UNIVERSITY OF ILLINOIS
URBANA-CHAMPAIGN • CHICAGO • SPRINGFIELD

WITHOUT

INNOVATIVE DISCOVERIES
FROM THE UNIVERSITY OF ILLINOIS
THAT IMPACT OUR WORLD

OFFICE OF THE VICE PRESIDENT FOR RESEARCH

OVPR thanks our colleagues from across the University who contributed to this publication. Special thanks to the College of Engineering; Disability Resources & Educational Services; Institute for Sustainability, Energy, and Environment; Office of Technology Management; Office for University Relations; and University Archives.

Many of the world's greatest discoveries and inventions originated at the University of Illinois.

From life sciences and healthcare to engineering and software,

IT IS DIFFICULT TO IMAGINE THE WORLD WITHOUT UNIVERSITY OF ILLINOIS INNOVATIONS.

As one of the best research institutions in the world, the University of Illinois (U of I) educates the best and brightest researchers, scientists, and entrepreneurs. Our discoveries have changed the way people think, work, and live for nearly 150 years.

The University of Illinois is built on a legacy of innovation and discovery. Many of the University's earliest groundbreaking inventions were trailblazers for the research and innovation that are coming out of laboratories today.

This publication contains information about innovations and discoveries that originated at the University of Illinois (Urbana-Champaign, Chicago, and Springfield campuses). This is not a complete list, but rather a sampling, of U of I discoveries.

WITH

WITH THE UNIVERSITY OF ILLINOIS:

SOUND-ON-FILM MOVIE TECHNOLOGY

At the request of University President David Kinley and the Board of Trustees, Joseph Tykociner—the University's first research professor in Electrical Engineering—debuted **the first electronic sound on film** to the Urbana section of the American Institute of Electrical Engineers on June 9, 1922. His double feature consisted of his wife ringing a bell and a reading of the Gettysburg Address.

WITHOUT

IMAGINE THE WORLD WITHOUT THIS INNOVATION:

- Inventors from around the world experimented with sound movies from the very beginning of the cinematograph.
- Joseph Tykociner dreamed of recording sound on film for more than 25 years.
- Tykociner's arrival at the University of Illinois in 1921 as the first research professor of Electrical Engineering signaled a shift in the department's focus from being a technical program to one that focused on research and innovation.
- Despite the apathy and skepticism shown by industrial leaders, films featuring sound were commercialized shortly after Tykociner's demonstration.
- Today, movie producers and technicians design virtual realities based on Tykociner's original technology that create realistic experiences for moviegoers.

IMAGINE THE WORLD WITHOUT...

OTHER INNOVATIVE DISCOVERIES FROM THE UNIVERSITY OF ILLINOIS:

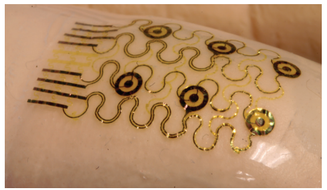
The **PLASMA DISPLAY PANEL** represents a revolutionary way of producing illuminated images by means of electrified gas and is the forerunner to today's high-definition flat-panel television monitors. Inventors Donald L. Bitzer and H. Gene Slottow first conceived the idea in 1964 during a casual conversation about the anticipated needs of another University of Illinois discovery—PLATO, the nation's first computer-based program of instruction.

A.C. Willard, Head of the Mechanical Engineering Department and later University President, developed the **VENTILATION SYSTEM USED IN THE HOLLAND TUNNEL**, the world's longest underwater tunnel for motor vehicles when it opened, and the first tunnel with a ventilation system specifically designed to handle vehicle exhaust fumes. The Holland Tunnel facilitates the transport of people and goods across and under the Hudson River.

Professor of Mechanical Engineering Seichi Konzo invented the basis for present-day **HOME AIR-CONDITIONING SYSTEMS** as the result of a cooperative research program between the heating industry and the University.

The interdisciplinary team of Nancy Sottos (Materials Science), Scott White (Aerospace Engineering), and Jeff Moore (Chemistry) has collaborated in self-healing research for over a decade. **SELF-HEALING MATERIALS** can be used in elastomer coatings, thermosetting coatings, and powder coatings, making them useful across a wide range of markets, from marine to aerospace.

