



THE LITTLE BOOK

of Science, Technology
and Innovation in Peru

MILLENNIAL CULTURE,
BICENTENNIAL COUNTRY

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and Innovation in Peru

MILLENNIAL CULTURE,
BICENTENNIAL COUNTRY

Welcome to the little book of science, technology and innovation in Peru. The bicentennial country of millenary culture that backs science and technology. Peru the megadiverse country where everything is possible and where we are prepared to welcome small and great ideas.

Ricardo V. Luna Mendoza
Minister of Foreign Affairs

A GLANCE
AT WHAT
PERU
IS DOING



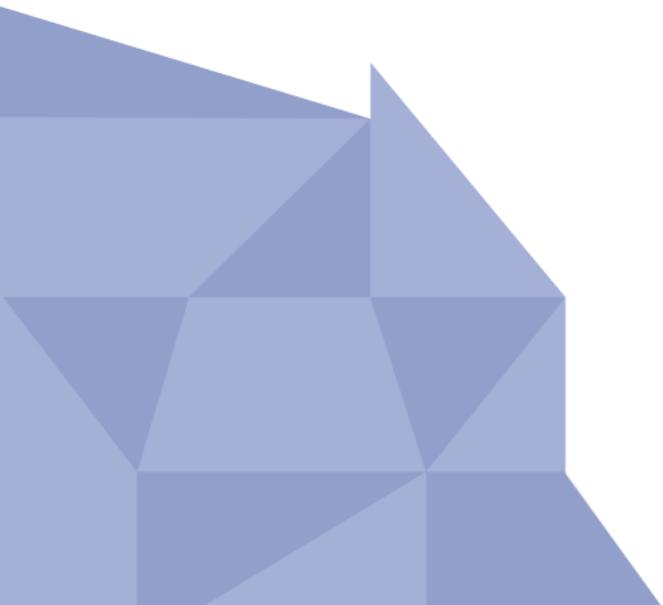
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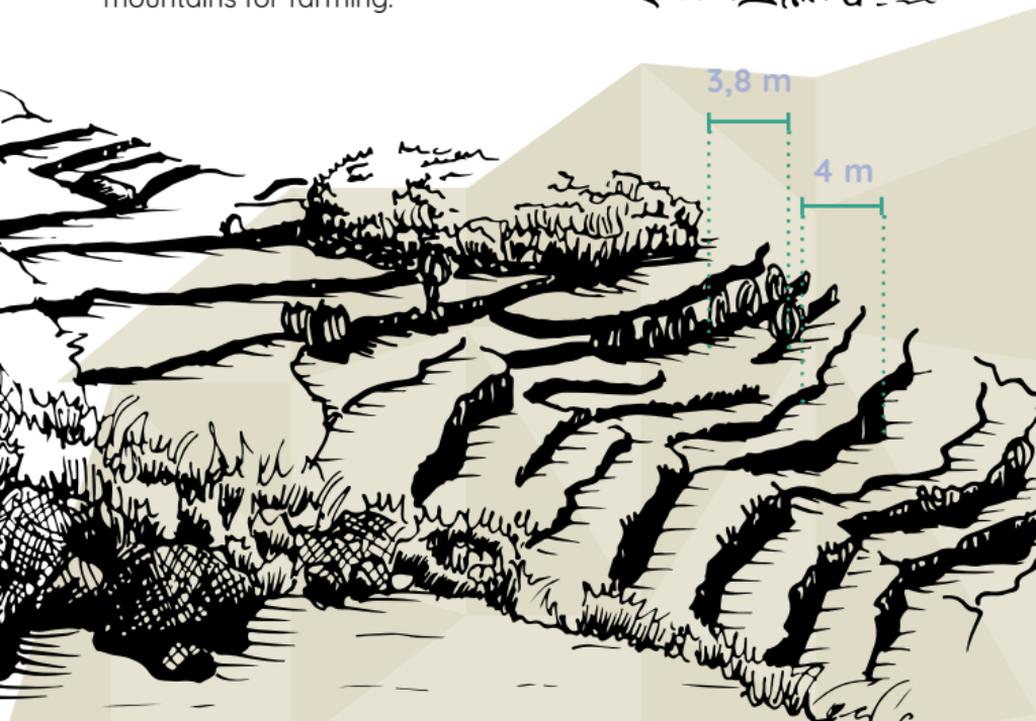
INVENTIONS OF PRE-HISPANIC PERU

Important cultures flourished in pre-hispanic Peru anticipating the inventive activity of Peruvians. These cultures developed agriculture, fishing, animal husbandry, construction, metallurgy, hydraulic works, medicine, textiles, astronomy, ceramics, music and art, among many other activities, into which they incorporated scientific and technological elements. Thanks to these it was possible to secure sustenance for the largest population of the Americas as well as a friendly and sustainable coexistence with nature.



ANDENES

Stepped terraces built on the slopes of the Andean mountains for farming.



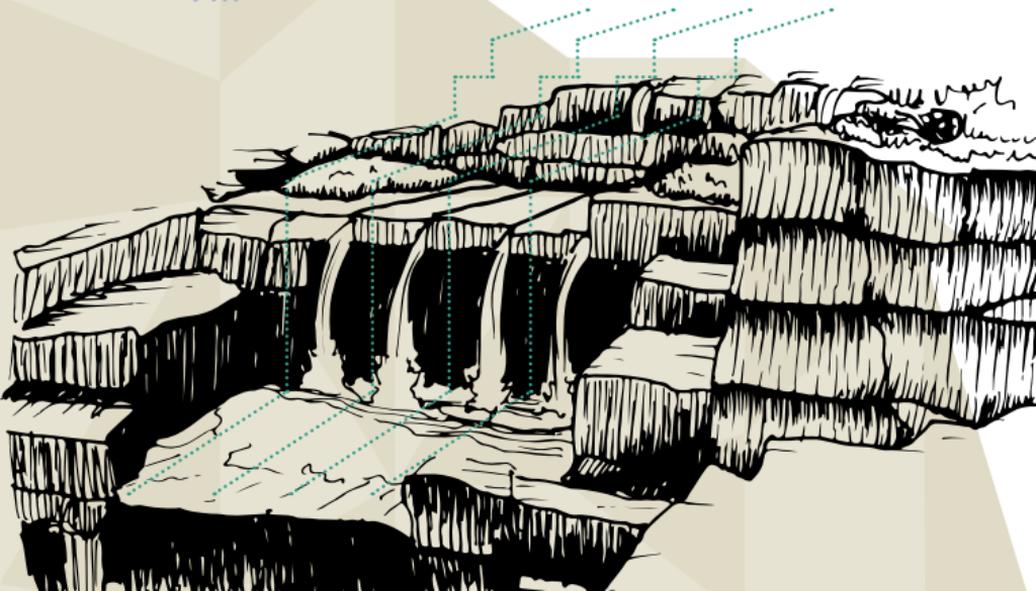


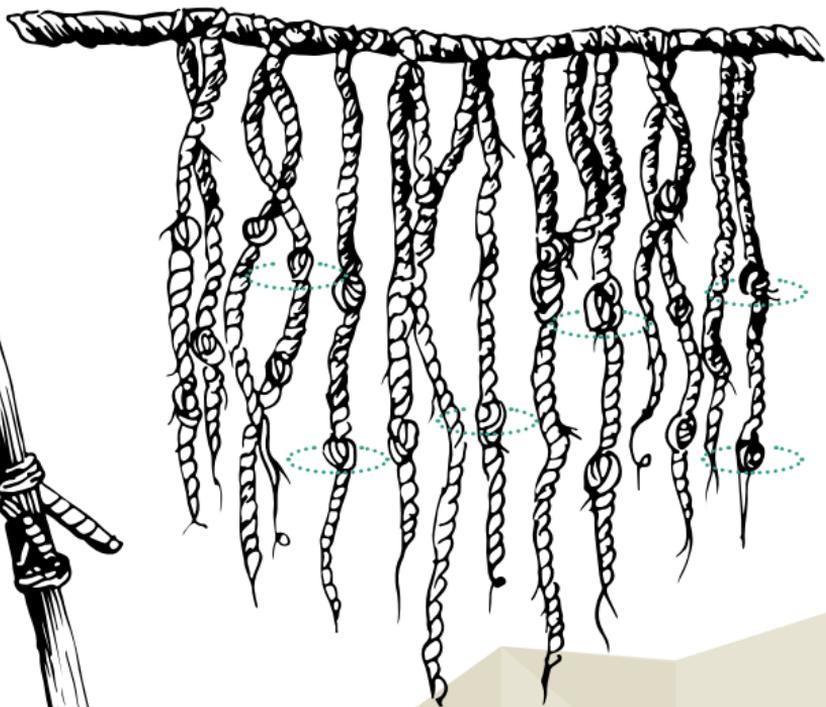
CAMELLONES

Artificial land or mounds of land built in flood areas that allowed better storage and use of water for crops.

