Commercializing Technologies for Societal Impact

U.S. - India Science and Technology Endowment Fund

The governments of the United States of America (through the Department of State) and India (through the Department of Science & Technology) have established the **United States–India Science & Technology Endowment Fund (USISTEF)** for the promotion of joint activities that would lead to innovation and entrepreneurship through the application of science and technology. The aim of the Fund is to support and foster joint applied R&D to generate public good through the commercialization of technology developed through sustained partnerships between U.S. and Indian researchers and entrepreneurs. The U.S.-India Science and Technology Endowment Fund activities are implemented and administered through the bi-national **Indo-U.S. Science and Technology Forum (IUSSTF)**.

U.S.-India Science and Technology Endowment Fund (USISTEF)

Status Report

April, 2017

USISTEF
UNITED STATES - INDIA SCIENCE & TECHNOLOGY ENDOWMENT FUND

From the Executive Secretary's Desk

Innovation is the corner stone that translates the fruits of scientific discovery into tangible deliverables of utilitarian value for the benefit of human kind, and, enterprise is the vehicle to carry them forward and deliver to the people and end-users. In the absence of innovation and enterprise, scientific discoveries would merely remain a matter of intellectual quest, devoid of any net utility to people at large and do very little for the advancement of civilization.

Nevertheless, translation of scientific knowledge through innovation into products and services of distinct utility and taking them further to the market place requires investment and involves risk. Unlike innovations which are solely based as new business and delivery models; scientific innovations involve an additional component of risk, require domain knowledge and have comparatively large gestation periods to the market. Hence, not all conventional investors including those who operate in the "high risk - high reward" domain like Angels and VCs, prefer to support such initiatives until they have come to a level of advanced maturity.

The *United States – India Science and Technology Endowment Fund* (USISTEF) grants are specifically created to address this gap and hence have a very unique positioning in the space of funding innovation and enterprise. The present USISTEF grant-in-aid model, without any pay-back liability, also gives an additional comfort to grantees to pursue their journey through the valley of death during the cross-over phase.

The fund has been operating for the last eight years and through seven calls, "twenty five" companies have been supported so far. Most of the initial awards have successfully concluded with products formally launched in the market. Several of them have attracted additional investment for scaling up. Quite a few of the awards are pertaining to bio-medical devices that have improved features/ functionalities and score high on affordability without compromising on quality, reliability or safety standards. Most of these products have global appeal and meet global standards of safety and quality.

This book showcases the profiles of all the awards made so far and presents a detailed account of the projects that includes product innovation, specific need it addresses and the current status in terms of their impact and market reach.

We expect that this book will help in providing a face to the program; it will eventually encourage new innovators to pursue their ideas making use of the available support through USISTEF grant.

Rajiv K. Tayal
Executive Director, IUSSTF
Executive Secretary, USISTEF

About USISTEF

Objectives

Through a competitive grants program, the Fund selects and supports financially promising joint U.S.-India entrepreneurial initiatives that address the theme of "commercializing technologies for societal impact". These initiatives can originate from government, academic, non-governmental or commercial entities, and any combination thereof provided they focus on applied R&D, incorporate a business plan and proof of commercial concept, and have significant sustainable commercial potential.

Program Areas

Healthy individual: Supports the development of affordable biomedical devices, diagnostic/preventive/curative measures, or food and nutrition products to improve health. (Drug development and clinical trials are not eligible activities in this category).

Empowering citizens: Supports efforts to reduce the digital/technology divide. This could include information and communication technologies with societal impact in areas such as water, agriculture, financial inclusion, and education, among other areas.

Note: *The areas are subject to change with evolving priorities. Promising areas other than the above areas may also be considered.*

Eligibility

Proposals must include a minimum of one partner from each country. Bi-national teams applying to the Endowment Fund will work together to commercialize technologies for societal impact.

The bi-national teams can include:

- Incorporated companies including start-up companies; or
- Non-incorporated entities; or
- Individuals or consortia from academia, government laboratories, non-government R&D institutions

As a general policy, participation of large companies is not encouraged as a competitor for USISTEF grants. However, their participation would be encouraged if they can bring distinct value to the partnering start-up and demonstrate their long term interest. Notional cost(s) can be provided to such large companies to take care of their direct expenses.

Each bi-national team must include at the time of application an entrepreneurial (small-scale as opposed to large-scale) entity that will receive a portion of the grant and take the technology to the market. If partners are planning to form a new venture to commercialize the technology, the proposal should include planned incorporation date and the amount of grants requested for the new entity.

The teams should be able to accept the terms and conditions of the award in case the proposal is approved.

The relationship between the U.S. and Indian partners must be clearly defined, including ownership of intellectual property rights for the technology proposed to be developed and commercialized.

The applicants must make a credible case that the proposed technology can enter the market within 2-3 years.

Funding

Grants of up to Rs. 2.50 crores or approximately $400,000 (subject to prevailing exchange rate).

Contact Us

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ICELINGS

promethean power systems

Principal Investigators

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The Context

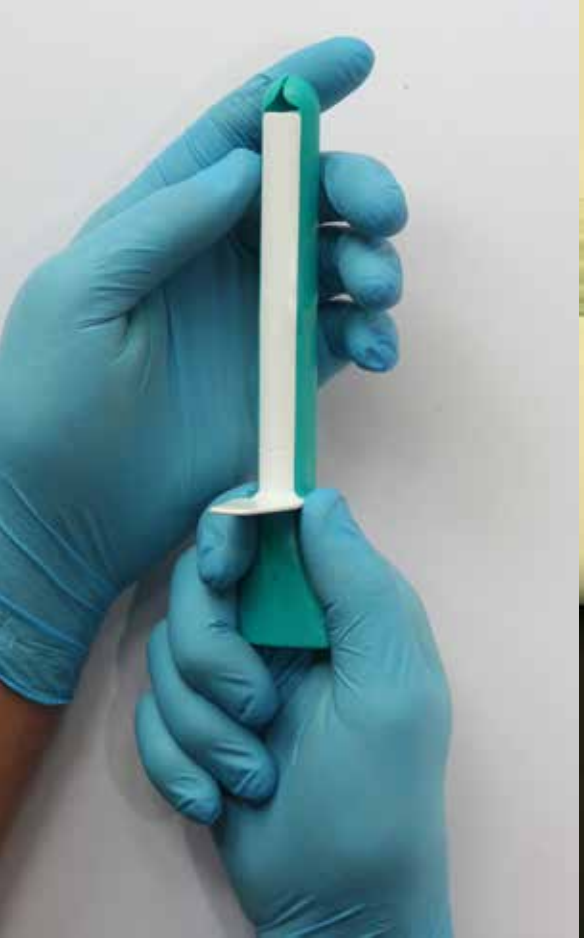
The annual value of harvest and post-harvest losses of major agricultural produce at the national level, according to data published by the Ministry of Food Processing Industries in 2016, has been estimated to be of the order of Rs. 92,651 crores (USD 13 Billion). A large part of this avoidable loss of agricultural produce is attributable to inadequate availability of cold storage infrastructure. The common practice adopted by farmers is to use diesel generators for chilling that is both costly and impractical for small farms. Strategically, holistic development of integrated cold-chain holds the key for reducing post-harvest losses, ensuring uninterrupted supply and thereby minimizing food inflation.

The Initiative

Promethean Power Systems, a U.S.-based company,and *Icelings*, an Indian company were awarded the U.S.-India Science and Technology Endowment Fund (USISTEF) grant to develop a mobile refrigerated storage container to store and preserve fruits, vegetable and other perishable agricultural products both at the source of production and as they make their way from rural farms to urban markets. The solution is achieved through the new Thermo-power technology, which stores electricity in the form of thermal energy (using a phase-change material), as opposed to electrical energy. The innovators have engineered a solution that makes it possible to take advantage of grid power whenever it is available. Working independent of harvest timing, this off-grid refrigeration container has allowed farmers to sell their produce at fair prices.

The Outcome

The use of this innovative technology has also resulted in reduced capital and operating costs. Additionally, the equipment pays for itself in cost savings from reduced spoilage within a single peak season. The product is more durable and less expensive than existing diesel-fuel powered refrigeration systems. Another advantage is that the solution can be customized depending on the requirements of the users. The team has successfully installed a cold-storage facility with thermal battery backup at a farm in Pune. Currently, 1-2 ton cold-storage facilities are available at competitive prices.



Tackling Fecal Incontinence

consure MEDICAL

LUNAR

Principal Investigators

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Matt Peterson
Lunar Design
San Francisco

The Context

Poor bowel control, which leads to the involuntary and untimely release of faecal matter or flatus, is an especially embarrassing and distressing condition for non-ambulatory patients and their caretakers. The prevalence of liquid stool incontinence and diarrhoea among these patients is 18-44% in the ICU, 40-79% among skilled nursing/long-term care facilities and 30% in medical wards. This creates several primary and secondary complications that include increased risk of skin breakdown or inflammation leading to perineal dermatitis,skin infections, and pressure ulcers. Existing management solutions include absorbent pads, adult diapers and intra-rectal balloon catheters that cater to a very limited patient population, and have been shown to manifest complications like necrosis and sphincter dysfunction while also causing significant discomfort to patients.

The Initiative

Consure Medical Pvt. Ltd., New Delhi and *Lunar Design*, San Francisco have developed a novel technology - ***Qora™*** Stool Management Kit, which addresses the clinical and economic implications of fecal containment, diarrhoea and skin infection by expanding indications for use and reducing the skill level required to use the device. The kit has introduced a new level of care for patients suffering from fecal incontinence outside the ICU setting. Trademarked as the *Qora* suite of products, it is a self-expanding stool management device with a unique placement, deployment and withdrawal mechanism. The kit, which is the world's first FDA 510(k) cleared indwelling fecal drainage device,can be used across a continuum of care facilities. It is the only stool management device that integrates a hygienic applicator to deploy a diverter inside the rectum by a minimally trained care provider or a motivated family member. The indwelling diverter resides between the rectal valves without distending the rectum beyond its natural state and without interfering in its natural physiological function. The Collection Bag is odor-proof and is integrated with a unidirectional valve that prevents accidental soiling. Additionally there are inbuilt sampling and withdrawal ports for easy and accessible clinical care.