WEARABLE ELECTRONICS developed by Materials Science & Engineering Professor John Rogers fold and stretch to 3D surfaces and can be used in medical, industrial and defense, and athletic applications, among others. John Rogers is one of the world's leading researchers focusing on soft materials for conformal electronics, nanophotonic structures, microfluidic devices, and microelectromechanical systems.



Close-up view of a stretchable circuit applied to the skin

WITH

WITH THE UNIVERSITY OF ILLINOIS:

PREZISTA®

PREZISTA®, **the first treatment for multi-drug resistant HIV**, was developed at the University of Illinois at Chicago by Dr. Arun Ghosh with researchers from the National Institutes of Health (NIH). This lifesaving drug is widely available, including in underdeveloped nations where it is needed the most.

The discovery of this drug represented a turning point in HIV therapy.

WITHOUT

IMAGINE THE WORLD WITHOUT THIS INNOVATION:

- When the HIV/AIDS epidemic began, people with AIDS were not likely to live more than a few years. Now, thanks to antiretrovival drugs like PREZISTA®, people infected with HIV can lead longer and healthier lives.
- PREZISTA® is the number one prescribed protease inhibitor for patients who begin a new combination HIV therapy.
- The drug is highly accessible and affordable, including in underdeveloped nations where the vast majority of people with HIV reside.

IMAGINE THE WORLD WITHOUT...

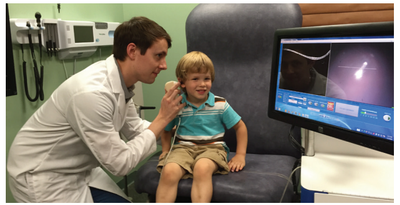
OTHER INNOVATIVE DISCOVERIES FROM THE UNIVERSITY OF ILLINOIS:

BCG TICE is a **BLADDER CANCER DRUG** that is less toxic than many other treatments, providing greater overall wellness when fighting cancer. Developed by Dr. Sol Roy Rosenthal, the first Director of the UIC Institute for Tuberculosis Research, BCG Tice is being clinically tested to treat other diseases.

Professors Stephen Boppart and P. Scott Carney developed an ultra-high **RESOLUTION IMAGING PLATFORM** that enables real time scanning of tumors and lymph nodes, providing immediate feedback to optimize surgical effectiveness.

William Fry, a pioneering biophysics researcher, initiated the use of **ULTRASOUND IMAGING FOR DISEASE DETECTION**.

Professor Bellur Prabhakar developed an **AUTOIMMUNE DISEASE TREATMENT** that can also be used for people with allergies and Type 1 diabetes.



The CLEARVIEW™ otoscope allows physicians to look through the eardrum to directly visualize the infection in the middle ear.

Stephen Boppart, Professor of Electrical and Computer Engineering, Bioengineering, and Medicine, led a team that developed the **CLEARVIEW™ OTOSCOPE** that provides physicians with an unprecedented, non-invasive view inside the ear to more accurately screen and diagnose ear infections.

Paul Hergenrother, Professor of Chemistry, and an interdisciplinary and cross-campus team of researchers developed personalized **CANCER THERAPEUTICS** for unmet or underserved markets.

