology will also find bees that are resistant to parasites. This will lead to the possibility of breeding new generations of insects.

A small team of beekeepers headed by Lagerman works on this technology. They conducted a campaign to raise funds and **in 10 days they raised \$ 5745**. However, the company requires **\$ 350,000** of fixed assets for the project. They believe that they will be financed by the European Innovation Program as well. The company plans to compile a

database of 40,000 images of hives for artificial intelligence training and to pilot this technology. According to Björn Lagermann, their team is not going to dwell on the result, in the future, they want to add technology to detect the queen, bees with deformed wings and several other features.

**Company name:** BeeScanning, Ink.

**Contact person:** Björn Lagerman

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**Website:** <http://beescanning.com/eng>

**Phone:** +460705603893

**Patent status:** pending

**On market since:** 2017

**Regions:** United States, Sweden

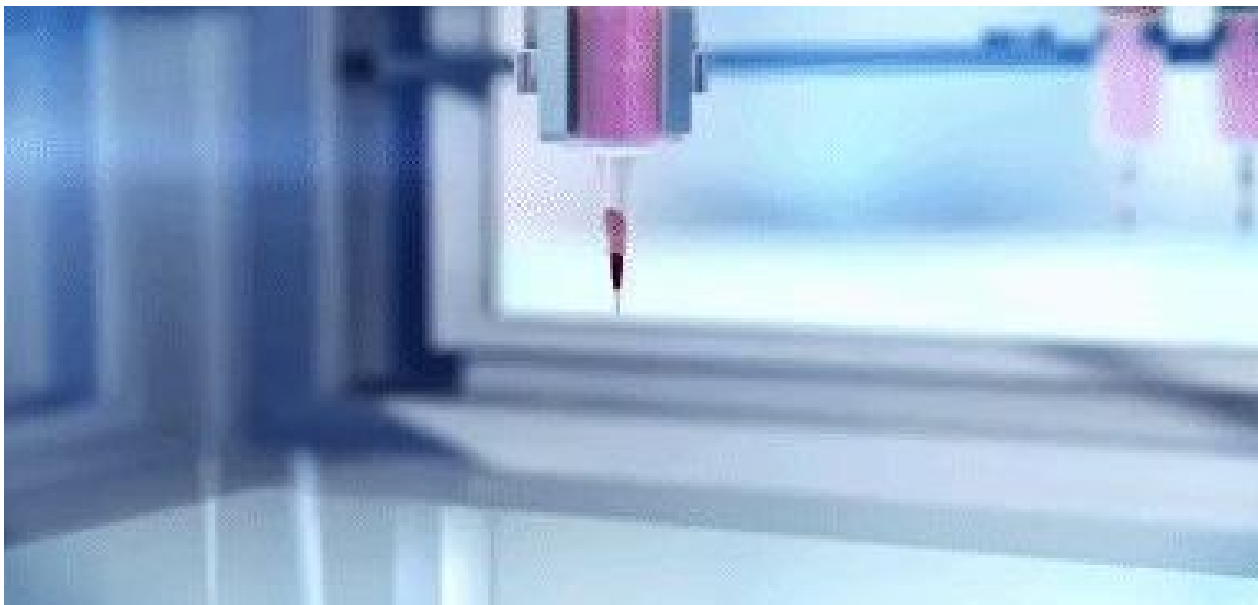
**Industries:** Electronics

**Source links:** [Bayer AG](#)

[FriBi](#)

[BeeScanning](#)

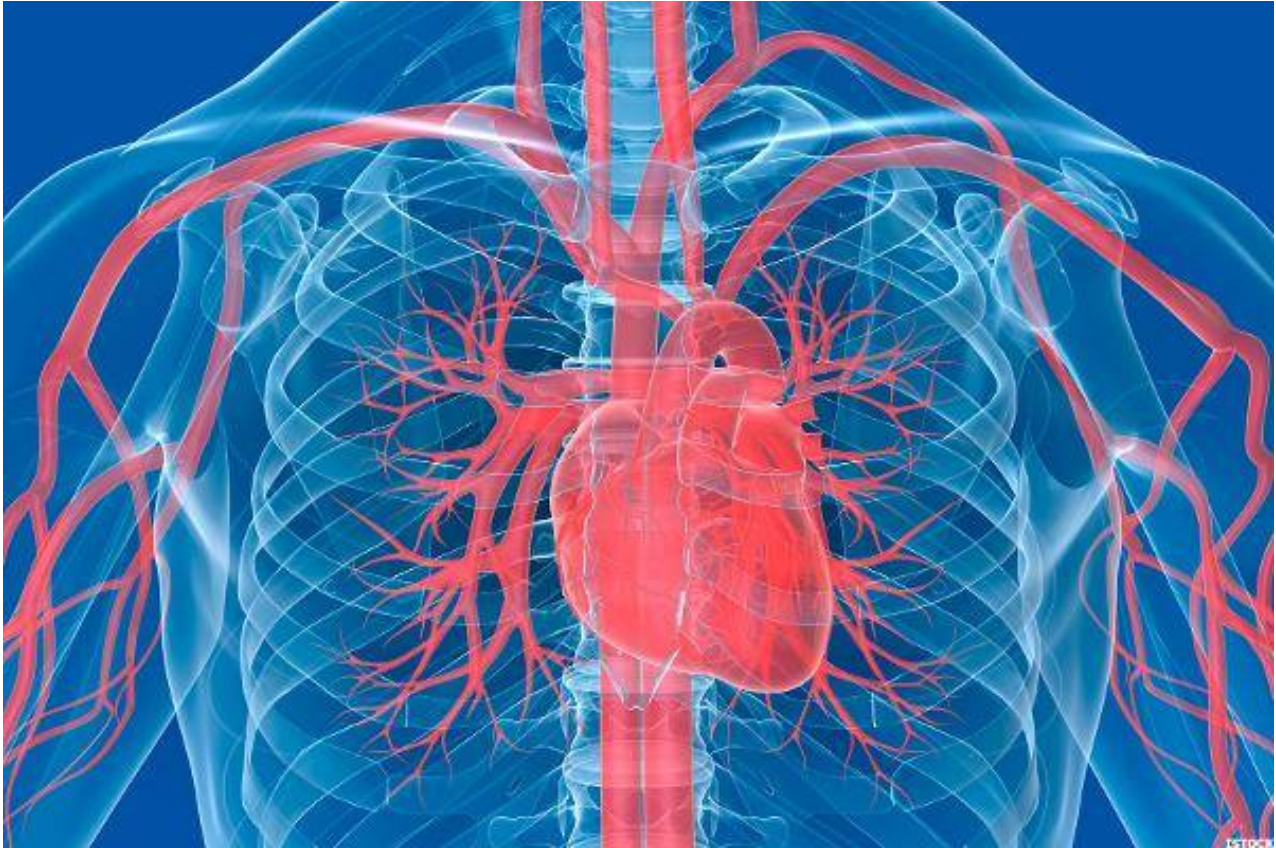
# PROTOTYPES



## THE HEART CAN BE 3D-PRINTED FROM OWN CELLS

The technology which will print a working heart from a patient's cells is been developing by Biolife4D Company. A few months later, a laboratory in Chicago will open, which can turn over the history of transplantology. The company consists of medical and science team. Founding partner and CEO is Steven Morris; Chief Medical Officer is Professor Jeffrey Morgan; Chief Science Officer is Dr. Ravi Birla, and Scientific Advisory Board is led by Dr. Adam Feinberg.

Most people who have the heart transplant, after the operation, live no more than ten years. Their life is subject to enormous risks, namely the immune system can reject the body, and drugs that inhibit its activity, weaken the body's defense against many diseases, for example, cancer. Another problem is the small number of donor hearts available for transplantation.



The heart, which is a genetic copy of the patient's heart, will not cause a reaction of the immune system  
source - biolife4d.com

**Biolife4D** spinoff intends to overcome these difficulties with a single technology - **biological 3D-printing** based on the patient's own cells. If the seal is put on stream, the deficit of the donor organs will disappear. Moreover, the heart, which is a genetic copy of the patient's heart, will not cause a reaction of the immune system. It will have more chances to get accustomed to a body, and the patient will not have to take immunosuppressants.

**It will be necessary to go through several stages to create a fully viable heart.** First, the patient's heart is scanned with MRI to get his exact digital image. Then the blood cells extracted from the samples are converted into stem cells and cardiomyocytes are grown from them. The resulting heart cells are mixed with nutrients and hydrogel to create



biochanin, which can be used in a specialized 3D printer.

One layer will be printed at a time. The basis is a biodegradable skeleton that copies the shape of the original organ. In the bioreactor, where the printed heart will be placed, the cells will begin self-assembly. According to [Steven Morris](#), founding partner, and CEO, it is surprising that new cardiac cells outside the body will self-assemble. When scientists finish 'bioprinting', they have something similar to the heart, but these are only its individual cells. Only after a couple of days, the cells know that they are a heart cell and they must unite and begin to work.

When the organ becomes sufficiently strong, the skeleton is melted, raising the temperature of the medium. After that, the heart will be ready for a transplant. [The heart from Biolife4D does not require patients to receive immunosuppressants since the heart is an exact genetic match.](#) On the path of researchers, there is a number of difficulties, for example, the creation of a network of blood vessels in printed hearts. However, they are determined to cope with them in the coming years.

The first task of the spinoff will be the production of miniature hearts for drugs testing. At present, [drugs are tested on animals](#), and the results of such studies are not always well tolerated by humans. Then the team will proceed to print hearts for small animals, then it will go to large and, finally, people.

Biolife4D is committed to perfecting the technology to make viable organ replacement a safe, accessible and affordable reality. [The company opened an investment for the public](#) as well. According to [Steven Morris](#), they want to make the investment opportunity accessible to everyone, not just for the rich.

Company name: Biolife4D  
Contact person: Steven Morris  
E-mail: contact@biolife4d.com  
Website: <https://biolife4d.com>  
Phone: -  
Patent status: -  
On market since: -  
Source links: [Biolife4D](#)



## CULTURED CELL PRODUCTS, INGREDIENTS AND CLEAN MEAT

Exclusive interview for [SPINOFF.COM](https://www.spinoff.com) with Mr. Yuki Hanyu, Integriculture Inc. CEO, about developing clean meat, clean foie gras and other cellular agriculture based on unique and low-cost large-scale cell culture technology

Integriculture Inc. is a cellular agriculture company aiming to reform modern food system through the clean meat. The company is dedicated to positively impacting human health and the health of our world. Since meat production is unsustainable and it in 10 times is more resource intensive than soy, for instance, 70% of arable land is used for feedstock and 18% of greenhouse emissions. Cultured meat can solve these problems and it can sustainably feed the world population. As result, cultured meat produces 96% less emissions, uses 92% less water, and takes 99% less land.

**SOC:** Dear Mr. Yuki Hanyu, we are so grateful for your generosity this day in spending time speaking with us and sharing your insights about the clean meat.

**Mr. Hanyu:** Thank you for inviting me to this opportunity at [Spinoff.com](https://www.spinoff.com). Our project, basically, works on [agricultural-scale cell culture to produce meat without killing animals](#). It has a huge potential as breakthrough technology going all the way to 22nd-century regenerative medicine and space farming while solving more immediately pressing problems.

**SOC:** Our investors and we would like to learn more about a vast experience of your academic endeavours and your professional background.

**Mr. Hanyu:** My background is chemistry, with more focus on surface, organic and biological chemistry. I got my PhD in [Oxford](#) in 2010. During my PhD I worked in the field of "nanofabrication", the study of manipulating atoms and molecules. The field spans surface science, organic chemistry, and biochemistry. After working as a post-doctoral research staff at [Tohoku University](#) for 2010-2012, I worked as a research scientist for Systems Engineering Laboratory, Toshiba Research, and Development Center for [October 2012 - December 2014](#). I have worked in public infrastructures team to develop battery-based electric energy storage systems. On [January 2015](#), I founded a business which in November became [Integriculture Inc](#), a registered company.

**SOC:** Considering your tremendous experience, we would like to know whether you had other projects? Could you please share the story of their creation and success.



The dish of clean meat  
photo provided by Integriculture Inc.

**Mr. Hanyu:** As mentioned, I used to work on the battery material project in my postdoc project. Like any other material science research, the number of experimentations made the difference and succeeded in developing a highly anticipated metal-free cathode solid-state battery. The project culminated in a coverage by a nationwide newspaper [Nikkei](#).

**SOC:** It is so interesting to know more about the process of your technology creation. Please tell on which stage of commercialization your technology currently is? Was your project funded by any state financing or grants? Has it already received any honors or awards?

**Mr. Hanyu:** Our core technology, “cell network co-culture” that we call 'Culnet System', was independently and solely developed by us. We are in early phase, but already catching significant attention and traction. Recently, we started a joint research and development project with [Tokyo Women’s Medical University](#), got the first government funding and then a joint development contract with a food-pharmaceutical company. We are also talking with cosmetics company over our uncontaminated ingredients made by cell culture, which also happens to be 'cruelty-free'.

SOC: In the formation of every scientific spinoff, one of the most important keys to success is the team. For many potential investors, the management team is the most important element in deciding whether to invest in it or not. Could you please share some information about the team members who supported you and the project? What are the key additions to the team needed in the short term?

Mr. Hanyu: I am CEO of the company. Keita Fukumoto is CTO. He holds extensive knowledge in molecular biology and cell physiology. He leads large-scale tissue engineering system development at Integriculture Inc. Ikko Kawashima is Senior Advisor. He co-developed an innovative industrially scalable cell culture system and medium based on his expert knowledge of the endocrine system and agricultural science. Ryutaro Mori is Business Director. He is in charge of marketing and business development. Keita Tanaka is Chief Culture Officer. Keita specializes in muscle tissue engineering and graphical science communication and education. His cultured meat demonstration attracted national media attention. Thus, founders are mostly scientists, we have a team member whose background is in marketing and business development, and we have an advisor from Leave-a-Nest Co., Ltd. as well. We are also supported by a seed incubator program called "[Tech Planter](#)" hosted by [Leave-a-Nest Co., Ltd.](#) We will soon be needing more specialists in marketing and business development.



**Yuki Hanyu, CEO**  
**Chemistry, Systems Engineering**  
 Ph.D (Chemistry)  
 2010 Oxford University



**Ikko Kawashima, Senior Advisor**  
**Regenerative medicine, Cellular biology**  
 Ph.D(Agronomy)  
 2012 University of Hiroshima



**Keita Fukumoto, CTO**  
**Molecular Biology**  
 Ph.D (Medicine)  
 2017 Uni. of Hiroshima



**Ryutaro Mori, Business Director**  
**Marketing, Biz.Development**  
 BA (Dev. Economics)  
 2015 Univ. California LA



**Yusuke Shinozawa**  
**External Advisor**  
 Leave-a-Nest Inc., Real-Tech Fund

Integriculture Inc. team  
 photo provided by Integriculture Inc.

SOC: It is not a secret that the development of a new technology and its subsequent commercialization presupposes some problem and addresses unmet



needs. Respectively, what problem did you intend to solve by creating your technology? What results did you plan to achieve?

Mr. Hanyu: **Food security problem is our target.** In Japan, we learn about import dependence from primary school and people are very aware of the situation. Food security is also one of the top priorities in China too. We plan to produce real meat with much less resources thereby improving this resource-stricken situation. If our technology also enables space farming in future, that will also be a very good news.

SOC: The problem which you targeted to solve was actual before. Probably someone has already tried to solve it. Is it right? Understanding the unique selling points from the investor's side could make the technology N° 1 for them. What are the unique selling points of your technology and fundamental difference from other technologies that tried to solve this problem before you?

Mr. Hanyu: Soy meat and plant-based alternatives have been around for a while. We are also seeing improved plant-based alternative such as [Impossible Foods](#) and [Beyond Meat](#). However, the problem is, plant-based alternatives remain niche, mostly because culinary versatility remains limited and not quite fulfilling the experience and culinary culture that consumers expect, especially in countries that have rich culinary heritage. Clean meat being real meat, seamlessly replaces the current slaughter meat with all culinary experience and cultures intact.

SOC: In order to understand the peculiarities of this particular spinoff our investors always ask what is the investment structure of the company? Do you still own the controlling stake in your spinoff?

Mr. Hanyu: Currently, **90 percent** of the shares owned by the founders and **10 percent** by our seed incubator.



The technology is in an early phase, but already catching significant attention  
photo provided by Integriculture Inc.

**SOC:** We wonder what is the actual addressable market currently for your invention and what are the current competitors there? Could you please share with us the results of the market studies, if there are any? What might be the barriers to entry?

**Mr. Hanyu:** The global protein market is set to reach **\$2T in near future**. The beef market alone is already **\$700B**. At the same time, conventional meat and caught fish will not meet the future demand. There will be a significant portion (**20~30%**) in the market going to alternative proteins in the near future, and this market will be populated by various products such as plant proteins, insects, algae, and clean meat. Further down the road, there is a potential that clean meat replaces conventional meat. At the moment, the entry barrier to clean meat is the highly demanding technology.

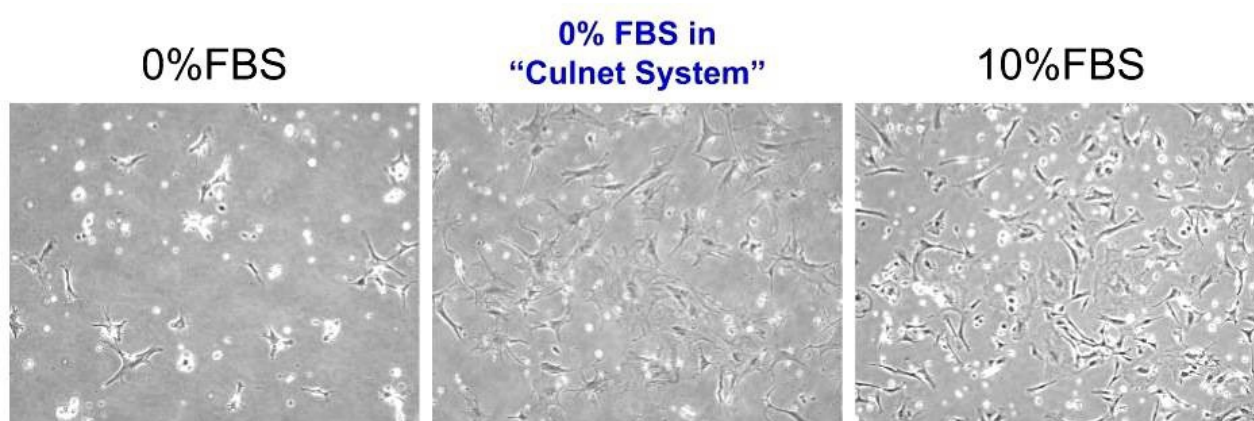
**SOC:** We always need to paint a clear picture to the potential investors of the market opportunity of the spinoff that is meaningfully large and growing. Why in your opinion your company might have a high growth potential? Could you tell us all current industries and fields of your technology/product application and where do you think it could be successfully applied in the future?

**Mr. Hanyu:** While meat is our final target, we can re-purpose our “**Culnet System**” to uses other than food. We are planning to launch cosmetics and supplements ingredients by **2020**, break even around **2021** and then clean foie-gras test production around the same

time. All these activities bring forward breakeven point much earlier than other clean meat companies. There is also a potential for medical and pharmaceutical application for “Culnet System”, for which we will probably seek IP licensing or corporate partnership model.

**SOC: The potential investors will be curious whether you already have the first clients and signed contracts? What was the feedback from your partner's markers and customers?**

**Mr. Hanyu:** We already have multiple **signed contracts on joint R&D**. The latest contract with a food and pharmaceutical company is on joint development of novel health food. There is another conversation in a pipeline with an international cosmetics company. Traction from cosmetics companies tend to show interests in our ability to produce contaminant-free (and “cruelty-free”) ingredients.



'Culnet system'  
photo provided by Integriculture Inc.

**SOC: We both know that for you and the investor it is crucial to reach positive cash flow as soon as possible. Certainly, the market scaling cannot be achieved without proper distributors network and clients. Please tell us about your criteria of partners selection and which markets are open for spinoff activity.**

**Mr. Hanyu:** **We are looking into two fields of collaboration** - product development and process development. The multiple cosmetics companies and pharmaceutical-food companies that we currently talk with, are in the former category. The recent partnership agreements with Tokyo Women's Medical University and [Japan Science and Technology](#)

Agency (government agency) are the latter category. We are also talking with plant engineering firms to get our technology to scale. As we scale, we plan to start from supplements and cosmetics ingredients, then functional food like supplements, high added value food and then to specialty meats like foie gras and general meat.

**SOC:** It is very important to understand your particular vision about unique features of your company. Why do you consider the major market players might be interested in investing into a promotion of your technology/product on the addressable market?

**Mr. Hanyu:** The advantages of clean meat have multiple significance ranging from food security to animal welfare and they are the strongest messages already conveyed by other players too. What is unique to us is we can convey similar messages on more immediate products such as cosmetics and supplements. For cosmetics, cell culture being "cruelty-free" is important. Also, the ingredients produced by cell culture is free of viral or bacterial contamination and that is where cosmetics and food companies have immediate interests. With such short-term applications of our technology around the corner, we plan to reach breakeven much sooner than other clean meat companies which do just food.

**SOC:** Now we would like to refer to the next very crucial and we would even say essential aspect for spinoff companies' as the strategy of R&D, production, distribution and marketing processes. Do you have your own unique strategy? Which of these processes do you consider your spinoff is strong at?

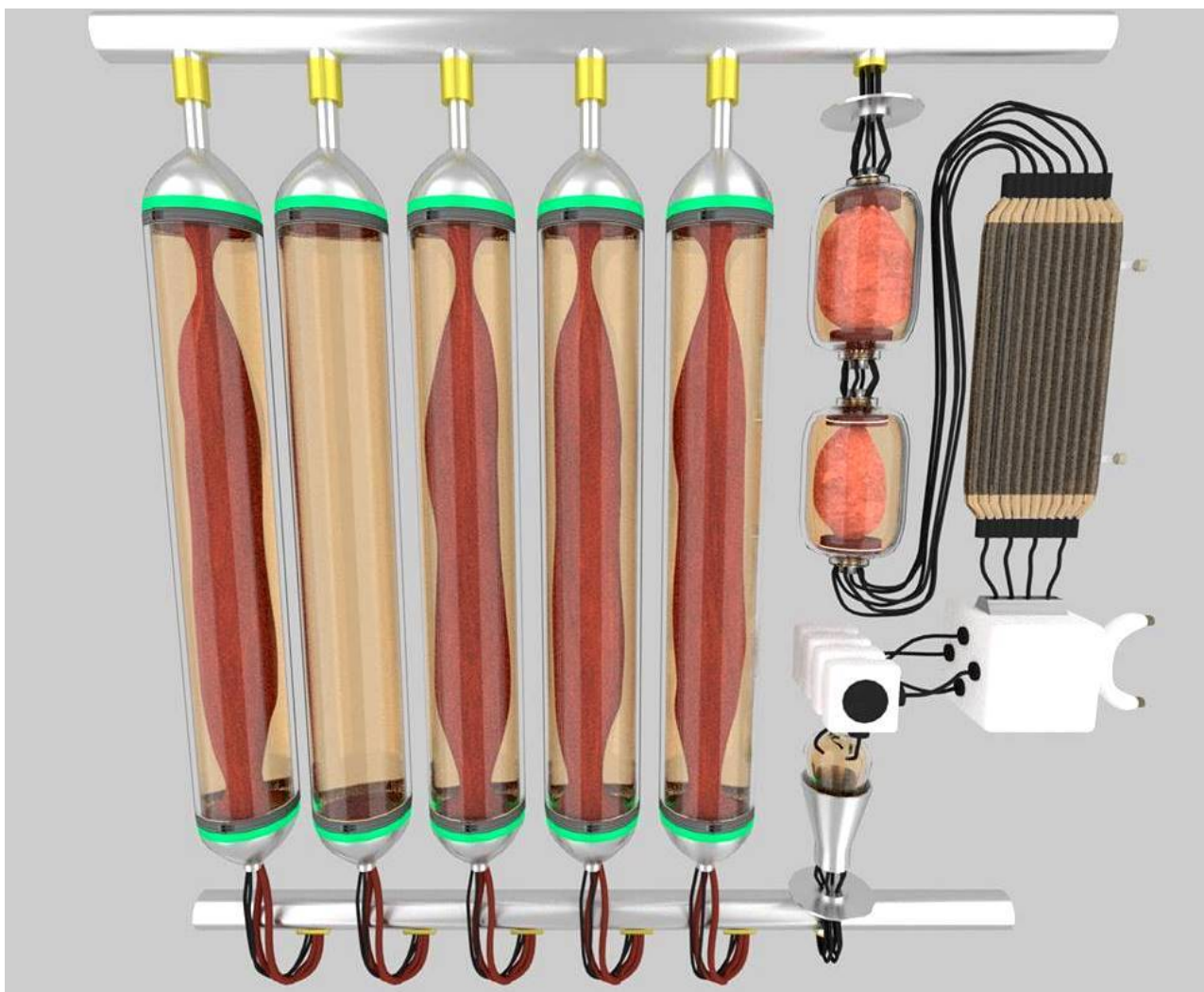
**Mr. Hanyu:** Our partnership with the medical university has a built-in feature that they are interested in medical applications with human cells and we are interested in cellular agriculture with animal cells. This way, we can avoid IP conflict while making the maximum out of this partnership on developing our cell culture and tissue engineering core IP.

As we make partnerships with multiple cosmetics, pharmaceutical, and food companies on product development, our strategy is to clearly define the target product and application to avoid conflicts between partners.

**SOC:** As a rule, the majority of spinoffs outgrow into exits. How do you determine the market for your product/technology and estimate its volume and dynamics?

What is your potential share on the market? How do you think what market cap your company plans to reach at the peak of its development and why? How long might this process take?

Mr. Hanyu: The unit price for cultured cells is the key KPI. We plan to start test production of cosmetics and supplements ingredients **by the end of 2019**, foie gras on **2021** and general meat around **2024**. What we mean by 'meat' here is not burgers, but steak. For the production volume, pilot plant in **2019** and first commercial plant going online in **2020**. We plan to go public on Jan.**2024 at \$1B**. And further into the future, scaling clean meat production by building large-scale factories is time-consuming and better ways to scale will be needed.



Integriculture Inc. plans to produce real meat with much fewer resources  
photo provided by Integriculture Inc.

SOC: For spinoff companies their intellectual property is a key to success. The investors pay particular attention to it. What key intellectual property does your



company have (patents, patents pending, copyrights, trade secrets, trademarks, domain names)?

Mr. Hanyu: **We solely own our core IP on 'Culnet System'**. We are currently filing more IP's on its key components including cells. In addition, patents alone is insufficient to reproduce our outputs. It also takes detailed know-hows on incubation times, mixing ratio and hundreds and thousands of other parameters. Since we do the R&D, we keep those know-hows.

SOC: For both of us, as well as for thousands successful spinoffers, it's not a secret that a new technological breakthrough may become obsolete very fast. Respectively, patent validity period becomes shorter. It is interesting to know the perspectives and protection plan of your technological advancement and leadership in a medium- and long-term prospectives

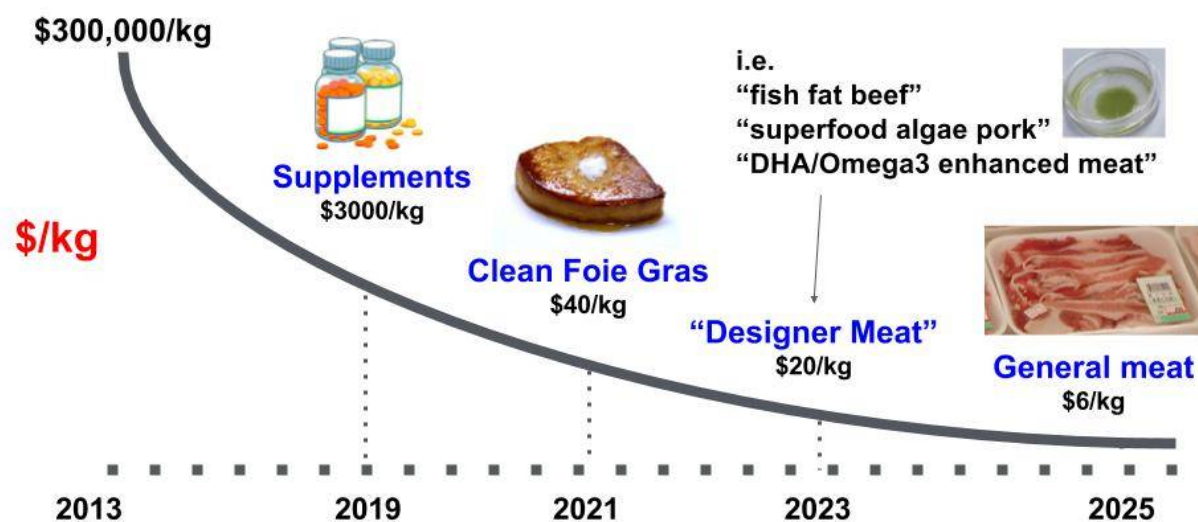
Mr. Hanyu: **Firstly**, Getting to scale as soon as possible is one of the keys. **Secondly**, food market has a characteristic that high level of personalization and market segmentation occur. Our "Culnet System" has a versatility to accommodate such variations, and we plan to provide cultured food platform, thereby avoiding direct market conflicts with other clean meat products.

SOC: The investors will want to get a clear picture of how many rounds of investments have you completed? Are you seeking for the investments at the moment? What is the volume and time limits? What milestones will the financing get you to? What did you plan to use the invested funds for?

Mr. Hanyu: We have completed the angel round and currently on a seed round fundraising. **We are aiming for 3 million dollars** and we are aiming for the end of March closure. **The fund will mostly be used for R&D and building of the pilot plant** which makes it ready for the cosmetics and supplements ingredients first commercial plant. **We are anticipating Series A around January 2020.**



## Go to market roadmap



Test production timeline  
photo provided by Integriculture Inc.

SOC: Could you please describe your ideal investor? What aspects are important for you, for instance, is it experience, country, the amount of own private capital or maybe some personal qualities? Will existing investors participate in the round?

Mr. Hanyu: **An ideal investor for us will bring in joint projects**, which is either product development or R&D/process development. In that sense, corporate partners are good. Also, long-term mission and social impact driven investors are very much welcome onboard.

SOC: And the last question, could you specify the most convenient way you would like to receive inquiries from potential investors? Should it be by e-mail or personal phone call?

Mr. Hanyu: Investors can reach out to us via e-mail at [info@integriculture.jp](mailto:info@integriculture.jp).

We would like to express gratitude for the time you have dedicated to this interview. SPINOFF.COM will be pleased to support your project and to share the interview about clean meat with all potential partners and investors

**Company name:** Integriculture Inc.  
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**Website:** <http://integriculture.jp>  
**Phone:** +819019383025  
**Patent status:** One approved (solely owned), another on th..  
**On market since:** -  
**Regions:** United States, Japan  
**Industries:** Food and Drink, Biotechnology  
**Source links:** [Integriculture Inc.](#)  
[Integriculture Inc. Clean meat initiative](#)



# A CAR THAT FLIES, A PLANE THAT DRIVES

Exclusive interview for [SPINOFF.COM](https://www.spinoff.com) with Dr. Markus Hess, PAL-V, Chief Marketing and Sales Officer, about the PAL-V Liberty, which is a groundbreaking product and gives the joy to drive and to fly as well as unequaled freedom of mobility.

The PAL-V Liberty is a marriage between safety and fun, designed to satisfy the most demanding customers. Thanks to a number of patented technologies, the dimensions of the PAL-V Liberty do not exceed those of a regular car. It, therefore, blends perfectly with everyday road traffic, yet offers a new level of mobility. FlyDriving the PAL-V Liberty gives opportunities to fly over mountains, rivers, lakes, traffic jams and drive on. The gap between driving and flying has never been so small.

**SOC:** Dear Mr. Hess, we are so grateful for your generosity this day in spending time speaking with us and sharing your insights about the EVA X01 project.

**Mr. Hess:** PAL-V aircraft transport provides a personal area, a land vehicle and a model of the liberty and freedom. **PAL-V is going to be the first commercial flying car**, which will appear on the market. This is a combination a helicopter with the car. PAL-V aircraft uses the tilting technology which trains use. In some sense, it is all in one, because the aircraft consists of plane, car and motorcycle functions.

**SOC:** Our investors and we would like to learn more about a vast experience of your academic endeavors and your professional background.

**Mr. Hess:** **I joined the company about three and a half years ago** because I had a passion for aviation since I was a kid. I mean, all started with the model of the flying airplane, then glider, hang glider. Then I switched to single engine planes. When I started working, I began to remember all that was forgotten. Actually, I have not flown for a while.

A couple of years ago, I thought about what I wanted to do with the rest of my life. I understood that my heart, actually, was in the aviation. Thus, I joined [PAL-V Company](#) in the Netherlands. They are building a flying car. Currently, **I am responsible for marketing**. As for my professional background, I studied economics and got Ph.D. I have been in many different industries in the areas of marketing strategy sale.

**SOC:** Considering your tremendous experience, we would like to know whether you had other projects? Could you please share the story of their creation and success.



The sky is no longer the limit  
source - pal-v.com

**Mr. Hess:** I graduated with an MBA from [Clemson University](#), SC and received a Ph. D. from [the University of St. Gallen](#) in the field of strategic management in the airline industry. Then I joined [the Power Tool Company](#) after my study at University. We introduced something that was completely unique. I was responsible for marketing at the time and it was totally unknown to me. We produced unique tools and it was a good way showing the quality of our tools. We extended the warranty of our tools. Nobody dared to extend the warranty in more than six months, which was required by law back then. I think that were early days in my career. I held various executive positions with [Festool](#), [Multiplex](#), [Malik Consulting](#) and [RUAG](#).

**Then I started ventures in the consulting and consumer goods industries.** My own company was called like ideaForge. We promoted a new concept and at the same time, we were the first commerce store in Germany. Then I sold this company a few years later. Thus, I have been in consulting sphere. I have been in the defense industry, in the toy industry as well. The latest company I set up was Chuckler company. Currently, this company is being run by my partner. We also created a niche in the chocolate market. Moreover, now it is quite a big niche of the market.



SOC: It is so interesting to know more about the process of your technology creation. Please tell on which stage of commercialization your technology currently is? Was your project funded by any state financing or grants? Has it already received any honors or awards?

Mr. Hess: Yes, **we get funding from the Dutch state**. This is definitely a big support. This support is not just financial but also applies to human resources and credibility at the same time. It is a good support lobby from the administration. Moreover, **the most of our current shareholders are private investors**, but the state is also in this group with different grants and subsidies.



Increase your productivity while having fun  
source - pal-v.com

SOC: In the formation of every scientific spinoff, one of the most important keys to success is the team. For many potential investors, the management team is the most important element in deciding whether to invest in it or not. Could you please share some information about the team members who supported you and the project? What are the key additions to the team needed in the short term?

Mr. Hess: **Most of us are engineers**, including aviation engineers and acquiring engineers.



It makes sense because we make flying cars and we have a lot of professional passion within the team. I mean those people really want that flying car appears on the market. They love what they do because otherwise, they would not have spent so many years on an engineering school and university. They did become experts in this. We do have a rather young team combined with a few very experienced expert and I think this combination or this mixture is just about the right combination.

As I mentioned, I am Chief Marketing and Sales Officers and responsible for business development and sales; Ir Robert is CEO and Co-Founder. He is responsible for general management and strategy; Bartjan Rietdijk is R&D Manager. He is s leading the daily technical development operations and responsible for Research & Development. Mike Stekelenburg is Chief Engineer. He is responsible for overall system design and integration.

**SOC:** It is not a secret that the development of a new technology and its subsequent commercialization presupposes some problem and addresses unmet needs. Respectively, what problem did you intend to solve by creating your technology? What results did you plan to achieve?

**Mr. Hess:** I am living in London, but the company is in the Netherlands and I commute quite frequently. Therefore, I can say that I am traveling a lot. Certainly, there are many ways to get from point A to point B. The first way is by a car. The second one is by a train. The third way is by a plane. Moreover, if I had the PAL-V aircraft I would save my time because I could get to my job in 45 minutes. Currently, my commute, which includes taking a car to the airport, taking a plane from London to Amsterdam and then renting a car again to get to the office, takes 4 hours. However, if I had the PAL-V aircraft, I would have a real advantage.

The main advantage is that people might get to places, which they cannot really get now. Our company wants that it will possible to cross a lake, a river, and a mountain in the future. If we look at some places on the planet, we cannot have other solution than get to these places by plane and this is where the PAL-V comes.

**SOC:** The problem which you targeted to solve was actual before. Probably someone has already tried to solve it. Is it right? Understanding the unique

selling points from the investor's side could make the technology N° 1 for them.

