

Over 300 years of useful research

LUIS | LUND UNIVERSITY INNOVATION SYSTEM



Innovations and discoveries from Lund

Lund University is an innovative university. For several hundred years, researchers from Lund have made discoveries and created innovations that have been of great significance for wider society. Here is a sample selection of discoveries from Lund through the ages:

1707 | HEALING WATER

Professor of Medicine and Provincial Doctor Johan Jacob Döbelius discovered and developed the Ramlösa healing spring at the start of the eighteenth century. According to Döbelius, the water from the spring, which was rich in minerals, cured both scurvy and vertigo as well as gout and shaky joints.

1770 | NEW ORGANIC ACIDS

By releasing organic acids, scientist Anders Jahan Retzius and apothecary Carl Wilhelm Scheele managed to produce tartaric acid in crystalline form. The new method led to their subsequent discovery of other polyatomic organic acids, such as citric acid and malic acid.

1801 | FIRST SWEDISH VACCINATION

At the turn of the 19th century, Professor of Medicine Eberhard Zacharias Munck af Rosenschöld carried out the first smallpox vaccination in Sweden. The discovery was not his own, however, but borrowed from Edward Jenner, who carried out the first experimental vaccination in England as early as 1790.

1813 | SWEDISH MASSAGE AND GYMNASTICS

Per Henrik Ling developed a system for massage and muscle stretching. Today the technique is known as Swedish or classical massage and is one of the most common forms of massage in the Western world. Ling later moved to Stockholm where he founded the Royal Central Institute for Gymnastics, now the Swedish School of Sport and Health Sciences.

1824 | ALGAE RESEARCH AND NEW FINANCIAL CONCEPTS

Botanist and economist Carl Adolph Agardh founded the research branch of algology and systematised algae in a way that is largely still used today. As an economist, Agardh introduced the concept of “national debt” to Swedish thinking on economic policy.

1843 | SCHEUTZIAN CALCULATION ENGINE

Per Georg Scheutz and his son Edvard Scheutz invented the first working calculation and printing machine. Scheutz received a gold medal at the World Fair in Paris in 1855 for his achievement.

1847 | ICE AGE THEORY

Scientist Sven Nilsson launched the notion, epochal for its time, that Scandinavia had once been connected to the European mainland. He was also one of the first to discuss the “the great glaciation” (the Ice Age). He based the theories on studies of subfossil mammals in Skåne peat bogs.

1887 | RYDBERG'S CONSTANT

Physicist Janne Rydberg discovered that the wavelengths of photons in atoms can be calculated using a certain formula. One of the constants in the formula is common to all matter and is known within the international science community as the Rydberg constant. The discovery provided fundamental knowledge on the structure of atoms.



- ▲ The world's first clinically useable artificial kidney, developed by professor Nils Alwall.
- ▼ The tetrahedron-shaped milk carton (in front) gave the Tetra Pak company its name.



1916 | THE M SERIES AND NEW METHODS OF MEASUREMENT

Physicist Manne Siegbahn constructed new instruments which were to be of great significance for x-ray spectroscopy. For example, Siegbahn discovered the so-called M series, a new group of spectral lines in the elements, with the help of these instruments. Manne Siegbahn received the Nobel prize in 1924, by which time he had left Lund for Uppsala.

1925 | NEW CROPS

By converting his research results into practical use, geneticist Herman Nilsson-Ehle was able to develop new, improved agricultural crops. This contributed to the reduction of food shortages in Sweden during World War II.

1926 | THE FIRST RESPIRATOR

Physiologist Torsten Thunberg constructed the barospirator, the first apparatus for artificial respiration. By increasing and decreasing the air pressure around the patient, the machine could force air in and out of the lungs. The barospirator led the way for several subsequent designs, which gradually became more and more successful.