The Outcome

The product was commercially launched in India and the U.S. in 2016.The product is protected by patents in all key markets such as Canada, Australia, Japan, European Union, Singapore and Israel. *Qora*™ has been introduced in more than 50 hospitals in India and 35 hospitals in the U.S. Around 175 doctors and 500 nurses in India and the U.S. have been trained on the use of *Qora*™. Switching to *Qora* not only brings down the cost of consumables, but also decreases net overall cost burden of fecal containment. The *Qora* suite of products (with three variants for short, medium and long-term fecal management) are more cost effective and have been shown to reduce hospital associated complications like dermatitis, cross-infection and pressure ulcers commonly associated with traditional fecal management techniques.

Branchless Banking and Financial Services for the Unbanked and Underbanked

EKO/-

IDMISSION
empowering identity

Principal Investigators

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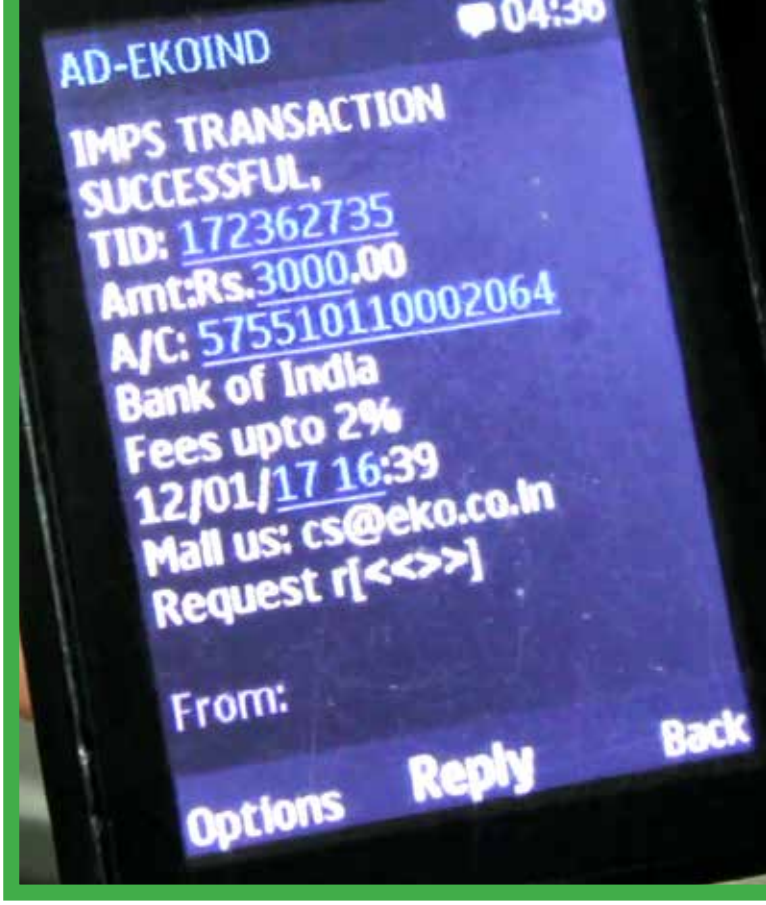
Angela Schmuck
IDmission LLC, Mesa



The Context

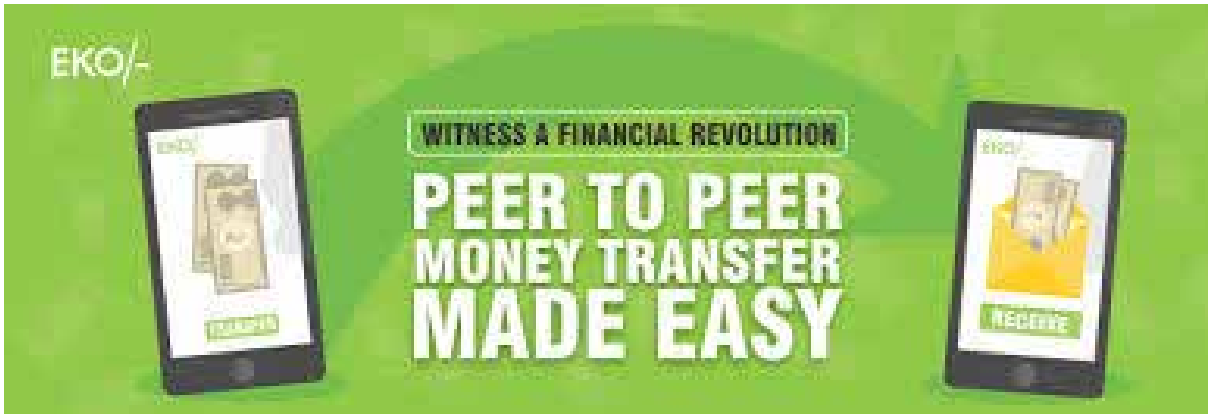
A large section of the Indian population (~500 million) continues to remain without access to banking services. Traditional financial service delivery models are inadequate to serve low-income groups. This project aims to deliver financial services efficiently to the common man by leveraging existing retail shops, tele-connectivity and banking infrastructure through smartphone-based application mechanisms integrating with the Unique Identification (UID) of India Program.

The Initiative

Eko India Financial Services Pvt. Ltd. is a technology company contributing to the changing financial inclusion landscape by integrating its platform with those of the Banking sectors. The primary focus of *Eko's* efforts is to enable customers / agents to perform secure financial transactions on any mobile without installing an app on the phone or SIM. With support from the U.S.-India Science & Technology Endowment Fund, *Eko* and *IDmission LLC*, USA have jointly developed the world's most usable and universal 'strong'2-factor authentication solution and a user interface that works across all mobile phones. This universal user experience is helping build a P2P (peer-to-peer) network for payments and transfers. *Eko's* innovation not only makes the life of the customer easy but the person sitting across the counter also partakes of it. *Eko's* Assisted Model of banking allows for a quick, safe and secure financial transaction even though the merchant sitting across the counter is not in the banking business per se.

The Outcome

As of today, hundreds of crores of rupees change hands through thousands of *Eko* Customer Service Points (CSPs) in over 16 Indian states. *Eko* has 5,000 operational CSPs processing financial transactions worth 70 million USD and acquiring 500,000 new customers per month. Leveraging existing retail shops, tele-connectivity and banking infrastructure, *Eko* makes 'cash in and cash out' a simple process that is available from seven in the morning to eleven at night. Since a CSP can be easily set up alongside an existing business such as a pharmacy, stationary or grocery store by downloading just two basic pieces of data from the *Eko* website; this innovation has turned thousands of regular merchants into entrepreneurs throughout India. The innovation is completely integrated with the Unique Identification Authority of India (UIDAI) and National Payments Corporation of India (NPCI) for Aadhaar Enabled Payment System (AEPS).



Mobile Phone-based HbA1c Analyzer

JanaCare

TC Teco Diagnostics

Principal Investigators

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The Context

As of 2015, an estimated 415 million people had diabetes worldwide; with type 2 Diabetes making up about 90% of the cases. This represents 8.3% of the adult population, with equal rates in both women and men. From 2012 to 2015, approximately 1.5-5 million deaths each year resulted from diabetes. The global economic cost of diabetes in 2014 was estimated to be USD 612 billion. Diagnosing and monitoring diabetes is therefore critical to its management. There are three primary methods for diagnosing diabetes in the developing world - the fasting blood glucose (FPG) test, the oral glucose tolerance test (OGTT) and the WHO recommended HbA1c test. The FPG and OGTT methods require standard blood glucose monitors and only cost about $1 per test. However, they are quite complicated to administer as they either require the patient to fast 8-12 hours prior to the test or test their blood sugar randomly, consume a glucose drink and then re-test after 2 hours. The HbA1c test is significantly easier to administer as it does not require fasting or timed samples and provides a measure of the average blood glucose for the preceding 2-3 months. There is an acute need for a low-cost and portable HbA1c monitor to manage diabetes, especially in the developing world. However, most standardized HbA1c monitors are expensive, bulky, assay-based systems and thus not suited for mass adoption.

The Initiative

The project aims to develop a novel and low-cost phone platform comprising of a colorimetric strip and a software application that uses the phone's camera to analyze the strip. The Device ***Aina*** comprises of a novel hardware sensor that plugs into any smart phone and an array of proprietary dry-chemistry strips to test seven basic blood parameters. Instead of drawing blood from a vein in a lab, this innovative device takes just a drop of blood from a finger prick to estimate for glycated hemoglobin or HbA1c. The software application provide automated decision support and transmit data to specialists, thus enabling millions of field health workers to screen and manage diabetes in even the most remote communities.

The Outcome

Apart from HbA1c, this device can also test the lipid profile, including High Density Lipoproteins (HDL) as well as abnormal levels Creatinine and Hemoglobin. The product has been commercialized under the brand name *Aina* and includes separate versions for use in Primary Healthcare Centers, and for use by patients themselves. Janacare is aiming to reach 5 million patients by 2030.

Commercialization of Cultivated Sea Plants based Organic Bio-stimulants

AquAgri

GloBridge Ventures

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The Context

Consumers across the globe are becoming increasingly health conscious, which has in turn resulted in a change in their tastes and preferences. A growing number of consumers are moving towards the consumption of organic foods, to avoid adverse health effects caused by chemical preservatives. Moreover,the increasing popularity of organic products has significantly expanded the availability of organic food across the globe. With organic food becoming easily accessible, the global organic food market is expected to witness a remarkable growth. This opens up opportunities for production of bio-stimulants, which can help in greatly enhancing organic crop productivity.

The Initiative

The project involves the development of a sustainable cultivation model, involving coastal communities to grow and harvest natural sea plants such as the red algae *Kappa phycusalvarezii*. The cultivated sea plants are processed to produce organic bio-stimulants. The cultivation in itself provides a new livelihood option for the coastal communities particularly women, while the output is leveraged to produce bio-stimulants, which can help in greatly enhancing the organic crop productivity. These organic biostimulant products are marketed in the United States under the brand name ***AquaSap***. Rich in potash and other primary and secondary nutrients, *AquaSap* contains substantial amount of plant growth regulators and are rich in amino acids that makes it especially effective for improving seed germination, roots system, soil conditioning, and yield.

