

## University Inventions that Changed the World

Not only did these university inventions change the world by saving countless lives from diseases like diabetes and tuberculosis, they also made people sneeze less and smile more ... and had the side effect of millions of dollars of income going back to the universities to fund further research, build laboratories and buildings and support fellowships and other educational programs.

Invention	Institution	Inventor(s)	Year	Comments
Saccharin	Johns Hopkins Univ.	Constantin Fahlberg, Ira Remsen	1879	Fahlberg, a visiting research fellow from Germany, discovered and isolated saccharin. He patented the compound independently since Remsen, his advisor, was against patenting academic discoveries.
Rocket Fuel	Clark Univ.	Robert Hutchings Goddard	1914	US Patent 2,397,657 "Control mechanism for rocket apparatus solid-fuel rockets" was monumental advance.
Insulin	Univ. of Toronto	Frederick Banting, Chas Best	1922	Banting sold the patent to U. of T. for \$1; later won Nobel prize with Best for the work. Insulin prepared from pancreas samples was injected into patients.
Vitamin D Fortification	Univ. of Wisconsin	Harry Steenbock	1925	Fortification of food with Vitamin D helped eliminate Rickets, a crippling bone disease in children.
Concrete Steam Curing	Univ. of Saskatchewan	Thornbergur Thorvaldson	1920s	Steam-curing concrete resulted in resistance of concrete to alkali soil, alleviating widespread damage
Plexiglass	McGill Univ.	William Chalmers	1930	Chalmers was a graduate student in the Department of Chemistry.
Pablum	Univ. of Toronto	Fredrick Tisdall, Theodore Drake, Alan Brown	1930	Pablum was a breakthrough infant cereal — nutritious, easy to prepare and vitamin-rich.

Electron Microscope	Univ. of Toronto	Albert Prebus, James Hillier	1938	First practical electron microscope. Prebus and Hillier, graduate students, adapted original concept developed by Max Knoll and Ernst Ruska in Germany.
Drunk-O-Meter	Indiana Univ.	Rolla Harger	1938	The Drunk-O-Meter was the first breath-testing instrument to measure blood alcohol content and paved the way for the modern breathalyzer.
Penicillin (production method)	Oxford Univ.	Howard Florey, Ernst Chain	1939	Florey and Chain developed a powdered form of penicillin, which was mass-produced in Britain in time to treat Allied soldiers on D-Day.
Pap Smear	Cornell Univ.	Nicolas Papanicolaou	1939	The pap smear originated in Papanicolaou's practice in Greece; the test was re-evaluated and brought into mainstream medicine at Cornell.
Blood Preservation	Columbia Univ.	Charles Drew	1940	Technique of separating red blood cells and plasma, then freezing, allowed for stored blood to be used in transfusions during WWII.
Ultrasound (pioneering work)	Univ. of Vienna	Karl Theodore Dussik	1942	First use of ultrasound--Dussik imaged a cerebral ventricle.
Streptomycin	Rutgers Univ.	Selman Waksman, Albert Schatz	1943	First antibiotic effective against Tuberculosis
Electronic Computer	Univ. of Pennsylvania	John Mauchly, J. Presper Eckert	1946	This was the first large-scale, general purpose electronic computer.
Magnetic Core Memory	Mass. Inst. of Tech.	Jay Forrester	1940s	Replaced vacuum tubes in memory storage; used in 1st and 2nd generation IBM computers
Cephalosporin C	Oxford Univ.	Sir Edward Penley Abraham	1953	A broad-spectrum antibiotic resistant to penicillinase and effective against penicillin-resistant bacterium. Abraham later deduced chemical structure and method of synthesis.

Heart-Lung Machine	Univ. of Minnesota	C. Walton Lillehei	1955	Allowed for spread of open-heart surgery, which was also pioneered at Univ. of Minnesota
Polio Vaccine	Univ. of Pittsburgh	Jonas Salk	1955	First working Polio vaccine. Used infected monkey tissue killed with paraformaldehyde.
Fluoride Toothpaste	Indiana Univ.	Joseph Muhler, Harry Day	1956	Originally used in Crest toothpaste.
Pacemaker	Univ. of Minnesota	Earl Bakken, Wilson Greatbatch	1958	First small, battery-powered pacemaker.
Ultrasound (practical application)	Glasgow Univ.	Ian Donald	1958	Donald pioneered technology making ultrasound practical for imaging bone structure, unborn babies and tumors.
Warfarin (coumarin)	Univ. of Wisconsin	Karl Paul Link	1950s	Coumarin isolated from rotting clover displayed anti-coagulant properties. Warfarin is a coumarin derivative commonly used as rat poison and in humans as an anti-coagulant.
Seat Belt	Univ. of Minnesota	James "Crash" Ryan	1963	First retractable, locking seatbelt for use in automobiles.
CEA (Carcinoembryonic Antigen)	McGill Univ.	Samuel Freedman, Phil Gold	1965	CEA as a marker for digestive (i.e. colon) cancers was discovered by Gold & Freedman; a radioimmunoassay for CEA detection was later developed.
Gatorade	Univ. of Florida	Robert Cade, Dana Shires	1966	Previously, Florida athletes were not properly hydrated. Gatorade helped team to first Orange Bowl win in 1967 and improved record.
LCD	Kent State	James Ferguson	1967	LCD (Liquid Crystal Display) paved the way for flat panel (laptop) displays and is used in digital watches.