1944 | THE TETRAHEDRON – MILK PACKAGING FOR THE MODERN ERA

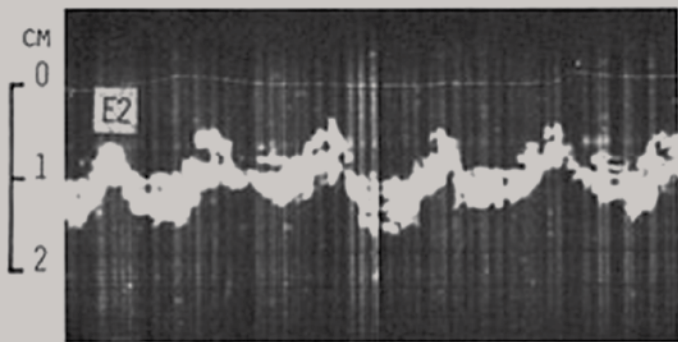
The “tetrahedron” milk package was the first step towards one of the world’s most successful industrial enterprises. In 1944, laboratory assistant Erik Wallenberg came up with the idea of the package’s four-sided pyramid shape and entrepreneur Ruben Rausing patented it and launched Tetra Pak in 1951.

1946 | THE ARTIFICIAL KIDNEY

The world’s first clinically useable artificial kidney was developed by professor of medicine Nils Alwall. In 1964, together with industrialist Holger Crafoord, he founded what is now a global company, Gambro, and three years later the first artificial kidney was launched.



▲ Inge Edler (1911-2001). ▼ The very first recording of the ultrasound echo from the heart.



UCG 1 OCT. 29, 1953

1953 | MEDICAL ULTRASOUND

Physicist Hellmuth Hertz and cardiologist Inge Edler were the first in the world to see a heart beating. Together, the two researchers had developed the first echocardiogram for ultrasound examination of the heart, a technology which would prove to be revolutionary for diagnostics. Edler and Hertz were nominated several times for the Nobel prize, but had to make do with the next best thing – the American Lasker award.

1955 | THE NILSSON MODEL

Nuclear physicist Sven Gösta Nilsson developed the so-called Nilsson model, also known as *The independent particle model*, which made it possible to describe the energy levels and structure of atomic nuclei using mathematical calculations.

1956 | HUMAN CHROMOSOME NUMBER

Geneticist Albert Levan succeeded, together with visiting researcher Joe Hin Tjio, in identifying the 46 chromosomes that determine human hereditary characteristics.

1957 | DOPAMINE

Under the leadership of Arvid Carlsson, later professor in Gothenburg and Nobel Prize recipient in 2000, it was discovered that dopamine is a powerful signal substance in the brain. The discovery led to the first drug to relieve symptoms of Parkinson's disease, which is still the main treatment in use today.

1962 | THE FALCK-HILLARP METHOD

Medics Bengt Falck and Nils-Åke Hillarp developed the so-called Falck-Hillarp method to detect the presence of neurotransmitters in nerve cells. The technique came to acquire great significance for modern pharmacological treatment.

1962 | PARTIAL DIFFERENTIAL EQUATIONS

Mathematician Lars Hörmander developed the general theory of linear partial differential equations, which are commonly used to describe physical phenomena. In 1962 Hörmander became the first, and as yet only, Swede to be awarded the Fields Medal – the mathematical equivalent of a Nobel Prize.

1963 | LACTOSE INTOLERANCE

Professor Arne Dahlqvist observed that people lacking the enzyme lactase in the small intestine were unable to digest lactose. In doing so, he discovered the underlying factors to lactose intolerance.

1966 | ASTHMA MEDICINE

Chemists Leif Svensson, Henry Persson and Kjell Wetterlin at the medical drugs company of the time, Draco, invented the asthma drug Bricanyl. The drug widens the respiratory passages and facilitates breathing by counteracting muscle cramps in the respiratory tract.

1967 | NICORETTE

Professor Claes Lundgren and his colleague Stefan Lichtneckert discovered that chain smokers could avoid abstinence problems by chewing tobacco. The discovery convinced them that the need to smoke depended on an addiction to nicotine and both doctors invested in developing an alternative to chewing tobacco. The result was Nicorette – the world's first nicotine medicine.

1969 | NEW X-RAY CONTRAST AGENT

Professor of radiology Torsten Almén developed new types of non-ionising x-ray contrast agents. Unlike earlier kinds of agents, which could directly harm the patient, Almén's contrast agent was harmless and considerably less painful. Currently around 45 million people receive an injection of contrast agent every year – that is more than one injection per second.

1971 | THE SERVO VENTILATOR – THE MODERN RESPIRATOR

Through the use of flow control, medical researcher Björn Jonson and his colleague Sven Ingelstedt succeeded in creating the modern respirator. The apparatus, which was named the Servo Ventilator, represented a breakthrough for the establishment of intensive care throughout the world.