The Outcome

Trials carried out by multiple universities and the Indian Council for Agriculture Research (ICAR) institutions at 43 locations on 9 crops and have validated the efficacy of the product. The *Aquagri* manufacturing facility has completed necessary organic certification as per the United States Department of Agriculture's (USDA) National Organic Program. *SeaNutri LLC*, a joint venture company between the Indian and the U.S. Partner, is undertaking the marketing and distribution of the product in the United State.

Solar Electric Tractor

LOVSON

Solectrac

Principal Investigators

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The Context

Mechanization of agriculture is critical to enhancing the agricultural production to feed an ever-increasing global population. Apart from the cost of buying an expensive piece of equipment like a tractor, the rising cost of diesel fuel also significantly impacts the affordability of tractors, especially in less-developed countries. This has led to a low permeation of tractors in the farming sector of developing countries. For instance, in India only 5% of agricultural households own a tractor. Tractor demand is expected to go up due to shortage and rising costs of farm labour. Development alternatives that aid in the transition from diesel to power tractors is the need of the hour.

The Context

The project has developed ***Solectrac*** - a Solar Electric Tractor that is a fully functional agricultural tractor operating with up to five times the efficiency of a diesel version performing the same farming tasks. *Solectrac* with a battery inverter system provides electric power anywhere, anytime. It can also be used for portable power, water pumping and mechanical functions as well as hauling and transportation needs. Since the *Solectrac* is electric, its batteries can be charged directly by renewable energy or it can be charged at a low cost from the electric utility grid at off-peak rates. *Solectrac* uses patented “quick change” battery packs to extend operational periods. A striking technical feature here is the special transmission system made specifically for electric tractors wherein it takes power from the batteries instead of the PTO (Power Take Off) Shaft as in the case of conventional tractors. Yet another novelty is the “Mid Hitch” which allows for clear visibility and hence better control of the implements attached in front of the tractor, a feature not seen in traditional diesel driven tractors.

The Outcome

The team has completed the development of Pre-Production Prototype and implements. The Computer Aid Design (CAD) drawings are also complete. The Final Production Prototype and complete testing for commercial production is presently under progress.

Clean Energy and Power Source for Rural Households in India

Greenway

Hi-Z TECHNOLOGY, INC.

Principal Investigators

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The Context

Despite decades of effort, around 2.8 billion people worldwide still rely on solid fuels such as wood, dung and coal to meet their basic domestic energy needs. Use of solid fuels for cooking is responsible for an estimated 4 million premature deaths every year. In India, over 160 million households, constituting 70% of the population, are cooking on polluting cook stoves/indoor open fires. Over 50 million households do not have access to reliable electricity. These households are a representative of the high demand for clean cooking and power generation. For cooking, rural Indians use mud stoves with firewood, cow dung or biomass for fuel. Women build mud cook stoves for free but pay huge recurring costs in terms of health, and lose productive hours lost on collecting fuel and drudgery. Alternatives for lighting in households with poor grid connectivity come from the use of kerosene lanterns, which are inefficient and harmful.

The Initiative

Greenway's improved biomass cook stove employs thermo electrics that powers a fan, providing cleaner combustion for healthier cooking and excess electricity for household needs. The ***Greenway Power Stove*** utilizes the residual heat generated while cooking and converts it into electrical energy, generating about 8W net power. With typical cooking times of 2-3 hours per day, 16-24Wh of power can be generated on a daily basis. This can charge any mobile phone or battery-operated electrical device, supply a 1-2W LED light with enough charge to illuminate a room for 6 hours and cook a delicious meal in a cleaner, healthier and less smoky kitchen.

The Outcome

Greenway has set up a manufacturing facility in Vadodara and currently the factory has the capacity to manufacture about 30,000 stoves in a month. It can also produce both the TEG (themo-electric generator) module and the power stove in-house. *Greenway* has thus far sold close to 400,000 Greenway Stoves with cumulative stove sales revenue of over INR 50 Crore. *Greenway* has since raised USD 2.5 million in venture capital.

Affordable and User-Centric Knee Joints to Remobilize Above-Knee Amputees

JAIPURFOOT

D-Rev

Principal Investigators

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D-REV (Design Revolution)
San Francisco

The Context

The loss of a limb through amputation following a mishap or for medical reasons has a drastic effect on the victim. If the victim is also the main breadwinner in a family, as is frequent in India, the impact on dependents can be even greater.

Providing victims with a prosthetic limb and rehabilitation at an early stage can boost their chances of regaining their ability and returning to productive work. However, prostheses are either not affordable for the large majority of the Indian population or are unsuitable for sustainable use and maintenance. Over 1.9 million people in India are above-the-knee amputees and are unable to live productive lives. With 77% of India's population living under $2 a day, amputees rarely receive rehabilitation and have no access to quality prostheses.

The Initiative

The team has developed the ***ReMotion Knee*** i.e. a high-performance, low-cost prosthetic knee joint for above-knee amputees that address problems seen with prosthetic clinics - successful fitting, follow-up and reporting of amputees. The *ReMotion* Knee is polycentric i.e. it has a changing axis of rotation that allows the user to bend the knee comfortably. The goal for the *ReMotion* Pilot Program is to become a global model of the delivery of high-performance, affordable medical products targeting low-income patients. This partnership will place India and the U.S. at the forefront of affordable quality medical products design and implementation and is the first step in global scaling and commercialization of the *ReMotion Knee*.

The Outcome

The *ReMotion* Knee was launched for sale in the U.S. in December 2015 and in India is February 2016. A total of 313 units have been sold in more than 17 countries since December 2015. The product has received CE Mark and Food and Drug Administration (FDA) Certification. The Innovators have also since received additional funding from the Wellcome Trust, Newmans' Foundation and the National Endowment for the Arts.

Easy to use, Integrated Neonatal Resuscitation Solution

Windmill Health
*Because **saving** lives should be **simple***

WHIPSAW

Principal Investigators

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The Context

Birth asphyxia occurs when the oxygen supply to a baby's brain and other organs are compromised or restricted before, during or immediately after birth. This can injure brain cells and cause hypoxic ischemic encephalopathy (HIE), seizures, permanent brain damage and long-term conditions such as cerebral palsy. Five out of every hundred babies born (6 million worldwide, 1.3 million in India every year) have birth asphyxia that is largely preventable through basic resuscitation. Current resuscitation devices are difficult to use, and can prove ineffective in skill-constrained settings found in much of the developing world.

The Initiative

The innovative ***NeoBreathe™*** is an integrated neonatal resuscitation solution that is much easier to use and will therefore empower front-line health workers such as medical professionals, community health workers, midwives and other skilled birth attendants to perform basic neonatal resuscitation easily and effectively – with minimal training. This is the world's first foot-operated resuscitation system and is the first to combine suction and resuscitation functionalities into a foot-operated device. Foot operation frees one hand from the task of hand-bagging – and the freed hand allows the user to create an effective face mask seal using both hands. Alternatively, it can be used for giving chest compressions, making it the first manually powered resuscitator. It also offers exceptional convenience and premium features like built-in suction, pressure monitoring, PEEP, and oxygen regulation for the sophisticated caregiver.

The Outcome

The team has completed the product design and development as per all applicable ISO standards. Industrial, bench and animal testing have been completed as per ISO guidelines for biocompatibility. User evaluations indicate a performance improvement of 20% as compared to bagmask in skilled as well as first-time users(consistently over 2 evaluations).The product is presently in use at selected sites (Apex tertiary level Govt. Hospital, Medical Colleges, Corporate and Private Hospitals) in 10 states under a Limited Market Release program. The project has since attracted additional investments to the Indian company to the tune of INR1.77 Crore.

The commercial launch of *NeoBreathe™* was done in December 2016 during the Xth Indian Medtech Summit -the annual flagship event of the School of International Biodesign (SIB).

OneBreath: Affordable Mechanical Ventilator

Vaatsalya HOSPITALS
Family Speciality Care

OneBreath

Principal Investigators

Ashwin Naik
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The Context

Respiratory illness is a leading cause of hospitalization and death in developing nations. Each year, thousands of patients die because of lack of early access to mechanical ventilation. Traffic accidents claim more than 120,000 lives each year and India makes up more than 50% of the world's pneumonia deaths. Despite improvements in infrastructure and economies, ventilators remain out of reach for many hospitals and pre-hospital care is in its infancy. Based on current bed-to-ventilator ratios, India's shortage is estimated to be over 1,000,000 devices. New machines cost upwards of $20,000 and are often too complex and fragile for use in harsh rural environments. Many facilities use poorly maintained refurbished devices, and emergency facilities and transporters often forego mechanical ventilation altogether.

The Initiative

Under this project, *Vaatsalya* and *OneBreath* are working on the development and commercialization of a novel ventilator specifically addressing the need for high-quality, pre-hospital and emergency care in India's lower income populations. The primary customers for this new ventilator would be Tier II Hospitals, Trauma Centers and Ambulance Providers in semi-rural areas of India. The *OneBreath* ventilator is designed to provide continuous respiratory support for infants through adult patients. Some of its key features include advanced ventilation modes, condition-based ventilation,intuitive touchscreen interface with real-time waveforms, Bluetooth wireless connectivity,operation on internal compressor or external oxygen and compressed air, and, long-lasting rechargeable batteries.

The Outcome

The team has developed a Ventilator that has advanced from proof-of-concept through production, with regulatory approval pending beta testing in hospitals around India including at *Vaatsalya*. The product's core IP has been granted utility patents in Singapore and Australia, with applications pending in India, the U.S., EU, China, and Canada. The team has begun manufacturing in Singapore and a total of 15 units will be produced and released for pilot use. Additionally, *OneBreath* has secured a Phase II "Transition to Scale" award from Grand Challenges Canada for $1M CAD.