**What are the unique selling points of your technology and fundamental difference from other technologies that tried to solve this problem before you?**

**Mr. Hess:** There have been lots of concepts in the past and, unfortunately, most of them didn't really make it work. This idea requires the right technology, the right people at the right time when the market is ready for something like that. Some of the concepts in the past did not have results because they were running right into an economic crisis. At the time of the crisis, people were not really thinking about flying cars but they were more concerned about how they got to the crisis. Currently, the time is certainly very good. Looking at other concepts which are only coming out upon the market, the main our difference from them is that our **concepts of PAL-V are designed and engineered with existing regulation, rules, and law**. It will be an airplane in the air and it will be a car on the road and we do all the requirements for that. Therefore, as soon as we get the application from [the European Aviation Safety Agency](#) we are ready to hit the sky and drive on the roads. All the other companies, which are currently also coming onto the market, could compete with us, but they do not have a regulation. This technology might work in some countries of the world such as Dubai, Abu-Dhabi.

Nevertheless, I do not think that this happens within next **10 to 20 years** in any democratic country of Europe or anywhere else. I personally see **a time horizon at least 10 years**. The reason for that is that the energy density of gasoline is about 16 times as higher as the current batteries have. Therefore, if somebody wants to reach the range and the specifications of our current position then they should have the batteries in 16 times better than we have them today. It might happen in the future but we do not see that it happens within the next couple of years. Therefore, we use existing analogies combine and make the great product.

**SOC:** In order to understand the peculiarities of this particular spinoff our investors always ask what is the investment structure of the company? Do you still own the controlling stake in your spinoff?

**Mr. Hess:** We have many private investors. There is no controlling stake and there are no major stakeholders yet.



Designed for those who value time  
source - pal-v.com

**SOC:** We wonder what is the actual addressable market currently for your invention and what are the current competitors there? Could you please share with us the results of the market studies, if there are any? What might be the barriers to entry?

**Mr. Hess:** We do not have any barriers to entry. I mean there is definitely the professional market that is definitely attracted by our content. I can say that **our potential market is the police force, the border patrol and other professional spheres.** We definitely see a big market there.

At the same time, we are the big market in the consumer market. I mean we have quite many regular customizers and entrepreneurs. They like high technology and innovation. They also tell that our creation is that what they need. I am convinced when we start producing we will not be able to fulfill all the orders that will come in because of a large number of orders. **I believe that we will be popular as brands like the iPhone or Tesla.** I am sure that our innovation will turn out to be in the same mad dimension. Moreover, I think it is going to be a major breakthrough and we are coming in there. People will be very interested. Therefore, we have no concern about the market.

**SOC:** We always need to paint a clear picture to the potential investors of the market opportunity of the spinoff that is meaningfully large and growing. Why in your opinion your company might have a high growth potential? Could you tell us all current industries and fields of your technology/product application and where do you think it could be successfully applied in the future?

**Mr. Hess:** As I mentioned before there are a lot of professional spheres in our potential market such as the military, the police, the border patrol and a lot of industry-specific application. I also consider that PAL-V has an emotional part because there are people who buy our product just by instinct and no other vehicle will express the sense of innovation like the PAL-V Liberty. Imagine that you picking up a guest at the airport or the station using the PAL-V Liberty and then you fly to your office. It is simply unforgettable. You do not have to shout 'innovation'. Actions speak louder than words.



Engineered to beat the weather  
source - pal-v.com

**SOC:** The potential investors will be curious whether you already have the first clients and signed contracts? What was the feedback from your partner's markers and customers?

**Mr. Hess:** Yes, we do have the first clients. I am not allowed to disclose the number of



calls, which we get in order to purchase contract. But I can say that now **their number is higher than we really expected and it is quite promising**. Actually, we expect that business increase after signing many contracts. We actually see the real model. As soon as we show the real product this year we expect the number to increase dramatically.

**SOC:** We both know that for you and the investor it is crucial to reach positive cash flow as soon as possible. Certainly, the market scaling cannot be achieved without proper distributors network and clients. Please tell us about your criteria of partners selection and which markets are open for spinoff activity.

**Mr. Hess:** We focus on **Europe**, namely all European countries, because we are getting the European certification. PAL-V comes in European Aviation Safety Agency. The next market is definitely going to be **the United States** or other markets in North America because we have FDA approval. Nevertheless, **we have a lot of potential markets** such as Australia, China, South Africa, and India. However, it is a step-by-step approach because this process must be structured.

**SOC:** It is very important to understand your particular vision about unique features of your company. Why do you consider the major market players might be interested in investing into a promotion of your technology/product on the addressable market?

**Mr. Hess:** I think a lot of industries, especially in the last 20 years, proved that such interruptions have not being initiated by the major market players. Thinking about Nokia, it had 70 percent market share at the time but now we know that this company has lost its controlling stake. I think it is a natural phenomenon. Generally, small entrepreneur companies face such disruptions. Nevertheless, as I said this is natural and **we think we are a major market player**. Actually, at the moment an aviation, a car industry or maybe some other industry wake up. We will take our place in one long line in the future. I think that every company will come to a definite result early or late because a company that's been doing and researching all these years make an essential step in developing some industry.

**SOC:** Now we would like to refer to the next very crucial and we would even say essential aspect for spinoff companies' as the strategy of R&D, production,

distribution and marketing processes. Do you have your own unique strategy? Which of these processes do you consider your spinoff is strong at?

Mr. Hess: We create our strategy and I think our strategy is definitely going to be very successful. We really use our strategy on the radio channel. Moreover, I think we do have a strategy that is definitely unique and is appropriate for today's times. We expect it works very well and I guess in about two years, we will see our first results.

SOC: As a rule, the majority of spinoffs outgrow into exits. How do you determine the market for your product/technology and estimate its volume and dynamics? What is your potential share on the market? How do you think what market cap your company plans to reach at the peak of its development and why? How long might this process take?

Mr. Hess: These are internal numbers. I will discuss this with investors directly. Nevertheless, I can tell when we write a business plan, we usually write the worst case and the best case of the scenario and even the worst case of the scenario will be good for us.



The perfect blend between safety and fun  
source - pal-v.com



SOC: For spinoff companies their intellectual property is a key to success. The investors pay particular attention to it. What key intellectual property does your company have (patents, patents pending, copyrights, trade secrets, trademarks, domain names)?

Mr. Hess: We definitely have all of this. We do have a trademark, domain names and other intellectual property.

SOC: For both of us, as well as for thousands of successful spinoffers, it's not a secret that a new technological breakthrough may become obsolete very fast. Respectively, patent validity period becomes shorter. It is interesting to know the perspectives and protection plan of your technological advancement and leadership in a medium- and long-term prospectives

Mr. Hess: We do have a plan or a roadmap for the next 20 year. We have achieved the first step. We also have a platform that is extremely about the ball tomorrow's needs.

SOC: The investors will want to get a clear picture of how many rounds of investments have you completed? Are you seeking for the investments at the moment? What is the volume and time limits? What milestones will the financing get you to? What did you plan to use the invested funds for?

Mr. Hess: The most of the money had gone into the research and engineering development and small change. We needed to put money into marketing and sales. The next step must be taken relative to research and engineering, due to the fact that it had to be the first commercial flying car. Thus, we need money for that and for actually setting up production plant.



Off-road gets a new meaning  
source - pal-v.com

**SOC:** Could you please describe your ideal investor? What aspects are important for you, for instance, is it experience, country, the amount of own private capital or maybe some personal qualities? Will existing investors participate in the round?

**Mr. Hess:** It is a good question. It all comes down to that our interests should be the same. First of all, these are personal qualities of a person. Therefore it needs to be a good match between us and investors. **It will be definitely helpful that investor will have a passion for high tech innovation and maybe also for aviation.** Because this is what we are. We are not a biotech or nanotech company, we are flying cars company.

**SOC:** And the last question, could you specify the most convenient way you would like to receive inquiries from potential investors? Should it be by e-mail or personal phone call?

**Mr. Hess:** Both are fine. Investors can connect by e-mail [Markus.Hess@pal-v.com](mailto:Markus.Hess@pal-v.com) or personal phone call **+41793628750**.

**We would like to express gratitude for the time you have dedicated to this**

interview. SPINOFF.COM will be pleased to support your project and to share the interview of your PAL-V Liberty with all potential partners and investors

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Patent status: +  
On market since: 2017  
Regions: Netherlands  
Industries: Transport Systems and Vehicles  
Source links: [PAL-V](#)



## A PORTABLE AND SOLAR ENERGY SOCKET IS CHARGED ON THE WINDOW

The smart Window Socket on the solar panel was developed by specialists of Samsung Art and Design Institute. Instead of the usual fasteners, there is a solar panel on its reverse side. Window Socket, giving absolutely free and clean energy. The power socket can be placed on any window and due to this socket a person can receive necessary energy for his device.

Kyuho Song and Boa Oh, from [the Samsung Art and Design Institute](#) in Seoul, introduced a solar socket on [the Dubai Design Week](#). One side has a solar panel, while the other has a hole in which person inserts a two-prong plug. The solar socket works due to using its mini-solar panels, which transfer energy to the internal battery socket. It takes five to eight hours to fully charge the outlet, which can provide up to 10 hours of operation.



The socket is equipped with 1000 mAh batteries and completely recharges for 5-8 hours

The socket is equipped with 1000 mAh batteries. This is certainly not enough to fully charge the dead iPhone, but it is suitable for charging a variety of small equipment, for example, LED lamps. It should be noted that it is not necessary to remove the Window Socket device from the window in order to connect a device to the socket. **In addition, a small size makes it a real godsend for nature trips.** However, given the 10-hour battery life, the time frame for walking outdoors is somewhat limited.

According to the specialists of the Samsung Art and Design Institute, this product is designed to allow the free and comfortable use of electricity in rooms where this possibility is limited, for example, in airplanes, cars, and on nature. Thus, inventing this



product, [Kyuho Song and Boa Oh](#) intended to use a socket outside the premises. They tried to design the portable socket, which is easy to use.

The Window Socket was designed in such a way that users could use it intuitively without special preparation. The grid should be attached to the windows using a suction plate that surrounds the solar panel, and the main output supplies converted solar energy to the device. As the creators of this device note, this charging converter can be used wherever there is daylight, especially where there is limited use of electricity. [In addition to the convenience, it would offer a more sustainable and cheap way to generate electricity.](#)

The Window Socket got more than 300 enthusiastic reviews for the exhibition on the Dubai Design Week. However, the solar socket has some drawbacks, firstly it is a long-term charge, and secondly, the Window Socket battery currently only gives 1000 mA, and this is not enough to provide serious devices with electricity, for instance, a vacuum cleaner or laptop. This is only suitable for powering smartphones and other low-voltage mobile gadgets. The device is not yet on sale. Currently, this device exists in the form of a prototype. In the future, [the developers are aiming to produce a number of modifications, which consist in extending the battery life and USB connectivity.](#)

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**Patent status:** -

**On market since:** -

**Regions:** Korea

**Industries:** Electronics

**Source links:** [Samsung Art and Design Institute](#)



## CELLULOSE FIBER SCOBY IS A GOOD ALTERNATIVE TO THE SKIN

SCOBY as a byproduct of the tea fungus can become a new material for clothing. This technology was developed by Professor Young-A Lee from the University of Iowa. She studied biological material, namely compatibility of bacteria and yeast, which breed on a mixture of sugar and vinegar. Her team conducted a series of tests and found that cellulose fiber SCOBY is a suitable alternative to the skin. That is, the properties of this SCOBY film are similar to the skin when it is collected and dried, and it can be used to make clothes, shoes or bags.

As a result of research on cellulose fiber, the material has also been tested for applications such as cosmetics, food and biomedical tissue for wound dressings. **In the nearest future, Professor Lee is confident that this material will become a new clothing industry.** The fact that fiber is **100 percent biodegradable** is a significant advantage for the fashion industry, which by its very nature generates a lot of waste.



Cellulosic fiber growing in the lab  
source - news.iastate.edu

According to **Professor Young-A Lee**, fashion manufacturers are constantly releasing all new fabrics and suits, from season to season, from year to year, to meet the needs and desires of customers. Just think about what happens to all these clothes, which will accumulate in giant heaps, along with the rest of the garbage.

Despite the difficulties, Professor Young-A Lee is convinced that she made a big step forward. After all, **biological material SCOBY, a by-product of the tea fungus, is a truly resistant tissue or material that undergoes biodegradation.** It can reduce the dependence of light industry on non-environmentally friendly materials. If the clothes from tea fungus once turn out in the ground, it will be rotting without a trace and it will not harm nature, like any plant.

However, there are difficulties that have not been overcome yet. Professor Young-A Lee



and her research team received a grant from [the Environmental Protection Agency](#) to develop sustainable clothing and footwear from harvested cellulose fiber. They conducted several tests to determine whether a cellulose fiber based on SCOBY is a viable alternative to leather for the fashion industry.



Young-A Lee has designed a vest and shoe prototype from the cellulosic fiber

During the tests, scientists found that the main problem of this material is the absorption of moisture from the air and sweat of the owner. Moisture softens the material and makes it less durable. In addition, at low temperatures it becomes brittle. According to Professor Young-A Lee, the other obstacle was the production time. Since the cultivation of the material takes from 3 to 4 weeks, depending on the temperature conditions. Currently, Lee's team is working on reducing the production time.

Professor Young-A Lee believes that chemicals used to make synthetic materials and dyeing fabrics can pollute water and soil. The fashion industry is working to do better, but consumers also have to take part in this. Socially conscious awareness on the part of consumers plays a big role. The Professor Young-A Lee team produced several prototypes of footwear and clothes from biological material and conducted a survey among

consumers. Most were interested in questions of color, texture, comfort, wear, and care. They had a positive attitude towards the material because of its stability and they believed that this is an interesting alternative to the skin. However, their desire to purchase a product made of this material is not so high. However, Professor Young-A Lee is confident that researchers can successfully cope with these problems and provide a safer and more viable option to benefit people at different levels.



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**On market since:** -  
**Regions:** United States  
**Industries:** Biotechnology  
**Source links:** [Iowa State University News](#)  
[Iowa State University](#)



## STEM CELL FACTORY TO FIGHT VARIOUS DISEASES

The project of an automated plant for the production of stem cells will be developed by General Electric and the Center for Commercialization of Regenerative Medicine in Toronto.

Several years ago, Canadian scientists conducted a study and found transplantable stem cells. According to scientists, these stem cells can grow into any human tissue. At the moment, scientists are going to open a research center in Toronto to create an automated plant that will produce large quantities of these stem cells to fight various diseases. This project is very relevant for modern life because today the process of stem cell production is very slow and time-consuming. It is assumed that the factory in Toronto will not only produce stem cells but also develop new types of stem cells that are needed to combat various diseases.

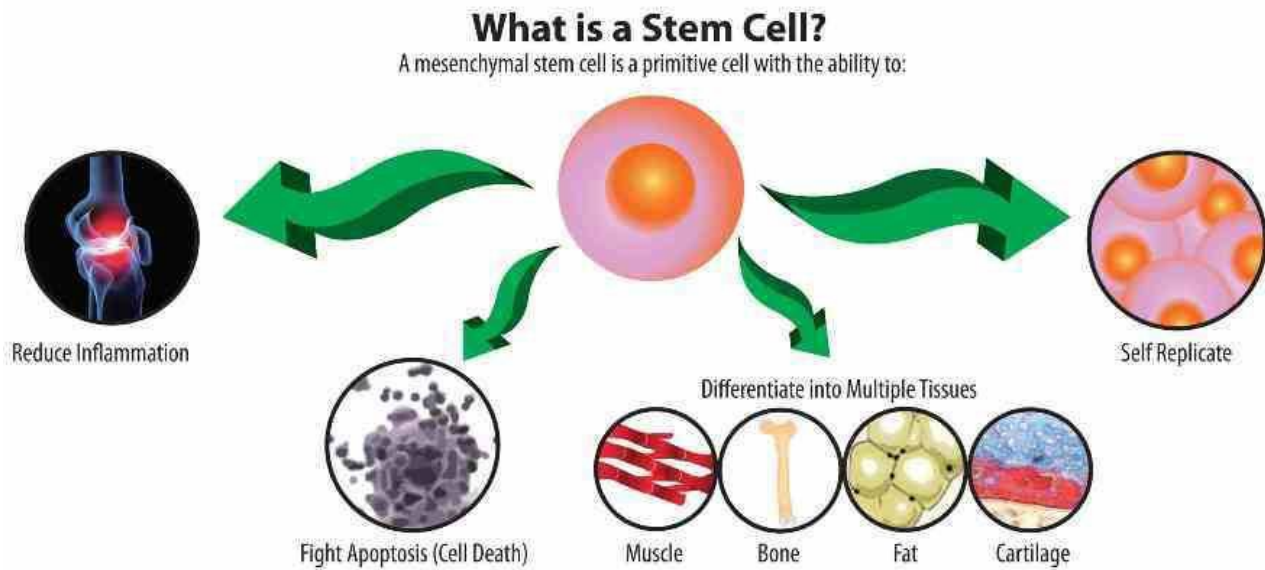


Stem cells to fight various diseases  
source - ge.com

In the modern world, the demand for stem cells is growing. In the most primitive case, they are used for clinical trials and only for these needs are required billions of cells. Nevertheless, their production remains a labor-intensive process. A qualified specialist should monitor each stage of cell growth and provide them with a nutrient medium and a suitable temperature and oxygen level. It is also necessary to carefully avoid contamination, to which the cells are very sensitive.

The whole process takes weeks and this is enough only for the needs of one patient. If cell therapy is needed by tens of thousands of patients, there will not be enough personnel or laboratories to deploy the necessary production. Therefore, the factory in Toronto will be partially automated, which will greatly accelerate the process and will enable the cultivation of many cell lines simultaneously and under ideal conditions. This will be

answered by specially trained artificial intelligence. Scientists believe, that over time, he will study this process and will offer his own options for optimizing production.



What is the stem cell  
source - ge.com

The Government of Canada actively supports the development of high technologies in the country. Researchers are granted tax benefits, and highly qualified foreign specialists receive working visas. A new project to create a stem cell factory will allow the country to take its place in yet another branch of the modern economy.

According to Michael May, president of the CSMM, the technology of stem cell production, which is developed in the laboratory, can be exported around the world. So, for example, the drug SAR-T for the treatment of oncology, based on the re-engineering of its own cells, led 83% of patients to persistent remission. Therefore, the world needs more such drugs, and for this, it is necessary to produce more stem cells.

It is assumed that the construction of this plant will take several years. Production time depends on commercializing of this large-scale project because it requires new technologies and automation. **The project has already attracted hundreds of millions of dollars of investment**, including from [German pharmaceutical giant Bayer](#) and companies from [the Silicon Valley](#). The success of the Canadian idea can provide the country's experience in the development of artificial intelligence and a high concentration of hospitals and biotechnology centers.

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Patent status: -

On market since: -

Regions: Canada

Industries: Healthcare

Source links: [General Electric](#)

[Center for Commercialization of Regenerative Medicine](#)





## CITYAIRBUS IS THE BRAND-NEW AND ECO-FRIENDLY URBAN MOBILITY

The project, a flying car that is designed to transport passengers in an urban environment was developed by the Airbus concern. The company has created a flying device for the urban environment while taking into account the economic efficiency, high production, and low pollution.



The [CityAirbus](#) prototype, first introduced at the beginning of the year at the Paris, is equipped with eight electric motors with a capacity of 100 kW, which propel eight propellers. The device has a cruising speed of 120 km/h and is designed to carry four passengers. This week, Airbus conducted the first tests of the engines of the device. In the next six months, he will have to pass many tests, and if they do not fail, the company will make the first real flight CityAirbus in late 2018.

At the first stage of testing, the characteristics of one of the cable lifting devices were checked. At the second stage, the aerial vehicle will be tested for an integrated transmission with eight propellers and eight specially developed transmissions Siemens SP200D. According to the company, it is assumed that a flying car will have several propellers. The company calculates that at first the car will be controlled by the pilot, in order to ensure a quick entry into the market. However, later, he will switch to unmanned control.



CityAirbus is the flying vehicle for the urban environment  
source - airbus.com

The creators of the flying machine provided a new mode of transport with artificial intelligence. Proceeding from this, a team of scientists and engineers believe that in the future, when transport is launched, passengers will be able to plan their trip and book it through a convenient application. The company introduced a prototype of a flying machine

called "Pop.Up". This prototype was developed together with European design company the [Italdesign](#). It was also presented at [the 87th Geneva International Auto Show](#) in the spring of [2017](#).

Pop.Up includes [artificial intelligence platforms](#), thanks to which the flying car manages displacements and offers alternative scenarios and travel experience; [passenger capsules](#) that are designed to connect to two different and independent electric motors, as well ground and air module; [the interface module](#) for interacting with users in a virtual environment. Pop.Up looks like a two-seater ground transport, but also combines the freedom and speed of a vertical airstrip. This is what makes it possible to overcome automobile and aerospace fields.



CityAirbus Pop.Up  
source - airbus.com

From the flying machine, it is easy to switch to ground transportation due to the fact that the capsule is connected to the grounding module. This module has a chassis made of carbon fiber and receives energy from the battery. To take off, the capsule is disconnected from the grounding module and connected to the air module. The flying machine is automatically returned to the station.

According to Marius Bebesel, they now have a better idea of the efficiency of the

innovative electric power plant CityAirbus, which they will continue to develop in future tests, the main of which will be the assembly and launch of a full-size prototype in 2018.

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On market since: -  
Regions: United States  
Industries: Others  
Source links: [Airbus S.A.S.](#)  
[Italdesign Giugiaro S.p.A.](#)



## EXERCISE PRESCRIPTIONS TO KEEP THE BRAIN SHARP

The BrainThrive allows people to create sports training, which is suitable for them, was developed by neuroscientist Wendy Suzuki.



Studies have long shown that exercise can positively affect brain function. However, up to now, there has been a lack of precision and an individual approach in this matter.

Moreover, studies neuroscientist [Wendy Suzuki](#) showed that some physical exercises have a positive effect on the brain, for example, the ability to focus attention and switch between tasks. Her interest in the topic arose after she experienced the effect on herself.

Wendy Suzuki believes that her pioneering research began after she gains weight by 25 pounds. Consequently, when she started to do sports, she noticed that after training she feels more focused and happy. Now she wants to share her experience with other people. Currently, Suzuki hopes to connect a brain to the pieces of training. She is sure that this will help people grow old easier and work more efficiently.



Wendy Suzuki  
source - [wendysuzuki.com](http://wendysuzuki.com)

Earlier studies have already shown a positive effect on the brain of various training, from aerobic exercise to weightlifting and meditation. For example, aerobic activity transfers fresh oxygen to the muscles and eliminates obsolete carbon dioxide and lactic acid, and reduces "hememia" in those who have recovered from breast cancer. In addition, yoga helps patients with post-traumatic stress disorder, and cycling alleviates the symptoms of



attention deficit disorder in children. Fitness can help and healthy people, however, for maximum efficiency, each person should perform an individualized set of exercises.

Currently, Suzuki is developing training programs that will help people improve brain performance and reduce the impact of aging. In the future, she intends to launch this BrainThrive technology based on her research. According to the calculations of Suzuki, this technology will be launched in late 2018. The developer BrainThrive is directed at creating and developing individual exercise programs, which will include detailed instructions on what exercises should be performed by a particular person and at what time.



The BrainThrive allows people to create sports training, which is suitable for them  
source - wendysuzuki.com

The basis for such instructions will be data on physical exercises and cognitive abilities derived from common applications for smartphones. In addition, Suzuki will rely on his work on the study of neurotransmitters associated with positive emotions. She found that within two hours of training in the brain, the serotonin and dopamine levels were increased.

It has also been shown that regular exercises contribute to the formation of new cells in the hippocampus, that is, in the brain structure that is responsible for memory, orientation in space and planning for the future. With age, the hippocampus and part of the cortex degrade, but Suzuki hopes that a specially designed program can support the aging brain

and reduce similar negative effects.

Currently, Suzuki works for the laboratory of memory and knowledge at [New York University](#). She took part in the [TEDWomen conference in autumn 2017](#) and talked about the results achieved and that she plans to launch spinoff in a year after additional research.

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Phone: -  
Patent status: +  
On market since: -  
Regions: United States  
Industries: Others  
Source links: [Wendy Suzuki](#)  
[New York University](#)

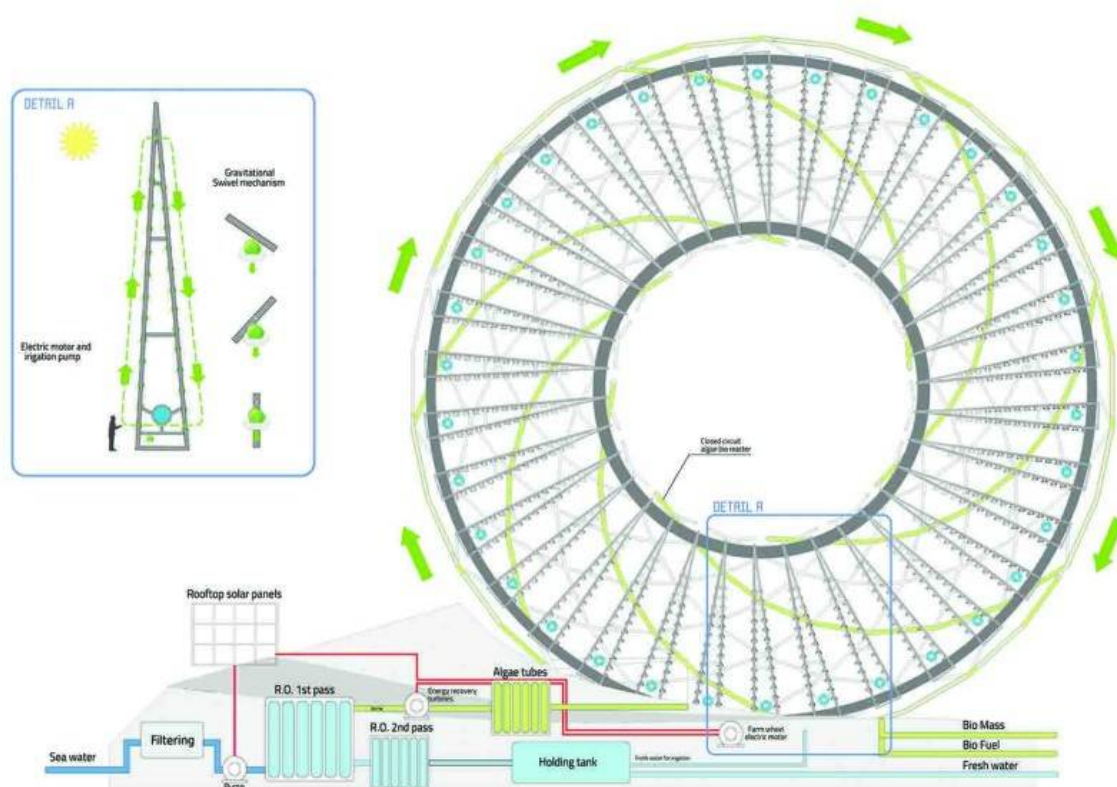


# RING GARDEN, WHICH DESALINATES WATER

Project Ring Garden, which runs on solar energy, is designed for desalination of water. This project was developed by Alexandru Predonu. He presented his project on the initiative of the [Land Art Generator](#) for Santa Monica in 2016. Creator hails from Bucharest, Romania. The energy technologies of this project are photovoltaic panels, algae bioreactors.

The problem with water is relevant for California. In this territory, there is a constant shortage of water supply for agriculture. Therefore, to solve this problem, Alexander Predon developed a rotating desalination plant for water. This desalination plant is powered by solar energy. It produces clean drinking water for the city of Santa Monica.

This project represents not only a project for desalination, but this is also a garden. According to the developer, this Ring Garden can perform several functions at once. First, it can produce 60 million liters of clean water; secondly, it can create 40 million liters of aerial culture; thirdly, it produces 5,000 Kg of spirulina for the feed of cattle; fourthly, 118,000 Kg of aeroponic crop yield, which conserves 331 million gallons of water. These functions have the positive impact on the environment. This project also uses photovoltaic panels to produce energy. They produce 440 MWh every year. All this energy is needed for working this project.

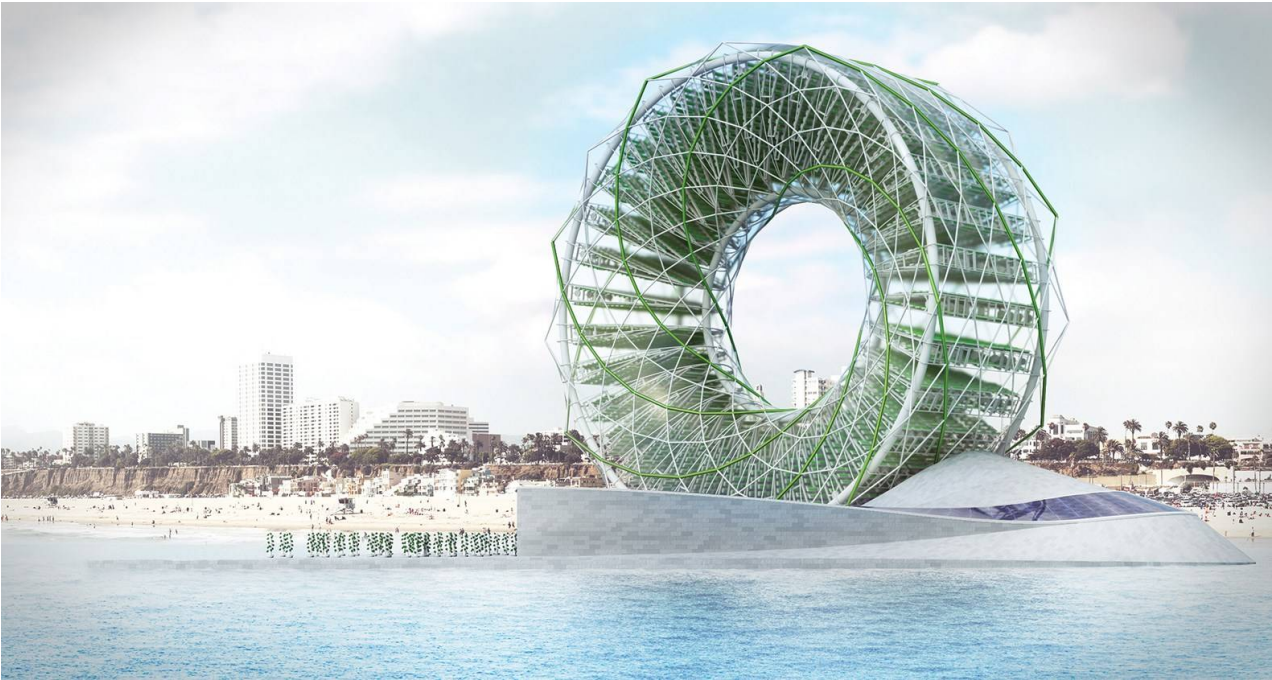


Ring Garden is designed for water desalination

Built-in special screens are aimed at protecting fish and underwater inhabitants. Seawater enters the desalination plant by special screens that protect fish and local wildlife. Solar panels power a high-pressure pump to pressurize seawater above the osmotic pressure



and through a semi-permeable membrane. Desalinated water is distributed as follows: the first 60% of the water of desalinated water is used for irrigation of plants, the second 30% is directed to urban networks, and the remaining 10%, which can be potentially toxic to marine life, is feed for the cultivation of spirulina through a bioreactor. Solar-powered Pipe desalinizes 1.5 billion gallons of drinking water for California.



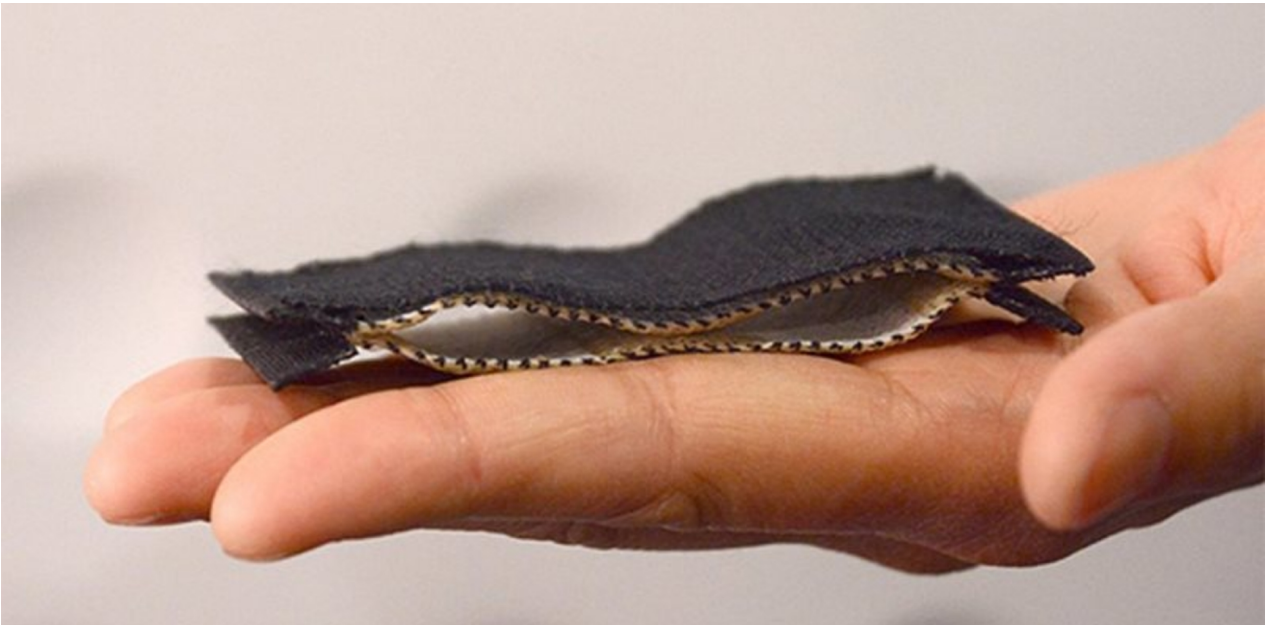
Ring Garden runs on solar energy

According to Alexandru Predonu, such a Ring Garden can be used in the future for growing vegetables. Because the garden provides water, sun, nutrients, and CO<sub>2</sub>. In addition, this is the main condition for the growth of the crop. If this project becomes a reality, it will consume 9 million gallons of water per year and process 331 million gallons that can be used in 2,300 California households.

It is also assumed that the Ring Garden will become a work of art. The wheel has a slight slope, so the sun every year will fall right into the middle of the wheel. It will happen on the Earth Day, which will be on April 22. People will be able to visit this garden on that day with the help of a boat, pick up vegetables and plant new vegetables. As a result, Alexander became a finalist of the Land  $\Phi$ rt Generator Initiative competition in 2016. It is assumed that the development of this project will take at least two years.



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Website: <http://->  
Phone: -  
Patent status: -  
On market since: -  
Regions: United States  
Industries: Environment, Others  
Source links: [Land Art Generator](#)

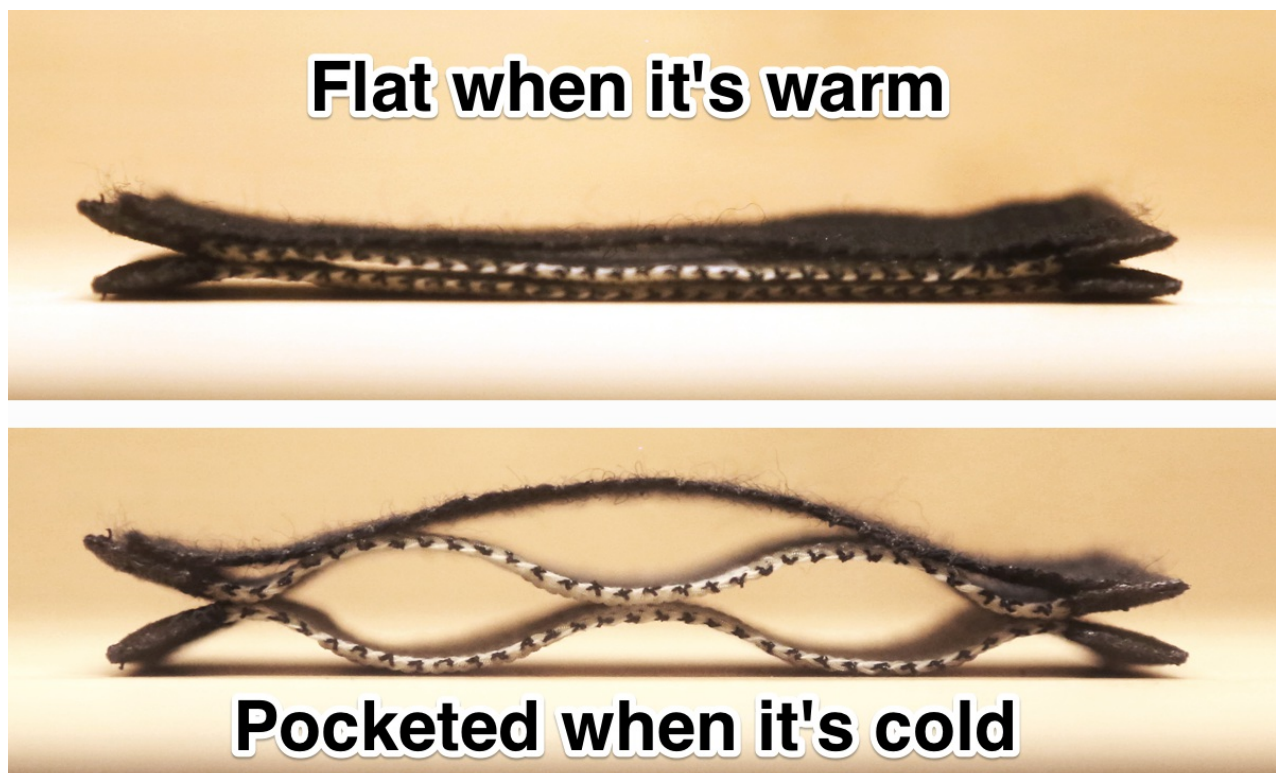


## A NEW TYPE OF COMFORT

Kestrel Materials is a material that narrows and expands according to the temperature of the air. This material was developed by the American laboratory Otherlab. The Otherlab team of scientists is focused on the development of new technologies with an emphasis on prototyping in combination with physical modeling and mathematical models. They are actively cooperating with commercial organizations, universities, research firms. Their main goal is to bring comfort to the world and reduce the need for cumbersome layers.