CANALS AND IRRIGATION SYSTEMS

Hydraulic systems built to improve water usage, mainly for agricultural purposes.





QUIPU

System of strings of wool or cotton and knots of colors, used for accounting.



CHAQUITACLA

Pointed stick with curved tip made of stone or metal for agriculture.

CHASQUIS

Communication system used by Inca royalty based on relays for the delivery of messages or objects.



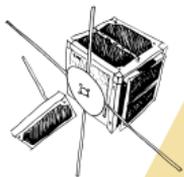
www.indecopi.gob.pe

ROPE BRIDGES

The Andean mountains have steep cliffs and cavernous gorges. Nonetheless, the Incas developed a way to overcome these natural hazards. Using the abundant materials available to them, such as cotton, grass and the wool of llamas and alpacas, the Incas created sturdy rope bridges that allowed crossing gaps of up 150 feet in width. These primitive hanging bridges were attached to large stone structures on both sides and were often used in the morning to avoid the strong winds that could turn the bridge into a hammock. For safety, the Incas would rebuild the bridges every year to prevent the natural fibers from deteriorating.

<https://goo.gl/m5Wwvy>





STEPPING INTO THE TWENTY-FIRST CENTURY...



A FROG CALLED *PRISTIMANTIS IIAP*

Frogs are the most numerous amphibians on the planet and one of the most striking and varied inhabitants of the Amazon. Like toads, frogs are very good indicators of the environmental quality of ecosystems, as they are very sensitive to changes. That is why we celebrated when a new species was discovered: *Pristimantis iiap*. Its discovery represents a great advance in our knowledge of Amazonian frogs and helps us measure the impact of environmental changes that are taking place.

www.iiap.org.pe



GENETIC BARCODE FOR FISH IN THE AMAZON

The amazon in Peru is home to an estimated 3,000 species of ichthyofauna, many of them used for ornamental purposes and/or human consumption. Since 2015, the visual identification of these species has made a qualitative leap thanks to the development of molecular categorization of the mitochondrial COI gene and the “barcoding and metabarcoding” of commercial fish. In addition, we have adapted Next-Generation Sequencing (NSG) technology for the massive molecular characterization of thousands of larvae in the Ucayali and Marañón rivers.

www.iiap.org.pe



POLLINATING THE AMAZON WITHOUT BEE STINGS

The popular image of bees is that of a laborious insect that collects pollen and nectar from flowers and, when annoyed, uses its sting to defend itself. However, there are species of bees that produce honey and do not have a sting. This type of bee belongs to the Apidae family and are found mainly in tropical zones and in South America. In Peru we are working to improve bee keeping methods and the artisanal management of native bees in the department of Loreto.

www.iiap.org.pe



TRAPPING CARBON IN THE AMAZON

The Amazon rainforest stores and processes carbon, therefore, studying and understanding the contribution of the Amazon rainforest to the mitigation of climate change is of the utmost importance. In Peru we have been developing a serie of studies focused on areas of permanent flooding and in Amazonian Swamps, which store large amounts of carbon. These show that the three billion tons of carbon stored in these areas, which represent only 3% of our forests, account for 60 years of Peruvian anthropogenic emissions of CO₂.

www.iiap.org.pe



MOBILE APPLICATIONS TO REVITALIZE AMAZONIAN LANGUAGES

Peru has 47 native languages: four are spoken in the highlands and the rest in the Amazon region. To protect this diversity, Peruvian scientists have developed ten computer applications that will facilitate the learning processes of indigenous languages such as: Ticuna, Achuar, Kandozi, Kichwa, Murui, Kukama, Shawi, Wampis, Achaninka, and Kichwa del Tigre. .

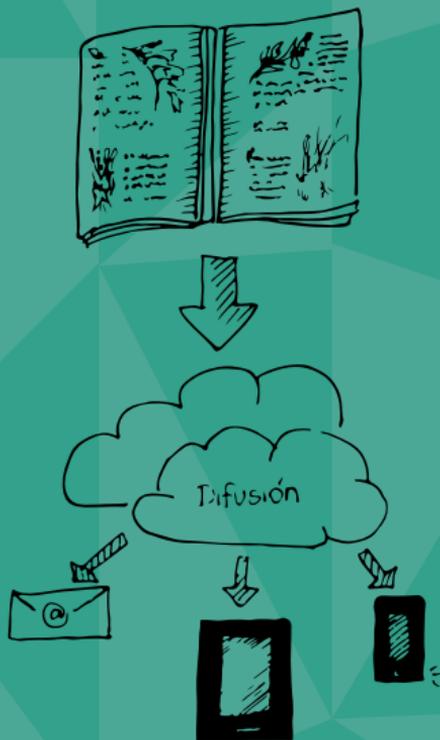
www.iiap.org.pe



CATALOG FOR THE CONSERVATION OF THE BIODIVERSITY OF ENDEMIC FLORA

Until now, searching through a plant catalog was only possible through printed books. The creation of a digital catalog will allow us to characterize the endemic plants of the Peruvian Amazon and make this information accessible to all interested parties through Internet.

www.pucp.edu.pe



TAPIRNET

We are developing a telematic network of sensors and cameras powered by detectors that capture images of terrestrial mammals. This technology will make it easier to make an inventory of the wildlife found in the Amazon rainforest.

www.pucp.edu.pe



BACTERIA TO CARE FOR COTTON

The use of microorganisms as biocontrollers of pathogens affecting agricultural production has proven to be an economical alternative to chemical pesticides but also has a positive effect on plant growth and does not have a detrimental impact on the environment or on the health of people. The use of strains of PGPR bacteria of the genus *Pseudomonas* has been successfully tested in other crops such as rice and quinoa.