Commercializing a Scalable and Low-Cost Arsenic Remediation Technology for Societal Impact

Livpure

ITT INSTITUTE FOR TRANSFORMATIVE TECHNOLOGIES

BERKELEY LAB

Principal Investigators

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Jadavpur University
Kolkata

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The Context

High levels of naturally occurring arsenic poisons the drinking water of close to 200 million people worldwide. Arsenic contaminated groundwater was first detected in India in West Bengal in 1983. Since then, arsenic contamination has been discovered in groundwater sources in the states of Punjab, Jharkhand, Bihar, Uttar Pradesh, Assam, Manipur and Chhattisgarh. Chronic ingestion of arsenic causes skin lesions, gangrene, cancer, cardiovascular diseases, reduced IQ in children, neuropathy and premature death. Tackling this problem requires the invention of a new, robust, efficient technology, coupled with a successful business model for effective social placement and local manufacturing that takes into consideration the cultural needs of the community.

The Initiative

This project adopts a systemic approach to identify a sustainable solution and works on the scale-up and demonstration of the patented Electro Chemical Arsenic Remediation (ECAR) technology for Arsenic remediation and commercial deployment. ECAR works by applying a small voltage (<10 V) to iron plates (which function as electrodes) suspended in arsenic contaminated water. The voltage causes continuous dissolution of the positively charged iron electrode leading to the formation of a particular kind of rust in the water. Arsenic binds to these newly generated rust nano-particles, which then coagulate, forming an easily removable sludge that settles as a solid.

The Outcome

The analysis performed by UC Berkeley and two independent NABL accredited laboratories in India confirm that the treated water meets all relevant drinking water standards (IS 10500:2012). While raw water has arsenic at ~250 ppb, ECAR-treated water is well below 10 ppb. The team have successfully designed, constructed, and commissioned a pilot plant in South 24 Parganas in the outskirts of Kolkata, capable of producing 10,000 L/day of clean water meeting all IS 10500:2012 standards. Automated Distribution Units (ADU) have been setup at the plant site and these ADUs delivers 200 ml of fresh ECAR water to each user when they place their plastic cards with an embedded electronic chip on the ADU.

The group has also conducted social science research to study local willingness to pay to ensure that the operation of similar plants can be fully commercially viable. The group has received additional funding support from USAID and UGC.

Transforming Arsenic and Fluoride Crisis in Drinking Water into an Economic Enterprise

rite water

drinkwell

Principal Investigators

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Nagpur

Mike German
WIST Inc., Texas

The Context

Up to 100 million people across 18 of India's 23 states are at risk of experiencing arsenic and fluoride poisoning from drinking naturally contaminated groundwater, resulting in potentially hundreds of thousands of people suffering from cancers, bone deformities and early death. The World Health Organization calls this crisis the "largest mass poisoning in human history."

The Initiative

The project aims to scale-up production and validate the effectiveness of HIX-Nano technology that is the first adsorbent for both fluoride and arsenic with high capacity across all relevant water conditions. HIX-Nano would be the first hybrid nanotechnology-based adsorbent produced in India and the world's first commercial hybrid adsorbent using zirconium nanoparticles. Unlike active Alumina or Reverse Osmosis, this technology uses an ion-exchange resin that selectively removes arsenic and fluoride contaminants. The polymer beads form the ion exchange resin material within which nanoparticles of Titanium oxide, Zirconium oxide and Iron oxide are infused. These in turn selectively pick up arsenic and fluoride. The energy needed for using this technology is minimal as compared to other energy-intensive processes like Electro-fluoridation and Reverse Osmosis.

The Outcome

The HIX media is being successfully manufactured in Kolkata and pilot plants have been set-up across the states of West Bengal and Andhra Pradesh. The technology has been validated by West Bengal's Fluoride Task Force. The team has received an order worth INR One Crore for setting up HIX-based plants across fluoride affected villages in Anantapur District, Andhra Pradesh and across arsenic affected villages in North 24 Parganas and Nadia Districts, West Bengal. Additionally, WIST has raised $422,500 through a bridge convertible note round that serves as a Pre-Series "A" Round of financing.

A Low-cost, Portable Autorefractor

aurolab

PLENOPTIKA
eye care for all

Principal Investigators

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PlenOptika, Boston

The Context

There are more than 1 billion people worldwide who suffer from poor vision due to lack of adequate eye-care; and in India, this number is more than 130 million. Eye glasses are extremely cost-effective, yet there is a huge barrier to obtain the appropriate eyeglasses in low-resource settings due to the acute shortage of trained professionals. It is estimated that India requires around 100,000 optometrists to provide adequate eye care. However, there are currently only 15,000 trained optometrists in India. Current approaches for prescription either require extensive training to become proficient at retinoscopy, or are too expensive for widespread use.

The Initiative

Through this project the team has developed an inexpensive, handheld device ***QuickSee/eSee™*** that helps eye care professionals to quickly carry out refractometry and prescribe eyeglasses. *QuickSee*, or *e-See* as it is called in India, is specifically designed to make existing eye care professionals more efficient; enable rapid training of new refractionists; and enable portable, fast, accurate refraction to be carried out in the field. To achieve this, the *PlenOptika* team created a rugged optical design; free of moving parts or need for calibration; with ergonomics that were intuitive for children, illiterate, and elderly patients; with clinical accuracy at par with an eye examination carried out by a professional; and a final price that was affordable to eye care NGOs and government programs. To make the *QuickSee* accurate, the team utilized wavefront aberrometry. Typically, wavefront aberrometers are prohibitively expensive ($50,000 USD) due to their scientific grade components, but the team leveraged low-cost optical sensors normally found in cell phones to ensure that the *QuickSee* device could be produced at affordable prices.

The Outcome

The team has clinically evaluated over 1,200 people at the New England College of Optometry (Boston, USA), Fundación Jimenez Diaz (Madrid, Spain), Aravind Eye Care System (Madurai, India), Sankara Eye Hospital (Bangalore, India), Wenzhou Medical College (Wenzhou, China), and other smaller pilot sites. They have fabricated 20 *QuickSee™* prototypes that have been used in pilot tests with strategic nonprofit and for-profit partners around the world. Two pilots have also been completed with the Essilor New Vision Generation program during the summer of 2015 and 2016. Production versions of *QuickSee™* is scheduled for sales in mid-2017 in India and the United States. The project has also received additional funding that includes NIH National Eye Institute SBIR Phase I grant ($150,000) to extend the device measurement range; NIH National Eye Institute SBIR Phase I grant Supplement ($25,000) to engage with regulatory consultants to complement necessary FDA/CE documentation; and, International Agency for the Prevention of Blindness “Seeing is Believing” grant ($200,000) to support design for manufacturing and mass-production scale-up.




Novel Biological Seed Treatments For Abiotic Stress Tolerance in Crops

SFPL Crop Life Science Pvt. Ltd

Adaptive Symbiotic Technologies

Principal Investigators

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The Context

Abiotic stresses like salinity, drought and temperature are major limiting factors in plant productivity, and sustaining growth and yield under such conditions is a key challenge for an agriculture system that is already struggling to produce enough to feed a burgeoning global population. Additionally there are biological stresses that affect metabolism of crops and livestock to reduce the expression of genes responsible for yield. Only 9% of the earth's landmass is fully conducive for crop production. The remaining 91%, to varying extents, is under abiotic and/or biotic stress due to land degradation, urbanization and climate change.

The Initiative

To mitigate the impact of abiotic stress on agricultural productivity, the project partners have developed a novel seed treatment called ***BioEnsure™*** (in the U.S.) and ***BioResilience*** (in India) which contains a mixture of beneficial fungal endophytes designed to enhance the tolerance of crop plants to abiotic stresses. These products are developed by harnessing the natural power of symbiosis that enables a broad-spectrum of agricultural crops to flourish under areas of drought, extreme temperatures and saline soils.

The Outcome

In India, *SFPL* has developed *BioResilience*, which is based on beneficial fungal strains native to India. They have conducted over 150 replicated field trials (State Agriculture University, farmer, in-house) in seven Indian states; and over 50 small trials and 20 pre-commercial trials are being conducted by regional seed companies. Results from these trails have shown enhanced plant growth under stressed conditions. *SFPL* is preparing for the commercialization of *BioResilience* in 2017 for the Indian market.

In the U.S., in January of 2016, *AST* signed its first distribution agreement to commercialize *BioEnsure-Corn*. Field tests have been conducted in more than 300 locations across 28 states in the U.S. covering numerous soil types, climate zones, and crop species. *AST* also expanded international field tests to Australia, Argentina, Uruguay and Brazil. They have since developed a novel production system resulting in a product shelf life of >2 years, and temperature resistance to 45°C. They have begun work on the next generation of BioEnsure; and, have closed a $3.4 million Series "A" from Australian Ag producer Twynam Agricultural Group and a group of impact investors.

Transformational Modular Roofing Solution for Low-income Urban Homes

ReMaterials

ITT INSTITUTE FOR TRANSFORMATIVE TECHNOLOGIES

Principal Investigators

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The Context

According to UN-Habitat, in 2012, around 33% of the urban population in the developing world, or about 863 million people, lived in slums. It is estimated that more than 150 million Indians live in slums that have housing of suboptimal standards. Among other inadequacies, a majority of houses in these localities have roofs made of corrugated metal, asbestos cement sheets, or clay tiles. This exposes the occupants to unbearably hot living spaces, high maintenance costs, frequent leaks, difficult installation, and a high risk of injury, in case the house collapses. Improved roofing solutions can enhance the quality of life of slum residents until such time that they are rehabilitated to planned townships.

The Initiative

ReMaterials have developed an innovative, low-cost, modular roofing tile for slum housing based on compressed recycled cardboard. To address the challenges of operating in the developing world, *ReMaterials* designed the roofing system to be modular allowing easy shipment, installation, and replacement of individual panels. The main components of the roofing system are panels that are custom manufactured from packaging and agriculture waste. The panels are strong, weatherproof, and long-lasting, allowing homes to stay cool, dry, and quiet, irrespective of the season. *ReMaterials* use compression techniques as well as natural fibre reinforcement to get the desired strength. With its fresh and colorful appearance, ***ModRoof*** is aesthetically appealing, making it a truly aspirational product.