The new fabric reacts to changes in air temperature. If the temperature decreases, the tissue automatically become thicker. It creates air pockets that hold heat and give people a sense of warmth. However, if the temperature drops, the tissue narrows. Pockets disappear and prevent heat from getting into clothes. The fabric is capable of self-maintenance, it does not need any connection to the power source, or to additional sensors. It works exclusively due to the properties of its artificial materials. The material uses common fibers, for example, nylon and polyester.

This material belongs to the class of thermally adaptive materials that are capable of passively changing the thickness and insulation in response to the local thermal environment. If this type of material is included in fabric and clothing, it will lead to an expansion of the range of comfortable temperatures for people. According to [the Otherlab](#), they have already created prototypes of this fabric and as a result, received a positive effect. The tissue increased by half when the temperature was lowered by 10 degrees Celsius.



Kestrel Materials  
source - [materialcomforts.com/](http://materialcomforts.com/)

Based on Jin Chang's words, a mechanical engineer in Otherlab, the thermal insulation of this material can vary from 0.5 to over 1.5 CLO (an optional system heat-resistant garment

element), for example, a T-shirt will be able to change into a warm jacket. To achieve this effect, the researchers used two types of materials with different thermal properties. Therefore, when the temperature decreases, the inner material begins to increase in size, while the external material remains practically unchanged. As a result, the inner material is bent and an additional air layer is formed in the fabric, which provides thermal insulation.

The Otherlab team tells that clothing that changes insulation in response its thermal environment has the potential to keep the wearer comfortable over the wide range of temperatures. In an office building, school or factory where everyone wears adaptive materials, this could reduce the need for heating and cooling control by 2 degrees Celsius (4 degrees Fahrenheit), domestic energy consumption and related emissions can potentially be reduced by 2%. This technology can greatly simplify the trip, trekking or traveling.

Otherlab plans to continue to study the properties of this material. They are going to conduct research and see how the material reacts to washing and ironing. In July 2017 Kestrel materials already secured \$120k at the seed round from [Y Combinator](#) on the development these materials.

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**Patent status:** +  
**On market since:** 2017  
**Regions:** United States  
**Industries:** Creative Industries, Others  
**Source links:** [Otherlab](#)  
[Kestrel Materials](#)



# BABELON IS SYNTHESIS OF SPEECH AND LANGUAGE

The device that translates the speech into foreign languages and reproduces the received translation by the voice of the user is being developed by BabelOn.



BabelOn technology is a synthesis of speech and language, so it will recreate the speaker's voice in English, French, Spanish, German, Portuguese, traditional Chinese, Japanese languages and even Hindi, copying emotions, the rhythm of speech and the breath of the speaker. BabelOn uses dynamics of emotions, the uniqueness of voice and mechanics of facial animation. As a result, we obtain the most complete method of synthesizing language in the world.

The BabelOn speech method is data collection via low power radar and quantification and manipulation of big data via predictive analytics and machine learning.

The device records the speech, analyzes how it is pronounced by the user, for example, how his lips move or how he breathes, and then translates it into the desired language, imitating the original voice and emotional message. Currently, this process takes several hours, but the project team hopes to reduce it to an instant translation in the future.



BabelOn connects all world  
source - babelon.net

This equipment was developed in partnership with [the National Laboratory of Livermore Lawrence](#), a federal institution dedicated to the development of science and technology. According to co-founder Daisy Hamilton, BabelOn is invited to complete the development of the technology at NASA to utilize their supercomputers and mentorship.

The working with Babelone requires several steps. **The first** is to create a BLIP (Information Profile). BLIP contains the key information necessary to recreate and transform the voice of a person and the corresponding face movements into several languages. **The second** is the capture of the content to be synthesized or translated. **The third** is speech modulation and translation.

On the other hand, BabelOn causes a serious security problem. This technology can become a quite attractive target for hackers, which can disrupt the security of a personal voice in the future. According to Daisy Hamilton BabelOn technology will use encrypted stand-alone voice storage. He believes that autonomous storage will be almost impossible to crack, and also notes that a control visual signal will be developed that indicates when voices and languages were changed.

At the moment the device is at the earliest stage of development. So far, there has not been a single experimental testing of technology and the company has not yet signed a contract with any client. However, the idea itself looks very promising. It is assumed to be able to translate speech in real time in the future. This will contribute to the fact that people from different countries can freely talk with each other, that the most important thing this device will be able to preserve the emotional component of communication.

Now the company BabelOn seeks support in raising funds for further research and development of technology. According to Daisy Hamilton, the company needs **\$ 30,000** to develop the project.

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Patent status: +  
On market since: -  
Regions: United States  
Industries: Communications  
Source links: [BabelOn](#)  
[Indiegogo](#)  
[National Laboratory of Livermore Lawrence](#)



## ATACAMA IS THE NEW STANDARD IN MOISTURE-CONTROLLED APPAREL

Atacama is a technology based on microhydrodynamics that is capable of removing moisture and making clothes virtually dry. This technology was developed by the [University of California at Davis](#). The research team received a grant from the US National Science Foundation for the development of tissue.

Spinoff Atacama was named after the driest desert in the world. [Atacama](#) uses microfluidic technology to create textiles that allow clothes to remain dry but also turns sweating into an element of design. Atacama also studies how this technology can be applied in a wide variety of industries, including clothing, automotive and healthcare.

The medical industry began to use microfluidics in the 1980s to create labs on chips that allow scientists to use microscopic samples of blood and other test fluids. Atacama integrated microfluidics into textiles and created an active environment that feels more comfortable. Most of the absorbent fabrics that are on the market allocate sweat on the clothing surface, so it evaporates faster, the microfluidics hide moisture direct in the tiny three-dimensional channels, and then control the direction of the liquid. The conducted researches show that the functions of Atacama clothes are similar to functions work of human skin.



Atacama  
source - [atacamadry.com](http://atacamadry.com)



The ATACAMA team is based in San Francisco. There are scientists of biomedical engineering and materials science UC Davis in the team. According to Alex Sina, chief technology officer of the company, the main difficulty, was that most of the processes for creating microfluidic devices, including photolithography and laser cutting, are designed for rigid materials like glass or silicon. Therefore, they had to look for a new solution in the light industry.

The advantage of Atacama tissue is that it is a technology of many years of research in the field of advanced microfluidics. Also, scientific studies have shown that this type of tissue under the influence of excreted sweat increases by 3 times less than modern absorbent tissues. Another plus in favor of ATACAMA tissue is that it has a 12-fold dry structure compared with the cloth with modern "dry" technology after a strenuous workout.



Atacama  
source - atacamadry.com

The first result was the shirt prototype that does not just absorb moisture and spreads it over its surface, but it takes it outside, remaining almost dry. Currently, the Atacama company works mainly with synthetic fabrics, polyester, and nylon. However, Atacama tested its technology on natural fabrics such as cotton and merino wool as well.



However, clothes made of Atacama fabric are not sold in stores yet, but the company is developing samples for several brands. It is believed, this fabric can be used in a variety of applications ranging from sportswear, ending with evening dresses, shirts that will not have sweat spots, diapers, bandages, bandages, hospital bedsheets, and car seats.

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Phone: -  
Patent status: +  
On market since: -  
Regions: United States  
Industries: Manufacturing  
Source links: [Atacama](#)  
[University of California, Davis](#)



# THE FIRST COMPACT ALL-ELECTRIC VTOL JET

Exclusive interview for [SPINOFF.COM](https://spinoff.com) with Mr. Olivier Le Lann, Electric Visionary Aircrafts, Founder&CEO, about their Electric Vertical Take-Off and Landing aircraft (E-VTOL), which is enabling personal, compact and autonomous flights within cities.

Electric VTOL aircraft is our future in which anyone can fly anytime and everywhere. As cities become more and more congested and fight against pollution, the technology improvement in electric mobility allows a new industry to raise and help to solve this issue. Our first compact electric automated aircraft, the X01, solves all problems related to traffic jam and transportation stress. Our e-aircraft will allow reaching any destination way faster than any transportation solution while enjoying a stunning view. It is the right time to open up the third dimension in cities.

**SOC: Dear Mr. Lann, we are so grateful for your generosity this day in spending time speaking with us and sharing your insights about Electric Visionary Aircrafts.**

**Mr. Le Lann:** We are creating the first electric visionary transportation for the city, which is going to avoid the traffic jam. Nowadays the main problem of our society is that we cannot move quickly while traffic is congesting our cities. Therefore, we decided to solve this problem and we came up with an innovative flying service. It is called [Electric Visionary Aircrafts](#). We are going to demonstrate our creation next year in **3 phases starting February 2018** and we are already in advanced contact with future customers.

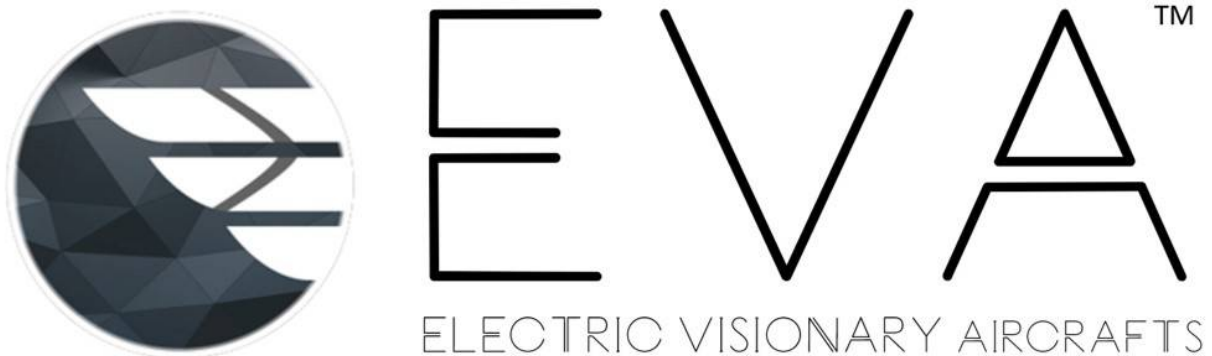
**SOC: Our investors and we would like to learn more about a vast experience of your academic endeavors and your professional background.**

**Mr. Le Lann:** I graduated from [Hitotsubashi University MBA](#) in Tokyo (MBA) and I am also an alumnus of [London Business School MBA](#). I have worked with different fast-growing companies such as [Auchan](#), [Roche](#), [Gree](#), and [Criteo](#). Before founding EVA, I worked for [Tesla](#) in the Asia Pacific. Throughout my career I **have opened 26 companies** and specialized in business set-up, turnaround, and fast-growth, always focusing on team chemistry and leadership as primary factors of success.

**SOC: Considering your tremendous experience, we would like to know whether you had other projects? Could you please share the story of their creation and success.**

**Mr. Le Lann:** While talking to Tesla naysayers I realized that they made a point saying that we would not solve the problem with traffic jams. Therefore **I had the idea to skip the**

traffic stress by simply flying over it. I gathered an international team with expertise in design, engineering, and finance and we launched the project very quickly.



Logo of Electric Visionary Aircrafts  
photo provided by Electric Visionary Aircrafts

**SOC:** It is so interesting to know more about the process of your technology creation. Please tell on which stage of commercialization your technology currently is? Was your project funded by any state financing or grants? Has it already received any honors or awards?

**Mr. Le Lann:** The technology was developed by Tesla. As we can see this technology is not new but assembling lithium-ion batteries to power a car was innovative at that time. We brought incremental innovation to this technology by developing first compact **all-electric VTOL jet**. It provides the direct landing in very tiny space in street and vertical take-off.

We have been supported by the private investor and **French government**. We are now contacted by several international investors from **diverse industries** and particularly from **Asia**.

**SOC:** In the formation of every scientific spinoff, one of the most important keys to success is the team. For many potential investors, the management team is the most important element in deciding whether to invest in it or not. Could you please share some information about the team members who supported you and the project? What are the key additions to the team needed in the short term?

Mr. Le Lann: We have an international team from day one. I am a French citizen and lived 10 years in Japan. Gianmarco Scalabrin is Italian and holds the position of CTO at Electric Visionary Aircrafts. Our head of design, Ramees Muhammed, is Indian and lives in Qatar. Mitsuru Honda is our CFO. He is from Japan and he has worked in California. I think the proof of success is that I have always managed the team with a high level of diversity. We are working very well and very hard.



OLIVIER LE LANN (FOUNDER)  
- PEOPLE



RAMEES MUHAMMED  
(FOUNDER) - DESIGN



MITSURU HONDA (FOUNDER)  
- FINANCE



GIANMARCO SCALABRIN  
(FOUNDER) - TECHNOLOGY

EVA team

photo provided by Electric Visionary Aircraft

SOC: It is not a secret that the development of a new technology and its subsequent commercialization presupposes some problem and addresses unmet needs. Respectively, what problem did you intend to solve by creating your technology? What results did you plan to achieve?

Mr. Le Lann: Autonomous electric cars, which was developed by Tesla, does not solve the problem of traffic jams. This problem is tremendous for China, India, Indonesia, USA and other big countries. The problem of traffic jams become vaster and vaster every year.

We cannot break buildings to make new roads, but we can bring the new solution such as an electric VTOL jet. People will have the opportunity to fly across the city. It will take 5 minutes to fly 10 kilometers. At the beginning, consultants, lawyers, businessmen, and businesswomen will be using this transport and then all people will have access to EVTOL jet.

SOC: The problem which you targeted to solve was actual before. Probably someone has already tried to solve it. Is it right? Understanding the unique selling points from the investor's side could make the technology N° 1 for them.



**What are the unique selling points of your technology and fundamental difference from other technologies that tried to solve this problem before you?**

**Mr. Le Lann:** It is a brand new industry. We do not have many competitors. Moreover, we have a cardinal difference from these competitors. They copied the technologies of vertical take-off from helicopters. They need the special landing seat. They can land and take off only from a special tower designed for helicopters.

**We came up with a completely different technology.** Our goal from day one is that our VTOL should land on the streets in the narrowest spaces and take off vertically from the place. Therefore, we can take off and land from on the street, because our aircraft takes little space.

That is a very good point for investors because we created very high service. The direct operating cost of the flight will not be high. **It will be \$ 1.5 per 1 km** and we are going **to charge \$8**. This cost is not really higher than what Uber offers. In addition, this advanced technology justifies the price.

**SOC:** In order to understand the peculiarities of this particular spinoff our investors always ask what is the investment structure of the company? Do you still own the controlling stake in your spinoff?

**Mr. Le Lann:** I am a shareholder of the company in **Delaware, USA**. I have **40 % of the share stake and three co-founders have 20%** of the controlling stake. This organization is an owning the French entity, based in **Toulouse, France**. There are many engineering schools, which link with aerospace manufacturing in Toulouse compared with **California**. However, all most of the business negotiation is made abroad.

**SOC:** We wonder what is the actual addressable market currently for your invention and what are the current competitors there? Could you please share with us the results of the market studies, if there are any? What might be the barriers to entry?

**Mr. Le Lann:** **At least \$8B based on** Uber industry figures. But we need to add to that

figures additional segments such as logistics, rescue (military and civil), VIP sales, etc.

The barrier to entry is about the algorithm and patents. The computer is going to manage a shift between vertical and horizontal flight and distribute powers to multiple engines, which requires a high stability as we transport persons.

We have protected our intracity segment with patents, particularly for the take-off and landing phase as well as different security features.

**SOC:** We always need to paint a clear picture to the potential investors of the market opportunity of the spinoff that is meaningfully large and growing. Why in your opinion your company might have a high growth potential? Could you tell us all current industries and fields of your technology/product application and where do you think it could be successfully applied in the future?

**Mr. Le Lann:** We are positioned in one of the **10 fastest growing industry** for the incoming decade and further. We see that the company's valuation is very fast. Similar companies in this area multiply their cost price by 10 times between each round of investment.



eVTOL solves problems with traffic jams  
photo provided by Electric Visionary Aircrafts

**SOC:** The potential investors will be curious whether you already have the first clients and signed contracts? What was the feedback from your partner's markers and customers?

**Mr. Le Lann:** We had several contacts, most of them are from cities from Asia and South America which are our initial primary target. We also got contacted by one large automotive supply company which want to use our VTOLs as a logistics vehicle. We had also negotiation with two military companies for our rescue segment. We are going to release our full prototype in a year from now and will take a preorder for VIP.

**SOC:** We both know that for you and the investor it is crucial to reach positive cash flow as soon as possible. Certainly, the market scaling cannot be achieved without proper distributors network and clients. Please tell us about your criteria of partners selection and which markets are open for spinoff activity.

**Mr. Le Lann:** The first year is mostly a year of investment in developing and creating the prototype. We will start the commercialize in 2019. We plan to get positive free cash flows from 2019. As I mentioned the cost of the flight is \$1.5 and revenue is \$8, we see the beginning of cash flow in 2019. We believe that we will get back cash very quickly.

**SOC:** It is very important to understand your particular vision about unique features of your company. Why do you consider the major market players might be interested in investing into a promotion of your technology/product on the addressable market?

**Mr. Le Lann:** Automotive companies are the most interested because they bring some expertise in manufacturing and R&D. Aerospace companies are also interested. We can include to this list internet companies. Booking of the aircraft will go through an app and people will share their experience also through networks.



eVTOL has very compact design  
photo provided by Electric Visionary Aircrafts

**SOC:** Now we would like to refer to the next very crucial and we would even say essential aspect for spinoff companies' as the strategy of R&D, production, distribution and marketing processes. Do you have your own unique strategy? Which of these processes do you consider your spinoff is strong at?

**Mr. Le Lann:** We are not going to use a lot of money for marketing. We are going to use it very smartly. We think that this technology is brand new. Therefore, we do not need to pay a lot of money for our promotion, because, in any case, newspapers will write about our new and creative technology.

The first time we are going to fly with a passenger, it will demonstrate that our aircraft is the safe flying vehicles. We will build a live business case on how our technology improves people's life. We will have a domino strategy, starting from low hanging fruits cities to a worldwide implementation.

**SOC:** As a rule, the majority of spinoffs outgrow into exits. How do you determine the market for your product/technology and estimate its volume and dynamics? What is your potential share on the market? How do you think what market cap your company plans to reach at the peak of its development and why? How long

might this process take?

**Mr. Le Lann:** The first item is valuation. We think this project will grow quickly because of the dynamic of the industry. Comparing the valuation history of other VTOL companies, we observe a very positive **9X valuation** growth between every round.

Concerning the potential share of the market. I can tell that, in the beginning, VTOL jet will be used by layer consultants, businessmen, people for those time is the real luxury. Long term the overall industry should cover **10 percent of a city population**.

**SOC:** For spinoff companies their intellectual property is a key to success. The investors pay particular attention to it. What key intellectual property does your company have (patents, patents pending, copyrights, trade secrets, trademarks, domain names)?

**Mr. Le Lann:** Yes, we have provisional patents and now we are launching additional ones. Most of the patents are protecting our uniqueness. This patent includes the entire calculation system and required the special management of airflow and noise, as well the special combination of the engines aerodynamics. We protect our capability to land in a very small space within cities.

If one day other companies will want to land on the street as we do. Then they will use our patent permission or pay royalties.

**SOC:** For both of us, as well as for thousands successful spinoffers, it's not a secret that a new technological breakthrough may become obsolete very fast. Respectively, patent validity period becomes shorter. It is interesting to know the perspectives and protection plan of your technological advancement and leadership in a medium- and long-term prospectives

**Mr. Le Lann:** We are in a new industry compared to other industries which are older. The main patents created by these legacy industries become obsolete quickly. Actually, **we are addressing untapped fields of our industry with our patents**, which makes them quite solid and valuable.



SOC: The investors will want to get a clear picture of how many rounds of investments have you completed? Are you seeking for the investments at the moment? What is the volume and time limits? What milestones will the financing get you to? What did you plan to use the invested funds for?

Mr. Le Lann: Basically, the company is derived from Tesla. We are collecting now **\$1M and expect more**. Currently, we have some persons, who contacted us and willing to invest. We have the plan to commercialize our jet next year. We have already had the investment in the round A. Now we seek the additional investment to finalize the 1:1 scale prototype.



eVTOL can land in very tiny space in street and take off vertically  
photo provided by Electric Visionary Aircrafts

SOC: Could you please describe your ideal investor? What aspects are important for you, for instance, is it experience, country, the amount of own private capital or maybe some personal qualities? Will existing investors participate in the round?

Mr. Le Lann: We look for people who have the passion for this technology and who want



to help to solve the problem on which we are working now. When the cars will fly over all the cities, **the person who invested in the project will say 'I have invested in this company and it became possible'.**

**SOC:** And the last question, could you specify the most convenient way you would like to receive inquiries from potential investors? Should it be by e-mail or personal phone call?

**Mr. Lann:** We receive a lot of requests. I would like that the first contact will be by **e-mail** including a brief introduction and interest for EVA. Then after this introduction e-mail, we can make the telephone call if our interests converge.

**We would like to express gratitude for the time you have dedicated to this interview. SPINOFF.COM will be pleased to support your project and to share the interview on your Electric Visionary Aircrafts with all potential partners and investors**

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**Website:** <http://www.eva.xyz>  
**Phone:** +330672492218  
**Patent status:** +  
**On market since:** -  
**Regions:** France  
**Industries:** Transport Systems and Vehicles  
**Source links:** [Electric Visionary Aircrafts](#)  
**Files:** [Electric Visionary Aircrafts presentation](#)



## IT IS FUN TO GO FAST

Arrivo is the technology which will change our world in the future and solve a number of problems of the modern society. It is assumed that Arrivo will become an underground transport of the future, which will provide the 21st century with passenger and freight traffic.

**Brogan BamBrogan** is the founder of [Arrivo](#). He is also the former engineer of [SpaceX](#) and [Hyperloop One](#). He and his team are going to build the first high-speed magnetic circuit, which is fully networked, ultra-safe, 100% reliable and commercially stable, and also able to solve the problem of traffic jams.

The idea of **Arrivo** has originated from the ideas of **Hyperloop One** and Elon Musk's [Boring Company](#). The **Arrivo** concept is reminiscent of **Hyperloop** because it is supposed to use the magnetic circuit for accelerated traffic and is very similar to Elon Musk's project to fight traffic jams. The main difference is that Arrivo company plans to move cars on electromagnetic carts not through tunnels, but along dedicated highway lanes. Despite the fact that tunnels are compulsory for construction of the Hyperloop system, they will not be used in the construction of Arrivo. There is an advantage in rejecting tunnels. The absence of tunnels will reduce the cost of construction.

The vacuum trains conceived by Elon Musk were able to speed up the movement only between cities. The Arrivo project offers longer distance tracks, however, magnetic tracks, according to the idea of the developer, will allow reducing the travel time by 5- 6 times even during the rush hours.

The speed of the modules will reach **320 km/h** on the track. The magnetic strip will allow to considerably increase the flow of cars. It is expected to increase from **2000-3500 cars** to **20 000 cars** per an hour.

Arrivo plans to build a test route along the E-470 toll road. This road is situated in the eastern part of Denver and runs north-south along past the airport. If this project is successful, the company will begin working on Arrivo system in 2019. They assume that construction will take two years.

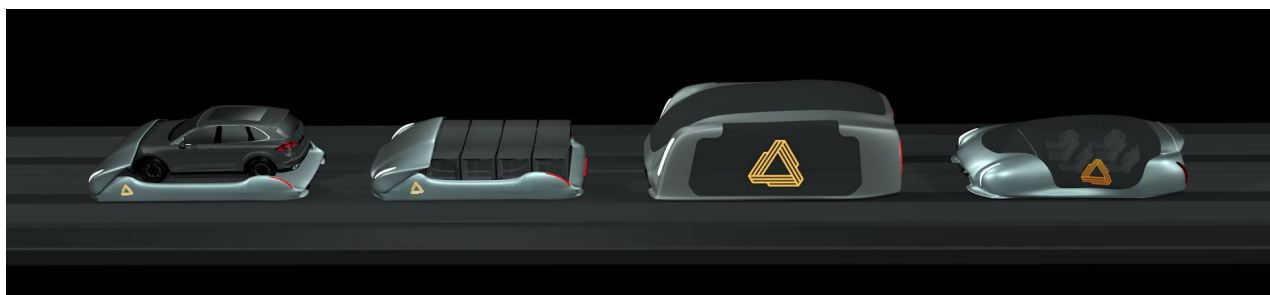


Arrivo team

source - <https://www.theverge.com/2017/2/9/14559974/hyperloop-brogan-bambrogan-arrivo-los-angeles-lawsuit>

The rapidly growing population and the booming economy make for a perfect location for the development of the Arrivo system. Arrivo's extra decision to locate their test facilities, hiring up to 200 employees by 2020 and contributing \$10 – 15 million to our economy in 2018, is evidence of the innovation process which will stimulate our economic progress.

As Brogan BamBrogan says, the main purpose is not the maximum speed, but the ability to get from one point to another without traffic jams.



Arrivo products

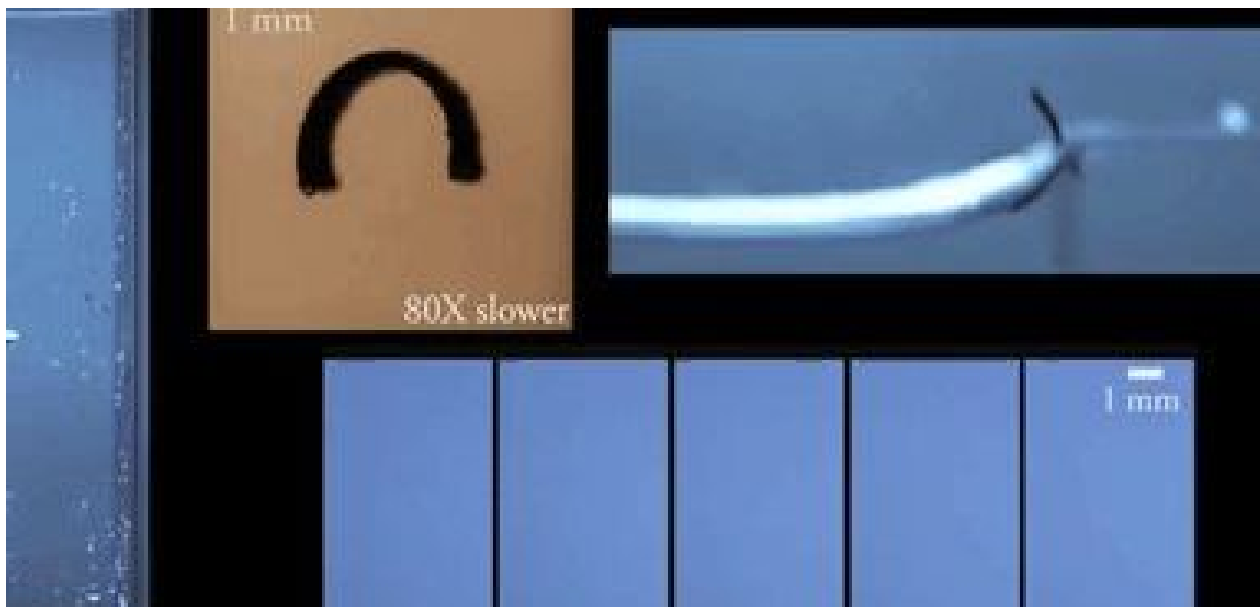
source - <http://www.arrivo-loop.com/>

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**On market since:** 2016  
**Regions:** United States  
**Industries:** Transport Systems and Vehicles  
**Source links:** [Arrivo company](#)  
[Vox Media, Inc.](#)





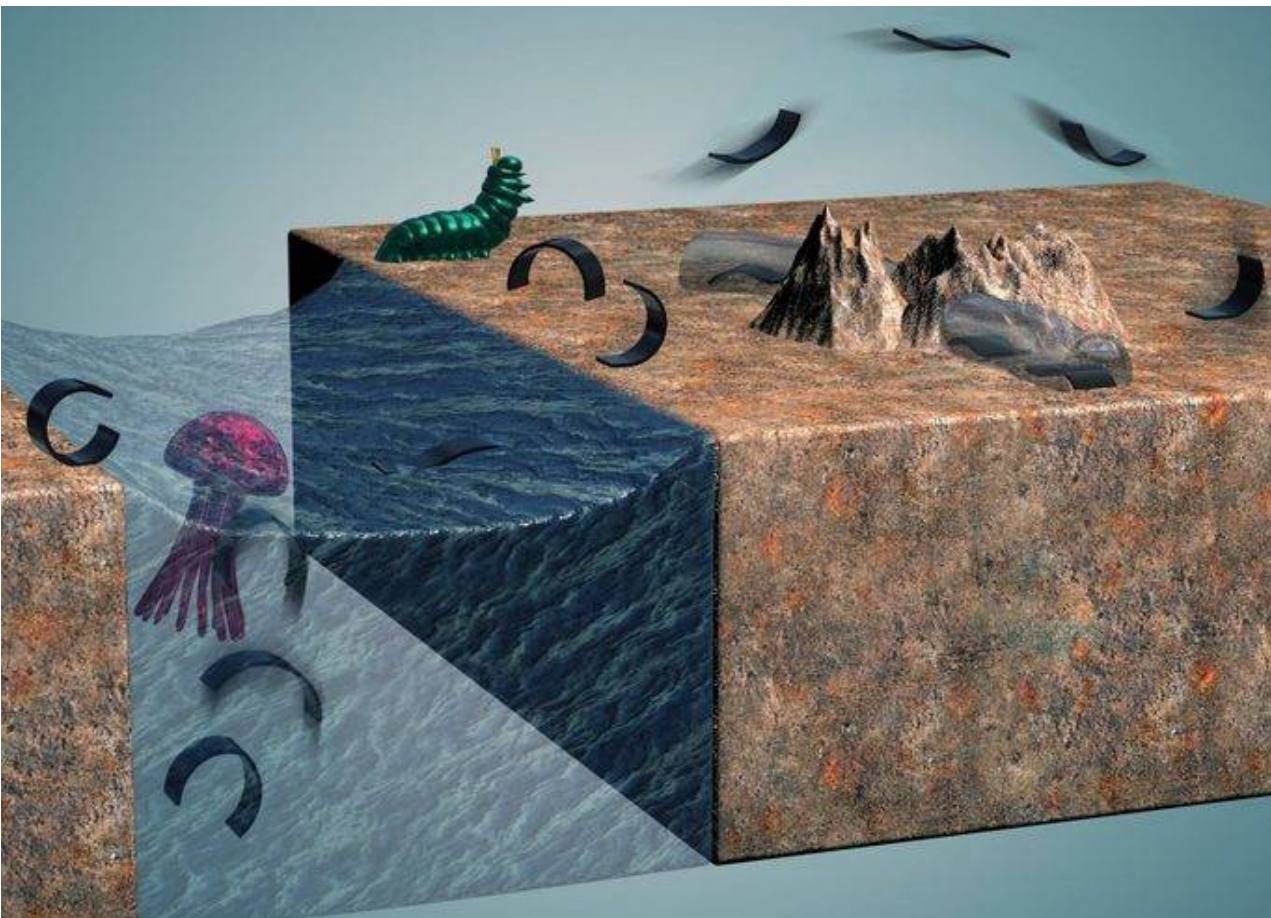
# RESEARCH



## THE MILLIROBOT IS INTENDED TO TRANSPORT MEDICATION

Millirobot, capable of carrying drugs inside the body was developed by engineers and scientists from the Max Planck Institute for Intelligent Systems in Stuttgart. Nature once again inspired the researchers. This time the caterpillar became a living example of scientists. Researchers have created a miniature robot that can cope with various forms of motion and move not only over the surface but also inside the body of an animal or human.

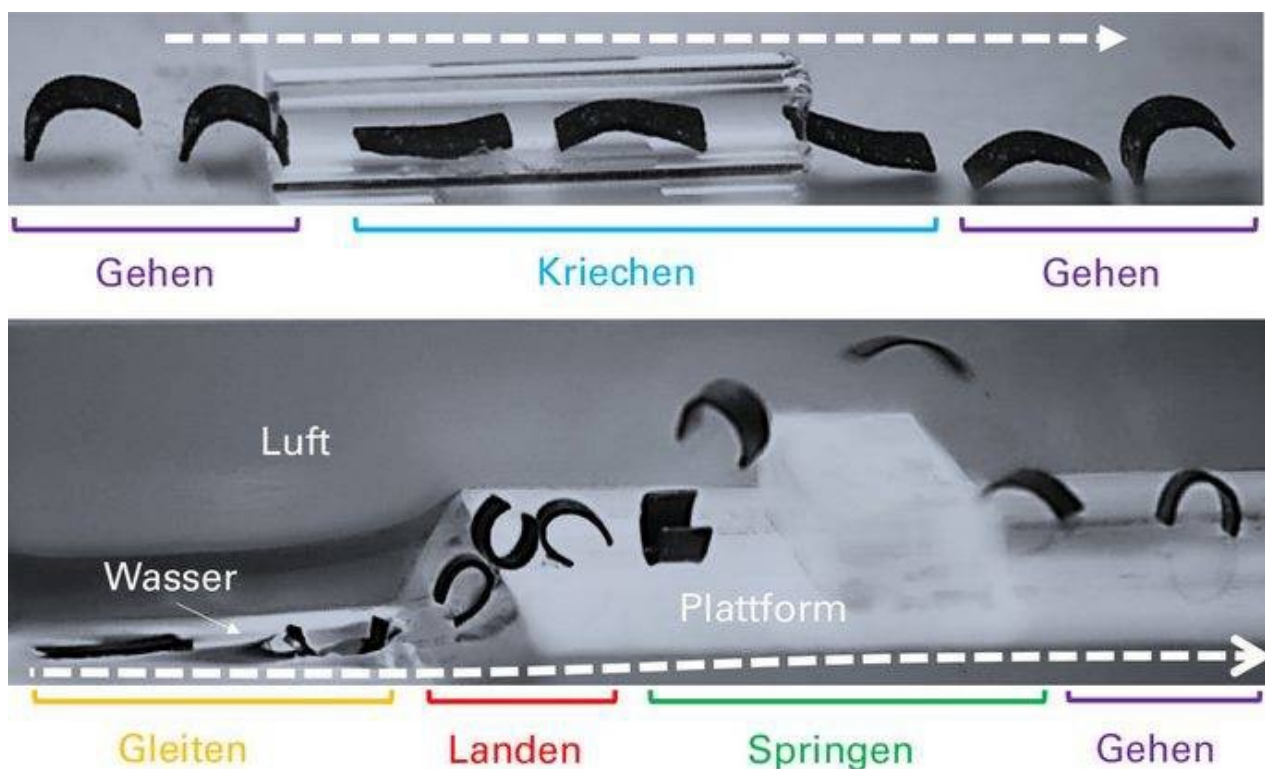
A new millirobot measuring just 4 mm moves like a caterpillar of a moth or larva of beetles, folding and straightening its 'body'. Movement is carried out by means of magnetic particles built into a plate of elastic silicon. Scientists were able to control the movement of an artificial caterpillar, changing the external magnetic field. According to **Professor Metin Sitti**, Director of the Physical Intelligence Department, when scientists began making a millirobot, they focused on the mechanics of the movement of soft biological organisms, such as larvae of beetles and caterpillars. However, spermatozoa and jellyfish also served as models.