<https://goo.gl/f3ULk8>

STOPPING COFFEE RUST

Peru is among the top ten producers and exporters of coffee worldwide. About 225,000 Peruvian families live from this crop. In 2013 the yellow roasted coffee fungus affected 60% of our crops. A group of peruvian scientists has developed a biotechnological solution to determine the severity of the infection using an automatic analysis of images of leaves captured with mobile cameras. This information is then used to determine the volume of fungicide to be applied to the crops. This technology works in a similar way to facial recognition technology and will identify characteristics such as color, shape and texture.

www.cienciaactiva.gob.pe



IMPROVEMENT OF GREEN ASPARAGUS' SHELF LIFE

Peru is the main producer of fresh asparagus in the world, in large part thanks to the work of producers, scientists and innovators who study, for example, the development of new techniques for the optimal conservation of the asparagus that are being transported to markets across the globe. This study is known as "shelf life" (the period of time between harvest and final consumption) and includes a tool that accurately evaluates the compounds emitted by asparagus' after being cut during harvest. Based on this analysis, it is possible to predict the shelf life of asparagus and organize its worldwide distribution.

www.pucp.edu.pe

TAKING ADVANTAGE OF THE ARTICHOKE

Peru is the second largest artichoke producer in the world. We are exploring the use of by-products and the solid waste discarded in the production processes which can be used for the making of functional foods (leaves, stems and bracts) developing a new productive chain from the organic waste. We are also developing a new variety of artichoke without thorns and with high nutritional properties.

www.pucp.edu.pe

www.inia.gob.pe



DEVICE TO DEPIGMENT SUGAR CANE

Sugar cane is coated by pigments that have an impact on the purity, flavor, color, scent and density of the final product. The process of depigmentation of the sugar cane has until now been manual and usually produces significant delays in production. We have designed a high performance machine for the depigmentation of sugar cane and thanks to it we will be able to efficiently process large amounts of this product. We are also taking advantage of sugar cane residues to produce energy and develop new by-products to be used as materials in the construction industry.

www.pucp.edu.pe





CERTIFIED COCOA SEEDS

Peru is home to 60% of the cocoa varieties that exist in the world and we are the second largest cocoa producer in the world. We have developed high quality and high yield cocoa seed varieties.

<http://appcacao.org>

CERTIFIED QUINUA SEEDS

The introduction of new technologies and the quality of our produce places Peru as the world leading producer and exporter of quinoa. We have 3,000 varieties of quinoa and we export conventional and organic produce. We are constantly improving our work and our seeds are of great yield and quality.

www.inia.gob.pe



CRAFT BEERS

Peru produces a good variety of craft beers that are internationally recognized, with aromas and defined flavors. They are unique and highly valued products because they use ingredients such as a quinoa, coffee and rocoto.

<https://goo.gl/eVpjr5>





SACHA INCHI, THE OIL OF THE INCAS

The sacha inchi seed, native from our Amazon region, has a concentration of up to 44% of Omega-3. This fatty acid possesses antioxidant properties, vital for cell regeneration and stimulation of the immune system. More than 100 companies in Peru manufacture various products derived from sacha inchi and 90% of these products are exported. Processing these grains require adequate machinery and our innovators have developed the equipment that assures the best selection and peeling of sacha inchi seeds.



WOULD IT BE POSSIBLE TO GROW POTATOES ON MARS?

An experiment developed in Peru has shown that it is highly probable that at least one species of this tuber will grow on Mars. The tests were performed on a modular satellite called CubeSat, which can emulate conditions on the red planet, including temperature, oxygen and carbon dioxide levels, among other variables, and concluding in the successful growth of a healthy patch of potatoes.

<https://goo.gl/dK8RkJ>



TARWI MILK

Tarwi is the famous Andean leguminous vegetable cultivated since pre-Inca times. Tarwi milk was developed as a nutritious and rich alternative to soy milk. The project already has a trade name: Nutri Tarwi. In the next few years the production of snacks, cookies, flour and even imitation meat with tarwi is expected to grow.

www.unmsm.edu.pe/noticias/ver/2850



NEW PRODUCTIVE FEATURES FOR ALPACA

We are the first producers of alpaca wool worldwide and to keep our high standard we are genetically improving the productive capacity of the alpaca. We have developed a genealogical record, validated by DNA and we have identified the genes and molecular markers associated with the most important productive traits of the Huacaya and Suri breeds.

www.ipen.gob.pe

CLONING AND IMPROVING ANIMAL FIBER QUALITY

A procedure that involves the division in half of the embryo of a bovine (cow or bull) with the aid of an ocular micro-knife. This technique allows the genetic improvement of the animals and reduces their reproduction time.

This invention is complemented by portable electronic equipment and methods for characterizing animal fibers that allows the measurement of the quality of the fiber (alpacas, vicunas and llamas) at a lower cost.

www.indecopi.gob.pe



HIGH ENERGY PHYSICS

In the past, high energy physics was a subject limited to those who could afford the enormous costs of “great science”. Today it is open to all those who meet the high scientific standards required to address a single question: What is the universe made of? The largest scientific machine in the world, the Large Hadron Collider (LHC) located in Geneva could help answer this and other key questions. Peru is part of this endeavor as an official member of LHC.

<http://sites.google.com/site/heppucp>



FOG HARVESTING

The project consists on the development of a modular urban fog harvesting device. Coastal cities in Peru have a high percentage of relative humidity which is a natural source of water that could be used, especially considering that an estimated 2.7 million Peruvians live in urban areas and do not have access to drinking water.

<https://goo.gl/rKzVJZ>



ADVERTISING PANEL THAT PRODUCES WATER

A panel that generates drinkable water from the humidity in the air. This technology is capable of collecting up to 100 liters of water a day through condensation and water purification.

www.utec.edu.pe

TECHNOLOGY TO MONITOR VOLCANOES

The southern region of Peru has more than four hundred volcanoes. Of these, sixteen are considered active and/or potentially active. We monitor some of these volcanoes in real time and one of the most innovative procedures for volcanic monitoring is the use of unmanned vehicles. We are developing a project that includes the construction of a fixed-wing scale aircraft with a quad-core, equipped with SO₂ and CO₂ sensors, infrared optical cameras and temperature and humidity sensors. The implementation of this technology will optimize surveillance and provide useful information for disaster prevention.

<http://ovs.igp.gob.pe>



PREDICTING CLIMATE CHANGE SCENARIOS

Tropical glaciers are key indicators of climate change. Peru holds 70% of the world's tropical glaciers, which are distributed in 16 snow-capped mountain ranges. We have calculated the reduction of the ice mass held in these glaciers to be approximately 40% since 1830. These estimates allow us to develop predictive climate change models for the next decades.

<https://goo.gl/HaVBwT>





MONITORING SPACE

We have the largest and most powerful ionospheric radar in the world, dedicated to the observation of ionospheric phenomena. This tool is added to other geophysical instruments that allow us to observe various phenomena in our ionosphere.

<http://jro.igp.gob.pe>



EARTHQUAKE PREDICTION

Peru is located in a region of recurrent seismic activity and we need to study different alternatives to face this reality. One of these is the Peru-Magneto project, which includes the use of magnetometers, which measure activity in the local magnetic fields with sensors (coils) buried in the ground. They are useful to monitor and predict earthquakes.

<http://inras.pucp.edu.pe>

[http://portal.igp.gob.pe/
servicio-sismologico-nacional](http://portal.igp.gob.pe/servicio-sismologico-nacional)



WATER: VARIOUS PROJECTS

The Rompemuelle Bomba (Speed Bump Pump) takes advantage of the weight of cars to pump water in places that do not have adequate pipelines. It aims to avoid the physical effort needed to transfer water manually.

Khoñi-Yaku is a system for boiling water using improved stoves. This system purifies water and helps prevent diarrhea and respiratory disease.

SANILAB is a dry, ergonomic and portable toilet. It works without water and transforms human waste into fertilizer through a chemical process.

The system for low-cost remote monitoring of water quality looks for ways to improve water quality by detecting concentrations of chemicals in the water supply.

The photocatalytic solar reactor for disinfection of water used in agriculture, treats water used for irrigation, preventing diseases that contaminate agricultural products.

www.cienciactiva.gob.pe



A FILTER TO REMOVE ARSENIC FROM RIVER WATER

Coconut shells serve as an input to prepare a filter to remove arsenic from water and make it fit for human consumption. When exposed to a physical-chemical process, coconut shells filter particular metalloids, thus extracting arsenic from the water source. This Discovery reveals that coconut shells contain high amounts of carbon and when carbonized, it becomes a porous material that, when added to arsenic-like chemicals such as manganese iron, can efficiently separate the toxic metal.