1972 | THE INKJET PRINTER

Physics professor Hellmuth Hertz developed continuous inkjet technology and with it one of the first inkjet printers. The new technology made it possible to produce colour images of a quality equal to that of colour photographs. In the same year, professor Erik Stemme at Chalmers University of Technology developed another variation on inkjet technology, the so-called drop on demand-technology.

1984 | NETWORK-BASED PRINTER SERVERS

Engineering student Martin Gren and Business student Mikael Karlsson started their company, Axis, from a small student room in Lund. The company's first product was a network-based printer server which was subsequently developed into a global product. Today Axis is the market leader in network video and had a turnover of close to SEK 3.6 billion in 2011.

1987 | INHALATOR FOR ASTHMA MEDICINE

Chemist Kjell Wetterlin and his colleagues at what was then Draco developed the Turbohaler – an inhalator for the dosage and inhalation of asthma medicine. The product revolutionised asthma medication and currently helps tens of millions of people the world over to control their illness.

1990 | OATLY

Professor Rickard Öste discovered that oats have the right properties to replace milk products. He developed a liquid oat-base as an alternative to milk drinks and founded a company, Oatly, in 1994, then under the name Ceba. The company is now the market leader in Sweden with a turnover of just over SEK 160 million.

1991 | LASER CANCER TREATMENT

Professor Karl-Göran Tranberg discovered a new method for treating so-called solid cancers in tissue such as the breast, liver and pancreas. Heating the tumour with laser beams kills it while the body's immune response learns to attack any remaining tumours. The company Clinical Laserthermia Systems (CLS) was founded in 2006 on the basis of these research findings.



1991 | PROVIVA

Researchers at Lund University's Faculty of Engineering developed the health-promoting bacteria culture *Lactobacillus*. The research finding was subsequently developed into a complete consumer product and the fruit drink Proviva was launched in the early 1990s. On 1 October 2010 Proviva was sold to French dairy giant Danone for billions.

1993 | QLIKTECH

Researchers Björn Berg, Staffan Gestrelus and Håkan Wolgé developed a software programme for rapid and simple analysis of information in different databases. The software became the basis for a company, Qliktech, which was listed on the Nasdaq stock exchange in the summer of 2010 with a turnover of SEK 1 540 million. Today, the company's software, Qlikview, is used by over 26 000 enterprises in just over 100 countries.

1995 | BLUETOOTH

Sven Mattisson and Jaap Hartsen invented the wireless technology standard for exchanging data over short distances, thereby opening a whole new world for the electronics sector. The technology was introduced onto the market in 1998 and was called Bluetooth after Viking chief Harald Blåtand (Harold Bluetooth). Currently, around five million new Bluetooth products are shipped every day.

1997 | PRECISE BIOMETRICS – FINGERPRINT READER

Entrepreneur Christer Fåhræus came up with the idea of combining smart cards with advanced image analysis for automatic recognition of fingerprints. Together with Mårten Öbrink and Nils Bernhard, he founded Precise Biometrics, whose technology is currently licensed to close to 160 million users.

1999 | DIGITAL DIAGNOSTIC SUPPORT

Professor Lars Edenbrandt realised how one could improve the analysis of heart images using artificial intelligence, thereby facilitating the work of doctors. Currently, hundreds of doctors all over the world use digital diagnostic support to diagnose heart attacks, bone cancer, Alzheimer's disease and dementia.

1999 | DECUMA – TECHNOLOGY THAT INTERPRETS HANDWRITTEN SYMBOLS

In connection with an industrial project on three-dimensional image analysis, researchers Gunnar Sparr, Kalle Åström and Richard Berthilsson discovered by chance a new way of interpreting human handwriting. By using the same mathematical algorithms as they applied in their industrial project, they developed an efficient program for the electronic interpretation of handwriting.

2001 | MECHANICAL HEART-MASSAGE MACHINE

Professor of Medicine Stig Steen helped to develop the LUCAS machine (Lund University Cardiopulmonary Assist System) which can save the lives of people suffering cardiac arrest. The machine compresses the chest thereby helping to maintain vital blood circulation to the heart and brain while ambulance or hospital staff attempt to resuscitate the patient.

2003 | BLOOD PURIFICATION WITH ULTRASOUND

Researchers Henrik Jönsson, Thomas Laurell, Andreas Nilsson and Filip Petersson came up with a way of separating lipids from blood using ultrasound. The purification process can mean that patients who get their own blood back in major operations can avoid brain damage.