The Outcome

The *ReMaterials* factory in Ahmedabad currently is able to produce up to 10 roofs in a month (single shift operation). The team has installed 50 roofs in the slums of Ahmedabad thus far and has sold 50+ roofs with a revenue of approx. INR 25 Lakh. Three micro-finance organizations have recently collaborated with the team. The project has also attracted additional investments that include Ketto Crowd Funding Campaign (INR 1,00,400/-); Awards from Global Social Venture Competition (INR 5,49,880/-); and, Equity investment (INR 2,04,78,241/-).

Moving Beyond the Pavement: Affordable Mobility for Users

Pinnacle INDUSTRIES

GRIT GLOBAL RESEARCH INNOVATION & TECHNOLOGY

Principal Investigators

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Global Research Innovation and Technology
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The Context

People with disabilities face challenges, as regular wheelchairs do not meet most of their needs. The World Health Organization estimates that over 65 million people in the developing world are in need of an appropriate wheelchair. Over 75% of them live in rural areas, where standard wheelchairs just do not work - they are hard to push, they break easily, and they cannot be repaired locally. The ***Leveraged Freedom Chair (LFC)*** is an all-terrain wheelchair designed to meet the needs of people with disabilities. LFC1 is currently in production in India. Though being rugged and ultra-low-cost, it does not fold, making shipping and transportation difficult. LFC2 that is currently in production in the U.S., folds and uses efficient manufacturing techniques to produce, but is too expensive to be viable in emerging markets. There is therefore a need to develop a third version of LFC with all functionalities for resource-constrained markets.

The Initiative

This project proposes a third version of the ***Leveraged Freedom Chair (LFC3)*** designed to be both low-cost and foldable, that would be manufactured at scale in India. Being developed by ***Pinnacle Industries Limited and Global Research Innovation and Technology***, LFC3 seeks to combine the mobility offered by LFC1 with the folding and manufacturing improvements of LFC2. This would be achieved by integrating the Lever Drive-train in its mechanism which allows it to create more torque. Another equally unique technical feature of the chair is its front wheel that allows it to move over obstacles and yet remain comfortable by absorbing shocks. Once fully developed, LFC3 promises to be a global-scale mobility solution that provides life-changing mobility for those in need of such assistance.

The Outcome

Third prototype of Leveraged Freedom Chair (LFC-3) has been developed in a pilot batch of 10 units for extensive user feedback. LFC-1 has thus far sold over 2000 units across four continents. The U.S.-made version of the product (LFC-2) is currently on sale in the U.S. and Canada and has sold over 180 units.

Forced Oscillation Device for Detection and Monitoring of Airway Diseases

IGIB
INSTITUTE OF GENOMICS & INTEGRATIVE BIOLOGY
Genomics Knowledge Partner

COGNITA Labs

Principal Investigators

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Ashutosh Sabharwal
Cognita Labs LLC, Houston

The Context

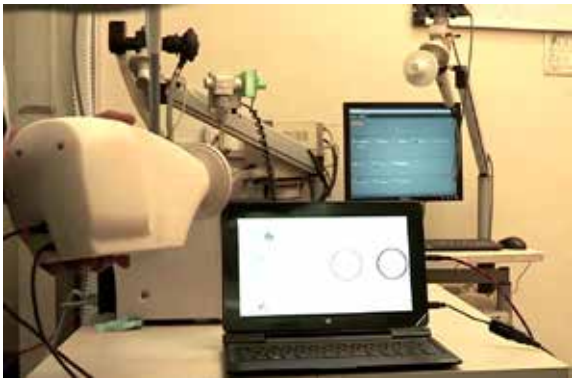
Increasing global urbanization and pollution has led to a steady increase in Obstructive Airways Diseases (OAD) like Asthma and Chronic Obstructive Pulmonary Diseases (COPD) similar to those caused by smoking and secondhand smoke inhalation. Together, OAD and COPD, affect an estimated 650 million people globally. A major global challenge is that a significant number of OAD and COPD cases remain undiagnosed, under-diagnosed or wrongly diagnosed, due to lack of easy-to-conduct diagnostics. Spirometry remains the clinical standard in diagnosing Asthma and COPD, but it is hard to conduct, as it requires patient training by trained technicians. It is also very expensive due to technician costs and hence remains under-used. In fact, many patients simply avoid spirometry, creating health risks due to delayed care.

The Initiative

In this joint project, the team from *CSIR-Institute of Genomics and Integrative Medicine* and *Cognita Labs LLC* is developing the world's first handheld, low-cost, portable and battery-powered Forced Oscillation Technique (FOT) device, called ***PulmoScan***, for measurement of lung function. *PulmoScan*, is a next generation of smart portable airway diagnostic device, with an assistive coaching tablet application and a cloud support. The key breakthrough here is in co-designing the hardware and signal processing algorithms for accurate flow design, combined with accounting for the unique features of human breathing. The device's innovative zero-effort, quick test makes it possible to integrate respiratory diagnosis in primary-care work flows and to customize its use in different contexts. *PulmoScan* allows minimally trained medical professionals to conduct accurate airway testing, including small airways at the periphery of the lung. The device is suitable for testing patients who are very young (<3 years), elderly or highly debilitated.

The Outcome

The first fully functional industrial design has been completed and demonstrated. The new ultrasonic sensor and industrial design is the basis for a provisional patent filed by *Cognita Labs* in February 2016. The team has recently completed version 2.1 of the prototype that not only increases accuracy but also aims to improve test repeatability by making changes to the flow dynamics of the design and reduce mechanical resistance. *Cognita Labs* has secured NSF Phase II funding ($750k) for commercialization of the technology.



Jaipur Belt™
(Belt System for Body Support)

newndra INNOVATIONS

MedSpark Innovation Ignited

Principal Investigators

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Newndra Innovations Private Limited
Jaipur

Paul Scott
MedSpark, LLC, San Luis Obispo

The Context

A common problem across a wide range of professions is back and waist pain. Lower back pain can be caused by a variety of issues concerning any part of the complex, interconnected network of spinal muscles, nerves, bones, discs or tendons in the lumbar spine. Possible remedies include intake of high doses of painkillers or usage of constrictive elastic belts, which usually restrict body movements. Surgery of the spine is complex and can have severe side effects in addition to a lengthy recuperation period. There is therefore a need to develop a prosthetic solution that mitigates pain without dependence on painkillers and potentially risky surgical interventions.

The Initiative

The ***JaipurBelt™*** is a lightweight, protective and therapeutic device that supports the backbone. The concept of load diversion is very common in orthopaedic and rehabilitation practice, but the manner in which the *JaipurBelt™* system has achieved it is what makes it especially innovative. Complete with a shoulder strap, thigh pad and a back strap; the load is diverted from the lower back to the thigh region. It is a human powered, efficient and economical exoskeleton that supports the spine and waist by sharing physical workload up to a predefined, variable limit without restricting body movements. Weighing between 1.5 and 1.7kg, it will particularly help people who work in the manufacturing, construction and other labour-intensive industrial and agricultural sectors.

The Outcome

30 Prototypes have been manufactured thus far and the product was tested with 30 users from different backgrounds. More than 70% of the users reported a positive feedback. *Newndra Innovations* have filed one PCT application, two U.S. Patents, one Chinese Patent, three Indian Patents and one Trademark application. *MedSpark* has prepared the U.S. version of requirement specification, verification and validation protocols and anthropometry review documents. The product has secured Ethical Committee Approval and CTRI Registration for Clinical Trials. *Newndra Innovations* was selected for the Top 10 Promising Startups of the Year Award by the Confederation of Indian Industry (CII). They were also selected for the Trail Blazer Award 2016 by the India Today Group and HP India.

Wireless Sensor-based Wearable Device for Heart Disease Management

monitra health

DUPONT

Principal Investigators

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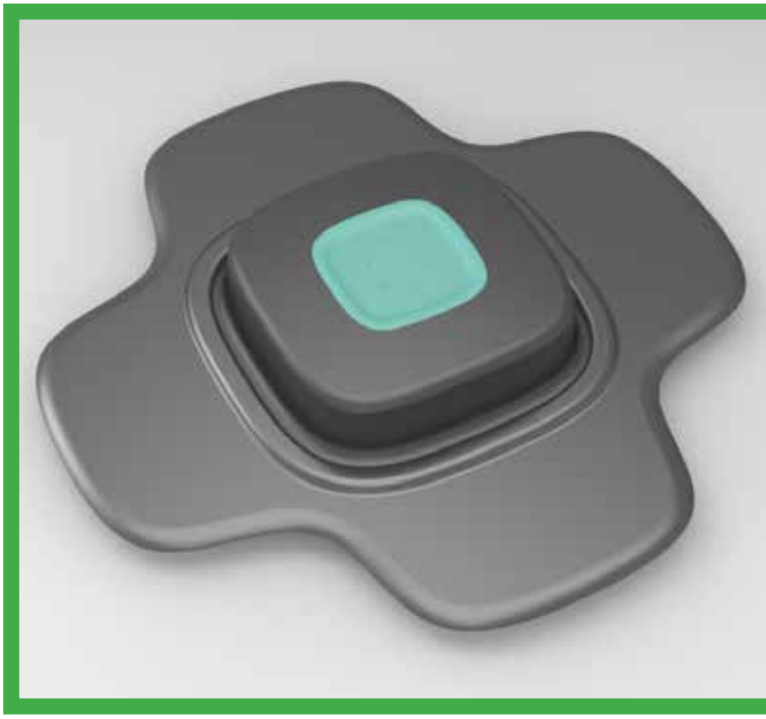
Joseph S. Menezes
DuPont, Sunnyvale