<https://goo.gl/QTPYLW>



THE URBAN AIR CLEANER

A group of Peruvians looking for a way to prevent smog in Lima, invented the Urban Air Purifier-20 (UAP-20), an invention that absorbs carbon dioxide, filters the air for dust and decreases the presence of harmful bacteria. More than 100 UAP-20s -equivalent to 1,200 trees- were installed in different areas of Lima, each with the capacity to filter approximately 200,000 cubic meters of air per day.

<https://goo.gl/m5Wwvy>

SENSORS FOR MEASURING AIR QUALITY

A low cost and rapid deployment system for the measurement of air pollutants, based on Wireless Sensor Networks (WSN), which aims to contribute to an effective monitoring of air quality in urban areas. This ongoing project will contribute to 'map pollution'.

www.qairadrones.com



FUEL CATALYST

An advanced fuel catalyst based on nano-technology, designed to be easily installed in a fuel tank or fuel line of any internal combustion engine. It purifies and refines gasoline and diesel catalytically, destroying microbiological contaminants. The benefits of using this technology are:

- ▶ Up to 15% less fuel consumption.
- ▶ Up to 6% more power.
- ▶ Up to 70% fewer smoke emissions, hydrocarbons and carbon dioxide.
- ▶ It makes low grade gasoline work like a high octane one.
- ▶ Prevents failures in fuel injection systems.

www.ecoevol.com



QAUCHU KULLU FOR THE ERGONOMIC FURNITURE MANUFACTURE

Qauchu Kullu is a new material which combines wood waste with recycled plastic. Its properties are similar to wood and in some cases, surpasses it thanks to its low weight, adjustable rigidity, its resistance to chemicals and insect damage, low level of water absorption and an appropriate dimensional stability. One of the advantages of the production of ergonomic furniture using this material is the reduction of costs by the use of recycled materials and the low energy consumption during production process.

www.pucp.edu.pe



PLANTALÁMPARA

Driven by the scarcity of electric power in remote areas of Peru, and especially in rural areas of the jungle, a group of researchers has developed the Plantalámpara, an innovative idea that seeks to generate clean alternative energy. During the photosynthesis, waste is removed, and once it comes into contact with microorganisms it produces electrons. These are captured through electrodes that are inside a grid, creating a current flow.

The current is stored in a battery during the day, which serves to light a LED lamp equivalent to a conventional 50 watt bulb.

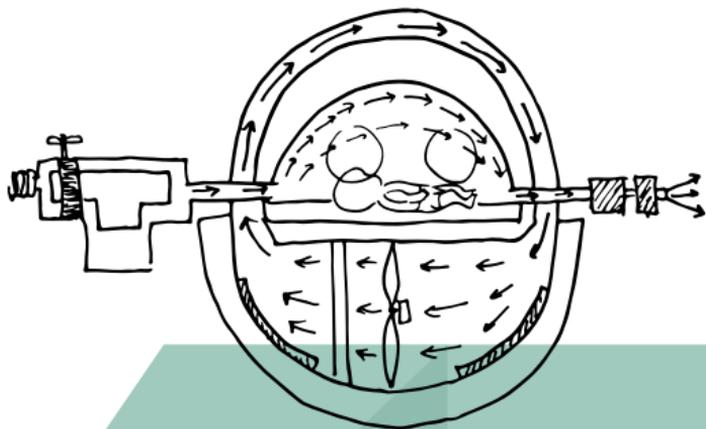
<https://goo.gl/K0IDtt>

INNOVATION IN AQUICULTURE

Research is being carried out on larvae of flatfish (Bothidae), fish larvae nutrition, microalgae culture, and the installation of pilot trout fingerlings in high Andean communities to secure subsistence.

www.imarpe.gob.pe/imarpe





NEONATAL BUBBLE

Equipment consisting of an independent cabin, heated by a closed flow of tempered air and continuously ventilated circuit. Air and oxygen enters directly into the nasal passages of the newborn improving the care conditions for extremely premature babies with critical breathing problems.

<http://gidems.pucp.edu.pe/index.html>

JAUNDICE PHOTOTHERAPY EQUIPMENT OR KANGAROO MOTHER

This device is used to treat neonatal jaundice. It is a flexible panel of blue light-emitting diodes that transforms the bilirubin in the blood so that it is then eliminated through urine.

<https://goo.gl/xedQTc>

<https://portal.concytec.gob.pe>



MAGIC SPHERE

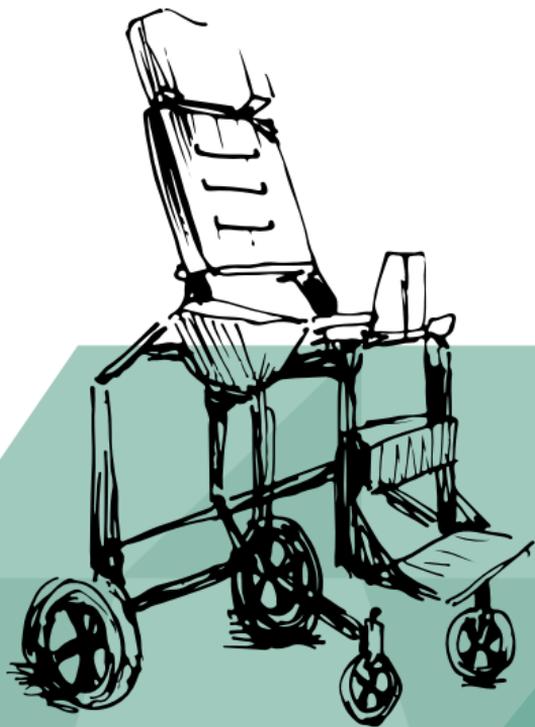
Transparent dial that indicates a child's health. It contains two spheres, the internal one has a sensor. If the child blows in it and it turns green, it is a sign of good health. If it turns red, it means that the child might be ill or in danger of getting sick. In addition, it purifies the air by eliminating dust mites, mold, bad odors, etc.

<https://goo.gl/qQM53>

TELE-PORTABLE ULTRASOUND IMAGING DEVICE

Ultrasound imaging devices are basic medical equipment for a variety of treatments that require diagnosis via ultrasonic imagery. They have different uses and are being influenced by the worldwide trend towards telemedicine development. Peruvian scientists are developing a project which works with alternative energies using a program aimed at remote health centers which do not necessarily have access to gynecologists or ultrasound specialists.

www.pucp.edu.pe



SPECIAL CHILDREN'S CHAIR

A cost-effective multi-functional wheelchair that incorporates the properties of a conventional wheelchair, a folding wheelchair and a stretcher or table. It is appropriate for children who suffer from a range of psychomotor disorders. Thanks to this invention, the patient may sit, recline, incline or stand.

<https://goo.gl/ayrHeU>

A WHEELCHAIR CONTROL SYSTEM FOR PARAPLEGIC AND QUADRAPLEGIC PEOPLE

A voice operated wheelchair for translational movement for paraplegic and quadraplegic people that can also be contolled via sensors placed on the wrists, neck or ankles, if the user is unable to use joystick controls.

It operates based on ICT systems incorporating hardware with Bluetooth and Android operating systems connected to a mobile phone. It also has a GPS localisation system. It is a low cost alternative compared to other motorized wheelchairs that can also be configured via mobile phone.