The millirobot now introduced by the Max Planck researchers in Stuttgart moves over land and water  
source - mpg.de

A tiny device can move in a variety of landscapes. He was offered to creep along narrow pipes and along slopes, climb stairs, jump over 'abysses'. All these tests the robot passed with ease. Moreover, he was taught to swim and carry on himself small objects. This is due to the fact that it has built-in magnetic microparticles in an elastic casing made of silicone rubber and this enables a precisely defined magnetization profile. Changing the strength and direction of the magnetic field, it deforms the rubber belt in different ways. This allows researchers to work and monitor different movements of the robot.

In addition, scientists conducted a series of tests in the synthetic model of the stomach and in chicken meat. The motion of the microrobot was monitored by ultrasound. The success of these experiments allows scientists to hope that studies on living objects will also show good results. However, before the beginning of clinical trials, it is necessary to prove that it can be controlled by the human body. However, researchers are confident that these obstacles can be accepted.



The millirobot walks, crawls, swims, climbs a step and jumps through a complex environment  
source - mpg.de

Profesor Metin Sitti, the lead author of the study, and his team are confident that in the near future controlled microrobots will be able to deliver drugs to the place of desired effects within the human body. To do this, a person only needs to swallow the silicon caterpillar-robot or implant it through a small hole. Then the robot can move through the digestive tract or bladder, or the heart. Scientists have foreseen numerous opportunities. Generally, the invention of small robots used for medical purposes, such as non-invasive surgery, occupies a central place at the Physical Intelligence Department, led by Metin Sitti.

Scientists hope that one day this robot will become a standard in healthcare to provide non-invasive access to confined spaces, such as unprecedented or hard-to-reach narrow

areas within the human body. According to scientists, today it is impossible to access many small regions within the human body without surgical interventions, but their goal is to reach regions that are not invasive and conduct diagnostic and therapeutic operations with soft robots. The team of scientists, consisting of [Wenqi Hu](#), [Guo Zhan Lum](#), and [Massimo Mastrangeli](#) and which headed [Metin Sitti](#) hope to get additional financial support for research.



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**On market since:** -

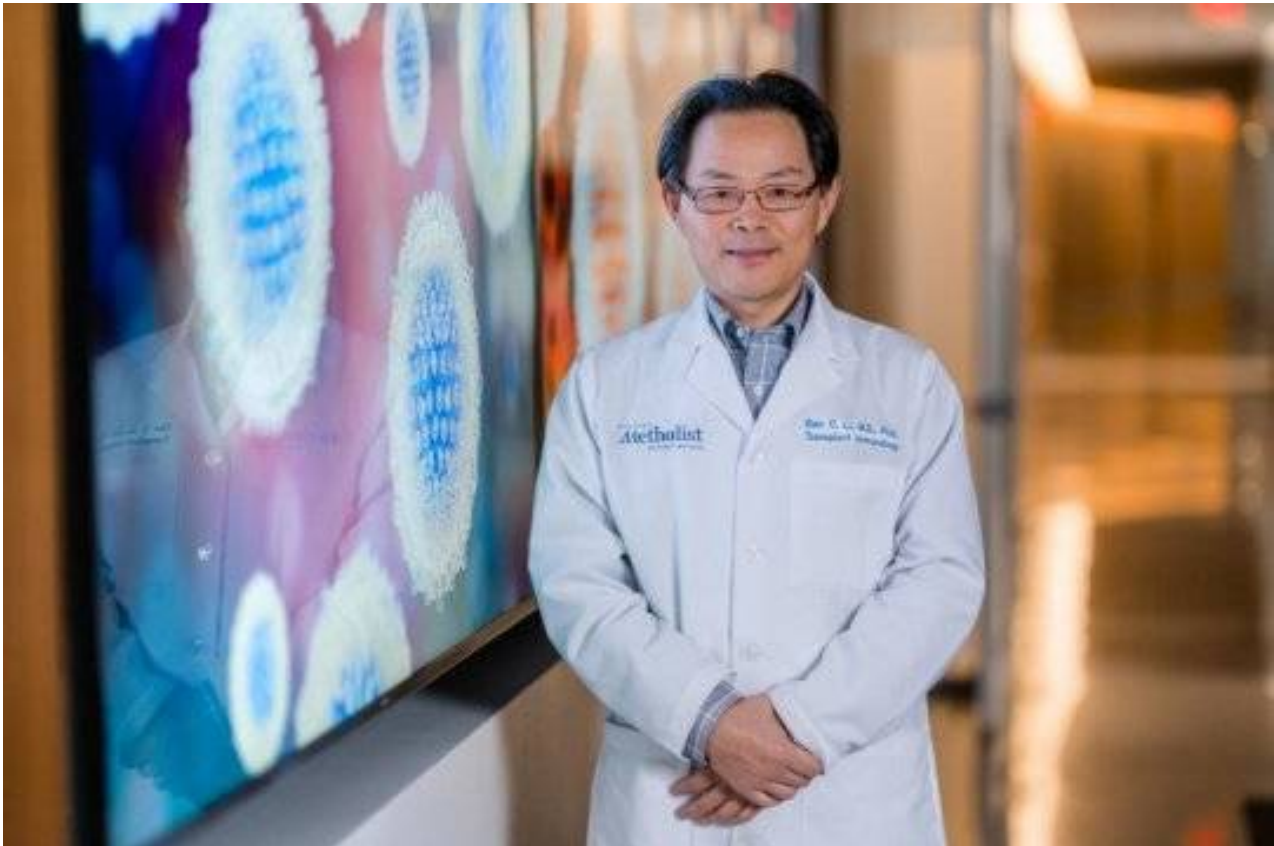
**Source links:** [Max-Planck-Gesellschaft](#)



## ASTHMA ATTACKS RESEARCH COULD CHANGE THE LIVES OF THE 300 MILLION PEOPLE

The technology which will lead to improved medication in the treatment of asthma is being developed by researchers at Houston Methodist Research Institute. Led by Xian C. Li, M.D., Ph.D., and his colleagues in the Immunobiology and Transplant Science Center at the Houston Methodist Research Institute are hopeful their discovery will lead to a new class of drugs for asthma that is more effective and radically different from the steroids currently used to treat it.

Scientists believe that they found the answer to the question of the origin of asthma. They figured out a mechanism that triggers the production of the mucin protein, responsible for exacerbating this airway disease, which affects 300 million people around the world and the number of sick people increases constantly. Scientists until this time knew that too much protein called mucin causes the lungs to close, causing an asthma attack, but why it happens science did not know. However, researchers from [the Houston Scientific and Methodological Institute](#) believe that the answer lies in how two molecules interact.



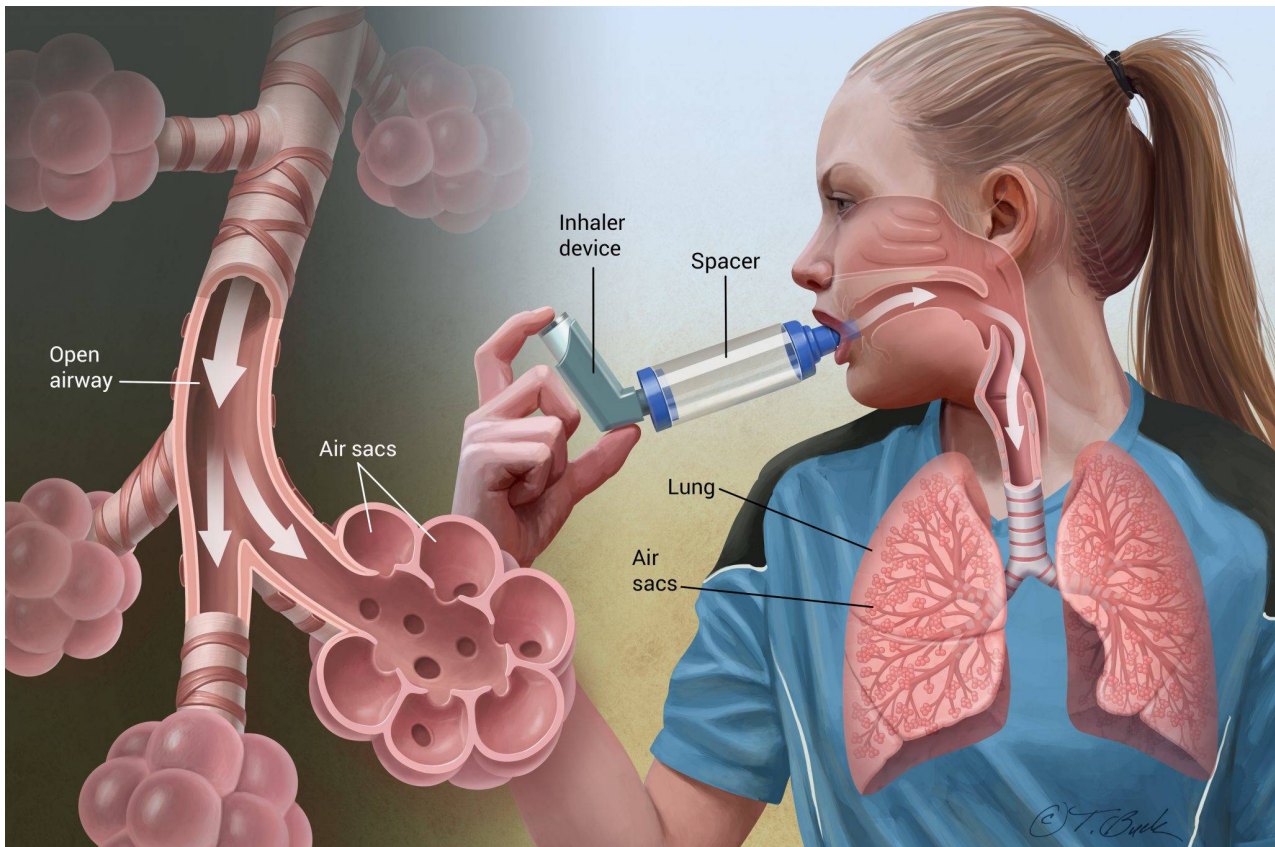
Dr. Xian C. Li, the director of the Immunobiology & Transplant Science Center at Houston Methodist Research Institute

source - houstonmethodist.org

Cells of the immune system, T-helpers, are able to recognize and fight with toxins, secreting interleukin 9 (IL-9). However, when they become hyperactive, as in the case of asthma, they produce an OX40 molecule, which starts the production of IL-9 in too much. This, in turn, leads to the production of a large volume of mucin, which reduces the flow of air, causing shortness of breath.

According to [Dr. Xian C. Li](#), the director of the Immunobiology & Transplant Science Center at Houston Methodist Research Institute, in fact, OX40 activates the IL-9 gene in T-

helper cells, leading to overproduction of IL-9 through the powerful molecular mechanisms of super-enhancers that regulate gene expression. Super-amplifiers are DNA sections that decide which genes should be activated. Using chemical inhibitors, researchers were able to block their action and, thereby, prevent the production of mucin. Dr. Xian C. Li believes if scientists succeed in developing better and more effective drugs for selectively stopping the work of superamplifiers, asthmatic patients will forget what dyspnea is.



Researchers hope that their discovery will help asthmatic patients to breathe again and feel healthy  
source - [houstonmethodist.org](http://houstonmethodist.org)

Researchers hope that their discovery will help asthmatic patients to breathe again and feel healthy. Now scientists are working on the possibility of preventing the formation of protein in the initial stages. Understanding the mechanisms of increasing mucin, their research has the potential to develop a new class of drugs for the treatment of asthma. Dr. Xian C. Li tells that finding new approaches to targeted and block supercells can be a new way to treat asthma patients who are likely to be more effective than the standard of care that is now steroids. **The study was funded by two National Institutes of Health. In spite of that, scientists hope for financial support for their research.**

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**Source links:** [Houston Methodist Research Institute](#)



## LYNDRA FORMULATIONS TRANSFORM THE DAILY PILL INTO A WEEKLY OR MONTHLY DOSE

The technology, which transforms daily pills into weekly treatments was developed by Lyndra Company. The co-founders of the company are Dr. Robert Langer is the David H. Koch Institute Professor at Massachusetts Institute of Technology; Dr. Gio Traverso is an Assistant Professor of Medicine and Associate Physician in the Division of Gastroenterology, Brigham and Women's Hospital (BWH), Harvard Medical School; and Amy Schulman is a co-founder and Chief Executive Officer of Lyndra, Inc.



Millions of patients worldwide depend on pills. Because of certain diseases, people are forced to take pills every day or even several times a day. This is a big burden for patients, as this requires constant attention and monitoring to ensure safe taking of medications. However, daily intake of tablets may soon remain in the past. At least, so believe co-founders of [the Lyndra Company](#), which has developed technology that allows you to extend the duration of the drugs and reduce the frequency of their intake to once a week.



Lyndra scientists are striving to radically change people's attitude to medicine due to the development of oral, ultra-long-term, sustainable methods of treatment  
source - <https://www.lyndra.com>

**Amy Shulman**, CEO of Lyndra, believes that in the future we will stop taking pills daily. Instead of this, it will be enough to take the medicine once a week. In addition to simple convenience, this will help patients who forget to take medicines. According to statistics in the United States, **approximately 50% of all patients do not adhere to their prescriptions**. This, in turn, leads to a deterioration in health and increased hospitalization. Such forgetfulness can be critical for the treatment of various diseases, including HIV. According to some estimates, **about \$ 100 billion is spent annually in the United States** to combat the consequences of late taking medications. The situation in developing countries is even more difficult.

The human gastrointestinal system digests and removes substances for 12-24 hours, only for 2-6 hours in the upper GI, where the optimal absorption of the drug occurs. To date, no existing oral delivery system has been able to achieve therapeutic serum levels for small

molecules in 24 hours.



The Lyndra Company has developed technology that allows you to extend the duration of the drugs and reduce the frequency of their intake to once a week

source - <https://www.lyndra.com>

**Lyndra scientists** are striving to radically change people's attitude to medicine due to the development of oral, ultra-long-term, sustainable methods of treatment. Lyndra's preparations turn a daily tablet into a weekly or monthly dose, promising to improve patient adherence and to optimize the pharmacokinetic profile of the dosage form. According to Amy Shulman, she imagines a world where children will be amazed that adults once took pills every day. Moreover, for them, it will be unthinkable, just like the fact that before there were no computers and telephones.

The pill, developed by Lyndra Company to solve this problem, looks quite normal. However, in the stomach the membrane dissolves, releasing the capsule in the form of a six-pointed star. Each corner of the star contains a dose of the drug that opens at the right time. Scientists conducted the research and proved that the method allows experimental animals to a weekly intake of diseases medications instead of daily. Currently, the founders of the spinoff intend to examine how effective these capsules will be in case of

Alzheimer's disease, behavioral disorders, as well as diabetes and cardiovascular diseases.

Lyndra Company was founded in 2016 after [the Gates Foundation](#) awarded a grant to the Professor of [the Massachusetts Institute of Technology](#), Robert Langer, to develop a long-term treatment for malaria. In 2017, [the company raised \\$ 23 million](#) to fund clinical trials.

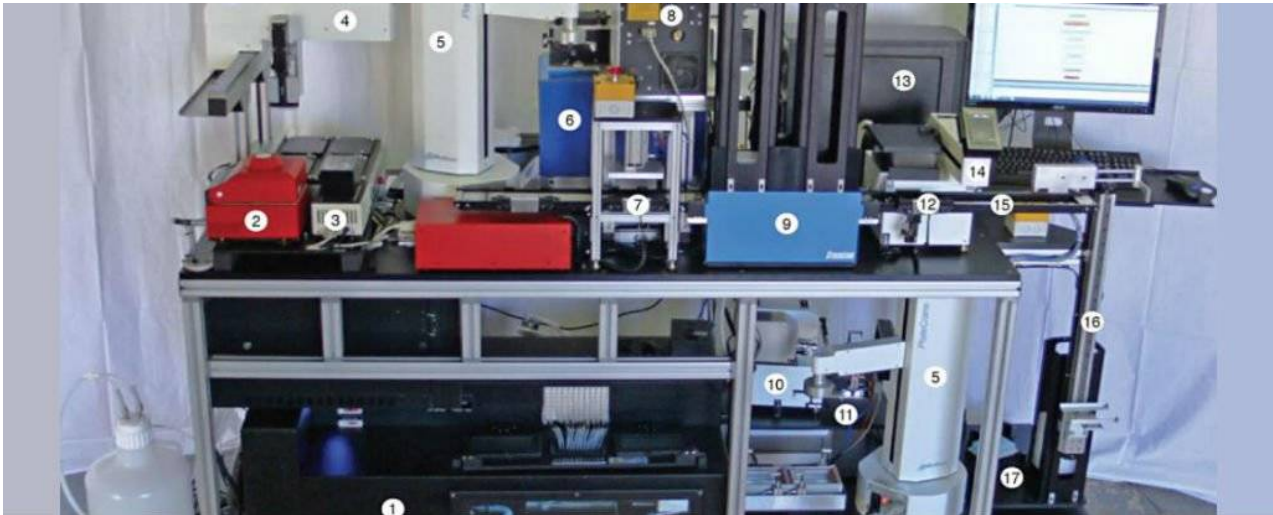
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Patent status: +  
On market since: 2016  
Source links: [Lyndra](#)



## NEW SPECIES OF BACTERIA FROM SCRATCH IN THE LAB

The machine for printing synthetic life forms was created by biologist Craig Venter of J. Craig Venter Institute. In 2016, biologist and geneticist John Craig Venter created in his laboratory a living bacterium, the simplest genetic form of life. He did this with the help of chemical synthesis of an artificial modeled genome. Now he assembled the world's first prototype bacterial printer. This mechanism is capable of printing these synthetic life forms on demand.

The Venter's machine works the same as a normal 3D printer. The scientist loads the genome design into it and replaces the ink with the main chemical compounds of DNA, namely guanine, thymine, cytosine and adenine (G, T, C, and A). By means of remote control, **the printer generates various biological components**. According to **Craig Venter**, the printer also needs tapes, but instead of paints, there are bottles of chemicals. He is able to collect complex biological forms in the same way as cells of our body on a much smaller scale.

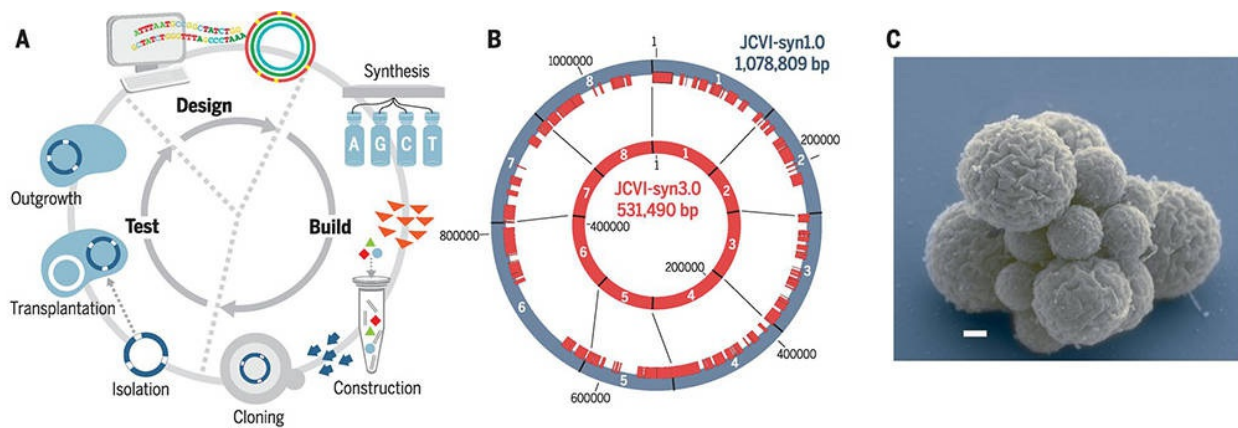


The machine which prints synthetic life forms  
source - [jcv.org/home](http://jcv.org/home)

The scientist has been working on this prototype for several years. However, **a new study shows that the new technology has huge opportunities**. This mechanism can create constituent elements of DNA templates, print RNA molecules (ribonucleic acid), proteins and other important bacterial particles. In particular, he was able to reconstruct the particles of the influenza virus and bacteriophages, which can fight bacterial infections.

**Venter's team also created a bacterium using only 437 genes**, which is a record low number. The shortest genome for an independent life consists of 525 genes and is found in the mycoplasma bacteria genitalia. In the process of synthesizing, a scientist must combine genetic information at his own discretion. In many respects it resembles genetic engineering, but with the difference that here the goal is to cut off all unnecessary without changing or adding anything to the genome of the organism.





Venter's team created a bacterium using only 437 genes  
 source - [jcvl.org/home](http://jcvl.org/home)

As a result, the smallest of the registered genomes in the cell, able to live and share, has turned out. It consists of 437 genes, each of which is necessary to maintain life, growth, and reproduction. It is curious that about a third of these genes have an unknown biological function. According to [Craig Venter](#), scientists discussed the philosophy of these differences in the genome and came to the conclusion that the only way to answer basic questions about life is to get a minimal genome, and the only way to do this is to try to synthesize it. [The discovery can shed light on the fundamental issues of the development of biological organisms.](#)

[In the future, such a printer can learn to print food, vaccines and basic life forms](#), which in the opinion of the scientist can come in handy when colonizing Mars. Thus, it will be possible not to send a person to the Red Planet, but to colonize it remotely. To do this, it is enough to send the Venter's apparatus filled with ink, and send it to the radio wave design of the genome. The idea was very interesting to [Elon Musk](#), and he agreed to work on this together with Venter. According to the scientist, this is another possibility of using this mechanism. This technology is called 'biological teleportation'.

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Patent status: -  
On market since: -  
Source links: [J. Craig Venter Institute](#)

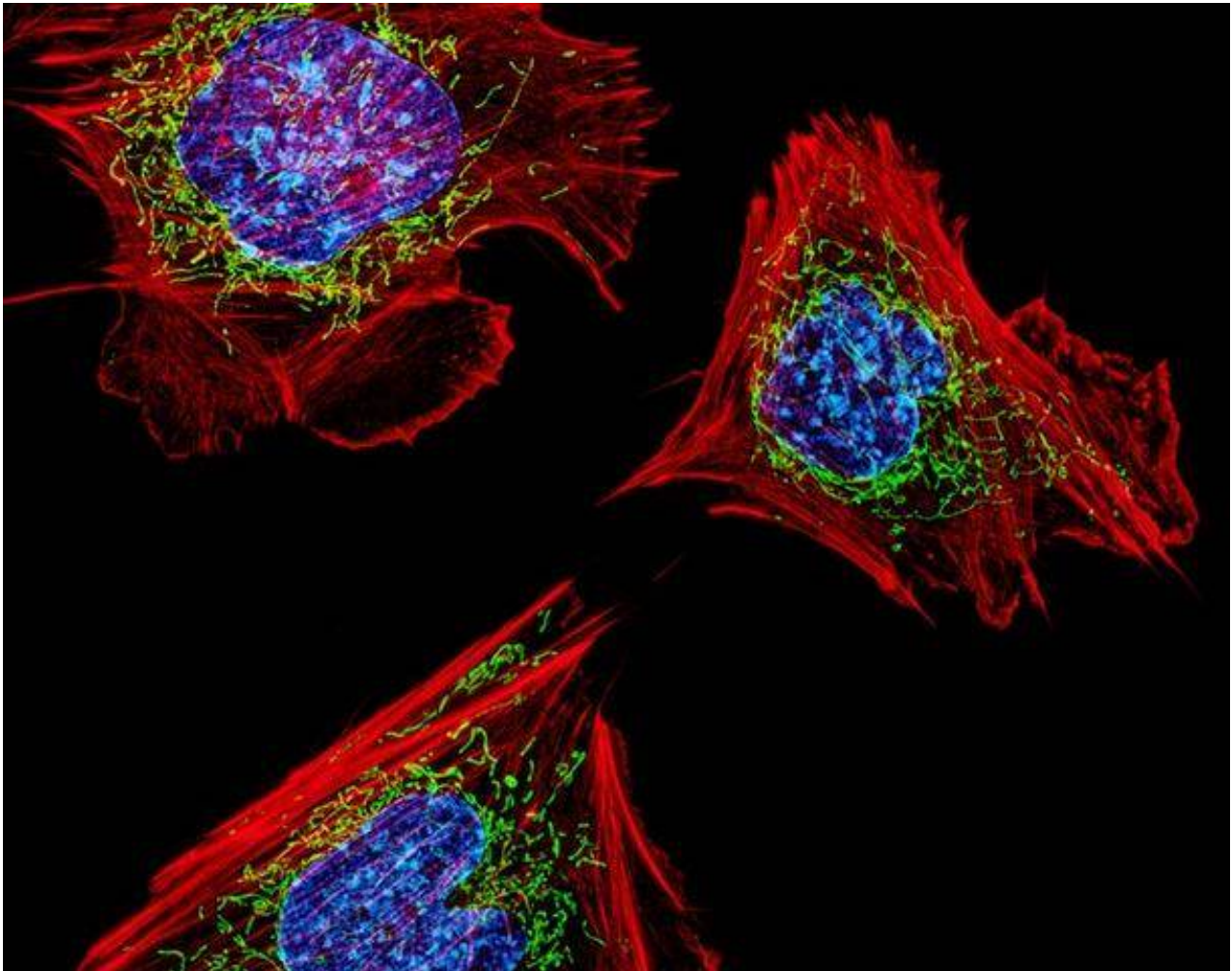


## MANIPULATING MITOCHONDRIA CELLS REDUCE DEVELOPING AGE- RELATED DISEASES

The method of genetic correction of mitochondria for increasing life was developed by Harvard T.H. Chan School of Public Health. According to a new study by Harvard T.H., manipulating mitochondrial networks within cells can defeat aging and improve health. To do this, either eating restrictions or genetic manipulations are necessary.

Mitochondria are tiny 'batteries' inside our cells. According to one of the hypotheses, it is the disorders in their work that are caused by aging and age-related diseases.

Mitochondria are intracellular 'power stations' that form networks. These networks change shape in accordance with energy needs. With age, their plasticity decreases, but it was previously unclear what effect this has on metabolism and cellular functions. **Scientists from Harvard** managed to establish a causal relationship between the loss of flexibility of mitochondrial networks and aging, as well as age-related diseases.

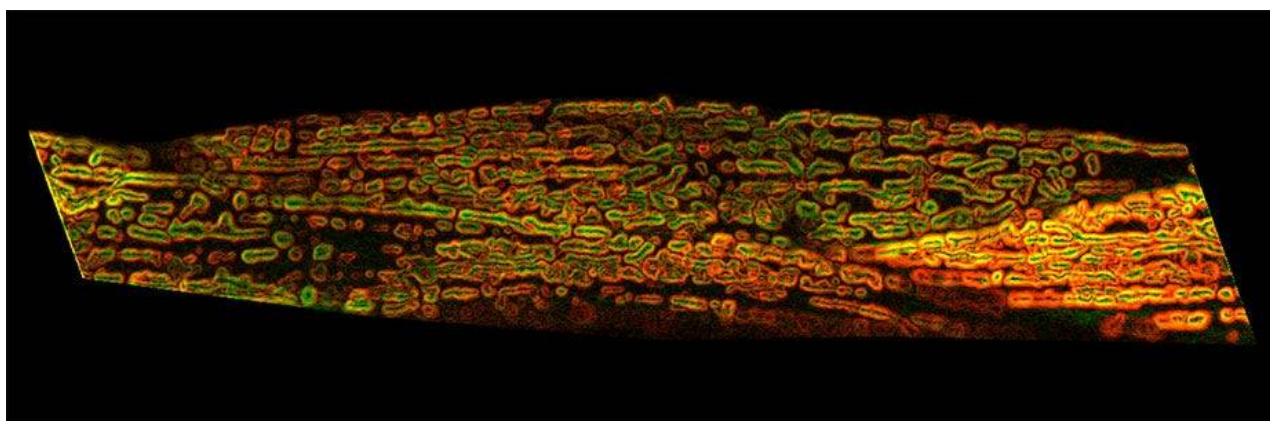


Mitochondria are intracellular 'power stations' that form networks  
source - [hsph.harvard.edu](http://hsph.harvard.edu)

As a model object, the famous nematode (roundworm) **Caenorhabditis elegans** was used. The lifespan of this species is only two weeks, which allows studying aging in real time in the laboratory. Mitochondrial networks inside cells switch between the two regimes, namely, they are either interconnected or exist in a fragmented state. The researchers found that limiting the diet of worms or imitating it through genetic manipulation of an energy-sensitive protein called **AMP-activated protein** kinase supported mitochondrial

networks in a connected or 'young' state. In addition, they found that connected networks increase life expectancy by interacting with peroxisomes, another kind of intracellular structures, to control the metabolism of fats.

According to [William Mair](#), associate professor of genetics and complex diseases at [Harvard Chan School](#) and senior author of the study, low-energy conditions, which consist of dietary food and intermittent fasting, have previously been demonstrated in order to promote healthy aging. The discovery of scientists demonstrates new opportunities for finding therapeutic strategies that will reduce the likelihood of developing age-related diseases.



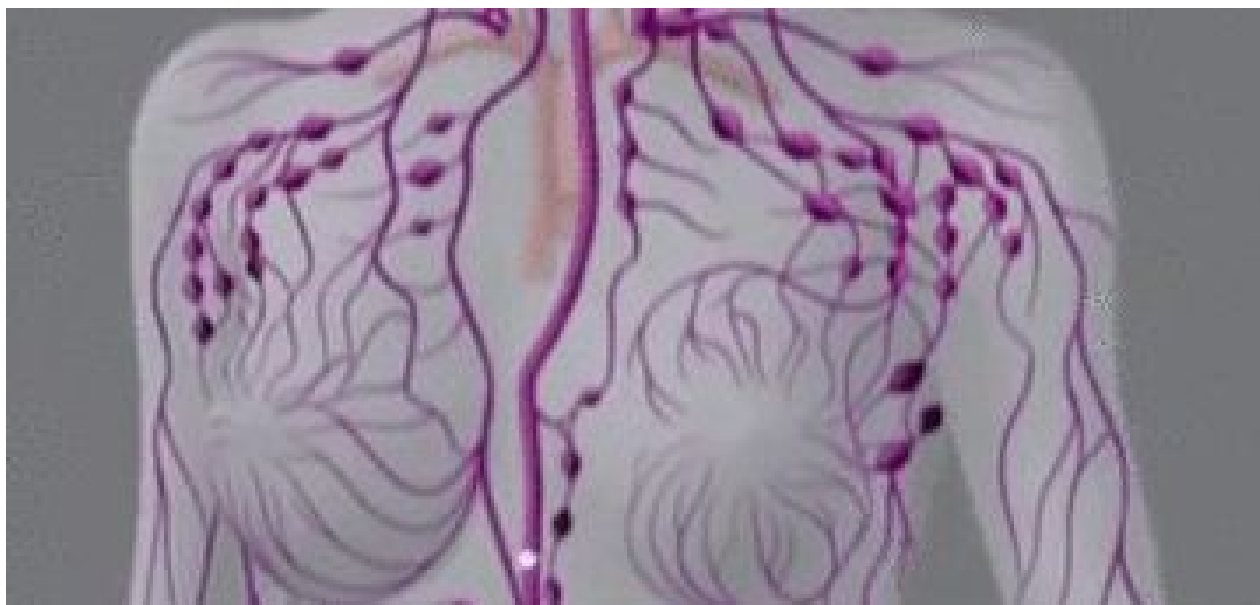
The discovery of scientists demonstrates new opportunities for finding therapeutic strategies  
source - [hsph.harvard.edu](https://hsph.harvard.edu)

It has already been shown that low-calorie diets and intermittent fasting provide protection against age-related diseases. Now scientists have managed to prove that at the heart of this effect is the preservation of the plasticity of mitochondrial networks. This is an important step in the search for therapeutic methods to combat old age. [In the future, researchers intend to test their findings on mammals](#) and understand whether a decrease in mitochondrial flexibility can explain the association between obesity and an increased risk of developing age-related diseases.

Funding for the study came from [the Lawrence Ellison Medical Foundation](#), [the Glenn Foundation for Medical Research](#), [the National Institutes of Health](#), and [the American Diabetes Association/Canadian Diabetes Association](#).

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**On market since:** -  
**Source links:** [Harvard T.H. Chan School of Public Health](#)

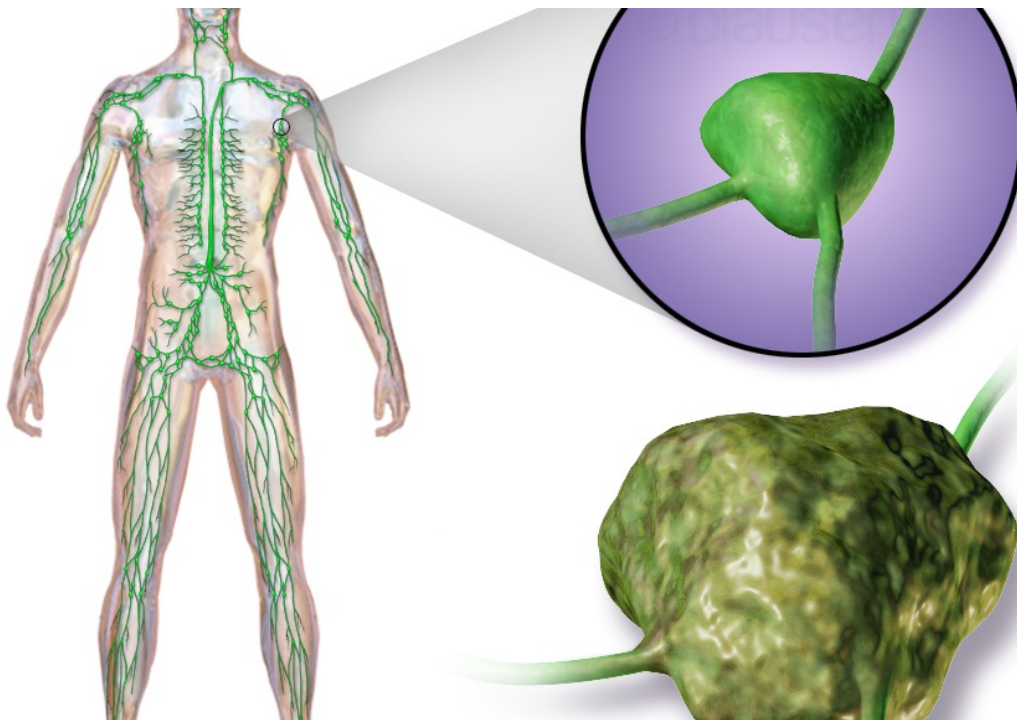




## KYMRIAH THERAPY TREATS PATIENTS WITH NON-HODGKIN'S LYMPHOMA

Treatment of cancer using genetically modified cells was confirmed by two independent groups of researchers. Both studies were conducted by Stephen J. Schuster, MD, from the Abramson Cancer Center and the Perelman School of Medicine at the University of Pennsylvania. The cause of cancer is genetic mutations in cells, so it is logical to deal with it using genetic methods of treatment. The results of studies demonstrated the effectiveness of therapy using genetically modified immune cells.

The focus of scientists was non-Hodgkin's lymphoma. This is a type of cancer of the lymphatic system. The most common form is recurrent diffuse B-large cell lymphoma, which is diagnosed annually in 56,000 Americans. Two-thirds of her cases are successfully treated with modern chemotherapy. If this does not help, doctors use chemotherapy at higher doses in combination with stem cell transplantation. Such an approach can lead to a long-term remission, but its success in a percentage ratio is very small. Another type of lymphoma is follicular. This type of cancer, even with modern treatment, in 20% of cases it causes a severe relapse for treatment.



The cause of cancer is genetic mutations in cells, so it is logical to deal with it using genetic methods of treatment  
source - med.upenn.edu

According to the authors of the study, patients with cancer who returned after several courses of intensive care can benefit from genetic editing. One method of genetic editing is the T-cell therapy using a chimeric antigen receptor (CAR). The technique is also known as [Kymriah™](#). Studies have demonstrated its high efficacy in the treatment of lymphomas and the ability to go out in long-term remission.