Hepatitis B Vaccine	Univ. of Pennsylvania	Baruch Blumberg, Irving Millman	1969	US Patents 3,636,191 and 3,872,225; "Vaccine against viral Hepatitis" and "Process of viral diagnosis and reagent vaccine for Hepatitis B" were result of a collaboration with Fox Chase Cancer Center in Philadelphia.
Tifway, Tifgreen, other 'Tif' grasses	Univ. of Georgia	Glen Burton	1960s	"Tif" grasses are Bermuda Grass hybrids that cover more golf courses, athletic facilities and lawns than any other types of grasses, while generating \$1 billion annually for the Georgia economy.
CAT Scan	Georgetown	Robert S. Ledley	1973	US Patent 3,922,552 "Diagnostic X-Ray CAT Scan" represents First whole-body CT scanner.
MRI Scanner	State Univ. of New York - Downstate Medical Center	Raymond Damadian	1977	MRI provided more detailed images of the body's interior than X-Ray based methods such as the CAT Scan. The first human MRI scan was performed using "Indomitable," a prototype MRI scanner built from scratch by Damadian and graduate students at Downstate. It is based upon technology in US Patent 3,789,832 "Apparatus and method for detecting cancer in tissue," filed in 1972 and granted in 1974. This is the original fundamental patent for an MRI scanner and was upheld as such by the U.S. High Court of Patents in 1997.
MRI Technology	State Univ. of New York - Stonybrook	Paul Lauterbur	1970s	Lauterbur is credited with the idea of creating 2-dimentional pictures by producing variations in a magnetic field, a critical concept in MRI imaging; he holds 4 patents in this area. Lauterbur performed the first MRI of a living animal (a clam);

				work was published in Nature in 1973.
MRI Technology	Nottingham Univ.	Sir Peter Mansfield	1970s	Mansfield showed it was possible to selectively image a 2-dimensional slice of an object held in a magnetic field and developed techniques to manipulate the applied magnetic fields as well as algorithms to interpret results.
Cisplatin	Michigan State Univ.	Barnett Rosenberg	1977	An early chemotherapy drug for testicular and ovarian cancer. Rosenberg subsequently developed Carboplatin, an equally effective analog with fewer side effects.
Recombinant DNA Technology	Stanford Univ, Univ. of California - San Francisco	Stanley Cohen, Herbert Boyer	1974	Has been licensed to over 200 companies, generating \$100 million in royalties and jump-started nation's first successful biotech company, Genentech.
Kentucky Bluegrass Hybrid	Rutgers Univ.	C. Reed Funk	1977	US PP4,223 represents first man-made Kentucky Bluegrass hybrid. Kentucky Bluegrass is perennial ground cover that withstands regular mowing and traffic. It is the turf of choice in cool-weather locations throughout the U.S. This was a major advance for Rutgers University's New Jersey Turfgrass Association.
Canine Parvovirus Vaccine	Cornell Univ.	Leland Carmichael	1979	Has been credited with saving the lives of millions of dogs since regular use of vaccine was implemented
Kennel Cough Vaccine	Iowa State Univ.	William Switzer, Dan Farrington	1970s	Has saved an estimated 30 million dogs in the U.S. from often-fatal respiratory disease.

Restasis	Univ. of Georgia	Renee Kaswan	1983	Low-dose cyclosporin reduces inflammation of tear ducts, curing chronic dry-eye.
Adenocard	Univ. of Virginia	Robert Berne	1985	Drug of choice in emergency rooms and emergency vehicles to treat supraventricular tachycardia--dangerously high heart rate.
Factor IX Gene Product	Univ. of Washington, Oxford Univ.	Earl W. Davie, G. G. Brownlee	1988	Originally licensed by international tech transfer company and re-licensed to four companies, including Genetics Institute (a Harvard spinoff) which produces BeneFix, widely-used recombinant Factor IX for treatment of hemophilia.
LASER Cataract Surgery	Univ. of California - Los Angeles	Patricia Bath	1988	First instrument designed for removing the cataractous lens.
Allegra	Georgetown Univ.	Raymond Woosley	1992	Allegra (fexofenadine) is the non-toxic active metabolite of Seldane, an earlier anti-histamine which could cause fatal heart failure.
Synthetic Taxol	Florida State Univ.	Robert Holton	1993	Relatively non-toxic chemotherapy drug was originally isolated from Yew trees; cost and environmental concerns led to Holton's development of synthetic Taxol.
Trusopt	Univ. of Florida	Thomas H. Maren	1995	An eye drop that treats certain kinds of Glaucoma; an alternative to systemic administration of Diamox, which had unpleasant side effects.
Emtriva	Emory Univ.	Raymond Schinazi, Dennis Liotta, Woo-Baeg Choi	1996	A nucleoside analog and reverse transcriptase inhibitor taken once a day as part of a multi-drug cocktail to treat HIV.

Combination PET/CT Scanner	Univ. of Pittsburgh	Ronald Nutt, David Townsend	2000	Combining Positron Emission Tomography (PET) and Computerized Tomography (CT) provided the first medical image containing both anatomical (CT) and metabolic (PET) data from patient, allowing for long sought-after precision in locating small tumors and/or lesions. Nutt and Townsend originally came up with PET/CT idea at the University of Geneva while working together there. Nutt and Townsend continued the project at the University of Pittsburgh, developing a working prototype in 1998; FDA approval came in 2000. Technology is protected by US Patents 6,490,470 "Combined PET and X-Ray tomograph and method for using the same" and 6,631,284 "Combined PET and X-Ray tomograph."
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The above table of university inventions and inventors was compiled from internal research findings and from third party contributions. It is not meant to be exhaustive, but rather an exemplary list of important university inventions.

We are aware that there may be conflicting stories with respect to the origin of certain inventions. We simply reported what we have found; perhaps additional investigation will lead to changes in the list. The U.Va. Patent Foundation does not warrant that the above information is reliable or fit for any particular purpose.