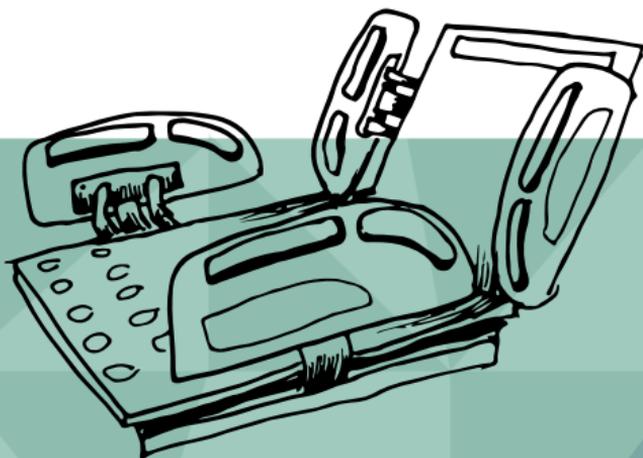
<https://goo.gl/w9tm9e>



WALKING SIMULATOR

It allows the patient's feet to perform coordinated and smooth movements simulating the normal gait, while a virtual environment, produced with the help of a device placed on the face, facilitates treatment. The device also has the VICON motion capturing system, that offers three-dimensional images in order to analyze movement, which can help clinical diagnoses and improve treatments.

<https://goo.gl/3CSPpj>



INTELLIGENT MEDICAL BEDS

We have developed a functional prototype of intelligent medical beds, which improve the breathing of bedridden patients, decrease the formation of wounds on the skin and facilitate simple tasks such as watching TV, reading, talking and eating.

<https://goo.gl/pvDWWU>

TRACHEOTOMY TUBE

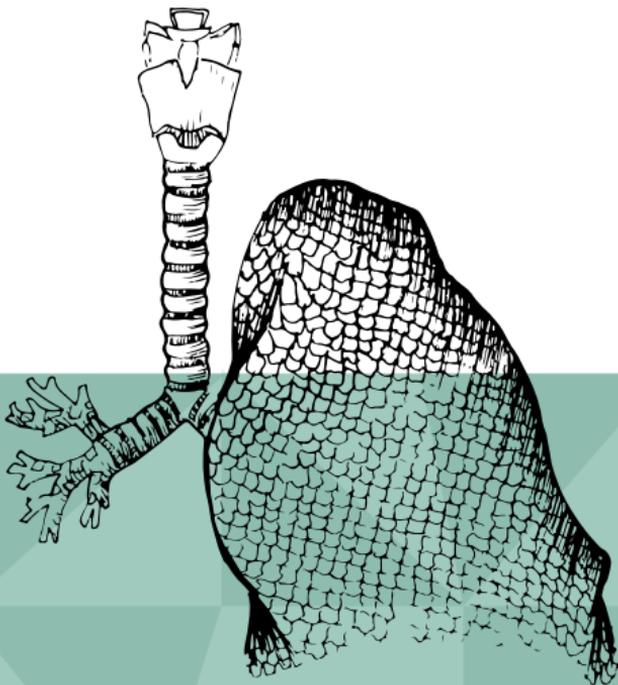
It helps perform the tracheotomy procedure in a safe, less complicated way and without causing further damage to the respiratory tract. The invention was created because unfortunately, tracheotomies save lives but after a while, they can also damage a patient's health. This apparatus is fixed to the interior wall of the trachea avoiding further damage.

www.indecopi.gob.pe/

PULMONARY VENTILATOR

Equipment designed to provide air/oxygen to patients in special conditions who cannot breathe on their own, as a result of trauma or diseases that compromise their respiratory system. This process is called Mechanical Ventilation.

<http://gidems.pucp.edu.pe/desarrollos3.html>



FIGHTING TUBERCULOSIS

Tuberculosis is one of the top ten causes of death in the world. SISBIOTB is a biometric treatment management software used to combat tuberculosis in real time, sending alert messages and reminders to patients and hospital staff. The system has a software, a biometric reader and computer equipment connected to the internet. This system aims to reduce the possibility of developing some type of resistance due to forgetfulness or the abandonment of treatment.

<https://www.sophimania.pe/>



OCULAR IMPLANT

Silicone eye implant that could help treat glaucoma, one of the leading causes of blindness. Thanks to its simple design, the device is able to halve the current price of treatment of the disease.

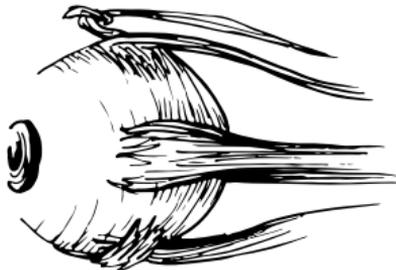
<http://udep.edu.pe>

DRAINAGE DEVICE DESIGNED TO CONTROL INTRAOCULAR PRESSURE IN CASE OF GLAUCOMA

It is a flat sheet, designed to create a temporary space to alleviate pressure that builds up in the eyes.

The device has been successfully used in end-stage glaucoma patients, who did not respond to other medical treatments, including surgery. It reduces eye pressure and pain.

www.flatdrainagedevice.com



BRAILLE TABLET

An app for visually impaired people that allows them to communicate via Facebook and Google chat by activating a touchpad on a tablet that mimics a Perkins machine.

<https://goo.gl/SzMnKx>

ARTIFICIAL VISION SYSTEM FOR QUADRIPLEGIC PEOPLE THAT ALLOWS THEM TO INTERACT WITH COMPUTERS

Software implemented with computer vision algorithms integrating different types of technologies, that develops techniques that allow a computer to “understand” facial gestures and specific commands. It was designed exclusively for quadriplegic people with serious mobility problems. Through their eyes and nose, patients can execute various functions on a computer such as surfing the web, word processing, sending e-mails or messages through WhatsApp, listening to music, preparing messages that can be viewed directly on a screen, printing or listening to them via a synthesized or digitized voice, and watching movies, among others.

<https://goo.gl/KqTvpV>



SOFTWARE FOR ANALYZING MALE FERTILITY

Existing systems use microscope observation techniques which are susceptible to errors. For this reason a software has been developed to process digital micrographic images allowing the generation and analysis of more reliable seminograms.

www.pucp.edu.pe



DEVICE TO MEASURE THE PROGRESSION OF CANCER

We have invented an automatic and portable device for the diagnosis of cancer. It uses Tecnicio-99 metastable, a radioisotope that is combined with radiopharmaceuticals, which are fixed in the organ that will be analysed, and using a SPECT measurement system, calculates the advancement of cancer.

www.ipen.gob.pe

DETECTING CERVICAL CANCER

In Peru a woman dies every 5 hours from cervical cancer. For this reason, a group of peruvian scientists developed an effective system for women to run a test at home and by themselves, receiving the results through their mobile phones. The HPV molecular test is based on the detection of the HPV DNA (deoxyribonucleic acid), making it a more sensitive and easy to handle test.

www.cienciaactiva.gob.pe



GERIATRIC DYNAMOMETER

It measures the grip strength of a geriatric patient, in kilograms-force, using a pressure measurement module. The patient who uses it will be able to know how much strength and muscle mass he has, and from this diagnose, his level of sarcopenia (the progressive loss of strength and muscle mass). The diagnosis of sarcopenia is fundamental to determine, for example, the degree of fragility of a cancer patient and decide whether or not chemotherapy treatment should be considered.

www.pucp.edu.pe



VENOGRAPH

This is an apparatus consisting of a light-emitting diode and a thermal camera which treats varicose veins without having to subject the patient to invasive surgeries. In addition, it is used to visualize any type of injury that could hamper the flow of blood through veins.

<https://goo.gl/SQ4v4M>

BIOLOGICAL METHOD TO CONTROL MALARIA

We have developed a method to control malaria through the biological control of mosquito larvae. *Bacillus thuringiensis* var. *israelensis* H-14 (BTI) is a naturally occurring bacterium that kills *Anopheles* larvae. It is harmless to humans, but expensive if purchased from commercial distributors. Our scientists have discovered a cheap way to produce the bacteria by growing it in coconuts and releasing it into ponds where mosquito larvae develop.

Similarly, since BTI has the capacity to control 72 species of larvae of tropical diseases, we have been developing a project for the implementation of a BTI production and validation plant based on local options such as cassava, asparagus and potato.