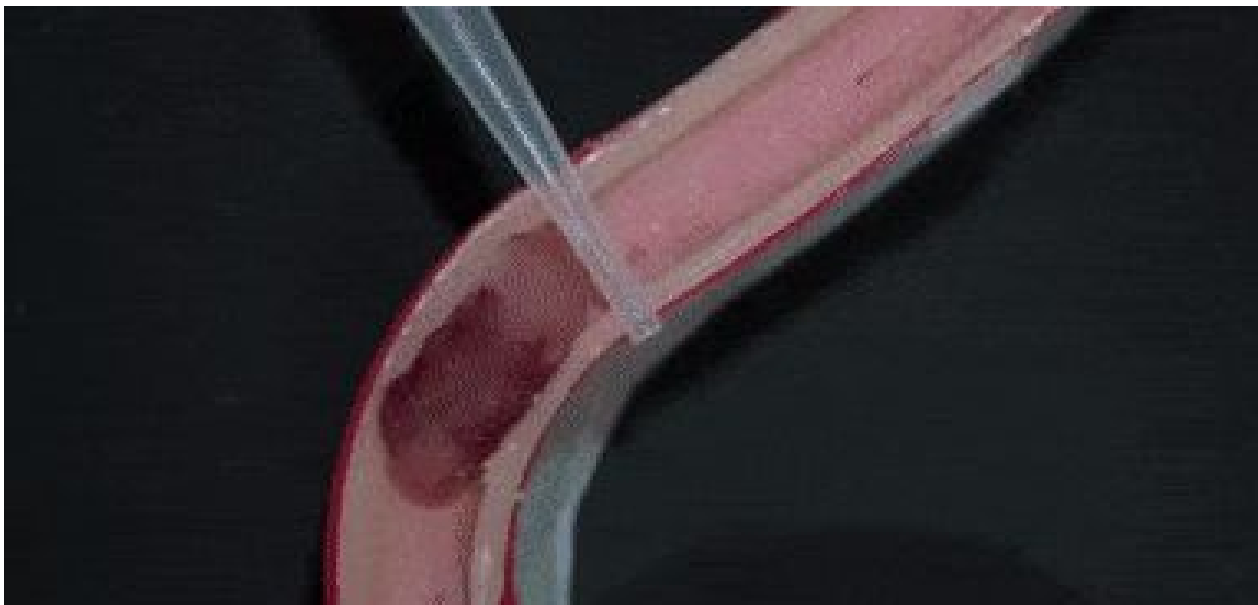
The method consists of collecting patient T-lymphocytes and reprogramming them for the search and destruction of malignant cells. They are then injected back into the body, multiplying and attacking the cancer cells, targeting the CD19 protein. Cells "hunters" can survive in the body for many years. The method has a number of shortcomings associated

with the mass destruction of malignant cells, the so-called cytokine release syndrome. It is characterized by influenza-like symptoms and may require additional help, but in general, it is relatively easy to solve.

During the study, 38% of patients with recurrent diffuse B-large-cell lymphoma showed a complete or partial response to treatment within 3 months. About 73% of patients within six months completely recovered from cancer. In total, 81 patients from all over the world participated in the experiment. The testing of gene therapy in the case of follicular lymphoma was also very effective: a total remission reached 71% of patients. In this case, it means complete recovery. Thus, the results from a global, multisite trial were presented at the 59th [American Society of Hematology Annual Meeting and Exposition in Atlanta](#).

According to [Stephen J. Schuster](#), the data from both studies show that the majority of patients who are in a state of remission within three months remain in a state of remission. The Kymriah™ method was approved by the FDA in August 2017 for the treatment of adult patients with relapses of acute lymphoblastic leukemia. He became the first method of genetic therapy, approved by the agency. The success of research gives hope that in the future this method will be extended to non-Hodgkin's lymphomas treatment. Both studies were supported by [Novartis](#). Research also have gotten grants from [the National Institutes of Health](#) and philanthropic support.

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**Patent status:** +  
**On market since:** -  
**Source links:** [University of Pennsylvania School of Medicine](#)



## ORIGAMI ROBOT FOR REMOVING EXTRANEOUS OBJECTS FROM STOMACH

The robot-capsule for removing a swallowed button battery or patch a wound was developed by Massachusetts Institute of Technology, Sheffield University and the Tokyo Institute of Technology. According to statistics of the USA, each year 3,500 button batteries are swallowed in the US. These batteries are usually digested, but if they come into prolonged contact with the tissue of the esophagus or stomach, they can trigger an electric current that produces hydroxide, which burns the tissue. Scientists are sure that the removal of swallowed button batteries and the treatment of subsequent wounds will be a convincing application of their origami robots.

A group of scientists conducted experiments with the tiny robot-capsule. The researchers created a model of the human esophagus and stomach and demonstrated how [the tiny robot origami can unfold from a swallowed capsule](#) and be controlled by external magnetic fields, crawl through the stomach wall to remove a swallowed button battery or cure a wound. This technology was presented at [the International Conference on Robotics and Automation](#). It is based on a long sequence of works on origami robots from the research team [Daniela Rus](#), [the Andrew and Erna Viterbi Professor in MIT's Department of Electrical Engineering and Computer Science](#).



Ingestible origami robot  
source - news.mit.edu

Scientists believe that the robot microsurgeon will be used for gastric mini-surgeries. The robot uses the so-called intermittent slip technique. The device is attached to the surface during movement and at the same time slides freely to change the distribution of its mass. The device consists of two layers of [Biolefin](#) structural material, between which is clamped the material, which decreases with heating. Since the stomach has many liquids, the robot is equipped with a mini fin.

Scientists conducted a large number of studies to create a biodegradable shrink film



called Biolefin. This film consists dried pig intestines, used in sausage casings. The mechanism resembles an accordion according to its structure and in its decomposed form is a small rectangle. The robot is embedded in a capsule with a digestible capsule and unfolds only when it enters the stomach. A small magnet in the body of the device allows controlling its movement.

Scientists used a model of the esophagus and stomach of silicone rubber. A mixture of water and lemon recreated the acid medium. All the mechanical properties of the robot in this environment are preserved. First, the device is created in order to extract small swallowed objects that are not always removed naturally and sometimes attach to the stomach wall, leading to the appearance of an ulcer.

**The main difficulty of the research is to make the origami robot biocompatible.**

Researchers have already demonstrated how the robot-capsule works. It works very simply. The scientists put it in a tiny ice capsule and sent it through the esophagus into the pig's stomach. As the ice capsule melts, the robot turns into action mode and begins to work, removing foreign objects from the body. **The next step is** that the researchers want to try out in vivo experiments, add sensors to the body, and redesign the robot so that it can move autonomously.

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**Patent status:** -  
**On market since:** -  
**Regions:** United States, United Kingdom, Japan  
**Industries:** Electronics  
**Source links:** [MIT news](#)



## **PAINKILLERS FROM SNAIL VENOM WILL BECOME THE ALTERNATIVE TO OPIOIDS**

Painkiller, which consists the snail poison, was developed by scientists at the University of Utah. Scientists believe that a small snail can become a substitute for opioids to relieve pain. According to the Centers for Disease Control and Prevention, 91 people die from an overdose every day from opioids. Therefore, the medical community is looking for other methods of treatment that would rule out the use of opioids for pain relief.

According to [Baldomero Olivera](#), Ph.D., professor in biology at [the University of Utah](#), nature has developed molecules that are extremely complex and can have unexpected applications. Scientists were interested in using poisons to understand the different ways in the nervous system.

A small sea shell conus regius is common in the Caribbean Sea, capable of paralyzing and killing prey by its own poison. [The substance Rg1A](#), which is part of the poison, acts as an analgesic, different from opioids. Based on the example of rodents, scientists have shown that Rg1A effectively blocks nicotinic acetylcholine receptors (nAChR), which ensure the transmission of a nerve impulse through synapses. They belong to a small group of non-opioid metabolic pathways that can help with chronic pain.



The substance Rg1A, which is part of the seashell's poison, acts as an analgesic, different from opioids  
source - [utah.edu](#)

It is curious that the action of the analgesic continues even after the substance leaves the body of the experimental rodent, that is, after 4 hours. According to [Michael McIntosh](#), MD, professor of psychiatry at the University of Utah, they found that the substance acted [72 hours after the injection](#), still blocking the pain. This duration indicates that the substance in the venom of the cochlea has a restoring effect, updating some components of the nervous system.

The main advantage of these results is the prevention pain aspect. Usually, **when chronic pain develops, it is difficult to treat. However, this compound offers a potential new way** to prevent the development of pain in the first place and offers new therapy to patients who have run out of options.

Testing a new drug showed that the action of RgIA is effective for rodents. However, the scientists wanted to make sure that they have a connection that will work for people. For this study, they applied synthetic chemistry to develop **20 analogs of the compound**. The RgIA key was the basis of the study, as it fits into the blockade of **the  $\alpha 9\alpha 10$  nAChR pain receptors**. Using this key, scientists have developed new analogs with slightly different configurations. As a result, the researchers found one key, most suitable for blocking. This key is an analog of **RgIA4**, tightly bound to the human receptor.

A team of scientists from the University of Utah believes that most of the medications available today work with a limited number of methods and are not sufficient to alleviate chronic pain. **RGIA4 works in a completely new way and this opens up new possibilities for the treatment of pain**. They believe that drugs that work along this pathway can reduce the burden on the use of opioids. Scientists moved on to the next step of preclinical trials to study the safety and efficacy of a new type of analgesic.

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**Patent status:** -  
**On market since:** -  
**Regions:** United States  
**Industries:** Healthcare, Biotechnology  
**Source links:** [the University of Utah](#)





## NEW IMMUNOTHERAPY THERAPY FOR CURING FOOD ALLERGIES

Effective technology for the treatment of food allergy was developed by a group of Canadian researchers from the University of Saskatchewan. Today, the world has a very large number of people with allergies. These people voluntarily offer their own cells so that scientists can use them in laboratory tests to advance this research. Thanks to this, scientists managed to develop an effective method of treating food allergies. Already after one application of the drug, anaphylactic reaction to the allergen is reduced by 90%.

The researchers conducted tests on mice that had an artificially developed allergy to peanuts and eggs, and as a result, it was possible to reduce the allergic reaction by 90%. The technology of immunotherapy, developed by scientists, includes the creation of a new type of immune cell, which then naturally develops in the body and sends signals warning the hyperimmune reaction to the allergen. This technology was approved in Canada.



The technology of immunotherapy includes the creation of a new type of immune cell, which then naturally develops in the body and sends signals warning the hyperimmune reaction to the allergen  
source -usask.ca

According to scientists, if they can prevent food allergies or related conditions, such as asthma or autoimmune diseases such as multiple sclerosis, with this new therapy, this will change the lives of many people with allergic diseases. About 3 million Canadians independently report the presence of at least one food allergy. Moreover, every year this number is increasing. For example, a disease such as anaphylaxis is a severe agonistic response of a rapid onset, can be life-threatening, and there are very few methods of treatment.

To solve this problem, scientists came up with the creation of a type of natural immune cell. These cells send a signal to cancel the hyperimmune response present in allergic reactions. This signal causes another 'switched off switch', which turns off the reactive cells further along the allergic pathway.

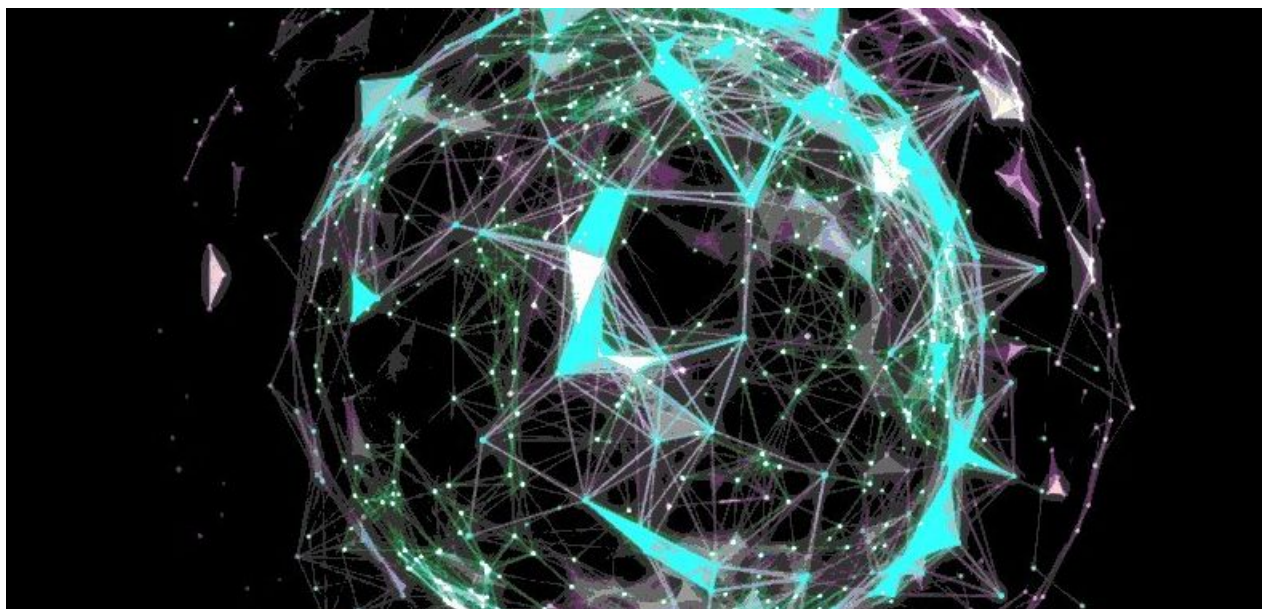


The new food allergy drug will be available to consumers in about ten years  
source -usask.ca

[John Gordon and his team](#) plan to work with fellow [AllerGen](#) researchers at the US, [McGill University](#), [Queen's University](#), [McMaster University](#) and [the University of Alberta](#) to pilot new technology. According to scientists, [this discovery portends a serious breakthrough to a therapeutic change in the sensitivity of food allergens](#). Since the treatment prevents anaphylactic reactions in previously sensitive mice, opening the door to transfer this therapy to the clinic. Scientists also predict that in the future they will be able to eliminate asthma in affected mice in just eight weeks.

The first tests on humans, scientists plan to start at the beginning of [2018](#). John Gordon, the lead scientist, predicts that the new drug will be available to consumers in about ten years. The scientist and his team are not going to stop on the achieved results. They want to find the keys to the treatment of not only allergic diseases, including asthma but also to other autoimmune diseases.

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**On market since:** -  
**Regions:** United States  
**Industries:** Healthcare  
**Source links:** [The University of Saskatchewan](#)

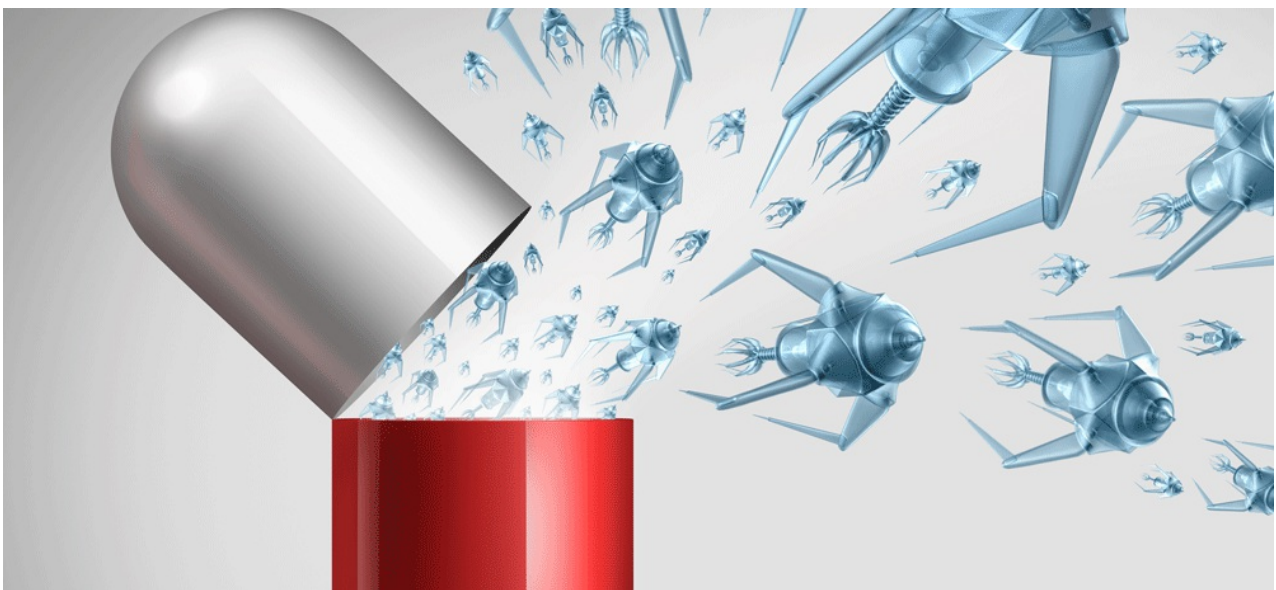


## THE NANO-DRUG FOR THE LIVER CANCER

Nanoparticle from liver cancer was developed by scientists from the Southwestern Medical Center at the University of Texas. Scientists synthesized nanoparticles for the treatment of cancer-affected liver. Among cancer diseases, it is the main cause of death of patients. The treatment of liver cancer at a late stage is a serious problem for therapeutic intervention. Usually, drugs that show positive results in a healthy functioning liver can lead to devastating toxicity in the cirrhotic liver with cancer.



Scientists created synthetic 'dendrimer' nanoparticles in order to solve this problem. They are able to provide a tumor-suppressing effect without destroying the liver or adjacent tissue. According to Dr. Daniel Siegwart, associate professor of the biochemistry department at [the University Oncology Center](#), they synthesized highly effective 'dendritic' nanoparticles capable of creating a tumor-suppressing effect without side effects, even when the liver is completely affected by the tumor. They also found that to obtain effective results, it is necessary to combine a small RNA preparation that can suppress cancer growth in the carrier, thereby solving the critical problem in the treatment of aggressive liver cancer and providing guidance for future drug development.



Nano-drugs are able to provide a tumor-suppressing effect without destroying the liver or adjacent tissue  
source -utsouthwestern.edu

Initially, liver cancer is a chronic consequence of liver disease and eventually becomes the leading cause of death from cancer and a serious global health problem. According to the CDC, **28,000 cases of liver cancer are diagnosed every year in the United States**, and **the percentage of survivors is only 17%**. These numbers are gradually growing.

Scientists have long developed non-toxic carriers and miRNA therapy. **MiRNAs** are short nucleic acids. They can function as natural tumor suppressors, but they require delivery strategies to transfer these large anionic drugs to the cells. The problem is that none of the existing carriers can provide an effective delivery to the late stage of liver cancer without increased toxicity, which negates the desired effect. Therefore, scientists from the Southwestern Medical Center at the University of Texas chemically synthesized more than **1500 different types of nanoparticles**, which made it possible to detect lead compounds



that could function in a highly compromised cancerous liver. Synthetic, artificial nano-sized compounds, called dendrimers, have made it possible to screen various combinations of chemical groups, physical properties, and molecular size. This approach led to the identification of dendrimers for the delivery of miRNA to the late stages of liver tumors with low liver toxicity.



Scientists created synthetic 'dendrimer' nanoparticles  
source -utsouthwestern.edu

**Scientists have already conducted a study.** They used mice with a highly aggressive form of liver cancer. The results showed that miRNA nanoparticles inhibit tumor growth and dramatically increase survival.

At the moment, scientists apply a chemical approach to materials to solve problems in cancer therapy and diagnosis. Currently, the laboratory focuses on developing advanced materials for the effective implementation of strategies for siRNA, miRNA, mRNA, and CRISPR to manipulate gene expression in tumors and to develop next-generation cancer treatments. [Institute for the Prevention of Cancer and Research of Texas \(CPRIT\)](#), [the Welsh Foundation](#), [the American Cancer Society](#) and [the Mary Kay Foundation](#) have supported this study.

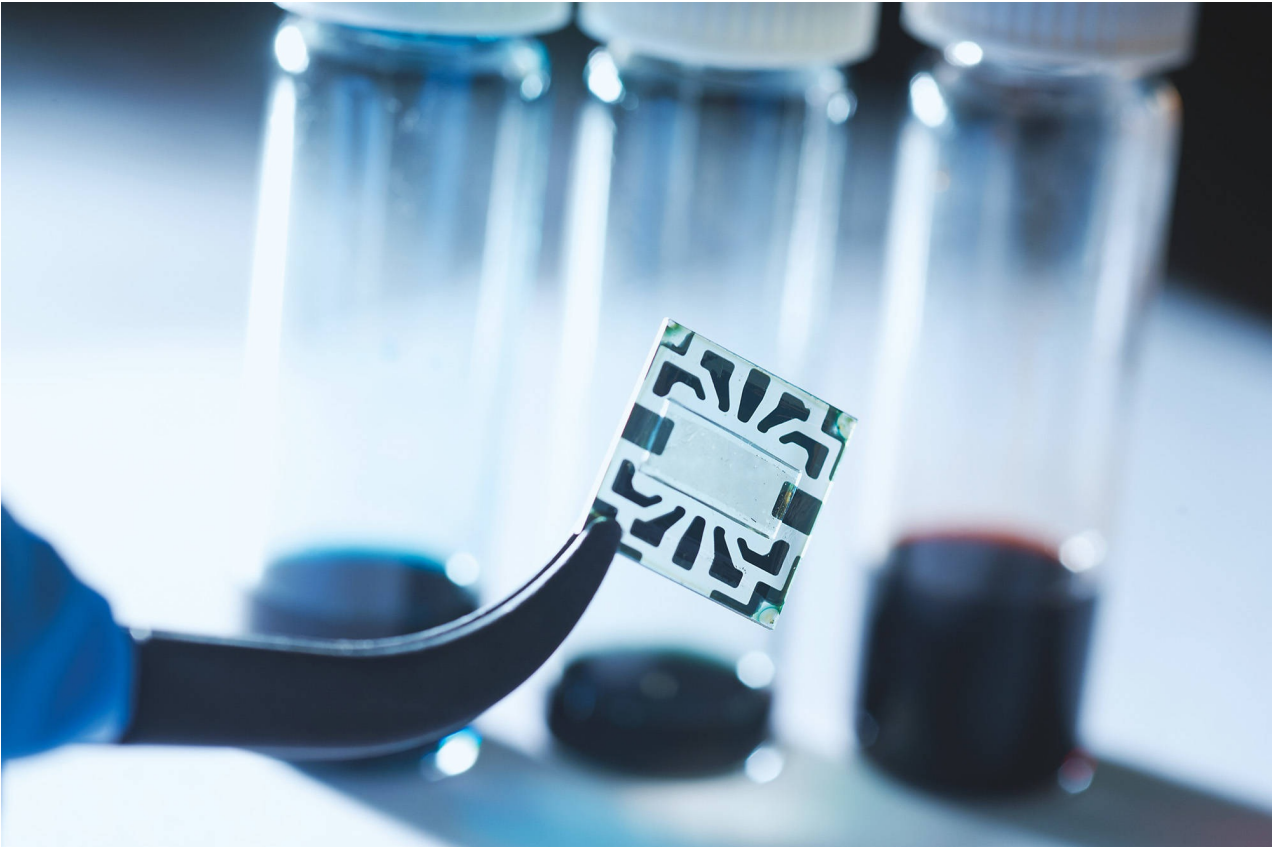
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**Industries:** Healthcare  
**Source links:** [the University of Texas](#)



## **SOLAR PHOTOCELLS WHICH ARE THINNER THAN HAIR AND LIGHTER THAN A SOAP BUBBLE**

The thinnest and almost weightless photocells were created by the Massachusetts Institute of Technology. American scientists have created such compact photocells that they can be attached to clothing, a sheet of paper or even to the wall of a soap bubble. Traditionally, solar photocells are created from separate layers of photovoltaic materials, which are superimposed on a special substrate of glass or plastic.

Scientists from [MIT](#) decided to change the production technology and combined all three components of the solar battery (photocell, supporting substrate and protective coating). Combining the process makes production more accurate - the substrate does not get dust and other contaminants, which significantly increases the productivity of the photocell.



Scientists combined all three components of the solar battery (photocell, supporting substrate and protective coating)

source - [news.mit.edu](https://news.mit.edu)

The substrate and coating were made of a parylene film, and the light-absorbing component was made from dibutyl phthalate. Parylene is a commercially available plastic coating used widely to protect implanted biomedical devices and printed circuit boards from environmental damage. The entire process takes place in a vacuum chamber at room temperature and without the use of any solvents, unlike conventional solar-cell manufacturing, which requires high temperatures and harsh chemicals. In this case, both the substrate and the solar cell are 'grown' using established vapor deposition techniques.

The team emphasizes that these particular choices of materials were just examples and that it is the in-line substrate **manufacturing process that is the key innovation**. The researchers consider that other materials will be used for this method, including

perovskite film, which increases the efficiency of solar panels. In this case, the resulting solar cells can be applied to any surface, including tissue and paper.

The thickness of the resulting solar cell was **1/50 of the thickness of the human hair**. To demonstrate this figure, scientists placed the solar cell on the wall of the soap bubble. The lightweight of the solar plates also benefits them. Specific power per unit mass is quite high and is 6 watts per gram, which is 400 times higher than the value of solar cells based on silicone.

So far, the finest elements have been created only in the laboratory, that's why mass production will take a lot of time. According to professor Vladimir Bulović, one of the study's leaders, while the solar cell in this demonstration device is not especially efficient, because of its low weight, its power-to-weight ratio is among the highest ever achieved. That is important for applications where weight is important, such as on spacecraft or on high-altitude helium balloons used for research. The work was supported by [the Eni-MIT Solar Frontiers Center](#) and [the National Science Foundation](#).

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**Regions:** United States

**Industries:** Electronics

**Source links:** [MIT news](#)



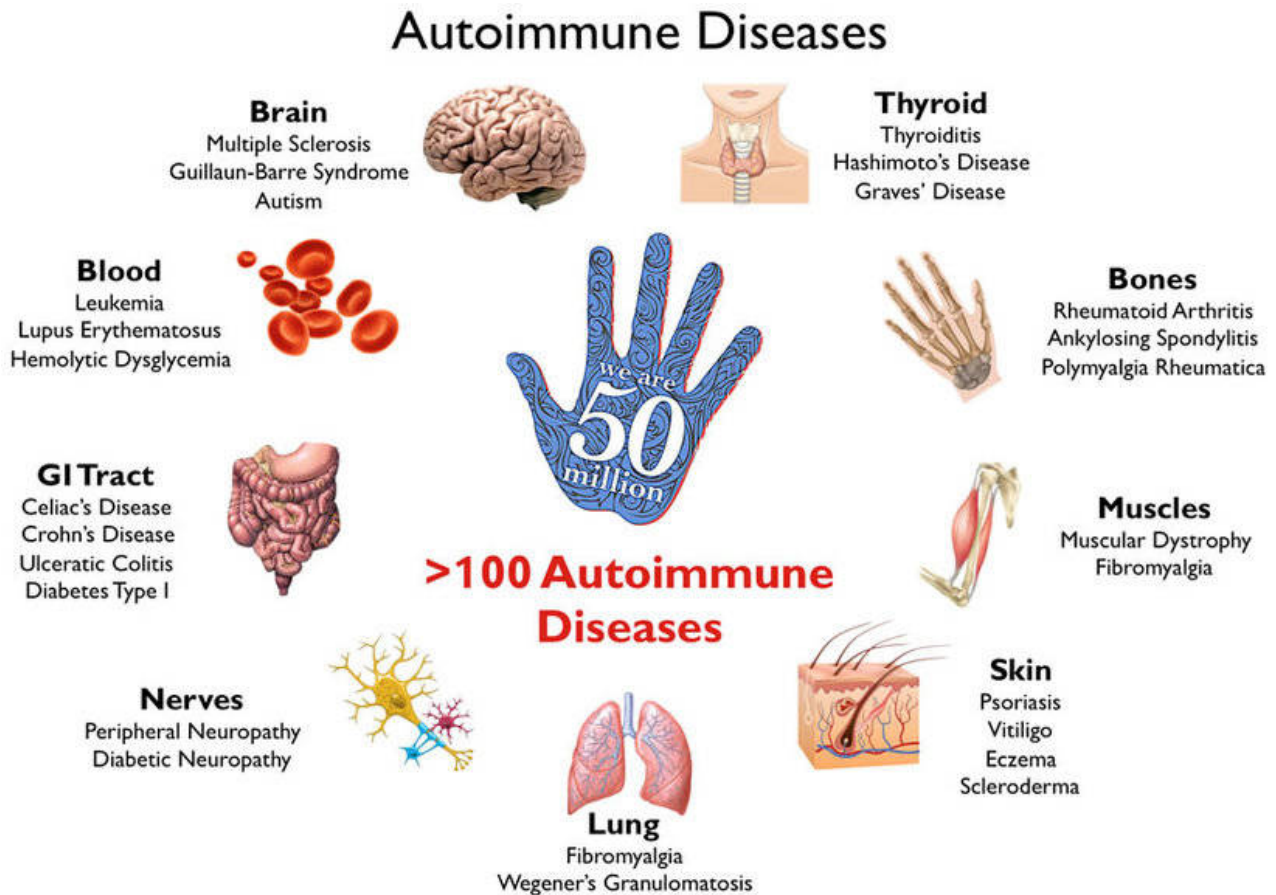


## SCIENTISTS HAVE FOUND THE CAUSE OF IMMUNE DISEASES

The mechanism that causes autoimmune diseases was discovered by researchers at Monash University in Australia. Studies at the Institute of Inflammatory Diseases at Monash University cover the basic experimental biology, clinical research and clinical practice in inflammatory diseases. Scientists of this University for the first time demonstrated the cause of the occurrence of immune diseases.

Our immune system is able to protect us from foreign invaders, as it learns to recognize various infections over time. However, sometimes an immune system works wrong, and it recognizes parts of our own body as foreign. This leads to autoimmune diseases.

**Autoimmune diseases** are associated with impaired immune system functions in the body, which incorrectly identifies healthy cells and attacks them, causing inflammation. For example, in type 1 diabetes, the immune system attacks cells that produce insulin, and with rheumatoid arthritis attacks the joints.

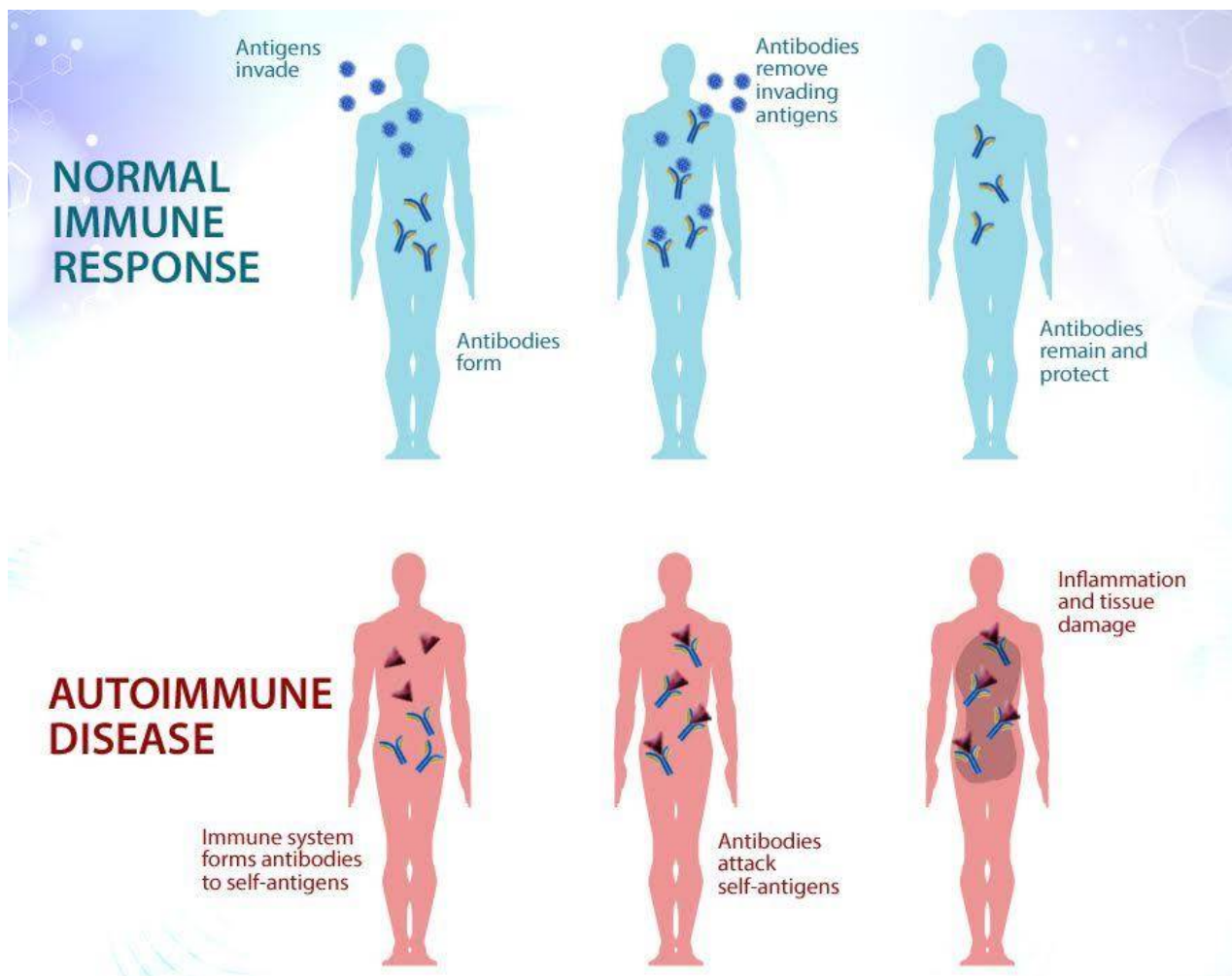


Sometimes an immune system works wrong, and it recognizes parts of our own body as foreign source - monash.edu

**Over 50 million Americans** suffer from autoimmune diseases, and science has not yet understood to the end their origin. Autoimmune diseases affect more than 1 million Australians, and in the Western world - one of the main causes of death in women under the age of 65 years. These diseases include type 1 diabetes, multiple sclerosis, Crohn's disease, ulcerative colitis, rheumatoid arthritis and several types of kidney disease.

According to **Professor Richard Kitching**, one of the researchers, they know that in autoimmune diseases there are T cells that are immune response regulators and that

make us susceptible to disease, and T cells that protect us from the disease. He suggests that their team of scientists has understood how autoimmune diseases develop.



Autoimmune diseases are associated with impaired immune system functions in the body, which incorrectly identifies healthy cells and attacks them, causing inflammation  
source - monash.edu

In the course of the study, an important interaction between the two genes was found.

They help the immune T cells to transmit the correct protective signals, which prevent their attack on the cells of the body. It is about the human leukocyte antigen (HLA), a gene system that helps the immune system. Some HLA molecules located on the surface of T cells are associated with an increased risk of autoimmune diseases, for example, DR15 or HLA-DR1, while other types protect against them. What scientists still did not know is how the mechanism of these molecules works and why they actually behave in this way.

Professor Richard Kitching believes that DR15 molecule is capable of instructing T cells to attack tissues, but if the protective DR1 molecule is present in the body, these T cells can be driven away. Australian researchers got these results on the example of experimental

mice. If scientists can stimulate the growth of these molecules or learn how to grow them outside the body and inject them, this will be a significant step in the treatment of autoimmune diseases.

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**Industries:** Healthcare



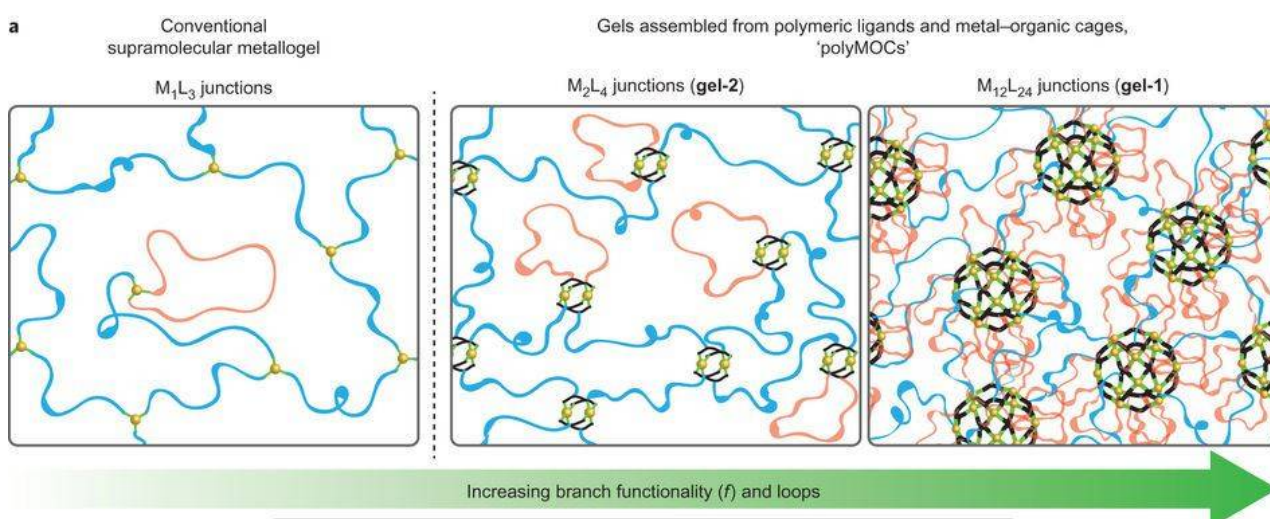
## POLYMOC IS THE GEL WHICH HAS A HARDNESS OF METAL

A substance combining the flexibility of polymer gels with a solid metal structure was developed by chemists from the Massachusetts Institute of Technology. The new substance is called polyMOC and consists of two materials - metal halide and metal organic lattices. Metallogalli, consisting of metal bonds with polymer chains, are similar to conventional polymer gels in softness and elasticity. Metal-organic lattices (MOC), on the other hand, have a rigid structure and tend to form crystalline materials.