The Context

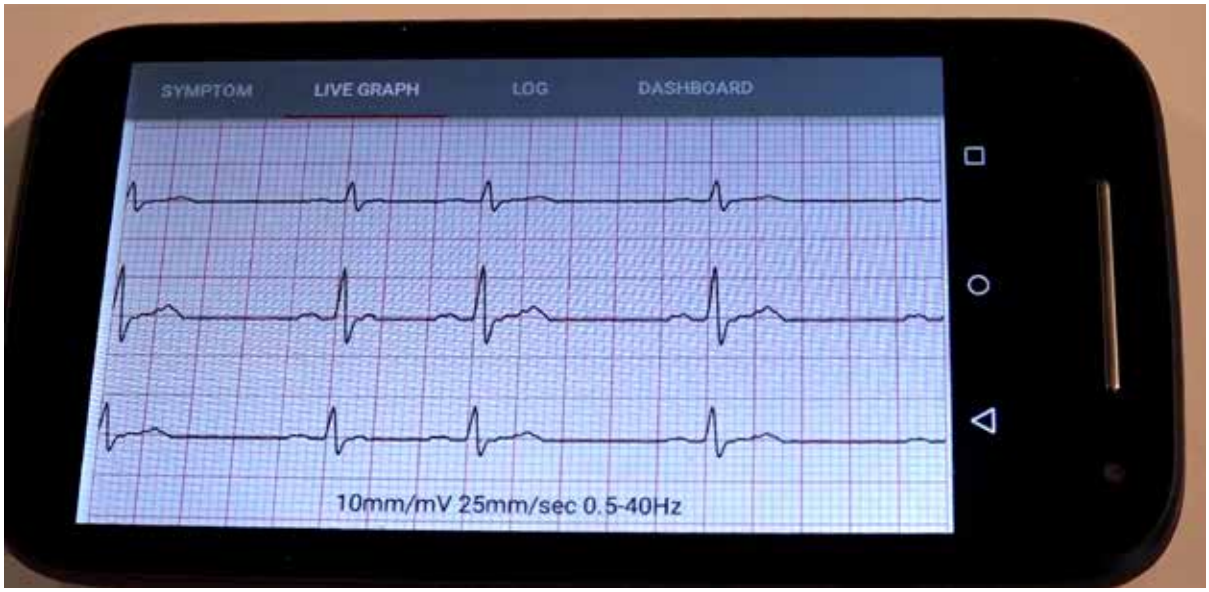
Millions of people experience irregular heartbeats, called arrhythmias, at some point in their lives. Most of the time, they are harmless and happen in healthy people free of heart disease. However, some abnormal heart rhythms can be serious or even fatal. Having other types of heart disease can also increase the risk of arrhythmias. A 24-hour (or longer) recording of the heartbeat is often necessary to detect any rhythm problem that occurs daily but not constantly. ECG and Holter device are conventionally used for such heartbeat monitoring purposes.

The Initiative

This project proposes the development of a wireless, wearable device for cardiac patients as a replacement for conventional ECG and Holter device for early diagnosis and management of heart rhythm disorders. The proposed device would be significantly cheaper leading to enhanced affordability and improved user experience and compliance. It is proposed to use a single patch made of breathable polymeric material with long lasting adhesion to capture the signal, which otherwise are sensed through multiple locations in the body using conventional protocols. In addition, the breathable polymeric material (a monolithic film) would prevent external moisture and air from penetrating through the material while allowing excess moisture to escape from the inside. The role of the device is to acquire signals, digitize and compress them, and then wirelessly transmit them to a server. The server then applies computation to generate meaningful reports for physicians.

The Outcome

Validation protocols for comparing Smart MCT device signals with those of standard monitors are currently underway. The first version of breathable, waterproof films has been shipped to India and work is in progress for the first milestone of materials development. The project has been recognized as a startup under DIPP's (Department of Industrial Policy & Promotion) *Startup India* program. The project also won first place in T-Hub's *Find your Funder* contest held in October 2016.



Hand Cranked Rugged and Affordable Defibrillators for Low Resource Settings

Jeevtronics

DHURJATY Electronics Consulting, LLC

Principal Investigators

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The Context

Sudden cardiac arrest (SCA) is a condition in which the heart suddenly and unexpectedly stops beating. If this happens, blood stops flowing to the brain and other vital organs. SCA usually causes death if it is not treated within minutes. India's (and other developing countries) death rate due to SCA is 3 to 4 times that of developed countries. This is largely due to inadequate availability of Defibrilliators. A Defibrillator is a device that sends an electric shock to the heart to try to restore its normal rhythm to reverse the arrest. Inspite of being a necessary life saving device, defibrillator availability in India is very limited. While global standards recommend 1defib per 3 ICU beds, India has 1 per 50 beds at best or even lower.

The Initiative

To address this challenge, the team from *Jeevtronics Pvt. Ltd.*, Pune and *Dhurjaty Electronics LLC*, Rochester, aims to develop a defibrillator with a built-in hand-cranked generator. This will enable it to work in un-electrified areas or areas without continuous power for 24hours a day. Further, the device is engineered to withstand harsh conditions in developing countries such as grid power fluctuations, impact, vibrations etc. making it rugged. Batteries are completely eliminated thus making the device virtually maintenance-free and highly reliable. The device will be highly affordable with the price to the end-user being one-fourth that of the international brands. The device's ability to quickly generate 1800 volts necessary to defibrillate a heart within 12 seconds by simply hand-cranking the device is its foremost novelty. Some other salient features of this defibrillator include input power from hand-cranked generator with backup from Grid (also possible); ECG from Paddles (standard practice) as well as ECG Electrodes; and, advanced features such as wifi connectivity for patient and device data.

The Outcome

The team has filed a design patent filed with Indian Patent Office and has prepared the ISO 13485 quality manual. The development of advanced prototype and CE Mark certification application process are presently underway.

An Association of Biotechnology Led Enterprises jury has selected *Jeevtronics* as the recipient of the first eN-ABLE Startup Award. Other awards include Tata Social Enterprise Challenge, Sankalp Summit,and International Knowledge Millennium Conference. The team was also a finalist at Social Venture Challenge Asia – a business plan competition organized by DBS Bank and National University Singapore (NUS).

Non-Stress Fetal Heart Rate Monitoring Tool for Ante-natal Check-up

brün health

Principal Investigators

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Berkeley

The Context

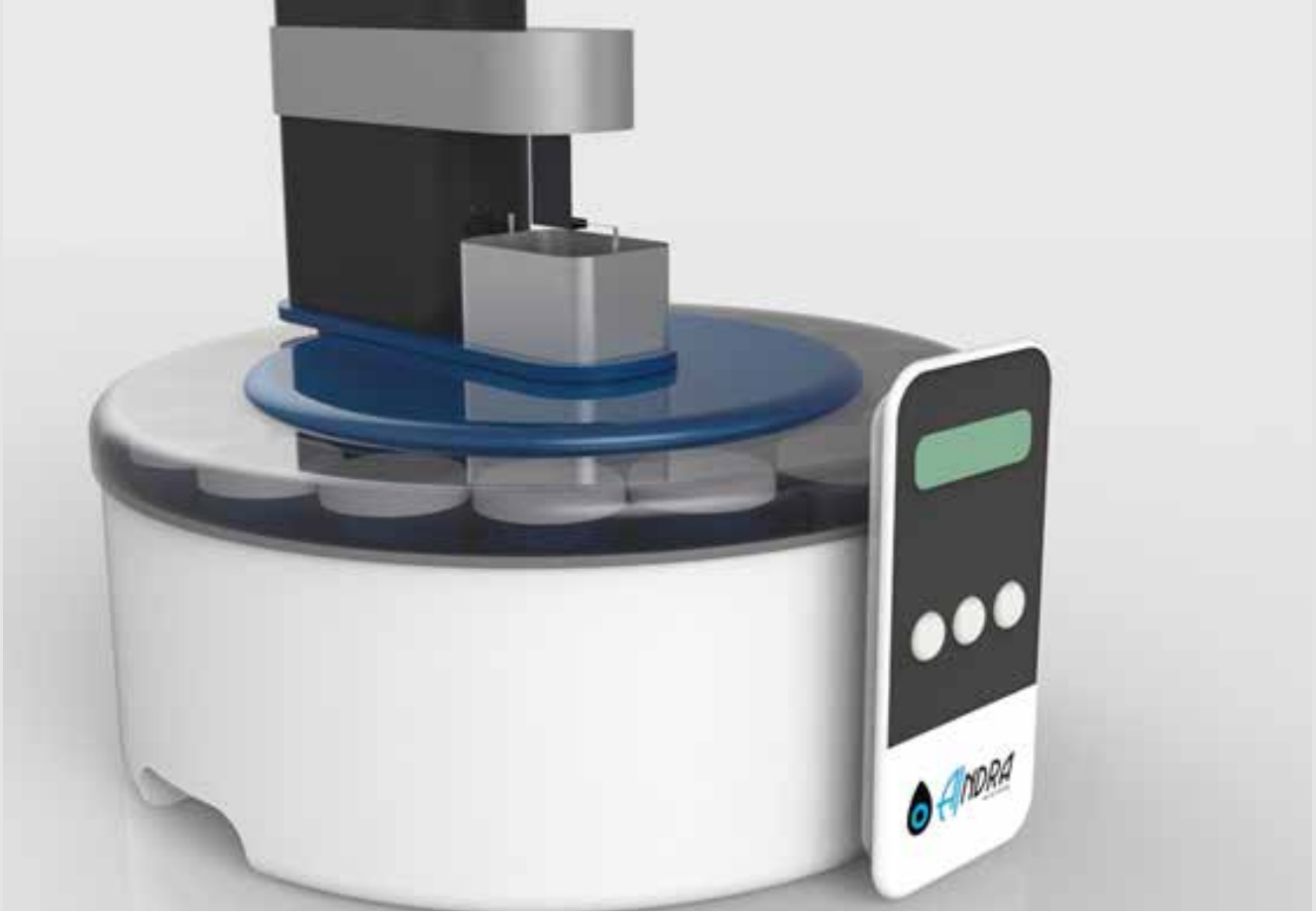
Lack of skilled workers has contributed to nearly 330,000 stillbirths among other morbidities in India. India has roughly 900,000 Accredited Social Health Activists (ASHAs) and 200,000 Auxiliary Nurse Midwives (ANMs). These workers are tasked with ensuring that pregnant women remain healthy, deliver safely and take appropriate care of newborns. Currently, they have limited tools at their disposal for monitoring fetal wellbeing. Fetal Heart Rate is a good indicator of several parameters of fetal health. Equipping community health workers with a readily usable device to monitor fetal heart rate during pregnancy can go a long way to reduce stillbirths, enhance neonatal health and social well-being.