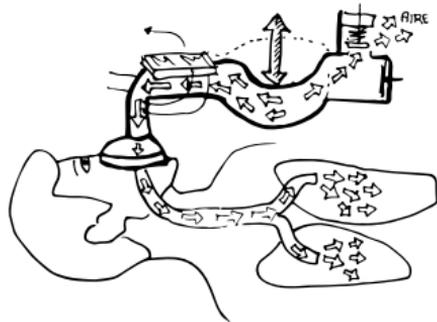
www.ncbi.nlm.nih.gov/pubmed/12288548



DIAGNOSTIC KIT FOR DENGUE FEVER

It is important to have a timely diagnosis to provide adequate dengue prevention and control. The Tariki-Dengue Kit, produced in Peru, serves this purpose. Peru developed a diagnostic Kit, of guaranteed quality, low cost and easy accessibility. It enables the serological diagnosis of dengue in affected populations and is available nationwide through the National Network of Public Health Laboratories.

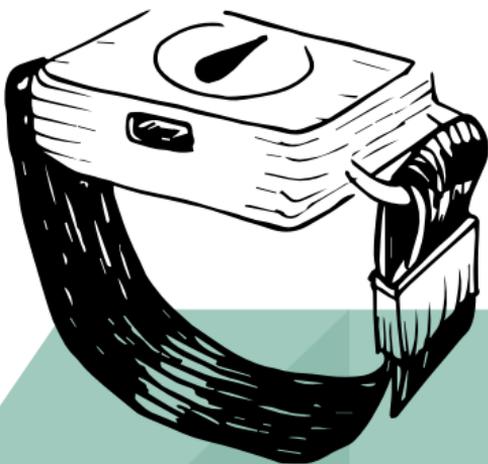
<https://goo.gl/zVPyAT>



RESUSCITATOR

An adjustable, low cost and easy to use manual resuscitator is a revolutionary device designed by a team of Peruvian scientists that could help save millions of lives. This unique device has precise functions that help people breathe in emergency situations. This device uses a cell phone battery to show –on a graph and in real time– the patient's respiratory parameters. It is low-cost and can be used for several hours with a 12-volts compressor replacing the need for the manual work. With this invention, hundreds of patients in remote health centers in Peru who need artificial ventilators and have to be transferred to hospitals, can receive treatment during their transfer, without their life or lungs being placed in danger.

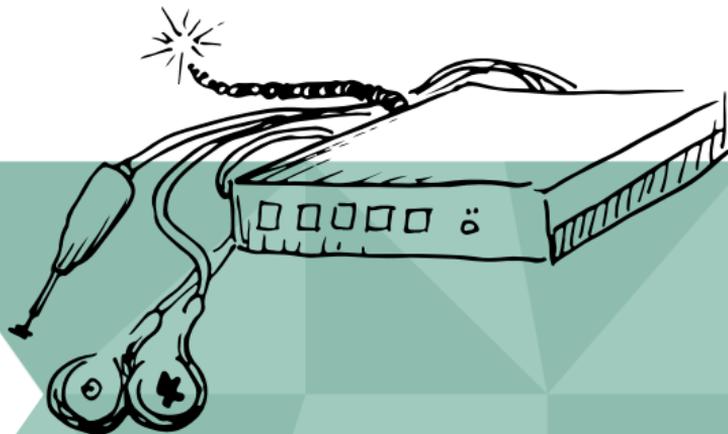
www.cienciactiva.gob.pe



INVENTION AGAINST HYPERHIDROSIS

DROP is a portable device that provides an automatic treatment to reduce excessive sweating by applying electrical stimuli to the sweat glands. DROP channels the user's thermal energy and turns it into electric current to power iontophoresis, a technique that provides small electric discharges to the area affected by hyperhidrosis. The device has a LED light indicating the start and end of the procedure (30 minutes). Used on a daily basis it can reduce hyperhidrosis between 60% to 70%.

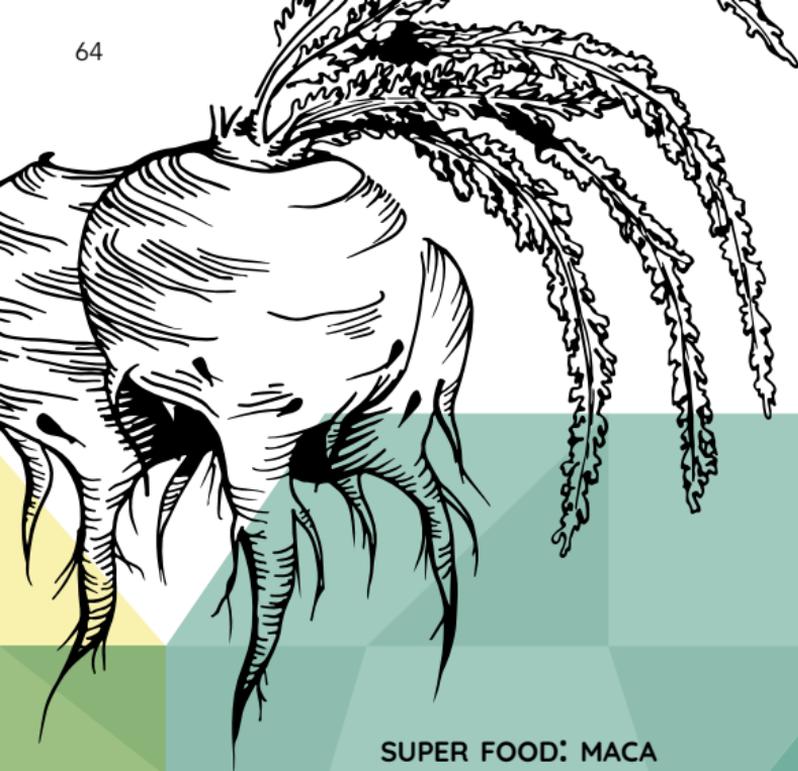
<https://goo.gl/Aaboik>



SOFT TISSUE AND BONE REGENERATOR

The device performs a cellular massage using four physical elements: LED, ultrasound, magnetic fields and laser, to regenerate tissue. Thanks to this technology, it is possible to have a medical device that regenerates soft and bony tissue as an alternative treatment for diseases where pharmacology may be limited.

<https://goo.gl/x6rfGc>



SUPER FOOD: MACA

Maca is a plant native to the Andes of Peru. It is also known as maca-maca, maino, ayak chichira and ayak willku. In addition to being a highly nutritious food, it is thought that its roots possess properties that increase fertility. From ancient times the inhabitants of the Andes used it to improve their physical and mental capabilities. Our researchers have found that maca has properties that slow the progression of neurodegenerative diseases such as Parkinsons and Alzheimers.

www.cayetano.edu.pe/cayetano/es

FROM BITS TO QUBITS

Quantum optics from bits to qubits: a small change of one word, a giant leap for science. Several research groups around the world are making steady progress toward the application of this technology in quantum computers, quantum cryptography, and quantum algorithms, among others. Once that goal is reached we will have entered a new era. Peru has the goal of contributing to this progress from a theoretical and experimental perspective.

<http://fisica.pucp.edu.pe/groc/>

RFID RADICAL SOLUTIONS

We have developed a coding label, which has an RF wireless communication capability. Through the use of graphene conductive inks, the label is able to emit information through a printed code. The code has a capacity of up to 12 characters and the material of the label is paper. The emission of RF waves is done by coplanar resonance of graphene ink.

<https://goo.gl/TLbSKJ>

SMART HELMET FOR WORKERS AND MINERS

This invention aims to reduce mining accidents by more than 30 percent. Through a personal protection system, with real time sensors and monitoring devices integrated into a security helmet, the concentration of oxygen or the presence of toxic gases in the workplace can be detected. Likewise, should workers suffer an accident, alerts to facilitate search and rescue can be emitted.