Scientists in their research have tried to make a class of materials that have well-defined, self-organizing MOC structures, and also has viscoelastic properties of the polymer gel. The metal-supramolecular assembly technology was used to create this substance. This technology makes it possible to create three-dimensional forms by mixing polymers attached to molecules called ligands. In this case, scientists used a ligand consisting of two groups of pyridines, each of which could be joined to a metal palladium. In addition, each palladium atom could form bonds with four other ligand molecules, creating a strong cell structure.

Of the 24 chains of polymers, only 4 or 5 are connected to other metal lattices, the others are twisted into a loop and connected to their own grating. Previously, this was considered a defect, but the team from [MIT](#) saw here the opportunity to expand the capabilities of the material, replacing some ligands with new molecules.

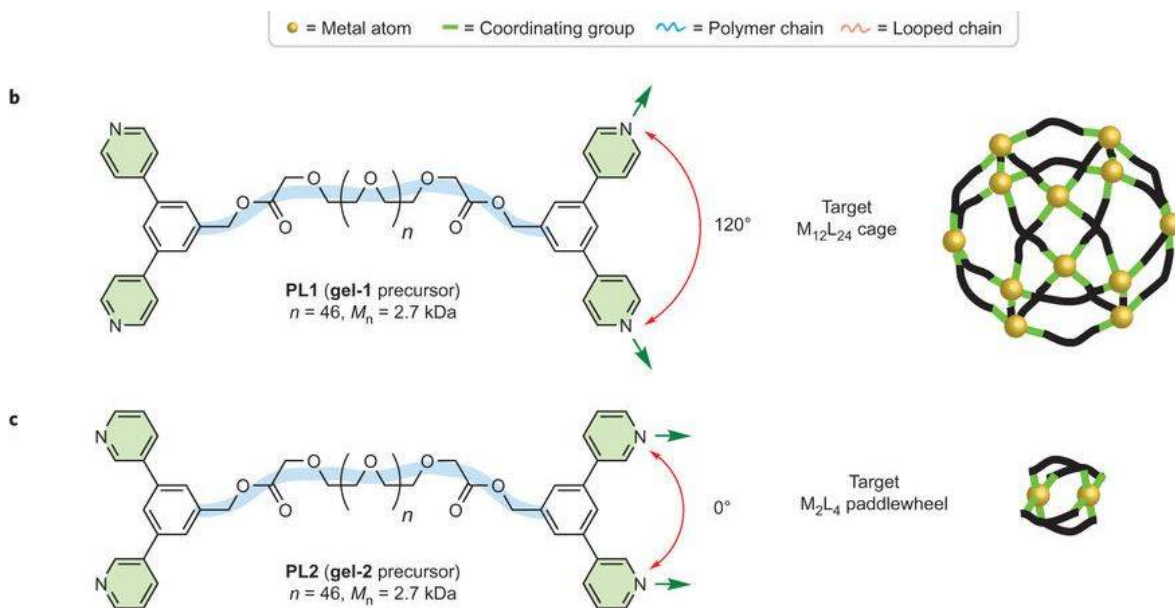


PolyMOC combines the flexibility of polymer gels with a solid metal structure  
source - [chemistry.mit.edu](http://chemistry.mit.edu)

According to Associate [Professor Jeremiah Johnson](#), one of the co-authors of the project, this technology is universal enough that it can be used to create other substances with different properties. [The scope of their application can be different - pharmacology, engineering, water treatment.](#) Such gels can be used to deliver drugs, creating them to store drug molecules in metal cells. They can also be used to store gases, such as hydrogen, that can be useful for fuel cell vehicles. By adding ligands that can capture and release heavy metals, these gels can also be adapted to purify water.

The researchers added a fluorescent molecule called pyrene to this project, instead of

some looped ligands. If look at this material under ultraviolet light, it is fluorescent, but mechanically it is identical to the material without a pyrene ligand. The module is the same, the swelling behavior is the same, but now this gel intensely fluoresces.



Scientists have tried to make a class of materials with well-defined, self-organizing MOC structures and viscoelastic properties of the polymer gel  
 source - chemistry.mit.edu

Professor Jeremiah Johnson believes that scientists can imagine all sorts of things for these additional ligands to adapt the material to the applications that interest them.

Currently, they are working on the manufacture of ligands that cannot only expose something outside the cell but also within the cell so they can control the uptake or release of molecules from within these cells. In addition, scientists are experimenting with other types of metals, namely zinc, iron, titanium. They are cheaper and not as toxic as palladium.

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**On market since:** -

**Regions:** United States

**Industries:** Chemicals



## SYNTHETIC BIOLOGY REGULATES PLANT CHARACTERISTICS USING GENE CHAINS

Synthetic biology, which allows to 'edit' the functions of plants with the help of gene chains, was developed by American biologists from the State University of Colorado. If consider electronics, then in it even the most advanced computer is simply a complex device of simple modular parts. They usually control certain functions, the same integrated circuit can be found in the iPhone or in an airplane. Thus, scientists from the University of Colorado created the same modularity in anticipation of this. They design gene schemes. Scientists control the specific characteristics of plants (color, size, resistance to drought) with the help of these schemes.

Most modern synthetic biologists use simple microorganisms, such as *E.coli* or yeast in their work. However, American biologists prove that gene chains, as well as electronic ones, can be controlled. The team of [the State University of Colorado](#), which is led by *June Medford*, professor of biology, and *Ashok Prasad*, associate professor of chemical and biological engineering, is doing the same thing, but in the much more complex biological world of plants.



The new method allows identifying hundreds of gene chains responsible for various functions  
source - colostate.edu

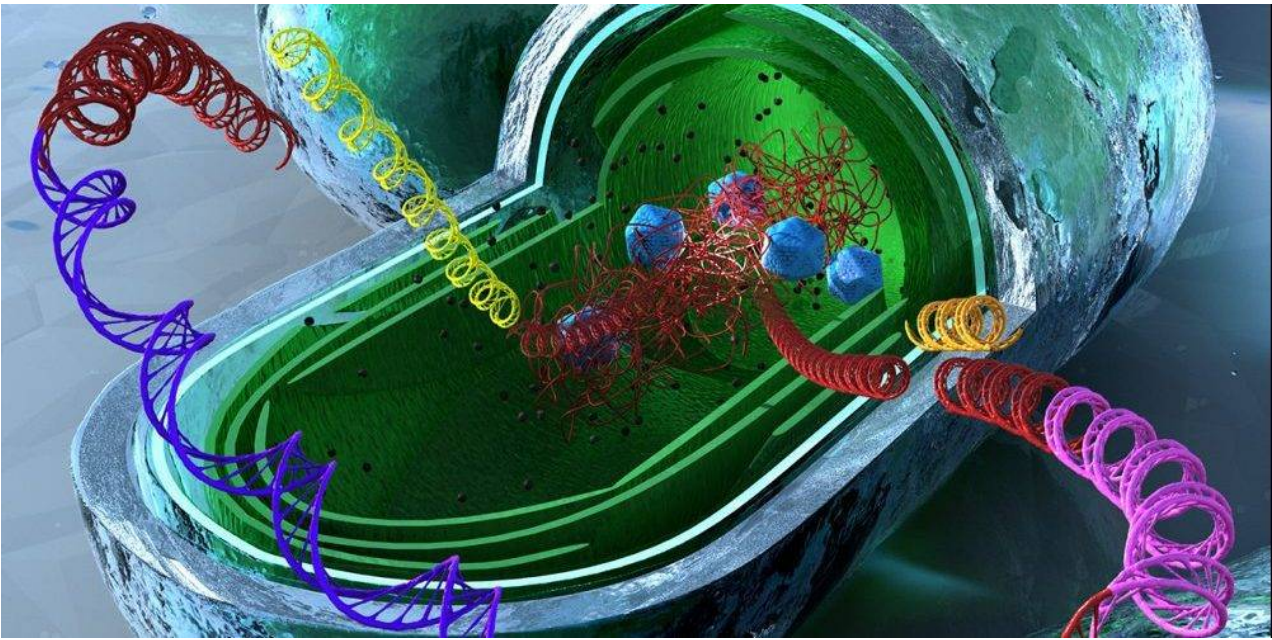
Thus, synthetic biology is a relatively new phenomenon in science. Scientists construct gene chains, as with electronics chains help. These chains control the functions of plants and they can easily be introduced into organisms. Usually, biologists experiment with simple microorganisms, since working with plants is a great challenge.

Generally, genetic engineering of plants involves the insertion or modification of genes that hold certain characteristics under control. Nevertheless, modern synthetic biologists use a different approach. According to Prasad, the main problem is plants. Because biology is much more complex than single-stranded microorganisms, they also slowly develop. As a consequence, simple testing of various genetic schemes becomes an important matter.

A team of scientists from [the State University of Colorado](#) is engaged in quantitative analysis of genes for the predetermination of plant functions. The new method allows identifying hundreds of gene chains responsible for various functions. To begin with, biologists have created blueprints for cell elements from which gene chains are formed. The researchers used protoplasts to test - plant cells, devoid of the cell wall, which, in



fact, are clots in the cytoplasm.



Biologists have created blueprints for cell elements from which gene chains are formed  
source - colostate.edu

Since the protoplasts are very fragile, scientists had to apply the technique of mathematical modeling to calculate the properties of each protoplast. After a detailed analysis of the data, they were able to isolate each of the properties of a single protoplast. This will allow regulating such plant characteristics as color, size, resistance to drought and others. Scientists demonstrated their method with the Arabidopsis plant, followed by validation in edible cereal species of Sorghum bicolor - demonstrating their technique with commercially important species.

This method can be used in agriculture. **Scientists are also planning** to develop a special gene chain that will be able to "turned on" and "turned off" certain genetic functions. **Their inventions have received a grant** from [the Department of Energy](#) to work on a specific scheme, which, when completed, will act as a hard switch that is turned on and given a certain genetic function.



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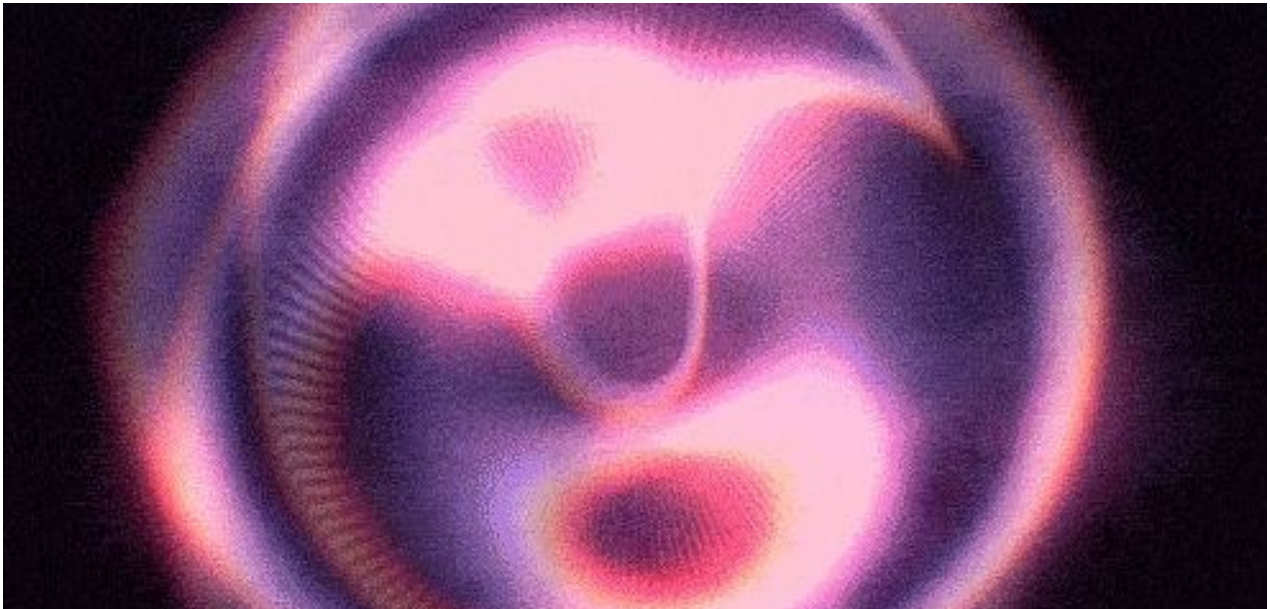
**Patent status:** -

**On market since:** -

**Regions:** United States

**Industries:** Food and Drink, Biotechnology

**Source links:**

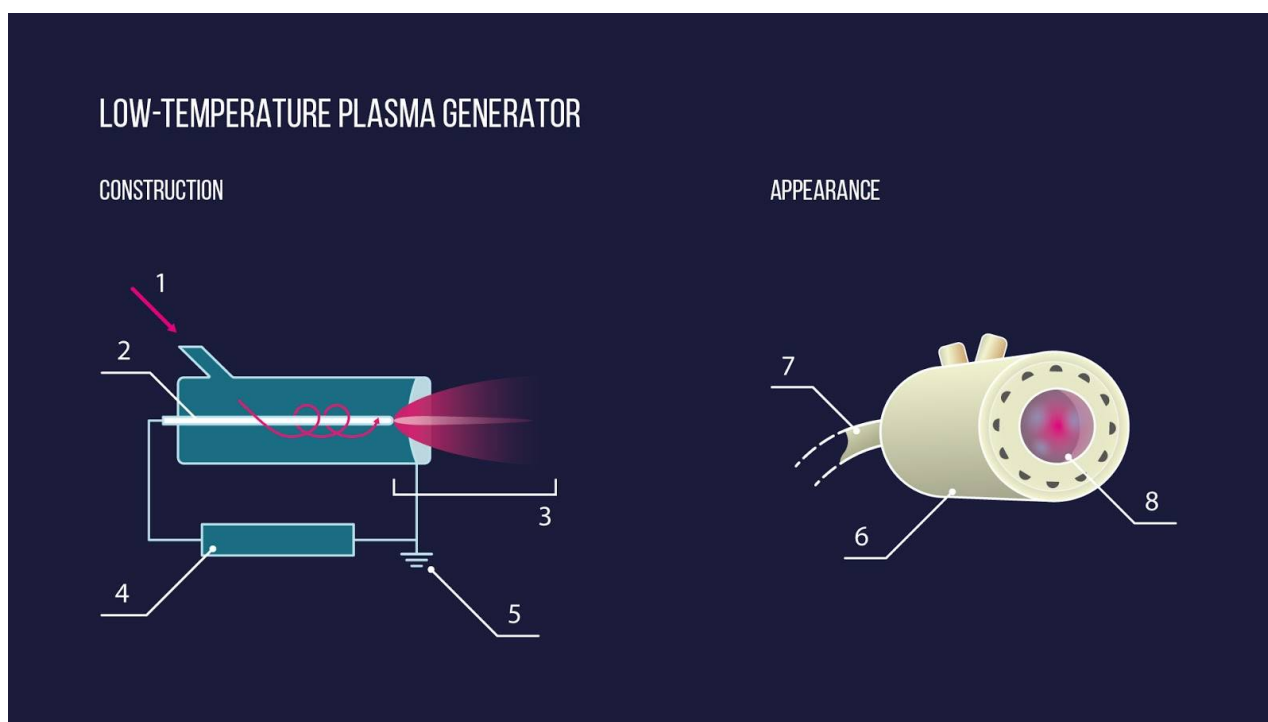


## **COLD PLASMA CURES THE NON-HEALING WOUNDS AND REJUVENATES THE CELLS**

Cold plasma, which regenerates the non-healing wounds and leads the cells to rejuvenate, was developed by Russian scientists from the Moscow Institute of Physics and Technology (MIPT), the Joint Institute for High Temperatures of the Russian Academy of Sciences and the Scientific Research Institute of Epidemiology and Microbiology N.F. Gamaleya.

Non-healing wounds are a real problem for doctors, as they complicate successful treatment. In diabetes mellitus, wounds are caused by blood vessels damaged by the disease. Oncology and HIV make wounds due to suppressed immunity, and in the elderly, the cause is the low rate of cell division. The treatment of such wounds by conventional methods is very problematic and sometimes impossible.

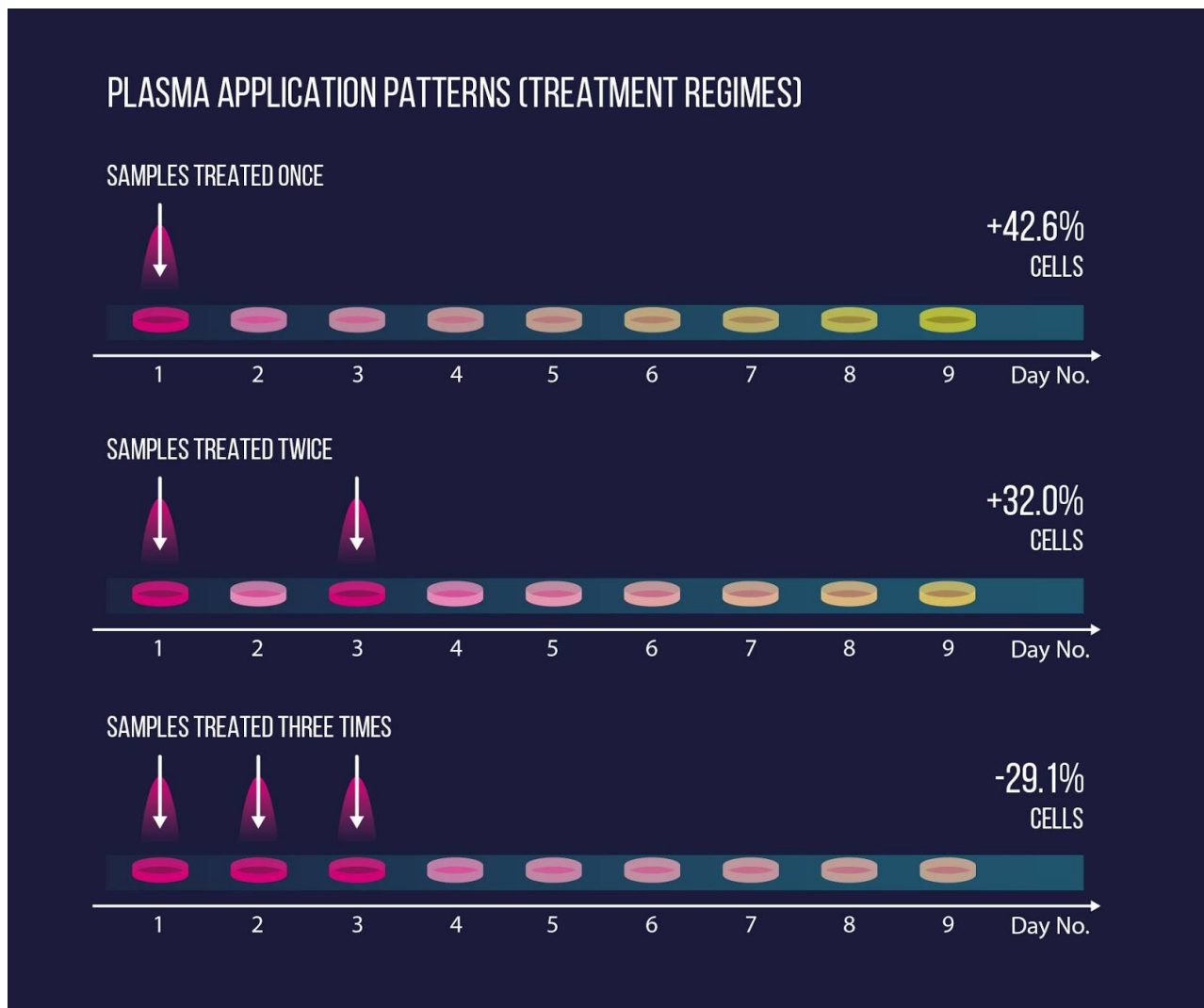
Physicists decided to try out a somewhat unusual means of fighting wounds like cold plasma. This is the so-called partially ionized gas with a fraction of charged particles of about 1 percent of their total number. The temperature of such a plasma is usually below 100,000 K, and in this case, plasma was obtained on compact generators, at a temperature of only 30-40 degrees Celsius. The authors of the work note that earlier experiments of this kind have already been carried out. However, they produced contradictory results. In some cases, after plasma treatment, the restoration of the tissues of the human body was faster, while in others it was slower.



Low-temperature plasma generator  
source - [mipt.ru/english](http://mipt.ru/english)

Researchers took human connective tissue cells (fibroblasts) and epithelial cells (keratinocytes) to understand how things stand in practice. They were divided into three groups, one of which was subjected to a single treatment with plasma, the other - twofold, and the third - threefold. As a result of the experiments, it turned out that keratinocytes are

almost completely insensitive to plasma treatment. At the same time, the fibroblasts after single and double treatment began to grow faster than individual groups that did not receive such treatment. In addition, after a single treatment, the number of cells was 48 percent more than in the control group. This is a rather sharp acceleration of growth. In the second group, the results were more modest - the number of cells by 32 percent outstripped the situation in the control group. Apparently, the multiple exposures to cold plasma are more likely to harm cells than to help them. In the third group of cells was 29 percent less than in the control group.



Experimental design  
source - [mipt.ru/english](http://mipt.ru/english)

A study of the state of the cells immediately after treatment showed that, in itself, contact with the cold plasma did not destroy them. The DNA of the fibroblasts and keratinocytes remained intact. However, certain changes did occur. The level of beta-galactosidase, a compound considered to be a reliable sign of aging, decreased after treatment.

Simultaneously, the phase of rapid growth of the cell culture was extended. The authors of the paper believe that one-time exposure to cold plasma activates the mechanism of autophagy of the cell. With it, its subsystems "attack" all the damaged organelle cells, which restarts the metabolic processes in it. It rejuvenates, starting to behave like a cage of a younger organism.

In the future, the scientists plan to conduct additional studies of the molecular mechanism of the effect of plasma on cells, as well as to study the effectiveness of treatment, taking into account the age of the patient. In the future, all this will make treatment of non-healing wounds more effective.

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**On market since:** -

**Regions:** Russia

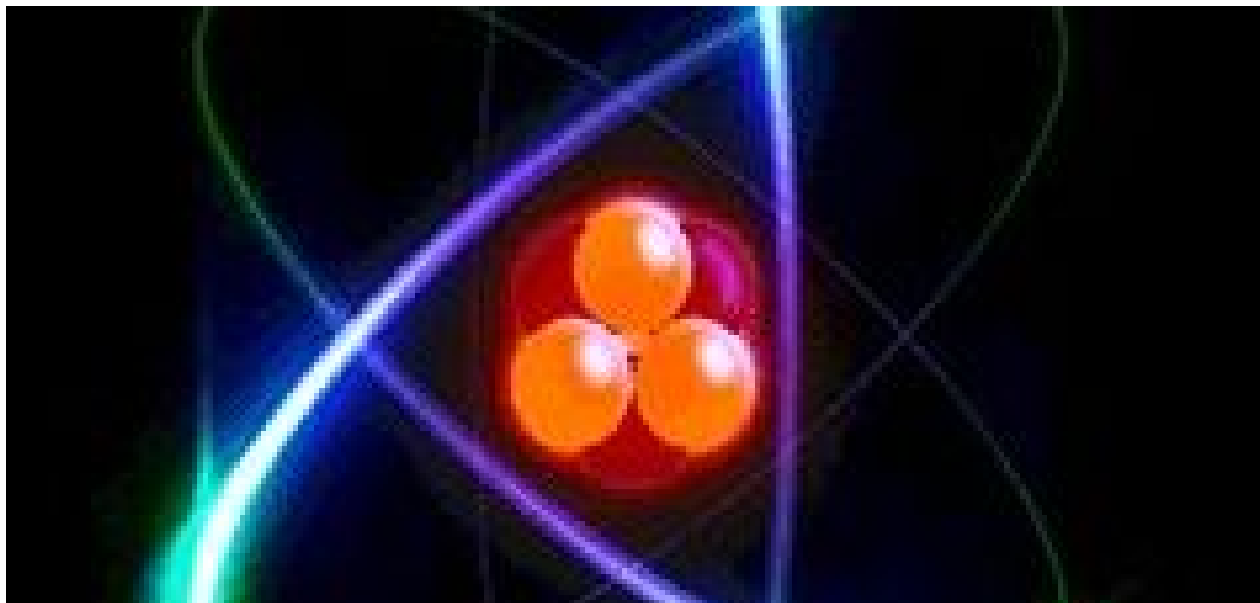
**Industries:** Healthcare, Biotechnology

**Source links:**

[Moscow Institute of Physics and Technology](#)

[the Joint Institute for High Temperatures of the Russian Academy of Sciences](#)

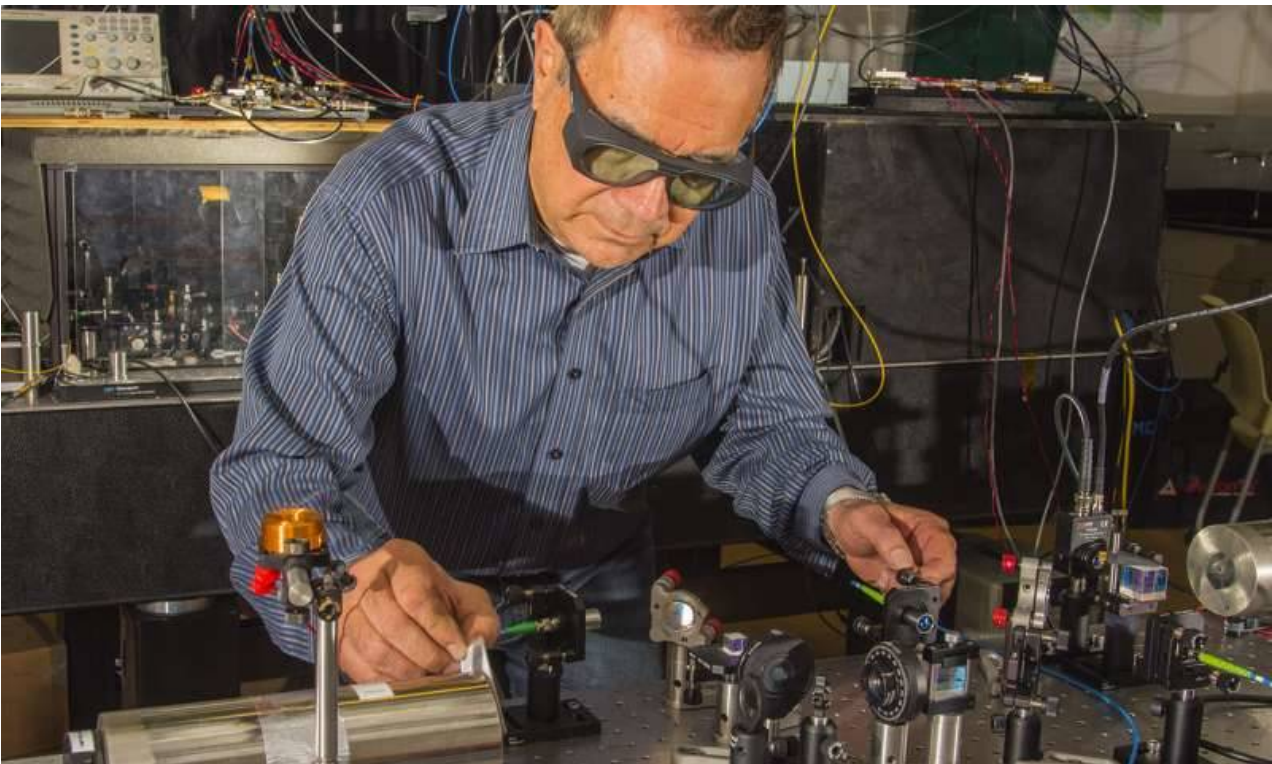




## ' QUANTUM RADIO' WILL INCREASE THE SIGNAL RECEPTION AREA WHERE GPS DOESN'T WORK

"Quantum radio" in the field of telecommunications was developed by scientists of the National Institute of Standards and Technologies. It is supposed to use it where mobile networks or GPS cannot cope, namely in urban jungles, under the water or under the ground.

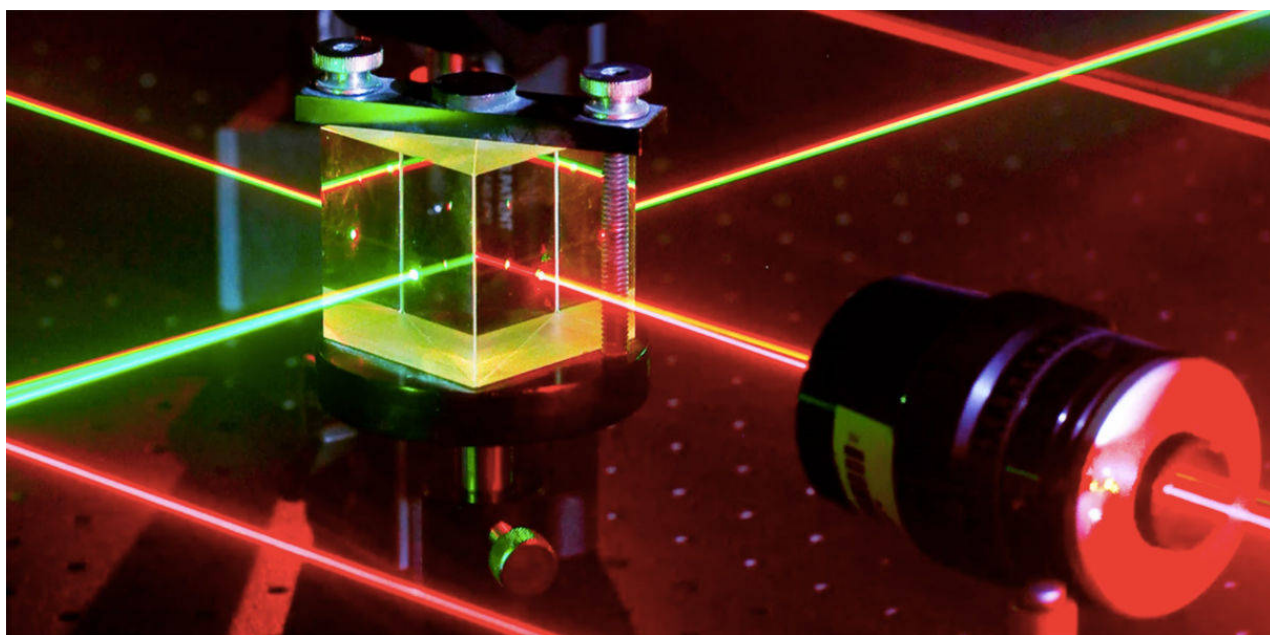
A group of NIST researchers works in the field of low-frequency magnetic radio - very low-frequency (VLF) magnetic signals with digital modulation, capable of penetrating walls of buildings, the thickness of water and soil further than conventional electromagnetic signals with higher frequencies. VLF electromagnetic fields are already used, for example, for text communication of submarines, but do not have sufficient capacity to transmit audio or video data. In addition, submarines are now forced to slow down and rise to periscope depth about 15-18 meters below the surface to transmit messages. This technology is also very useful for sailors, soldiers, and others. As for sways GPS, it does not always work well in rooms or even in the open air among city skyscrapers. As for the soldiers, radio signals for them are blocked in an environment cluttered with rubble or by many interfering electromagnetic devices during military or emergency missions.



NIST physicist Dave Howe  
source - nist.gov

According to Dave Howe, project manager, quantum sensors are more sensitive to magnetic fields, which allows increasing the signal reception area, as well as the channel width to the capabilities of a cellular phone. Thus, audio and video information can be freely transferred with help quantum sensors. They can be used under the water or in other areas, which are difficult for ordinary electromagnetic waves.

Scientists have demonstrated the possibility of detecting a magnetic signal using sensors that operate on the quantum properties of rubidium atoms. The [NIST](#) technology has made it possible to change the magnetic fields of atoms to modulate the frequency, more precisely, the horizontal and vertical positions of the waveform. During the tests, the sensors detected weaker signals than usual - with a power of **1 pTi** - and at a very low frequency, below **1 kHz**.



The NIST technology has made it possible to change the magnetic fields of atoms to modulate the frequency source - [nist.gov](http://nist.gov)

**Dave Howe** tells that NIST specialists build and test a quantum magnetometer where polarized light is used as a detector for measuring the "rotation" of rubidium atoms induced by magnetic fields. This ensures further improve the efficiency of the technology. This device like a quantum clock will catch signals, switching between the levels of energy of atoms, as well as their other properties. Scientists hope to increase the range of the low-frequency signal, increasing the sensitivity of the sensor, suppressing noise and increasing the efficiency of using the bandwidth of the sensor.

**The team strives to create an entirely new field that combines quantum physics and low-frequency magnetic radio.** They plan to increase the sensitivity by developing low-noise generators to improve the synchronization between the transmitter and the receiver. They are also going to study how to use quantum physics to surpass existing bandwidth limitations.

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**On market since:** -  
**Regions:** United States  
**Industries:** Others  
**Source links:** [The National Institute of Standards and Technology](#)



## SCIENTISTS HAVE DEVELOPED A VACCINE AGAINST RHINOVIRUS

The vaccine from rhinovirus was obtained during long studies by Professor Martin Moore and his colleagues from the University of Emory. Studies conducted on monkeys have yielded positive results. Macaques successfully developed antibodies to colds. Consequently, after many years of testing, the cold can be completely defeated.



Rhinovirus was first discovered in the 1960s, and soon a number of scientists were already working on developing a vaccine against it. Nevertheless, they quickly realized that they had a serious rival. The virus takes many forms, so antibodies against one form usually do not act against the others. The last tests of the cold vaccine took place in 1975, since then no one has done it.

However, in recent years interest in rhinovirus has revived again. It turned out that he was not as harmless as previously thought. According to Dr. James Guern of [the University of Wisconsin](#), this virus is increasingly referred to as pathogens. In addition, the cold does great harm to the economy. The US loses about \$ 25 billion because of the sick every year.



Scientists created vaccines that encouraged the immune system  
source - [emory.edu/home/index.html](http://emory.edu/home/index.html)

Scientists created vaccines that encouraged the immune system to create antibodies only for proteins on the surface of the virus envelope in the 60-70's. However, each serotype of the virus had its own form of proteins, and it was necessary to create a new vaccine.

However, our immune system is able to fight with rhinovirus otherwise, even after he



captured the cells. Once the virus has gotten inside, its shell is opened, and it throws out the molecules that it uses to create new viruses.

Our cells can capture some of these molecules and push them to the surface. In this way, a kind of alarm sounds. The immune system notices the invasion and causes the infected cells to die in order to slow the spread of the infection. In this case, since the proteins are almost identical inside, one vaccine acts on different types of rhinovirus.



The study will lead to the emergence of vaccines against rhinovirus disease  
source - [emory.edu/home/index.html](http://emory.edu/home/index.html)

After three years of testing on monkeys, Professor Martin Moore obtained promising results. Monkeys are able to produce antibodies against many types of rhinoviruses. Researchers received a strong antibody response to 49 of the 50 types of the virus after testing on infected monkeys. Professor Martin Moore and his colleagues are now following these results with a lot of research and are hoping to get down to testing people soon.

Ultimately, this study will lead to the emergence of vaccines against rhinovirus diseases, including asthmatic exacerbation, pneumonia, measles, poliomyelitis, mumps, and colds.

According to researcher Martin Moore, their studies demonstrate that it is possible to attenuate **RSV without loss of immunogenicity**. Therefore, for researchers, the next step

will be the production of a vaccine for clinical evaluation and they plan to study the safety and immunogenicity states in children in phase 1.