2004 | FACIAL RECOGNITION TECHNOLOGY

A mathematician at Lund University's Faculty of Engineering, Jan Erik Solem, developed a search engine with advanced image analysis and facial recognition. The search engine formed the basis of the company Polar Rose, which was sold to Apple in September 2010 for just over 20 million US dollars.

2005 | INVISIBLE CYCLING HELMET

The Hövding cycling helmet is the result of Engineering students Anna Haupt and Terese Alstin's joint degree project. The invisible cycling helmet – which can be compared to an inflatable airbag – rapidly earned worldwide attention, in part for winning the prestigious European Index Award for design.



2006 | INSTRUMENT FOR CANCER OPERATIONS

Surgeons Anders Grönberg and Henrik Thorlacius constructed a new instrument which reduces suffering for patients with colon and rectal cancer. The instrument can be compared to a garden hose connector, whereby the sections of the intestine are spliced together using elastic silicone and plastic rings.

2007 | SOFTWARE FOR HEART ANALYSIS

Lund researcher Einar Heiberg and his research team were the first in the world to monitor a whole blood volume's transit through the heart. Among other applications, the technology can be crucial in identifying congenital heart defects or heart failure, where the blood flow is completely different compared to a healthy heart.

2007 | TREATMENT OF PRE-ECLAMPSIA

Professors of Medicine Bo Åkerström and Stefan Hansson discovered that loose foetal haemoglobin is harmful if it leaks into the mother's blood circulation. This led to the idea of how to cure pre-eclampsia – a condition that kills one woman every three minutes worldwide.

2008 | SATIETY PILL MADE OF SPINACH

Professor Charlotte Erlanson-Albertsson succeeded in producing a satiety pill from ordinary spinach. The pill contains so-called thylacoids, which lower cholesterol levels and extend the body's feeling of satiety while providing natural nourishment. The hope is to use this discovery to prevent obesity in the future.

2008 | CANCER DIAGNOSIS USING MR TECHNOLOGY

Chemistry researcher Daniel Topgaard invented a new method of diagnosing cancer. Using an MR camera, the method makes it possible to distinguish healthy cells from diseased cells without having to remove tissue to examine it. In this way, the patient can get test results rapidly and avoid the worry of waiting. Chemists Karin Bryskhe and Anna Stenstam started their company Collodial Resource on the basis of the new technology.

2009 | SOLAR CELLS BASED ON NANOTECHNOLOGY

Physics researchers Fredrik Boxberg, Niels Søndergaard and Hongqi Xu developed a technology that can replace the conventional use of solar cells and photodetectors. Through piezoelectric photovoltaics, or solar cells based on nanotechnology, the solar cells become more efficient as well as being more cost-effective.

2010 | NIGHT VISION CAMERAS

By studying insects with night vision, Magnus Oskarsson, Henrik Malm and Eric Warrant succeeded in developing an algorithm which makes it possible to film in the dark. The technology has awakened great interest in automobile industry giant Toyota, which wants to use the algorithm to develop safer cars.

2011 | MOULD-PROOF CLOTH

Professor Lennart Larsson developed a cloth that blocks dangerous substances in houses damaged by humidity. The cloth is applied directly to the damp areas, where it lets water molecules through but blocks mould particles and other harmful substances. The effect is immediate and close to one hundred percent.

2012 | QUINOA-BASED SKIN LOTION

By replacing chemical additives with quinoa starch in skin lotions, Lund University's Faculty of Engineering researchers Malin Sjöö, Marilyn Rayner, Petr Dejmek and Anna Timgren succeeded in developing a new type of natural skincare products. The result – a more skin-friendly and stable cream with cheaper ingredients than the products available on the market today – formed the basis of research company Speximo.

2012 | SPIRAL BIOPSY

Lund researcher Dr Charles Walther invented an instrument that makes it easier to take tissue samples from suspected cancer tumours. The invention was called the spiral biopsy and in December 2012 he was named Sweden's best inventor for it.

LUIS – LUND UNIVERSITY INNOVATION SYSTEM

LUIS is Lund University's combined unit for innovation and commercialisation. With our help, valuable knowledge from Lund University is converted into new companies or licenses on the market. Since 1999 we have invested in over 60 new companies, which together have generated over 2 000 man-years and over SEK 600 million in tax revenue.

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