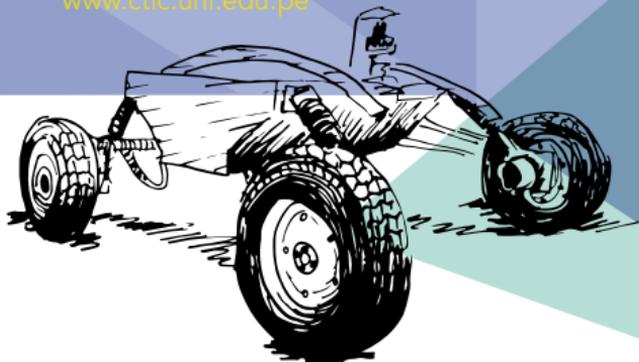
www.ctic.uni.edu.pe



MINING ROBOT

We have invented a mining robot, which can detect toxic gases that can cause injury and even death to workers inside a mine. The robot has a laser mapping sensor and gas and communications sensors. It can detect dangerous gases and send the information wirelessly to a station controlled by an operator who can visualize where the robot is located in real time on a map. The operator can then send a warning to the miners of dangers in the mine.

www.ctic.uni.edu.pe



ROBOT FOR CORROSION DETECTION IN TANKS

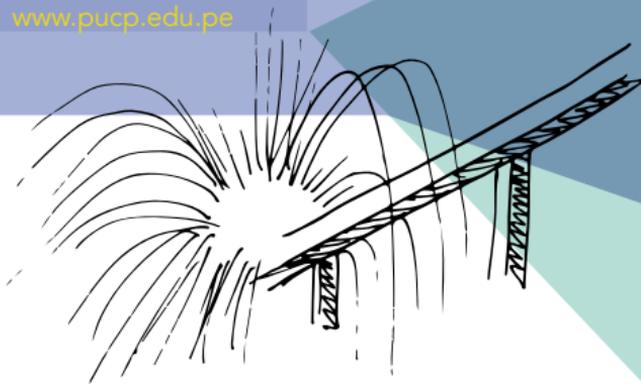
The semi-automatic robot called “Mobile Robot” has the ability to detect and accurately analyze the corrosion in walls, rooves and the bottoms of tanks. Data collected will help companies take corrective action to prevent spills and accidents. While a technician takes more than three days to inspect a tank of a height of around 10 to 15 m, the Mobile Robot can reduce this time by two days.

<https://goo.gl/CFKCP9>

WELDING ROBOTS

The worldwide trend towards the introduction of robots into industrial manufacturing processes has led us to design new alternatives. One of these is the automated welding mechatronic system with laser vision quality control. The innovation consists in the manufacture of a turntable for a heat exchanger, in a 10-step manufacturing process, allowing the industrial robot welding torch, greater flexibility and greater reach for the parts to be welded, all these within a secure environment.

www.pucp.edu.pe



STEERING RACK ARM EXTRACTOR

This idea re-conceptualizes an adjustable wrench by adding a device to facilitate its rotation and its access to difficult-to-reach nuts, which helps protect expensive electronic circuits and sensors.

<https://goo.gl/PzSRHw>

DEVICE THAT DETECTS FAULTS IN PRESSURE PIPES

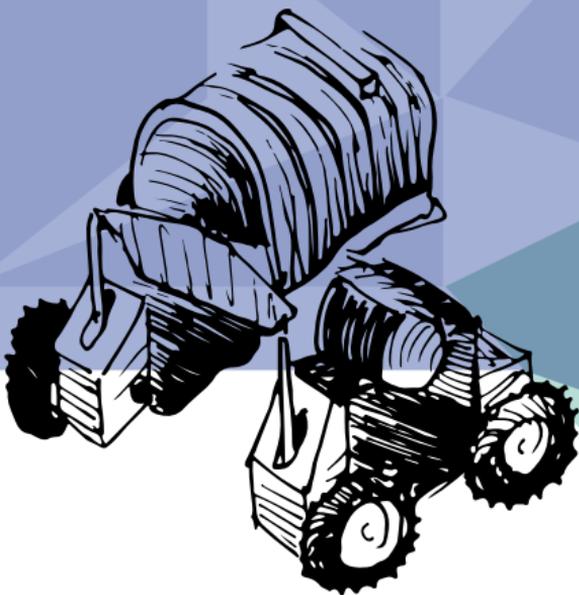
A team of Peruvian researchers has successfully completed a system that detects welding faults in pressure pipes used to transport oil, gas, as well as hydroelectric plants and mines.

<https://goo.gl/pWBzrM>

YUPIBOTS: ROBOTS FOR AGRICULTURE

In Peru, there are currently 7.6 million hectares of agriculture land, of which 42% are not harvested and 58% are in the highlands. These numbers offer a glimpse of the amount of land suitable for agriculture. A multidisciplinary group of young professionals has decided to launch a startup that seeks busting agriculture introducing automatic notions. Yupibots is the name of the initiative and it has designed and implemented an unmanned robotic mobile platform for sowing, irrigation and pest control. The robotic system consists of modular and reconfigurable off-road mobile robots that will perform the main tasks of a farmer.

www.pucp.edu.pe



IRRIGATION TECHNOLOGY

The entire irrigation system is displayed on a computer, which allows monitoring irrigation variables such as water flow, temperature, pH, electrical conductivity and soil and climate data. The irrigation technology components include an irrigation head, filter unit, controller, fertilizer center, valve line and irrigation tapes using industrial technology for precision farming. The internet and SMS messaging is used for data transmission to the central unit.

<https://goo.gl/7iFWDr>

PACKAGING MACHINE

This device, which is already being used in several companies, can pack up to 120 bottles (for medicine or cosmetics) per minute.

<https://portal.concytec.gob.pe/>

EQUIPMENT FOR UNREELING COCOONS

This is a system of motor driven reels that matches, twists and retwists fibers, producing single-strands ready to be used in looms or for knitting and needlework. The device allows processing cocoons in a faster and easier way.

www.pqs.pe

GRAINS SELECTOR

This machine is characterized by its easy maintenance and simple calibration. Its usefulness lies on the improvement of the selection process of various export grains, such as white corn. It adapts to different geographic weather scenarios and planting zones. Its maintenance does not require specialized personnel.

<https://portal.concytec.gob.pe/>

BEAN PEELER FOR SNACKS

The bean peeling machine for the production of snacks was created to be used in rural areas. In eight hours it can do the work of 26 people and relieves the difficult manual work that can injure the hands of workers. The device can peel up to 20 kilos of beans per hour and only needs one person to operate.

<https://goo.gl/g3DIn2>



GEOCHASQUI TO MONITOR EFFECTS OF CLIMATE CHANGE

An unmanned aerial vehicle, which has more versatility and flying hours than a drone. The project is called “GEOCHASQUI” and consists of a vehicle equipped with sensors which capture the environmental humidity, temperature, pollution, altitude, radiation and pressure parameters. This information is transmitted to a computer where specialized personnel analyze information on possible pollutants, estimate the location of crops, the amount of fertilizers, and prevent contamination. All this fosters precision farming contributing to optimize agricultural production and to raise productivity.