The Initiative

The project aims to develop a biomedical device for monitoring fetal heart rate during the course of pregnancy to help clinicians screen high-risk cases and take decisions regarding possible interventions to reduce the high rate of stillbirths. The team is working on a device ***Brün*** which is meant to monitor several critical parameters closer to the delivery date. The device is based on plurality of Ultrasound and Doppler sensors and captures the fetal movement without causing any stress to the baby. An algorithm analyzes the data to determine if it is reactive or non-reactive. A simple LED indicator then shows whether the baby is safe or not. The device is compact and is equipped to gather data and transmit it through a smart phone by primary healthcare workers to a point where they can be clinically examined. *Brün* is a revolutionary new labor-monitoring tool. Its technology ensures easy detection of vital signs improving its ability while keeping costs manageable.

The Outcome

The product is currently in the development phase with early clinical data being obtained to display efficacy. The device is slated to be commercialized in December of 2017.



Modular Diagnosis of Cervical Cancer Using Smartphone and Artificial Intelligence

Principal Investigators

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Louis Auguste
Alexpath, New York

The Context

Cervical cancer occurs when abnormal cells on the cervix grow out of control. Most cervical cancers are caused by a virus called the Human Papillomavirus, or HPV. Cervical Cancer is the largest killer cancer for women in India, making India the Cervical Cancer capital of the world. With an estimated 350million Indian women aged between 21-65 years in the risk category for Cervical Cancer; India is potentially sitting on a ticking time-bomb. Like in the case of most other cancers, early diagnosis and treatment is critical for favourable outcomes. For winning the war against cervical cancer,diagnostic tests for cervical cancer have to be easy, available at the point-of-care and affordable.

The Initiative

The project proposes to build an affordable and portable, 'point-of-care' Cervical Cancer Screening tool to automate the analysis of the Pap smear slides. The slides are stained,scanned, digitized and then analyzed using computer algorithms to triage them into normal, suspect and abnormal samples. The images are then sent over a Tele-pathology medium to pathologists for further confirmations and recommendations. Multiple sites around rural and urban Karnataka will be included in the initial trial. Each site will receive a kit that includes ***Aindra's*** Auto Staining Device, *Alexapath's* Slide Scanning Equipment and a computer with a powerful graphics processing unit to run the auto diagnostic. This kit will pair semi-skilled workers capable of preparing and scanning slides with robotics and a machine learning/computer vision artificial intelligence. The team aims to bring the cost of cytology down to approximately INR 150 per diagnosis, a cost that should be affordable for women across rural India.

The Outcome

The team has completed the development associated to hardware and have created a web application to allow for control of the ADA stage. They have successfully developed a concept prototype with established repeatability, positional accuracy, stabilized mechanical and electronic components. The team has also developed the ability to accept tiled images from an Image Acquisition Device and feed them into the program.

Affordable Digital Braille Accessibility

Principal Investigators

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Mumbai

Shraddha Sangelkar
The Pennsylvania State University
Erie

The Context

More than 40 million blind individuals globally face numerous challenges in access to resources - both printed and digital. For centuries, Braille based on the sensation of touch, has been the only script available for the blind. Braille has been used to support over 100 languages and is critical for skills such as spelling, grammar, analytics etc. According to the World Health Organization, with a shift towards digital resources, printed material has become limited and outdated, literacy rate decreased to 10% and employ mentrate decreased to 30 % for the blind. The assistive technologies to support digital devices - computers, smart phones have been audio-based, making them unsuitable for literacy and employment as they are limited by lack of script, language support

and privacy. In addition, prolonged usage of headphones can be detrimental to hearing making it unsuitable for long-term use. The aids which support digital content access in Braille cater to less than 10% of the blind population living in developed countries due to an unaffordable price that is upwards of $3,000.

The Initiative

This project proposes the replacement of print Braille with electronic digital display using Braille cells with actuator technology-based on magnetic actuators instead of piezoelectricity. This is expected to bring down the cost of products significantly and make it affordable to a large under-served population. Current digital aids are audio-based, have a language limitation, and cost more than $1,000. This technological innovation reduces the product cost by a factor of 10. The technology has been tested with a lab-scale single line electronic Braille device as a proof-of-concept. The present prototype has a Braille keypad,a 16-cell Braille screen and navigation buttons and displays functionality in a stand alone mode with an SD card and on being paired with an android phone via Bluetooth, whereby the entire accessibility of the phone can be done by means of the product.

Developing Millimeter Wave Transceiver for Secure Wireless Communication

Principal Investigators

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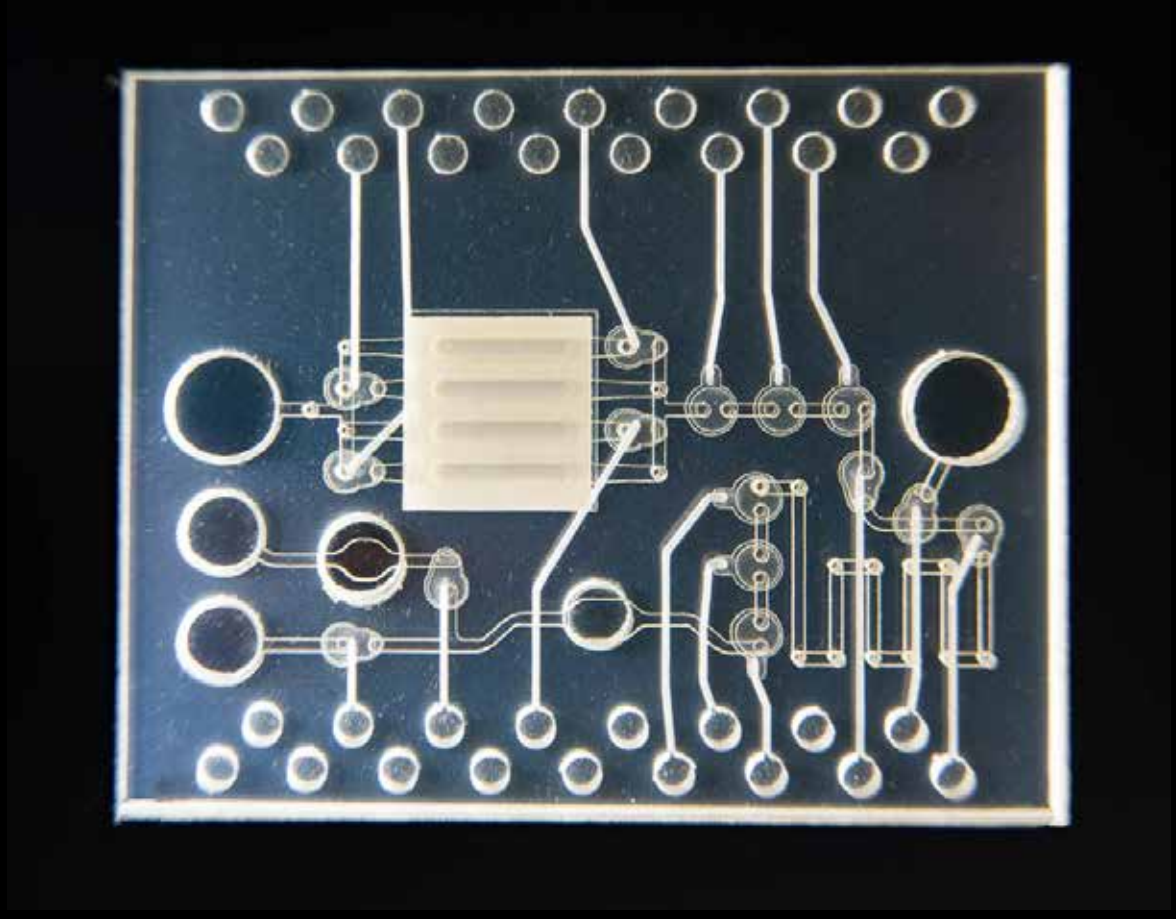
The Context

Every kind of wireless communication, such as the radio, cell phone, or satellite, uses specific range of wavelengths or frequencies. Increases in the amount of information transmitted require the use of higher frequencies. The millimeter-wave region of the electromagnetic spectrum is usually considered to be the range of wavelengths from 10 millimeters (0.4 inches) to 1 millimeter (0.04 inches).This means millimeter waves are longer than infrared waves or X-rays, for example, but shorter than radio waves or microwaves. The high frequency of millimeter waves as well as their propagation characteristics makes them useful for a variety of applications including transmitting large amounts of computer data, cellular communications, and radar.

The Initiative

The project involves high-bandwidth mm-wave wireless communication technology that has applications both in terrestrial and space sectors, coupled with space internet transponder, which will enable access to low cost, high-speed internet, to facilitate point-to-multipoint link formation through a key patented technology. The proposed development of microwave equipment supports communication between towers at 20+Gbps speeds as compared to 1-2Gbps available today. The first outdoor prototype that would be created will be able to form upto 10 point-to-multipoint links with other transceivers enabling a total capacity of 20+Gbps per transceiver across all links. Also, when scaled to form a space transponder, this will provide 100+Gbps capacity per satellite whereas that currently planned (for year 2018-2019) by competitors can provide only 8Gbps per satellite. The space transponder will have the unique capability of reusing spectrum spatially, which enables it to provide the said increase by 12 times.