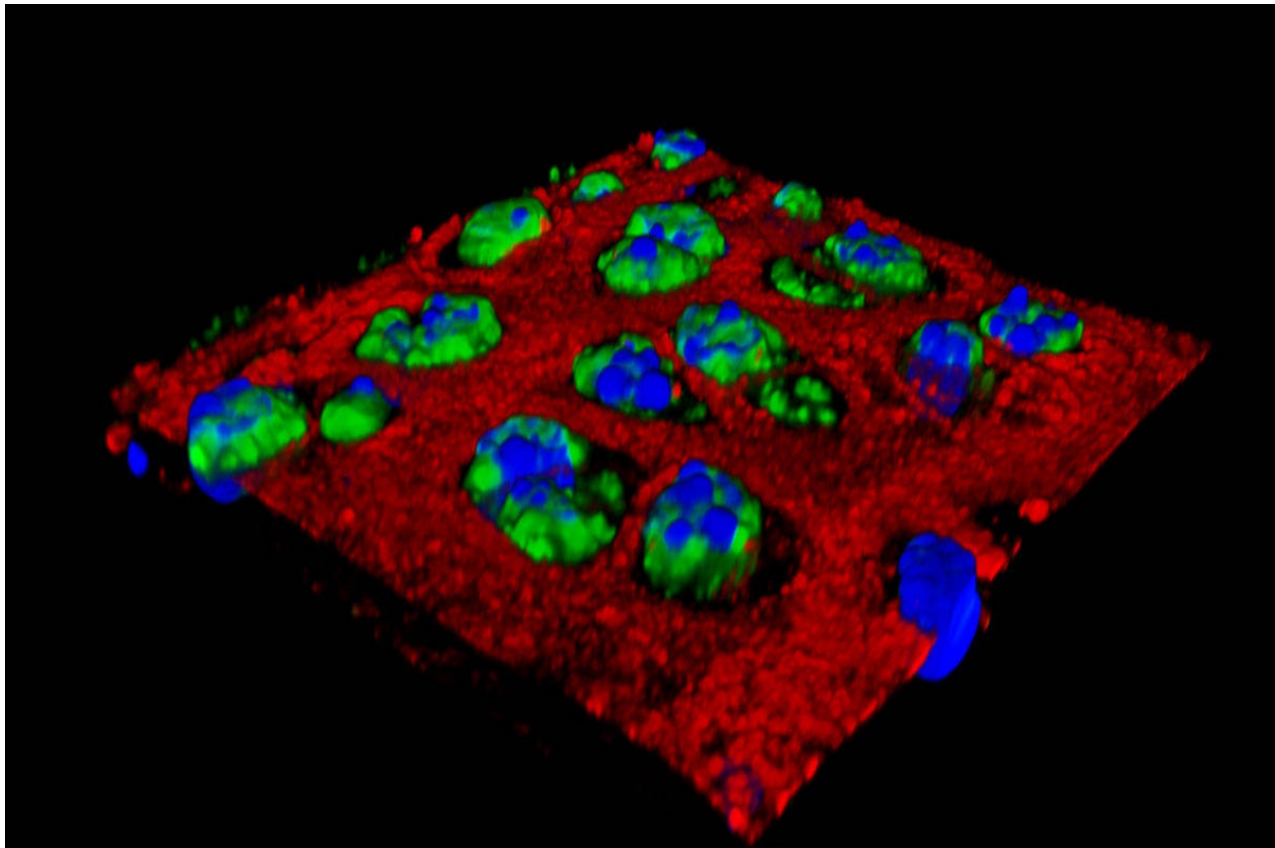
The vaccination technology formed the basis of the spinoff company Meissa Vaccines, Inc. Martin Moore is a co-founder and is the chief research officer of this company. The company's activity is aimed at developing a successful vaccine against the respiratory syncytial virus and rhinovirus.

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Regions: United States  
Industries: Healthcare  
Source links: [Emory University](#)  
[the University of Wisconsin](#)  
[Meissa Vaccines, Inc.](#)



## NANOPARTICLES WILL STOP THE DESTRUCTION OF JOINTS

Injections of nanoparticles, which reduce inflammation and stop the destruction of cartilage, were developed by physicians of the University of Washington. Recently, scientists have discovered a new way of treating osteoarthritis by injecting nanoparticles into damaged joints. In the United States, at least 27 million people suffer from osteoarthritis, 12% of diseases occur because of early injuries, for example, a damaged meniscus. Available painkillers help relieve pain but do not relieve the destruction of cartilage. Thus, pain becomes stronger and condition only gets worse.



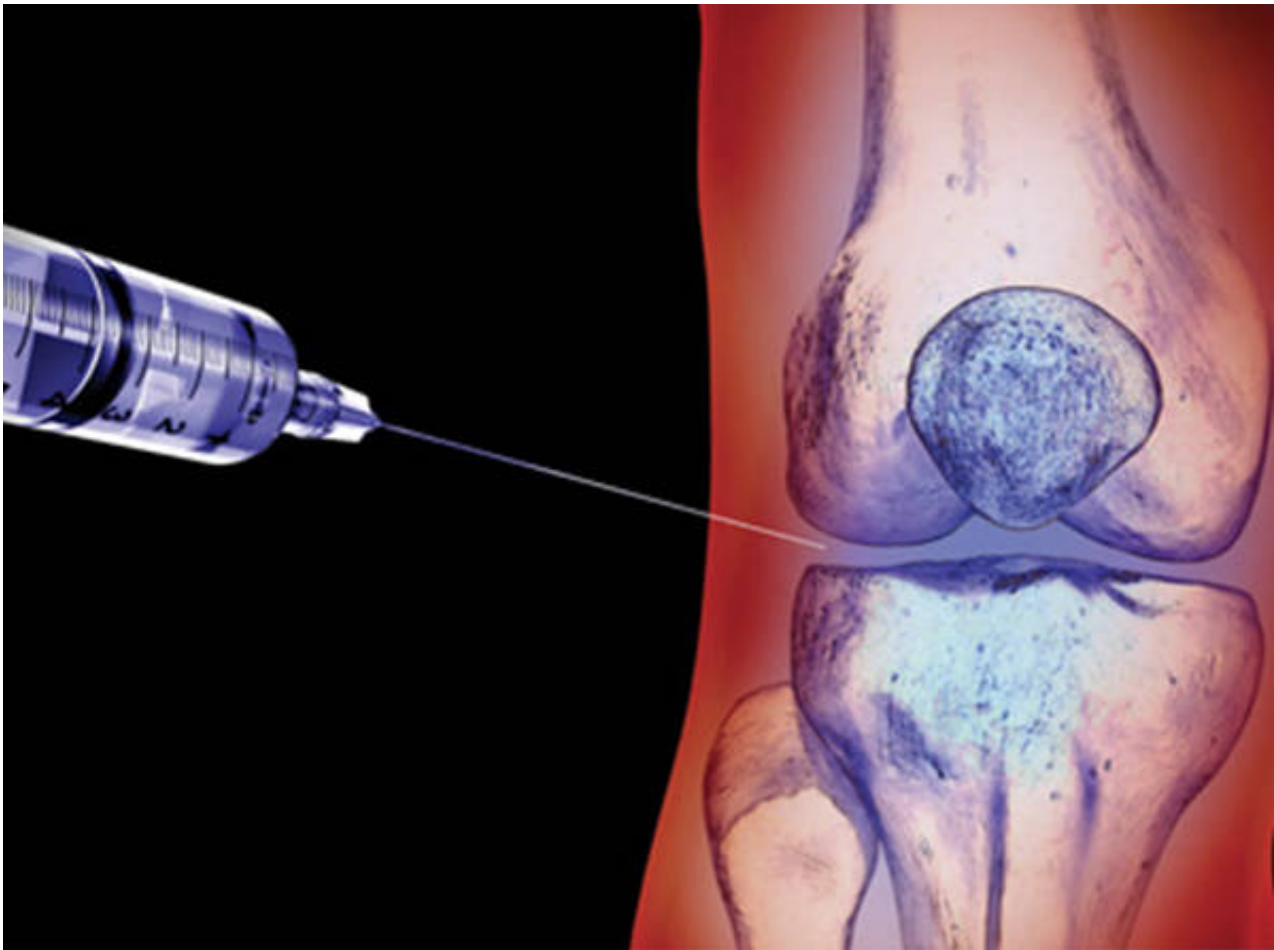
Researchers at Washington University School of Medicine  
source - [heumatology.wustl.edu](http://heumatology.wustl.edu)

Studies conducted by [the University of Medicine School of Washington University in St. Louis](#) showed that when they inject nanoparticles into damaged joints in mice, they suppress inflammation immediately after the injury. Thus reducing the destruction of the cartilage. According to [Christine Pham](#), MD, associate professor of medicine, scientists are thrilled that the number of patients with osteoarthritis is increasing every year, however, in medicine, there is no specific way of treatment of this disease. Scientists are trying to treat the symptoms, but even when steroids are injected into the joints affected by arthritis, the medicine works only a few hours and then is excreted from the body. Nanoparticles stay there longer and can prevent the destruction of cartilage.

In the course of the experiment, nanoparticles were introduced shortly after the injury, and within 24 hours they coped with the inflammation. However, unlike steroids, the particles remained in the cartilage cells for several more weeks.

These particles are [10 times smaller](#) than red blood cells, so they can penetrate deeper into tissues. They carry peptides derived from a natural melittin protein, modified so that it can bind to a small interfering [RNA \(siRNA\) molecule](#). Melittin delivers siRNA to the

damaged joint, suppressing the inflammatory process.



Injections of nanoparticles, which reduce inflammation and stop the destruction of cartilage  
source - [heumatology.wustl.edu](http://heumatology.wustl.edu)

The nanoparticles, which are salvage for joints, were developed by co-researchers [Hua Pan](#), MD, assistant professor of medicine, and [Samuel Wicken](#), professor of biomedical sciences. According to scientists, nanoparticles are injected directly into the joint, and due to their size, they easily penetrate into the cartilage. Consequently, they fall into the damaged cells on 100 %. Prior to this moment, scientists have been delivering nanoparticles through the bloodstream and they noticed that the nanoparticles play the main role in the treatment of the inflammation in rheumatoid arthritis. In the same study, they were injected locally into the joint and given a chance to penetrate into the damaged cartilage.

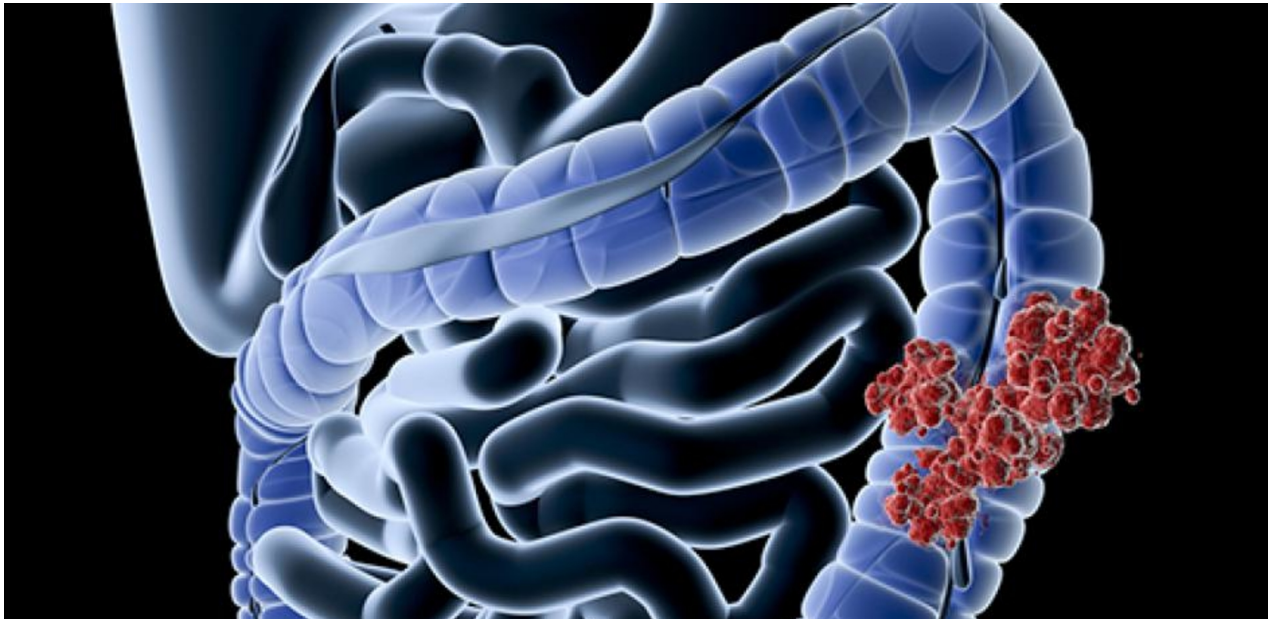
Whether such therapy can restrain the development of osteoarthritis for many years is not yet reliably known. Nevertheless, scientists believe that if patient injects nanoparticles soon after the injury, it will help to maintain the joint's ability and prevent the development



of the disease.

However, the discovery of nanoparticles marked the beginning in the treatment of diseases associated with joints. Therefore, according to scientists at the University of Washington, nanoparticles can be useful to patients who already have arthritis. Consequently, the study of nanoparticles continues. Now, scientists are working on developing experiments to test the idea of treating arthritis with nanoparticles.

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**Regions:** United States  
**Industries:** Healthcare  
**Source links:** [Washington University School of Medicine](#)  
[University of Washington](#)



## CURING COLON CANCER WITHOUT HARMFUL SIDE EFFECTS

The treatment of colon cancer with the help of nuclear medicine was discovered by specialists of the Memorial Sloan Kettering Cancer Center and MIT. Research is always going on in the area of colorectal cancer. Colon cancer treatments were not available 10 years ago. Research is ongoing all the time, scientists are looking for the causes and methods of preventing colorectal cancer, as well as the best ways to detect it early and ways to improve treatment. Currently, scientists discovered a treatment that can save lives. This treatment has a three-stage system that uses nuclear medicine to target and eliminates colorectal cancer. Scientists have achieved in the experience on mice a 100-percent level of cure without harmful side effects for the body.



Scientists discovered a treatment that can save lives  
source - mskcc.org

**Stephen Larson**, MD and **Sarah Chail**, Ph.D., of [Kettering's Memorial Cancer](#) state that this study is new because of the criteria achieved by the treatment regimen in terms of therapeutic doses of the tumor, with non-toxic secondary radiation in the body's normal tissues. Success in models of mouse tumors comes from the unique quality of the reagents developed by their group, and the methodology of reduction to practice, including a theranostics that can be easily transferred to patients. Until now, immunotherapy of solid tumors with the help of radioactive isotopes had limited therapeutic success. Now, the new technique is a consequence of the unique quality of the reagents developed by them, and the use of theranostics, a new approach to the creation of pharmaceuticals. The theranostics combines methods of early diagnosis with therapy and uses one drug to achieve both goals. The therachnical agent first finds a cancer cell and then destroys it

without harming the health and reducing side effects.



Scientists discovered how to treat a colon cancer  
source - mskcc.org

According to the US Centers for Disease Control and Prevention, colorectal cancer is the third most common form of cancer, affecting both men and women. Every year in the United States, **50,000 people die from it.**

In this case, the antigen A33, which is present in 95% of patients with primary or metastatic colon cancer, was exposed to two antibodies, one of which contained DOTA chelate compounds. During the tests in mice, all nine specimens proved, that a malignant tumor completely disappeared, and no radiation damage was found to the vital organs, including the bone marrow and kidneys. Thus, complete cure of mice indicates that **anti-GPA33-DOTA-PRIT** will become a powerful mode of radioimmunotherapy for colorectal cancer tumors, characteristic of GPA33 in humans.

The application of this treatment protocol can be extended to other types of cancer. According to **Stephen Larsen**, one of the researchers, if the clinical trials are successful, their method can enrich the repertoire of effective methods of therapy for cancer patients. This system is built on the principle of 'plug and play', that is, it allows the use of a variety of antibodies that affect the tumor and is applicable, in principle, to virtually all solid and liquid forms of tumors in humans.

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**On market since:** -  
**Regions:** United States  
**Industries:** Healthcare  
**Source links:** [Steven M. Larson](#)  
[The Memorial Sloan Kettering Cancer Center](#)  
[Massachusetts Institute of Technology](#)





## REDUCING THE RISK OF DISEASE AND IMPROVING THE HEALTH OF NEWBORNS

Technology that defines dwarfism, namely, growth below 140 cm, and IQ below 70 points by DNA testing of embryos, and is also able to program a genetically "ideal" child, was developed by Genomic Prediction Company.

The main purpose of [Genomic Prediction Inc.](#) is the provision of genomic tests to assess genetic risk due to a chromosomal abnormality and gene mutations. The company was registered in the state of Delaware in 2017. The Vice-President for Research is [Stephen Hsu](#). He is also Professor of Theoretical Physics at [Michigan State University](#).

Couples who resort to artificial insemination, even nowadays, can ask geneticists to check whether embryos have severe hereditary diseases. This was made possible by a combination of DNA tests and computer modeling. Genetic data were collected from large populations, and now it is possible to accurately identify genetic patterns and predict the potential risk of hereditary diseases.



DNA testing of embryos  
source - genomicprediction.com

Moreover, if previously only diseases such as cystic fibrosis caused by a specific gene were accurately diagnosed, now scientists can calculate the diseases that are formed under the influence of many genes. Having done this analysis, parents will be able to decide whether to condemn the future child to Huntington's syndrome, schizophrenia, and osteoporosis, or it is better to leave this embryo unplanted.

The Genomic Prediction specializes in this area. This spinoff has origin from the **Silicon Valley**. The breakthrough was made possible by the DNA samples of **500,000 Britons** who were collected by the national medical project Biobank. The very understanding of how genes work has changed. Sometimes the smallest and harmless changes in the hundreds of genes themselves together can lead to serious consequences. This allowed not only to calculate which genetic combinations lead to various diseases but also even to predict future food preferences of people.

Stephen Hsu, one of the founders of the spinoff, has been advocating artificial genetic selection for the creation of a super-intelligent person for many years. In his study of 2014, he described in detail how a DNA analysis could reveal a child's mental abilities, allowing him to find an embryo with IQ at least 15 points higher than other embryos prepared for IVF. According to Hsu, further development of the technology will allow predicting the growth of the child to within 3-4 cm, its ability, and even character. Already now, it is perfectly possible to identify dwarfism and IQ below 70 - for this is responsible for a number of genes. However, lifestyle and environment often affect human development no less than genetics.

Data is not yet enough to pinpoint very rare diseases. In addition, the existing DNA base can be useless for Asians and Africans, because their DNA sequence is different from the inhabitants of Northern Europe. Nevertheless, this question can be solved quite simply. Consequently, scientists need to create large databases of genetic data of the inhabitants of Africa and Asia.

The complexity of research also comes down to ethical issues. Stephen Hsu believes that when they collect enough data and the study will give **100% of the results**, countries will have to hold referendums on this ethical issue. In addition, Stephen Hsu predicts that it will be completely possible technology. This trend will start with billionaires and Silicon Valley. They will support this technology, because using this technology, they will start producing fewer unhealthy children, and then the rest of society will follow suit.

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**On market since:** 2017  
**Regions:** United States  
**Industries:** Healthcare  
**Source links:** [Genomic Prediction](#)  
[Michigan State University](#)



# CANCERLOCATOR DETERMINES THE TYPE AND LOCATION OF CANCER BY BLOOD ANALYSIS

CancerLocator research, which diagnoses cancer by measuring tumor DNA in the blood and additionally allows you to determine the source of the tumor, was developed by scientists at the University of California at Los Angeles and the University of Southern California.

The method of liquid biopsy allows you to diagnose cancer by biomarkers in the blood. The role of biomarkers is performed by circulating tumor DNA and DNA particles that enter the bloodstream from dying tumor cells. Tumor cells are often characterized by abnormalities in methyl DNA patterns, including an increased level of methylation. It is these data that make it possible to diagnose a disease by analyzing blood and to determine them, using statistical training systems, for which organ or tissue such methyl patterns are characteristic.



CancerLocator determines the type of tumor and its location  
source - usc.edu

During the study, American scientists studied circulating tumor DNA in patients with liver, lung and breast cancer. To do this, they used two systems based on the Support Vector Machine and Random Forest machine learning, as well as their own program CancerLocator. Each of the blood samples was tested 10 times. **The frequency of errors with the use of CancerLocator was minimal - 0.265**, while Support Vector Machine and Random Forest had 0.664 and 0.604. The new program reached 80% accuracy in the diagnosis of lung and liver cancer at an early stage.

[CancerLocator](#) finds and measures tumor DNA, which circulates in the circulatory system.



Whenever a cell dies, the fragments of its DNA enter the bloodstream with unique identifiers, called methyl groups. They should signal whether the gene affects the cancer cell.



CancerLocator will help diagnose cancer even before the symptoms appear  
source - usc.edu

According to [Jasmine Zhou](#), one of the researchers who heads the project, a team of scientists extracts from the blood samples the cell-free DNA and then they undergo profiling methods of statistical training in order to recognize the signatures of individual types of cancer. Usually, cells have a variety of gene expressions throughout the body, thus, by analyzing the methylation of a particular DNA fragment, using CancerLocator, scientists can determine where the DNA comes from.

According to another researcher of the project, [Wenyuan Li](#), a large number of DNA methylation profiles of various types of tumors that are in a public database, will make it possible to determine the DNA methylation signatures by which one can classify types of cancer and isolate normal plasma. In addition, scientists have found a method that will help determine the type of tumor and its severity.

Scientists will continue to refine the methodology, as long as its effectiveness is not officially confirmed. If the results are confirmed, a new type of diagnosis will help diagnose cancer even before the symptoms appear. As noted by scientists, in the US, lung cancer is killed most of all cancer patients, since it is most difficult to recognize at an early stage.

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**On market since:** -

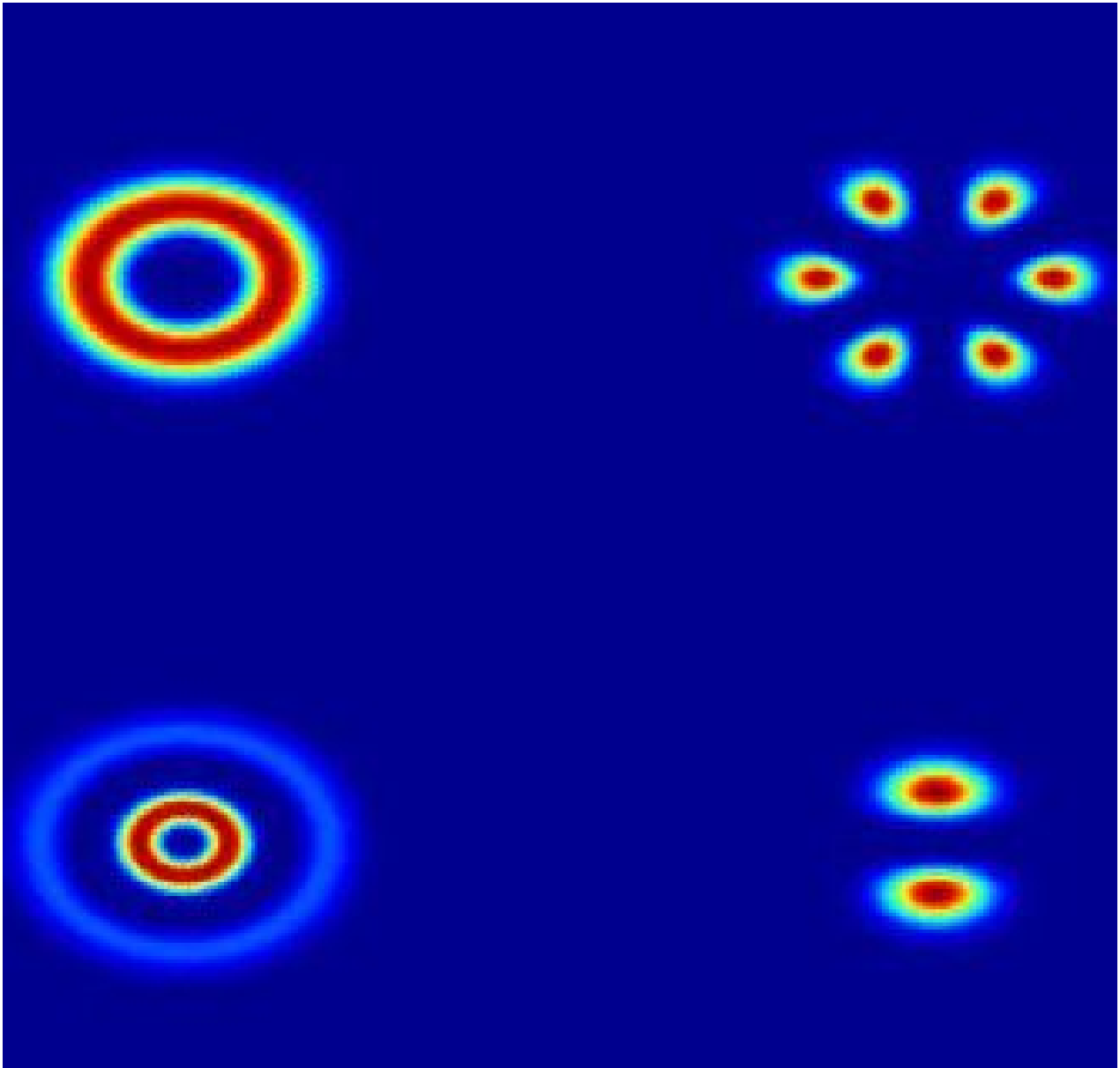
**Regions:** United States

**Industries:** Healthcare

**Source links:** [University of Southern California](#)

[The University of California at Los Angeles](#)

[Researchers of CancerLocator](#)

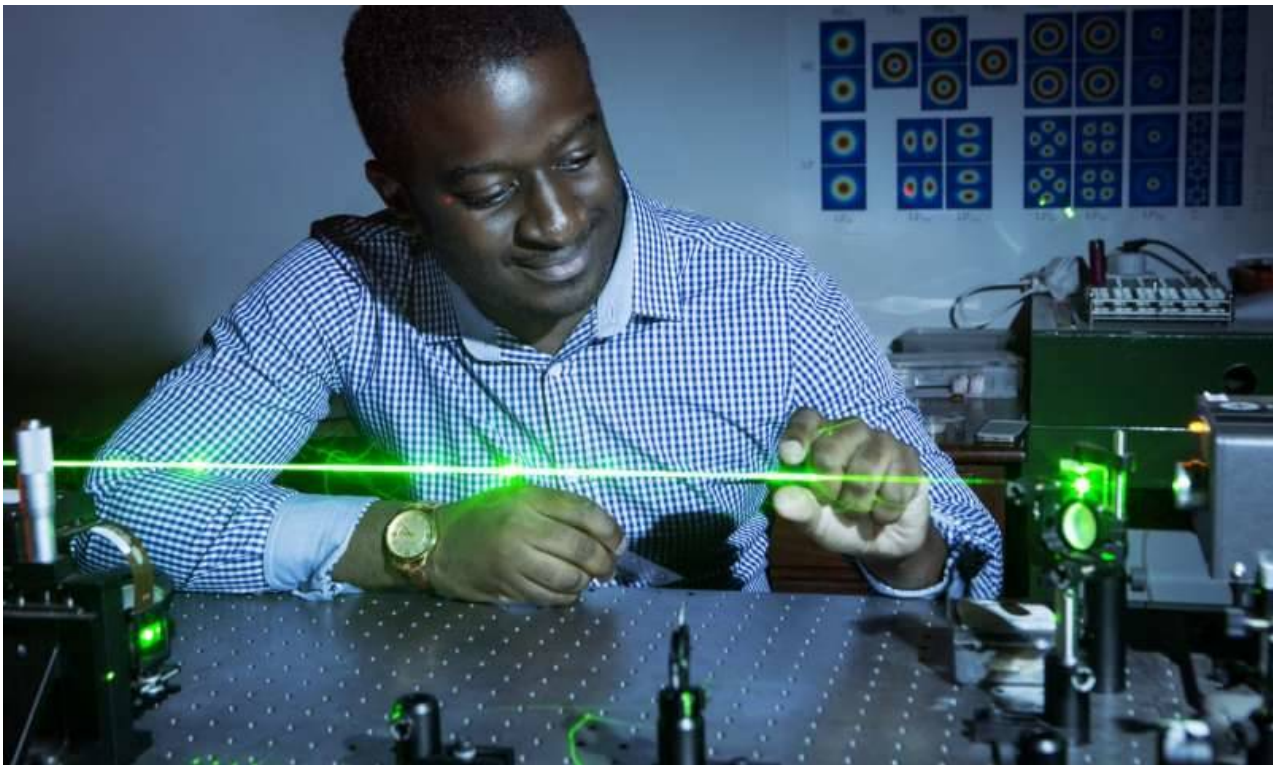


## THE LIGHT WILL SOLVE THE PROBLEMS OF QUANTUM COMMUNICATION

The first quantum experiment with the light, which is named "classical entanglement" was developed by the physicists of the leading university in South Africa, the University of Witwatersrand. Scientists of the African Institute have proved that there is a gray zone where classical and quantum physics are mixed.

Modern communication systems operate quickly but are not fundamentally protected. To enhance cybersecurity, scientists use quantum laws, in particular, the method of quantum key distribution.

However, the quantum world differs from the classical one, and it is more difficult to conduct experiments there. According to [Professor Andrew Forbes](#), in the classical world, intuition helps us. There are no surprises here, and experiments with many photons can be done. Generally, the total amount of photons is more than billions of photons. However, in the quantum world, where things are not as they seem, everything is different. Here the waves sometimes look like particles, but particles like waves.



Bienvenu Ndagano, First author of the quantum experiment  
source - Wits University

Professor Forbes is confident that it is very difficult to establish a secure quantum communication. Since quantum connections both in fiber optics use light circuits, therefore they tend to weaken at short distances, therefore there is no way to protect communication from interference without detecting photons, for example, this is affected by the effects of fog or bending of the cable. Nevertheless, once the photons are detected, there is no use for them.



His team overcame this problem with the help of classical light fields, which allowed for a quantum error correction in real time. For the first time, they proved that classical light could be used to analyze a quantum bond and it acts as a direct equivalent to the behavior of a quantum state. Not in a similar way, namely as an equivalent. In order to show this, they used a certain type of laser beam, a vector ray that possesses inseparability properties and which is sometimes called "classically tangled".



Quantum bond  
source - Wits University

Previously, in order to correct the error that occurred during the quantum communication, it was necessary to measure the sent photon, which meant the loss of information that he was trying to convey. The work of South African scientists makes it possible to test quantum connections with the help of classical entanglement, since in classical light, there is a sufficient number of photons, and all measurements can be carried out in real time without violating quantum information.

Working in the gray zone between quantum and classical physics, scientists can provide both a fast and reliable way to transfer data over existing communication channels. However, a serious obstacle to the emergence of reliable quantum technologies is decoherence, which is responsible for the interaction of the quantum system with the environment. It leads to entanglement and destruction of usable quantum properties of the system.



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**On market since:** -

**Regions:** United States

**Industries:** Others

**Source links:** [the University of Witwatersrand.](#)



## THE DECISION OF THE INFERTILITY PROBLEM

The technology, which allows solving infertility problems, was developed by OvaScience. If the technology shows positive results in the future, it can help to prolong the time of youthfulness.

[OvaScience](#) has developed a method that will increase the chances of getting pregnant with in vitro fertilization (IVF). This method is called Autologous Germline Mitochondrial Energy Transfer or [Augment](#) abbreviated. At present, this method is legally only in Canada and Japan. The company has not yet asked for approval from US management bodies.

Eggs have a big impact on birthrate. However, their work is under the influence of many factors. One of them is the presence of a good level of energy inside the egg. This factor is basic for the fertilization and development of the embryo. Such factors as aging, poor egg health due to inherited reproductive disorders, the environment or other diseases, also affect the work of the reproductive system. The Augment technology suggests the use of energy mitochondria from its own egg precursor cells.

For this method, it is necessary to use cells from the ovaries of a woman and mitochondria - tiny "power stations" that feed our cells. These mitochondria are then injected with the male sperm for the fertilization of the eggs, and the embryo is inserted into the uterus, as during the standard IVF procedure.



The Augment procedure is carried out in order to improve the health of existing eggs and to raise the level of IVF source - OvaScience, Inc.

Therefore, the Augment procedure is carried out in order to improve the health of existing eggs and to raise the level of IVF. Consequently, this Augment procedure is a complement

to the IVF procedure. According to OvaScience, additional energy from the mitochondria pushes the fertilization process.

In order to undergo treatment of the Augment needs to complete 3 stages of the procedure. The firstly, need to take a sample of ovarian tissue through the biopsies. The secondly, the tissue must be processed to isolate mitochondria from female EggPC cells, which are the producers of cell energy. The thirdly, combine energy mitochondria with sperm, which are then added to the female egg. Mitochondria from female EggPC cells supplement the existing mitochondria of the female egg during IVF.

Every year the problem of infertility becomes more urgent, as the age of planning for children increases. Today, about 10% of American women have already faced the problem of infertility. The company has already received the first result from the treatment. The couple Omar and Natasha Rajani became the first family had used the treatment of the reproductive system with the help of Augment technology. Natasha became pregnant after the first procedure. However, scientists can not say for sure whether this is the merit of Augment, or simply IVF procedure was successful in itself. Nevertheless, if in the future Augment technology still shows positive results, then scientists will be able to solve the problem of infertility and even prevention of aging.

According to David Sinclair, founder of OvaScience, a professor of genetics at Harvard University, reproductive abilities are some of the body's functions that deteriorate with age, and technologies such as Augment show that this process can be slowed down. In the future, the same mechanisms can help treat all diseases related to age such as diabetes and Alzheimer's disease.

Today, OvaScience is working on two more technologies. The first, OvaPrime, is to help women who are not able to produce enough ovum. The second, OvaTure, is aimed at improving IVF so that when it is used, it is no longer necessary to take hormonal preparations.

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**Regions:** United States, Japan  
**Industries:** Healthcare  
**Source links:** [Augment](#)  
[OvaScience, Inc](#)



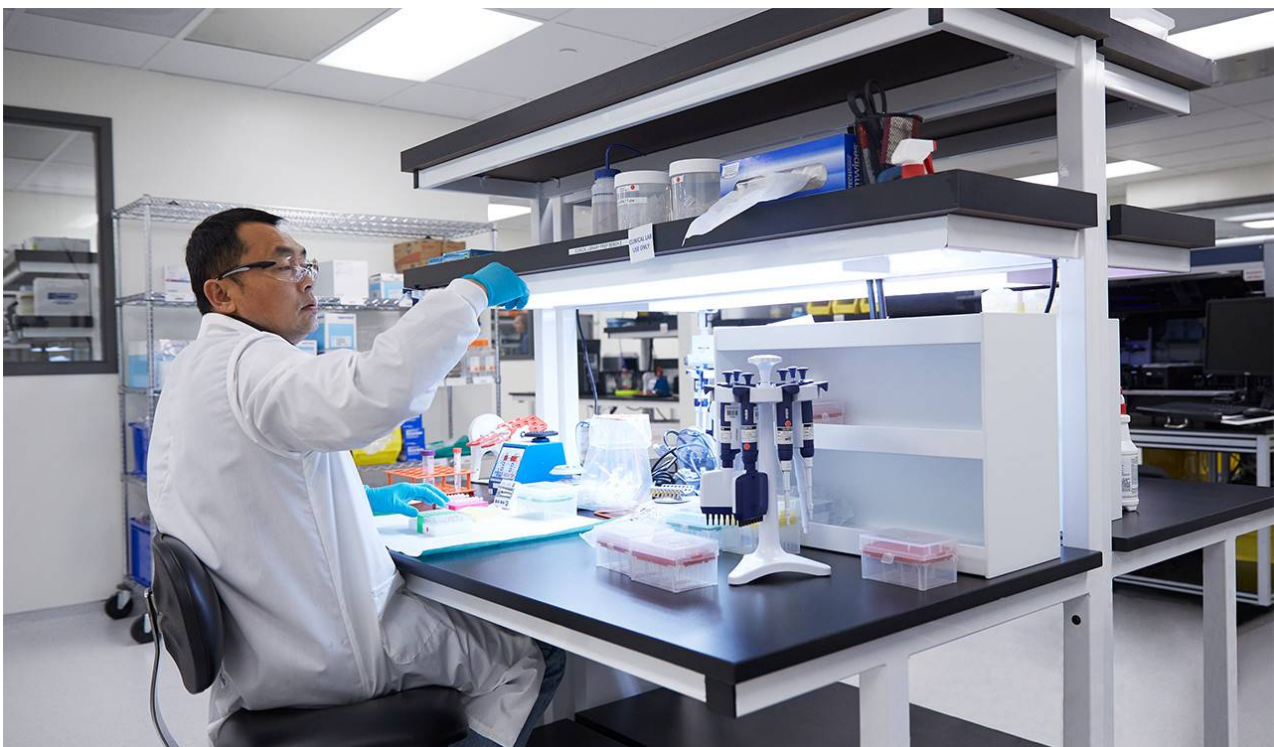
## RELIABLE DETECTION OF CANCER

The GRAIL technology allows you to diagnose cancer in the early phase via blood test. Illumina, Inc. has created this technology. It is believed to create the breakthrough in the cancer treatment in future.



Usually, the tiny cell of tumor DNA appears in the systemic circulation. There is more and more evidence that these cells are known as circulating tumor DNA (ctDNA), which directly encodes the genetic characteristics of the tumors from which they are gotten.

At the first stage of the disease, the fraction of ctDNA in the blood compared to DNA from non-cancer cells is very small. This is what helps to distinguish weak signals from early tumors from the overwhelming background of genomic DNA. The ability of [GRAIL](#) to demand ctDNA at the most extreme depths makes it possible to espy weak ctDNA signals in background noise.