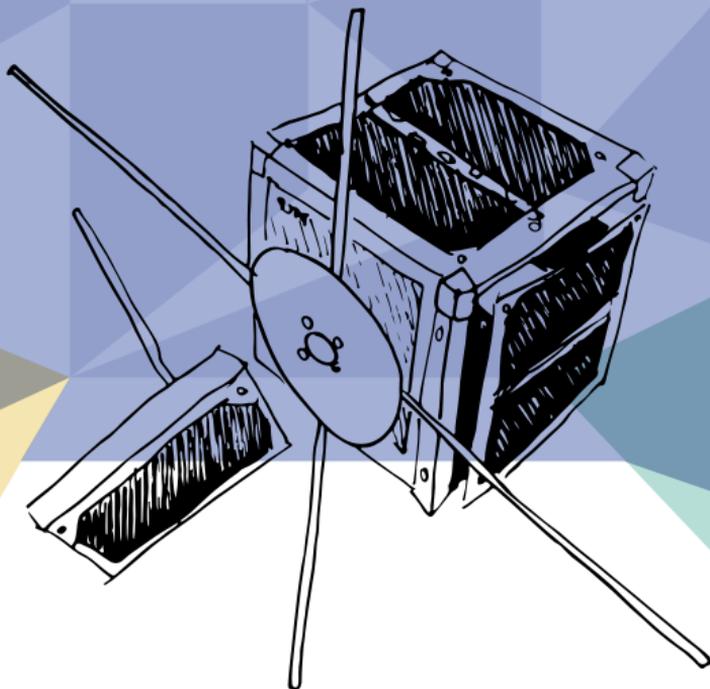
<https://goo.gl/1knPU7>

NANO SATELLITES

We have been building small satellites since 2013. For now, our purpose is to learn, experiment and prepare to undergo ever more challenging projects. We receive information and photographs sent by satellites designed by Peruvian scientists and engineers and we have ground stations to monitor our projects. We expect to achieve technological development that allows us to improve in telecommunications, meteorology and navigation.

<http://irras.pucp.edu.pe>

www.ctic.uni.edu.pe



PROFILOMETER CLASS I

This device, can be installed in a vehicle and measures longitudinal deformation of roads, as well as their roughness. In other words, any flaw in the asphalt can be detected thanks to this invention.

<https://portal.concytec.gob.pe>

VEHICLE COLLISION ALERT SYSTEM

The automatic vehicle collision alert system sends a sound and an alert message to the driver via a portable device using an Android operating system when there is a risk of collision with another nearby vehicle that uses the same vehicle collision alert system.

www.ctic.uni.edu.pe



REACH

This App allows users to warn of theft or incidents and to obtain a quick response from the authorities. The service can even deliver an alert if an incident has occurred near to your location. On the other hand, it also allows access to data that can help map potentially dangerous areas in each neighborhood.

<https://goo.gl/pRFtk>

GLIPS (GEOLOCATION SYSTEM) & SAVIA (VIGILANCE AND ALARM AGAINST GENDER VIOLENCE)

GLIPS & SAVIA is an ICT solution that provides a technological tool for law enforcement to prevent crime. Surveillance is carried out through mobile applications and an electronic foot shackle which continuously monitors the position of the victims and of the aggressors. In case of an indication of an infringement, a variety of different alerts are immediately generated, to the victim, to the police and to neighbors. In addition, different types of open data can be analyzed, creating alerts for future violations that allow authorities to act in preventively.

<https://goo.gl/eLytoH>

ASA PALM

A laboratory instrument, designed with pyrex material, which allows the production and harvesting all kinds of bacteria in microbiological laboratories in short timeframes. This rod is reusable and easy to sterilize making it a very economical device.

<https://portal.concytec.gob.pe/>

CINEPAPAYA

An application for smart-phones and tablets that allows its users to consult cinemas schedules all over Peru and other countries of the region, find information about their favorite films, watch trailers, and buy all the tickets that are wanted.

<https://goo.gl/yyKHWK>



EYE-TRACKING: TOOL TO MEASURE THE IMPACT OF ADVERTISING

A technological tool for the quantification and analysis of human eye attention paid to advertising panels. This way it is possible to assess if a given image captures people's attention, and specifically which parts of the image draw the most attention to the viewer.

www.pucp.edu.pe

COMPARABIEN

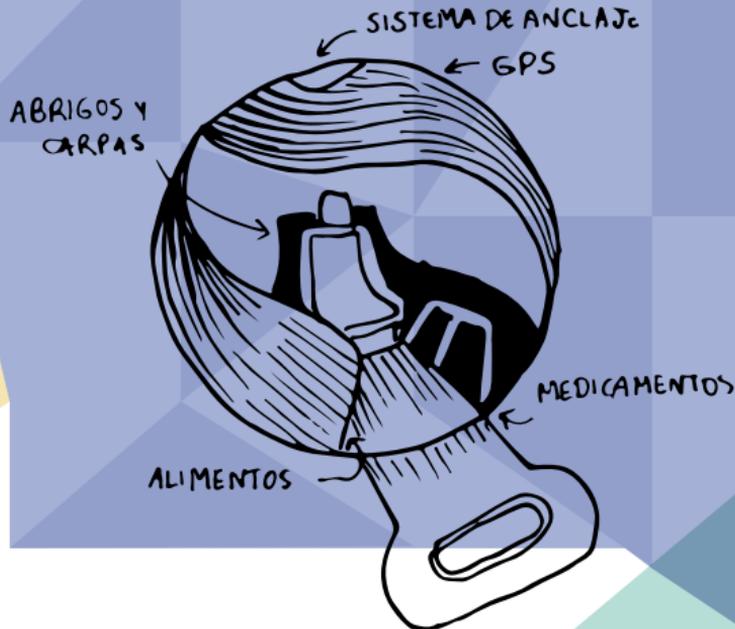
This service helps users to search and compare financial products such as insurances, vehicle loans, financial services, credit cards, among others. This not only saves consumers time, but also money. It also offers users information on the locations with the best fuel prices.

<https://comparabien.com.pe>

FLOATING UNIPERSONAL TSUNAMI SHELTERS

This capsule allows a person to survive a tsunami with waves of up to 20 m high. The shelter is shaped like a fiberglass sphere with a diameter of 1.40 m that allows the person inside to survive for at least 48 hours until rescued.

www.uni.edu.pe





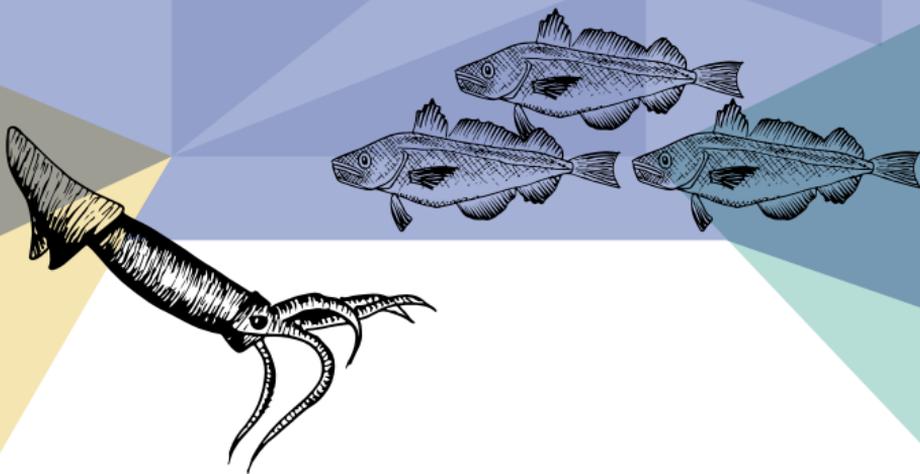
OCEANOGRAPHIC MONITORING

We are developing an underwater vehicle that includes video monitoring and real-time data collection assisted by surface control station. The system will collect video images and perform measurements of underwater noise, and water quality variables.

We also have large and small scale scientific research vessels and additional support vessels. These all have laboratory, hydroacoustic, oceanographic and fishing equipment, allowing Peru to undertake a wide range of research.

www.pucp.edu.pe

<http://www.imarpe.gob.pe/imarpe>



We would like to thank all the organizations that have collaborated with the Ministry of Foreign Affairs of Peru in the preparation of this book, and particularly, we wish to highlight the commitment of the scientists and innovators that have made these innovations and technological developments possible.

If you wish more information about the innovations and technological developments presented here, please send an e-mail to consultas@pequenolibro.pe



www.rree.gob.pe