Blood Cell Counter for Point-of-Care Diagnostics

Principal Investigators

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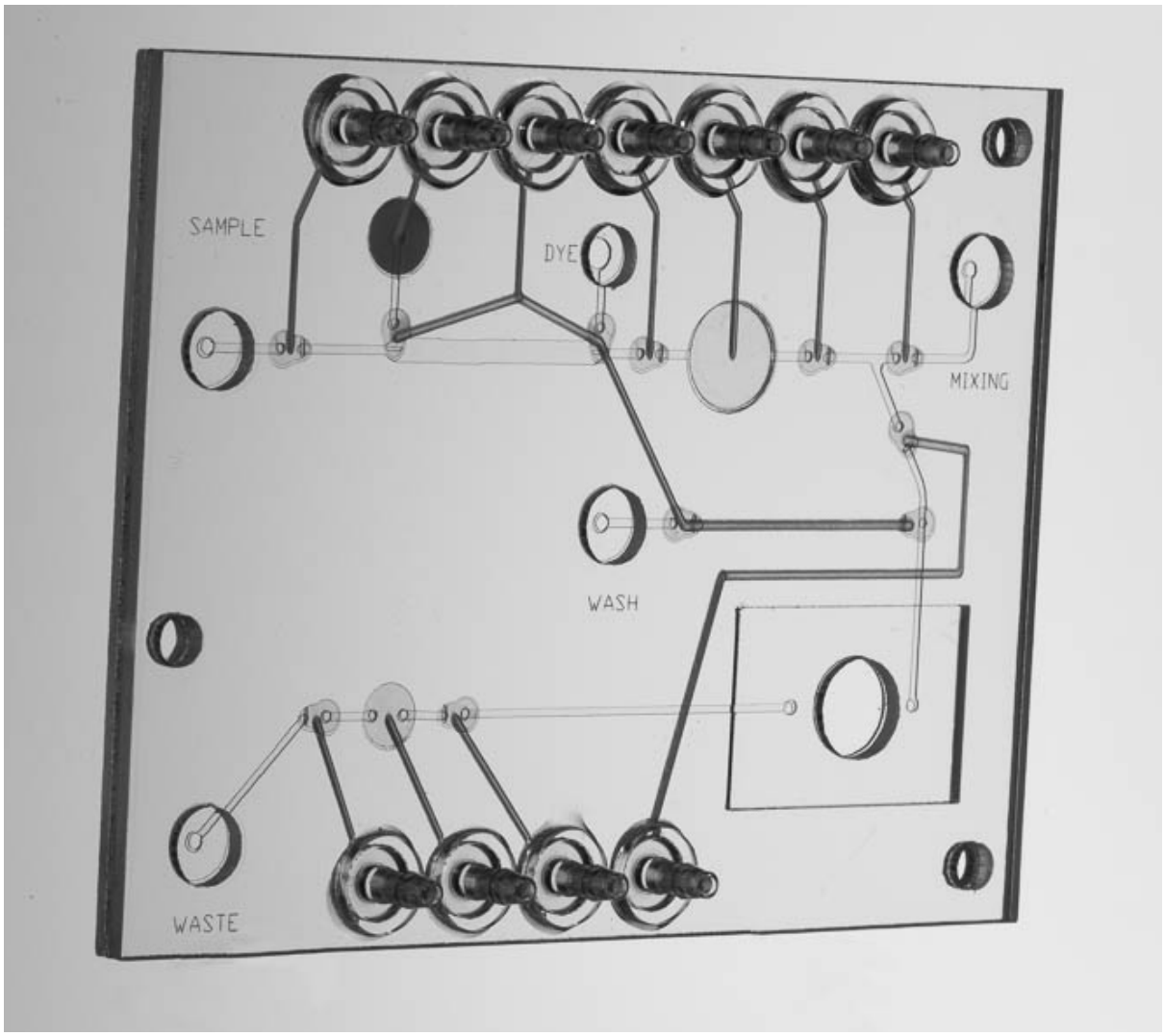
Leanna Levine
Aline, Inc, Rancho Dominguez

The Context

A complete blood count (CBC) is a blood test used to evaluate overall health and detect a wide range of disorders, including anemia, infection and leukemia. A CBC test measures several components and features of blood including Red blood cells,White blood cells, Hemoglobin, Hematocrit, Plasma and Platelets. Abnormal increases or decreases in cell counts as revealed in a complete blood count may indicate that you have an underlying medical condition that calls for further evaluation. Easy, accurate, quick and low cost solutions for measuring CBC can go a long way to reduce morbidity and mortality in large parts of the world.

The Initiative

The project proposes an automated point-of-care device for performing rapid Complete Blood Count using a single cartridge for low-resource settings based on single-cell impedance measurement in conjunction with a patented micro fluidic device. A second-generation prototype has already been realized with significant reduction in the initial cost of the device and operating cost per test. This prototype consists of a disposable micro fluidic cartridge with pre-loaded reagents for performing an automatic sample preparation at the point-of-care for CBC including a three-part leukocyte differential count, hemoglobin measurement in parallel to erythrocytes and platelet count at the point-of-care on the same chip. Broadly, the instrument consists of a single-use chip, the size of credit card, pre-loaded with reagents, to which the sample is loaded and which is fluidically insulated from the environment. The controller, the size of a toaster, performs the necessary fluid handling and the impedance measurements to deliver the results within minutes.



Lightweight, Ultra-Fast, Next-Generation Magnetic Resonance Imaging Scanners

Principal Investigators

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Shahin Pourrahimi
Superconducting Systems Inc., Billerica

The Context

Magnetic Resonance Imaging (MRI) scanners use strong magnetic fields, radio waves, and field gradients to generate images of the human anatomy. This process is time consuming as data is acquired sequentially and is not fast enough for imaging moving organs like the heart. Additionally, practical factors too have limited the adoption of MRI. For instance, the magnetic field of an MRI scanner should be strong and highly uniform over the anatomical region that is to be imaged. This is a demanding specification that results in bulky and expensive magnets that need liquid helium - an expensive, non-renewable resource.

The Initiative

The team proposes to develop the first liquid helium-free, commercial high-field full body MRI Scanner that would impart 3-4x acceleration in the imaging process as compared to current scanners. Ownership costs are expected to come down by 3-4x and the device would be 60% lighter in weight as compared to existing solutions. The technology enables increased patient throughput by enhancing system utilization, and expands the scope of MRI to real-time imaging of moving organs such as the heart and the abdomen. Foundation for Innovation and Social Entrepreneurship (FISE) and Superconducting Systems Inc. have entered into an MoU that covers the supply of initial magnet units to FISE by Superconducting systems, and, comprehensive technical support by Superconducting systems to enable FISE to manufacture next-generation MRI magnets in India.

All inventions driving this technology have been successfully validated through imaging tests performed on multiple human volunteers and patients at key hospitals sites and research centers in India. The mechanical and electromagnetic design of this scanner is complete. The manufacturing process for the MRI magnet, RF antennas, patient handling system and scanner electronics is presently underway.

Continent Ostomy Management Device

crimson Health Care

ximedica Living Innovation

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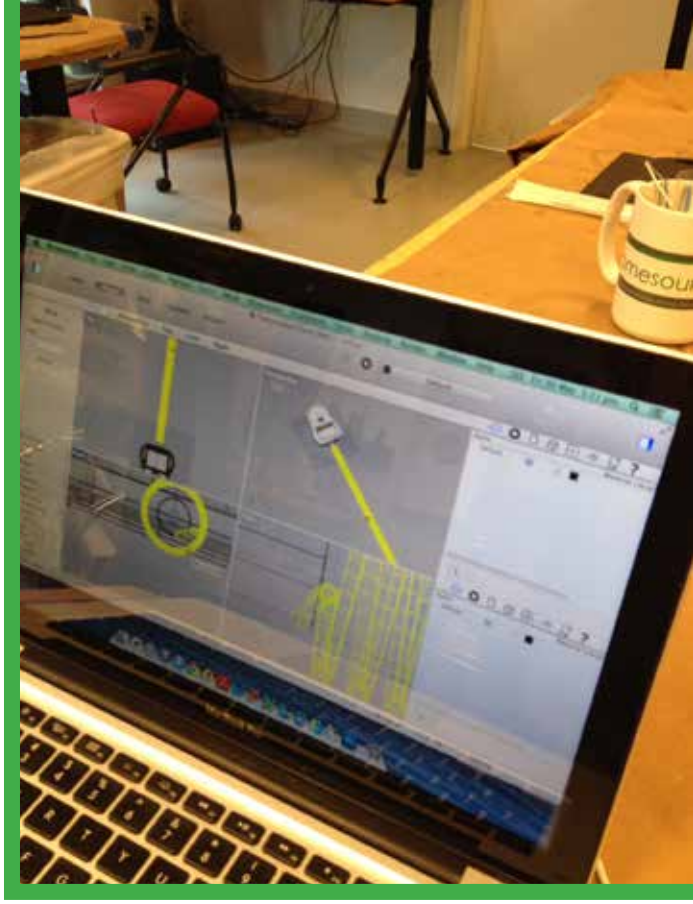

The Context

People suffering from colorectal cancers, inflammatory bowel diseases and other intestinal pathologies undergo surgeries that result in an ostomy, wherein the intestine is cut and the end(s) are brought out through an opening on the abdomen called a stoma. The global prevalence of ostomy is nearly 2 million, and the yearly incidence is several hundred thousand. Continence is lost, and the stool comes out through this stoma into a disposable bag (replaced every 3-5 days) attached to the abdomen. The quality of life for these patients is severely compromised not only due to the medical condition, but also due to the social stigma attached to it.

The Initiative

The project proposes the development of ***SphinX*** - a novel ostomy management system that provides a safe, secure, discreet, accessory-free and cost-effective solution for colostomates and ileostomates. The soft, pliable and insertable *SphinX* port is replaced every 29 days, and does not need supporting accessories such as adhesives, belts etc. It also eliminates bag-associated skin excoriations. *SphinX* will improve the patient's overall quality of life and provide them confidence in performing day-to-day activities while eliminating all complications caused by current products.

While currently an ostomate spends *USD 45-70 per* month in the United States; the selling price of *SphinX* is estimated at USD 30 or INR 1,800 per month. Product development began in January 2016 after the completion of the *Stanford India Biodesign Program.* The prototype for bench testing is ready. The product falls under the 510(k) exempt category for medical devices and therefore has a minor formal regulatory burden for the U.S. market. However, it falls under Class IIb as per the European Medical Device Directive and thus the team will follow CE mark procedure that includes product design and development as per standard, quality management system for manufacture, and pre-market clinical evaluation. The team will obtain the CE marking before entering the Indian market.

Notes

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