Grail technology  
source - [grail.com](http://grail.com)

According to scientists, the main focus of Grail technology is to espy DNA of cancer in the blood even before the symptoms of the disease appear. The [GRAIL technology](#) is based on the sequencing method. This method became the starting point in developing a screening test against cancer. The test is able to measure circulating nucleic acids in the blood. If this Grail technology proves to be effective, then scientists get the first blood test for cancer, which detects cancer before it appears.



Grail technology  
source - [grail.com](http://grail.com)

According to Jay Flatley, the chief executive officer of [Illumina, Ink](#), if cancer is espied at the earliest stages, this will increase long-term survival. He believes that it is the successful development of the test for asymptomatic individuals and such test will make a major breakthrough in the global fight against mortality from cancer.

The team of scientists implements the latest instruments of science, including strong approaches to computer training, such as hierarchical neural networks. GRAIL technology is aimed at a deep understanding of the biology of cancer. To realize this goal, it is important to make clinical experiments that will record tens of thousands of cancer patients and healthy people. Therefore, GRAIL Inc. plans to conduct the biggest research on cancer to obtain scientific and clinical proof of effective exposure. It is expected to create large data sets to develop products and show their clinical utility.

Grail technology was developed in January of last year and initially received funding from Illumina, Inc., as well as groups of investors from [Silicon Valley](#), including Jeff Bezos, Bill Gates and [Google Ventures](#). Other investors, such as [Johnson & Johnson Innovation](#), [Amazon](#), [Bristol-Myers Squibb](#), [Celgene](#), [Maersk](#), became interested in this technology

and they are going to support its development too. At the moment Grail, Inc. received \$ 900 million. According to the spinoff leadership, they hope to raise more than \$ 1 billion after this round. The initial fundraising of the technology GRAIL became the largest in the field of medical diagnostics.

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Regions: United States  
Industries: Healthcare  
Source links: [Grail, Inc.](#)  
[Illumina, Inc.](#)



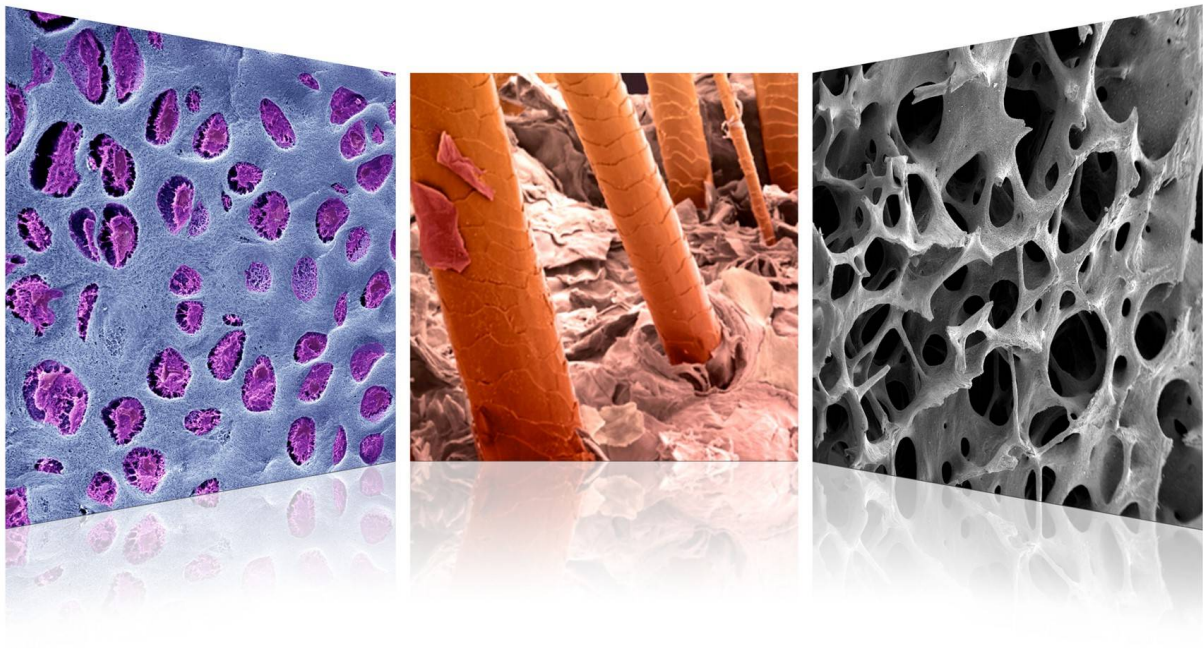
# SKINTE IS THE SKIN REGENERATION

Technology Skinte allows you to completely restore the skin of a person after third-degree burns. This technology was developed by Denver Lough MD, PhD of PolarinityTE, Inc. This company is aimed at regenerative medicine and tissue engineering.



Typically, skin grafts are the standard treatment for burn patients. But doctors can not use them for patients with large burns that require extensive coverage. SkinTE is the world's first technology that has been able to repair damaged skin. Previously, no one could do it. SkinTE allows you to restore the skin with the full thickness of the patient's own tissue. Regenerated skin is applied to the wound in less than 24 hours.

This summer, the company demonstrated pre-clinical data showing that Skinte regenerated all layers of the skin, promoting healing, a growth of hair follicles and immediate full coverage of the wound. The company was able to completely regenerate the thickness and structure of the skin, as well as regenerate hair on the skin after the third-degree burn. There is a team of experienced surgeons in this company. According to Denver Lough, all of they have unrivaled expertise in clinical research.



SkinTE

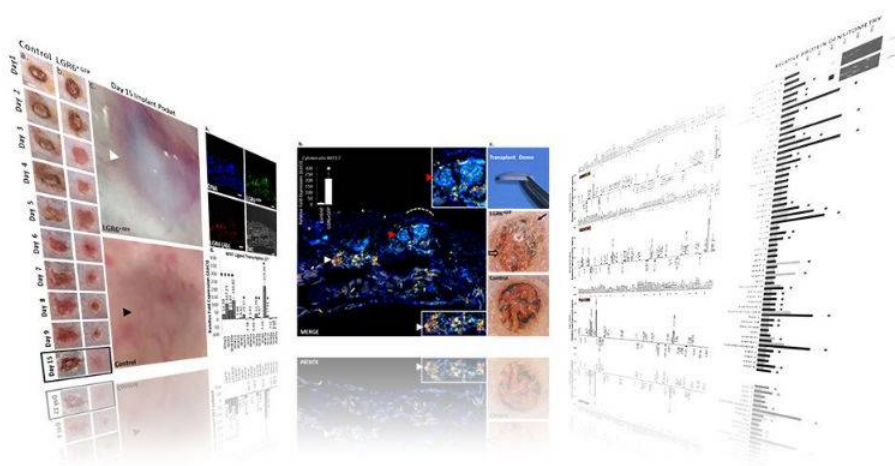
source - polarityte.com

According to [PolarityTE, Inc.](http://PolarityTE.com), the main function of the technology is that the patient undergoes a biopsy. Scientists take the biopsy out of the suffered place, after this procedure healthy cells begin to replace the dead cells. Healthy skin will gradually cover the wound without leaving scars. The skin regenerates entirely on all layers of the skin, including hair. However, the company does not disclose exactly how the recovery is going on.



The company announced that they are not going to stop only for skin regeneration. This is only the first stage that will lead them in the future to regenerate bones, muscles, cartilage, nerve, etc. The company pays much attention to the platform for bone regeneration, OsteoTE. It also plans to conduct a similar registration of the FDA as cells, tissues and cellular and human tissue product.

The most important is that the only way to restore the patient's tissue is to use his own cells and tissues. If a researcher takes cells and tissues from another patient, the body will always reject them. The basic principle of SkinTE is that the person must regenerate on his own.



SkinTE

source - polarityte.com

Currently, SkinTE researches were conducted only on pigs. Scientists believe that it will be appropriate for a person too because the skin of a pig and a man is very similar. The early experiments on pigs have always accurately predicted the behavior of human skin. If experiments on humans are successful, it will be a major breakthrough in the treatment of the most severe burns. The company planned to conduct the clinical research on a person at the end of 2017.

PolarityTE, Inc. is going to increase commercialization in 2018. The company plans to present the product in limited quantities for the selection of medical institutions. It will add institutions one at a time for expanding its manufacturing and its manufacturing capabilities. The future plans is to expand across the country. They are going to realize this plan in 2019.

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On market since: -  
Regions: United States  
Industries: Healthcare  
Source links: [PolarityTE, Inc.](#)



## THE WORLD FREE OF AGE-RELATED DISEASE

The anti-aging strategy was developed by Dr. Aubrey de Grey, the leading researcher of the SENS Research Foundation. The scientist considers that combating age-related changes will help people live longer and move into the era of post-aging.

**Aubrey de Grey** compares the human body with a machine, which needs constant updating and improvement. From his point of view, this will lead to an increase in the life of the organism and its productivity.

The main goal of the organization is to understand how to make immunity to be stable to fight undesirable cells and rid the body of their negative effects. [SENS Research Foundation](#) together with [the US Buck Institute for Aging Research](#), for achieving this goal, launched a research project on the study of dysfunctional leukocytes at the end of April 2017.

According to Judith Campizi, the project manager at the Buck Laboratory, various types of unwanted cells accumulate during aging and affect the function of many systems, including the immune system. Therefore, the main task is to study methods of eliminating these cells and rejuvenating the body, causing unwanted cells to self-destruct.



Dr. Aubrey de Grey  
source - SENS Research Foundation

Proceeding from this, Aubrey de Grey is convinced that he developed his strategy of "Divide and Conquer", according to which seven processes in the body are responsible for aging. He said that scientists could fight with them, whether loss of cells or destructive

mutations of mitochondria.

The scientist plans to study in detail all seven causes of aging and develop a plan to combat each of the processes separately. The organization concentrates on the rarest studies, which other scientists pay not so much attention. He believes that all these problems are mechanical, so they can be eliminated. Also, according to the scientist, the prolongation of life and the improvement of its quality will ease the financial burden on younger generations and help the elderly to remain active longer.

The first step in solving any problem  
is recognizing there is one.



Aging kills 100,000 people a day

**SENS.org**

Aging

source - SENS Research Foundation

Touching upon the problem of overpopulation caused by the growth of life expectancy, Grey notes that technologies in the field of renewable energy and desalination extend the life of our planet. In addition, the birth rate is falling, and in the future, in his opinion, it will be controlled artificially.

What for people is a priority the cure for a mother suffering from Alzheimer's disease or the need to have fewer children? He believes that the answer is obvious and the society will

have to answer this question soonly.

The use of the medicine against aging, according to Grey, will become available in the next 20 years. SENS already conducts clinical trials, but the maximum result can be achieved only after the release of funds to combat all seven aging processes.

SENS Research Foundation is aggressively pursuing the most basic, fundamental research in the new science of rejuvenation biotechnology. These researches are supported by Forever Healthy Foundation and its founder Michael Greve. But currently, none of SENS research programs are able to make use of human subjects.



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**Patent status:** +

**On market since:** 2017

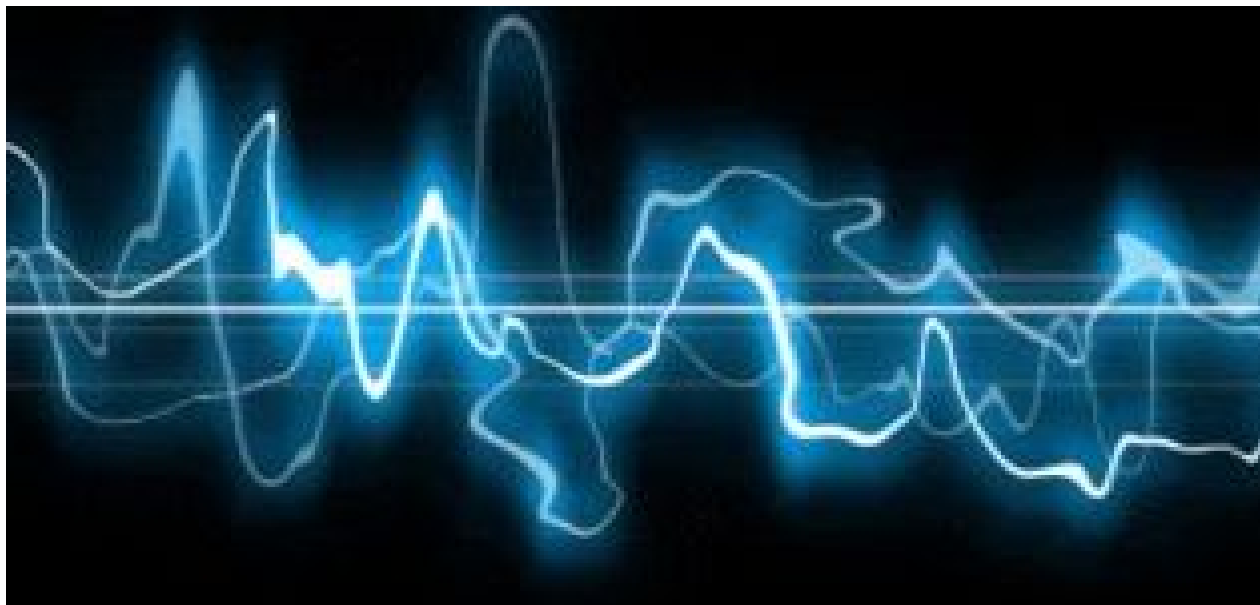
**Regions:** United States

**Industries:** Healthcare

**Source links:** [SENS Research Foundation](#)

[Buck Institute for Aging Research](#)

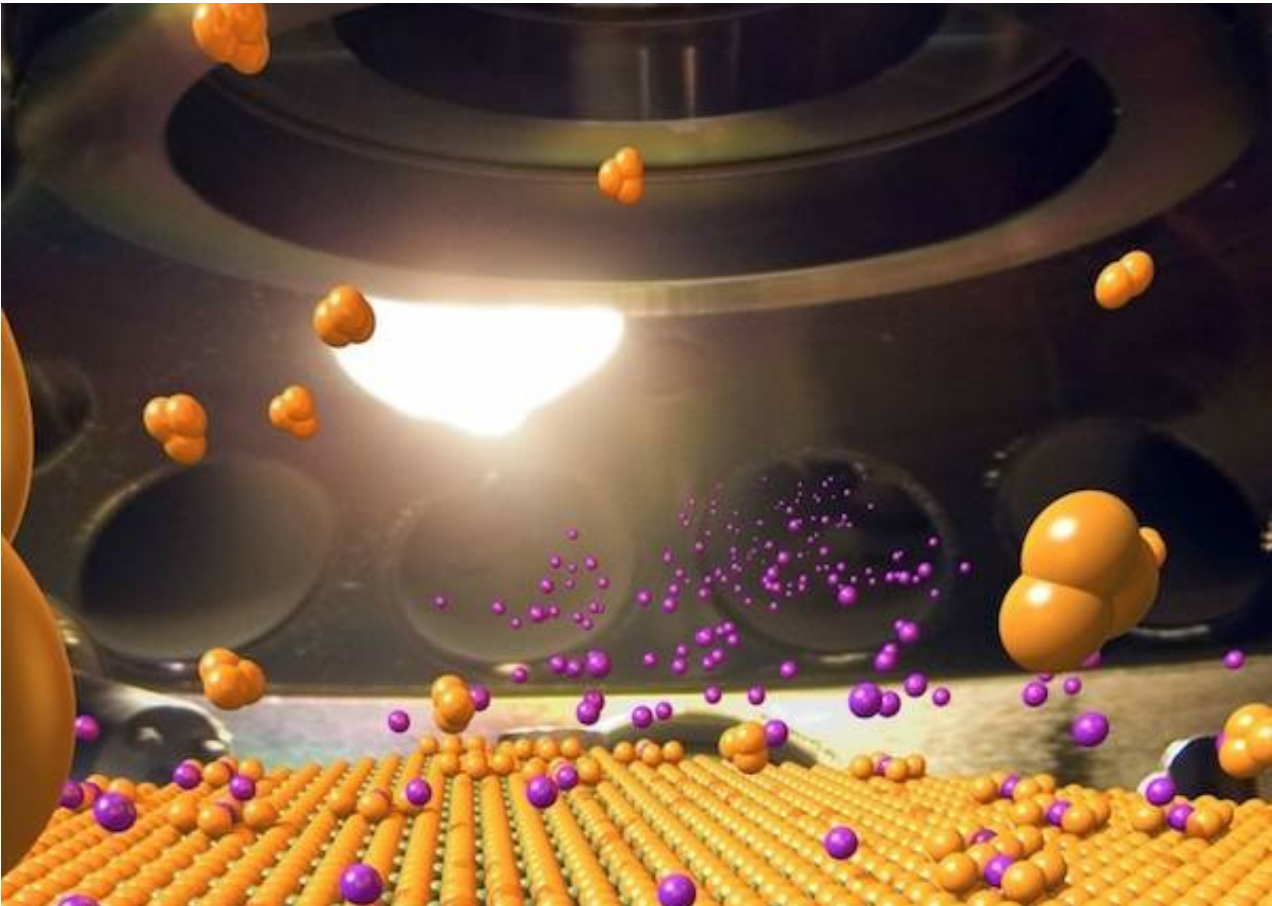
**OTHERS**



## THE NEXT GENERATION OF ULTRA-EFFICIENT ELECTRONIC DEVICES AND BATTERIES

Batteries, which do not heat up, are being developed by the scientists of the Brookhaven National Laboratory at the Department of Energy, USA. Superconductors are the main source of energy efficiency. These stunning materials allow the electric current to flow freely without resistance. However, this usually occurs only at temperatures within a few degrees of absolute zero (minus 459 degrees Fahrenheit), which makes it difficult to deploy today. However, scientists can use superconductivity forces at room temperature. They can transform how energy is generated, stored, distributed and used around the world.

American scientists have made a new discovery, which can help create a new generation of ultra-efficient electronic devices, batteries and power networks. In their opinion, the main component of this discovery is a class of materials called cuprates, consisting of layers of molecules of copper and oxygen. Cuprates can act as superconductors, without requiring super-cold temperatures, which are usually necessary for superconductors.

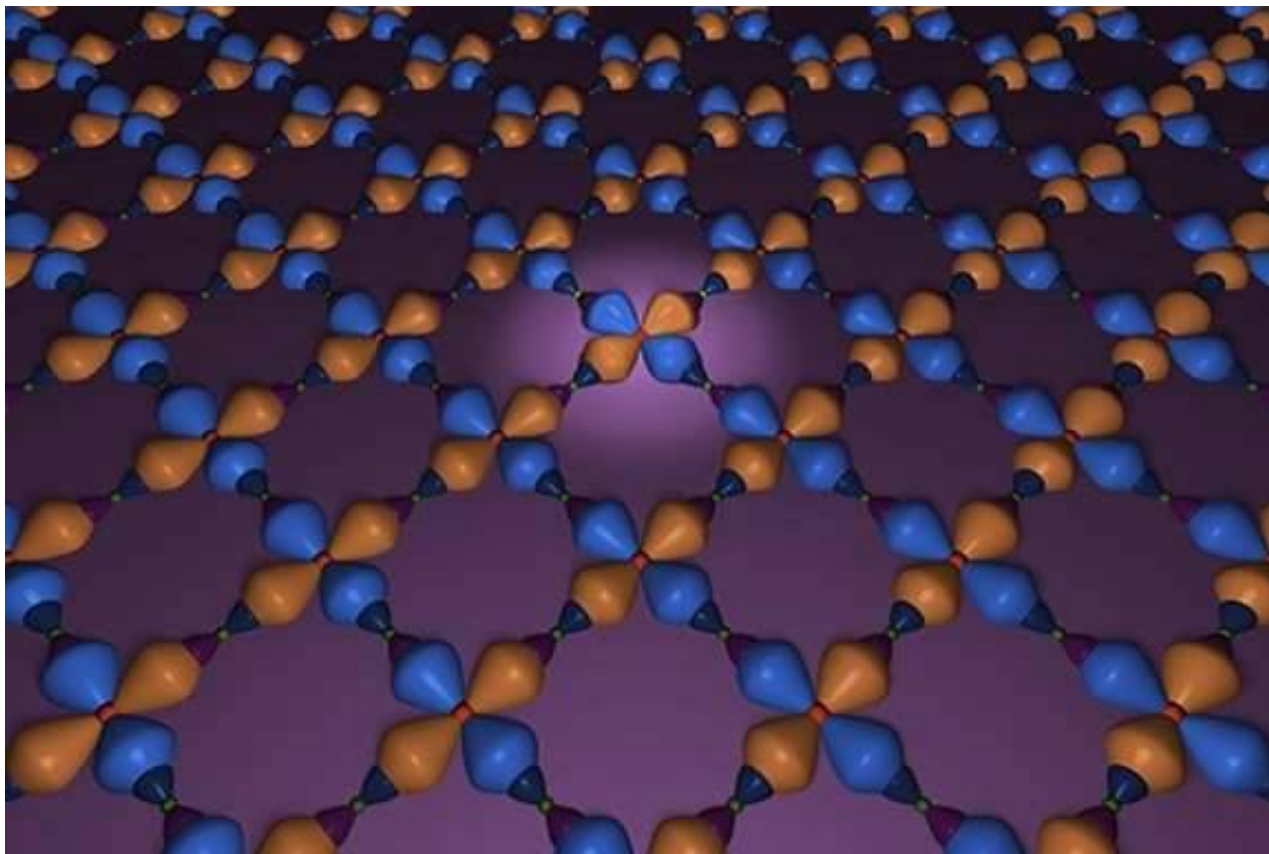


Scientists used cuprates that may pave the way for high-temperature superconductors  
source - energy.gov

The superconductors, on which all modern electronics are built, allow the electric current to move freely without encountering resistance. This happens only at temperatures close to absolute zero, which increases their weight, size, and cost. **If it were possible to create superconductors that would work at room temperature**, then the power stations would cease to lose energy, more accessible magnetic trains would arrive, cheaper MRI machines and small but powerful supercomputers.

Conventional superconductors are effective because they allow the passage of electric current without getting any 'checkpoints'. Now scientists are faced with the task of repeating this phenomenon only at room temperature using relatively inexpensive

materials.



A bonding structure of copper and oxygen atoms on a plane within a cuprate  
source - energy.gov

For [Ivan Bozovic](#), the head of research and Fellow of [the American Physical Society](#) and [the International Society for Optics and Photonics](#), and a Foreign Member of [Serbian Academy of Science and Arts](#), and his team, [the solution of this problem was using cuprates](#), substances consisting of copper and oxygen. In combination with strontium and some other elements, they exhibited the properties of superconductors but did not require ultra-low temperatures like conventional superconductors. According to scientists, the main thing that makes cuprates so special is that they can achieve this 'magical' state of matter at temperatures hundreds of degrees higher than those required by standard superconductors. This makes them very promising for real and energy-saving applications.

A research of the physicists of Brookhaven puts the traditional notion of superconductors on its head. In accordance with modern understanding, the temperature of the material depends on the strength of the interaction between electron pairs. In addition, according to Bozovic's team, the density of objects (in this case - pairs of electrons), and not force, controls the temperature. Scientists continue to work on this research. They call this the

first step to the development of ultra-efficient electronic batteries of the next generation.



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On market since: -

Regions: United States

Industries: Electronics

Source links: [the Department of Energy](#)



## CANDID IS THE SMILE YOU WANT

The technology, which fixes the bite was developed by Candid Co. Spinoff develops and sells orthodontic aligners, printed on a 3D printer and approved by the US Department of Health Supervision, designed to correct weak and moderate bite defects. The founding team includes graduates from Stanford, Harvard, Oxford, and Yale.

[Candid Co.](#) is a breakthrough in at-home Orthodontic care. The orthodontic aligner is very easy to use, gentle and safe. Its main advantage is **BPA-free plastic**, due to this orthodontic aligner does not irritate the gums and cheeks as traditional braces do. Orthodontic aligners Candid developed by the licensed orthodontist. The company takes care of working with patients directly to ensure a free and positive experience. The company also created removable aligners. Thus, people can take off them during eating. The company believes that their system can straighten teeth by **30% faster** than other orthodontic aligners can.



BPA-free plastic that won't irritate cheeks and gums  
source - candidco.com

The work with the client includes three stages. Firstly, the company sends the client a set for the self-creation of a cast of teeth. Secondly, after receiving it, orthodontists decide whether they can help in this case. There are orthodontists clinics in every state except North Carolina. When the case is more complicated, that is, it requires surgical intervention, Patient is advised to go to a dental clinic. Because this company's aligners are designed to minor to moderate teeth correction, for instance, they correct space between teeth and some bite correction. Thirdly, if the defect is weak or medium-strong, doctors write a treatment plan and send the customer a 3D model of how his teeth will look after the therapy. If the client likes the 3D model, Candid creates an orthodontic aligner in the laboratory. The whole process takes at least **6 weeks**. Another **5 months** will be spent on correction of the bite. The company also provides a fixator to wear the

orthodontic aligner at night. This is included in the price for \$ 1,900.



Aligners are easily removable  
source - candidco.com

According to [Nick Greenfield](#), co-founder of Candid, their company offers an inexpensive alternative. They increase accessibility for those who are not able to afford the high costs of treatment or do not consider it necessary to pay too much money for the cosmetic procedure. This is one of those untouched areas in which injustice reigns. If you are rich, you can buy braces, if you are poor, then no. They want to propose an intermediate solution. Nick Greenfield says that they view Candid as a company that increases market opportunities by reducing costs for orthodontic aligners.

US residents will be able to purchase these aligners for **\$ 1,900** with a one-time payment or **\$ 88 per month for two years**, while brackets can cost up to \$ 7,000, and removable Invisalign lenders up to \$ 8,000. The company raised **\$17 million** in funding from [Greycroft Partners](#), [Bessemer](#), [e.ventures](#), and [Arena Ventures](#) and other investors, which are orthodontists.

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**On market since:** 2017  
**Regions:** United States  
**Industries:** Healthcare  
**Source links:** [Candid Co.](#)



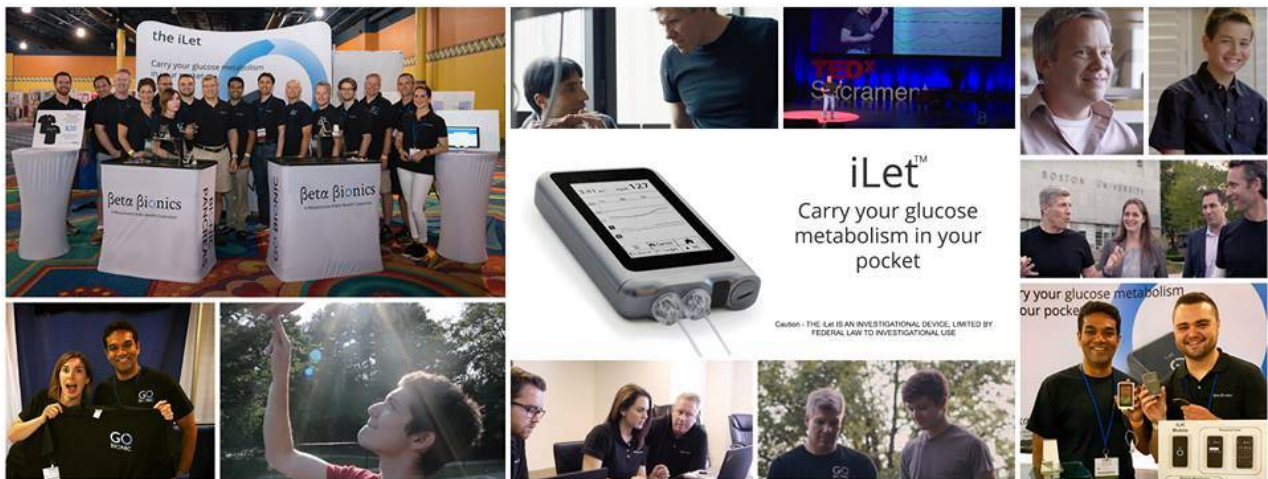
# ILET IS A FULLY INTEGRATED BIONIC PANCREAS

iLet spinoff is an artificial pancreas of a new generation for diabetics, which was created by Beta Bionics company. The main goal of the company is to facilitate the lives of people who live with diabetes or are associated with glycemic dysregulation. The team of the company consists of bioengineers from Boston University. Adaptive management of the artificial pancreas was developed by such scientists as Ed Damiano and Firas El-Hatib. Then it was laid on the basis of the iLet device.



The technology of artificial pancreas was developed by **Ed Damiano**, when his son, a patient with diabetes of 1 degree, was forced to do insulin injections himself. Some existing systems on the market use implanted sensors that measure the level of glucose in the blood. However, the device **iLet**, the development of **Beta Bionics**, can measure sugar and automatically injects insulin into the body when necessary.

**iLet** is a small invasive device that is attached to the abdominal surface. **This device contains 2 reservoirs** with medicinal fluids and can be used in a configuration with 1 or 2 hormones. Each reservoir is connected to the body by a conventional, subcutaneous, infusion set, which is currently used with insulin pumps. Also in the device are built-in wear sensors and a continuous glucose monitor.



iLet of Beta Bionics  
source - betabionics.org

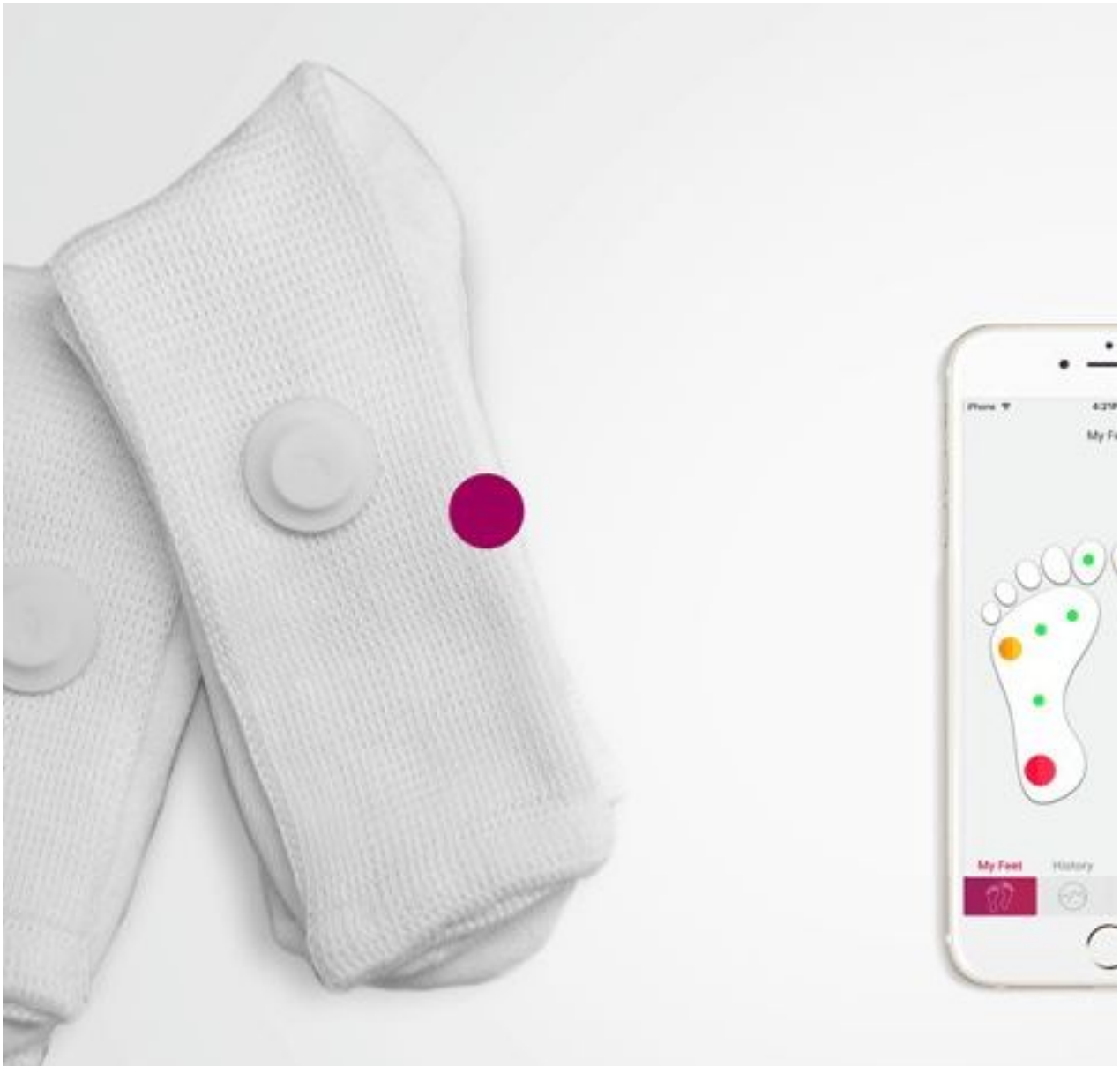
**The insulin cartridge** contains about 1.6 ml of drugs, and **the glucagon cartridge** contains about 1 ml. Consequently, for adults, insulin will be enough for 3 days, then a person should change the cartridge. Glucagon can be used up to 6 days, and then a person also needs to change the cartridge.

Currently, the company pays much attention to the iLet device for maintaining and managing the blood sugar level for people with type 1 diabetes. However, in the future, they hope to find a solution for managing a number of states of glycemic dysregulation, as the number of people, suffering from type 2 diabetes and people with rare but destructive conditions associated with chronic hypoglycemia such as congenital hyperinsulinism, insulinoma syndrome, etc., is raised every day.

The company decided to choose crowdfunding platform because it works for the benefit of society and for patients with type 1 diabetes. There are many among the contributors and scientists involved in diabetes research, such as Gabriel Smolarz of [Rutgers University](#). According to Gabriel Smolarz, the iLet device is like an unmanned vehicle. Sounds great and it has great potential, but there is not the risk of human error but at the same time, we give control to the car.

Beta Bionics collected on the crowdfunding platform Wefunder \$ 1,300 from 775 investors, the total amounted to just over one million dollars. Beta Bionics already tested prototypes on volunteers and started larger trials of iLet in March 2017. Initially, it is planned that the device will inject only insulin blocking blood sugar. In the future, the company is going to add glucagon, the second hormone, because the body needs at a reduced level of glucose, for example, between meals. In addition, the company hopes to win a grant from the [National Institutes of Health](#) for \$ 15 million.

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On market since: 2017  
Regions: United States  
Industries: Healthcare  
Source links: [Beta Bionics](#)  
[Boston University](#)



## SIREN SMART DIABETIC SOCKS MONITOR FOOT TEMPERATURE

Smart socks are a medical spinoff that uses temperature sensors to detect and prevent inflammation and swelling in diabetic patients. These socks were developed by Siren Care Company.

Patients with type 1 and 2 diabetes suffer from leg edema that can lead to serious problems, including infection and limb amputations. It is critically important to detect inflammation in the early stages in order to prevent undesirable consequences.

Smart socks for diabetics have direct contact with the skin. Therefore, they are designed to control the temperature of the feet, and they are aimed at combating the potential ulcers that appear on the feet due to diabetes. Socks keep track of the temperature because when the body gets damaged, it reports inflammation through temperature rises. Socks control the temperature changes that is why they can reveal early signs of potentially dangerous of trauma and diabetic foot ulcers. Socks contain **6 miniature temperature sensors** at the foot base, which are the most vulnerable for appearing ulceration.



Smart socks for diabetics  
source - siren.care

The sock sensors are woven into the fabric. All received data is downloaded to the application and notified in case of problems. All data is stored in the cloud, and when the sock detects a significant temperature increase, the user receives a message asking them to check the condition of the legs.

Socks are very easy to use. First, they should be worn every day to obtain the desired result. The sensors are activated during wearing socks and begin to measure the temperature between the legs during the day. Secondly, socks detect trauma and report it to the user with the help of a built-in Siren's plug. Thirdly, socks should be replaced every 6 months. Socks can be washed, water does not damage the sensors.

Smart socks include 5 characteristics that make them special. The first is non-binding top, which prevents the restriction in the calf, which can restrict circulation. The second is sensors of a siren are microsensors, smoothly built in for temperature measurement. The third is moisture absorbing fabric, which can keep feet comfortable and dry to minimize the risk of foot infections and blisters. The fourth is seamless toe and heel, which prevents friction of sensitive skin. The fifth is thick, padded footbed, cushions sole, which reducing strokes and protective feet.

According to Ran Ma, the company wants to expand the capabilities of socks, not limiting them to just a temperature detector. Their technology SirenSmart Textile will be able to install different sensors of the electronics into the fabric such as humidity, pressure, light, diodes, RFID tags, microcontrollers, BLE, and others. Smart socks for diabetics A siren can be pre-ordered right now. Approximate cost of 7 pairs, for each day of the week, is \$120



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On market since: 201  
Regions: United States  
Industries: Healthcare  
Source links: [Siren Care](#)