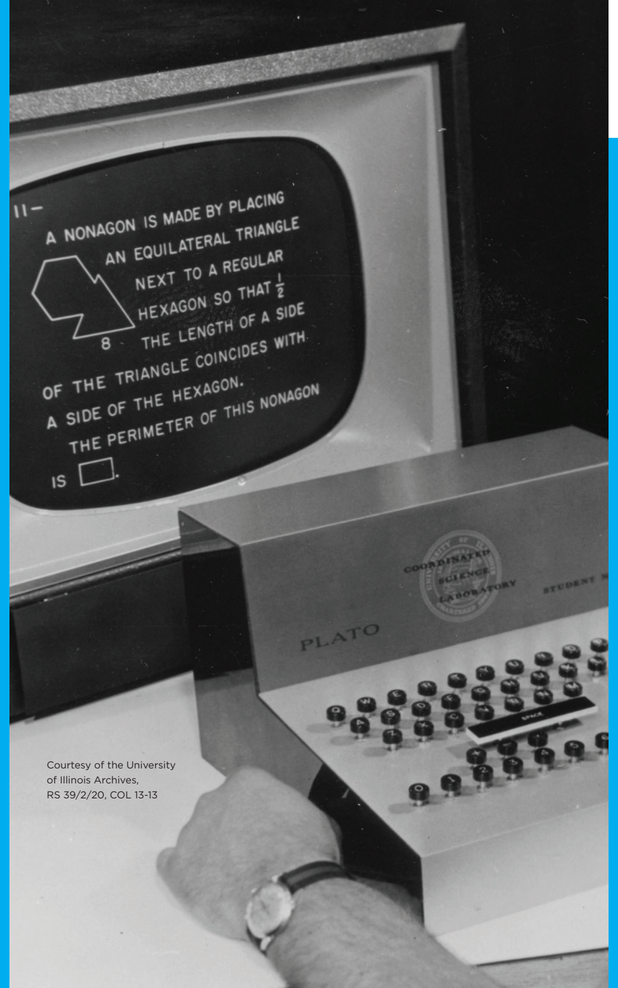
Dr. Seungpyo Hong developed a **MEDICAL DEVICE THAT DETECTS CIRCULATING TUMOR CELLS** (CTCs), the cells that can be responsible for the spreading of cancer cells.

WITH

WITH THE UNIVERSITY OF ILLINOIS:

PLATO

Introduced by U of I faculty in 1961, Programmed Logic for Automatic Teaching Operations, or PLATO, was **the first computer-based education system** and the home of the first online community. PLATO provided a means for individualized student instruction and opened the door for interactive computer education. It evolved into Lotus Notes, one of the earliest enterprise collaboration software tools.



Courtesy of the University of Illinois Archives, RS 39/2/20, COL 13-13

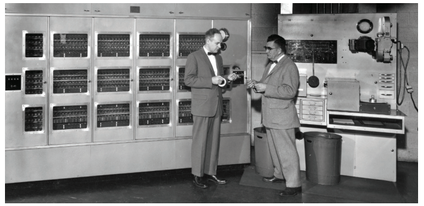
WITHOUT

IMAGINE THE WORLD WITHOUT THIS INNOVATION:

- On average, at least one in four students in the U.S. takes an online course.
- More than 42,000 students take online courses through the Urbana-Champaign, Chicago, and Springfield campuses.
- For more than a decade, the University of Illinois at Springfield (UIS) has been at the forefront of online learning and the use of technology in instruction. The campus has won numerous awards in recognition of its leadership in online education.
- UIS faculty members' responsiveness to adopting the Internet and other technologies for instruction has led to online learning and emerging educational technologies and establishment of the Center for Online Learning, Research, and Service (COLRS).
  The COLRS builds exciting new online collaborations among educational institutions, government agencies, organizations, and business entities around the world.

IMAGINE THE WORLD WITHOUT...

OTHER INNOVATIVE DISCOVERIES FROM THE UNIVERSITY OF ILLINOIS:



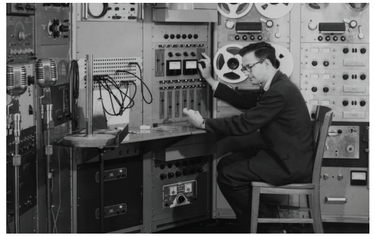
Illiac I, July 1951
Courtesy of the University of Illinois Archives,
RS 11/15/10, Box 1, Folder Illiac I

Built on the Urbana campus, **ILLIAC** (Illinois Automated Computer) was the first automatic electronic digital computer owned by a university. Called the “electronic brain,” it performed arithmetic, advanced computational analyses, and administrative tasks. ILLIAC was used by nearly every scientific department at the U of I and was available to faculty, staff, and students. Additional ILLIAC systems would follow.

NCSA MOSAIC™ was the first widely popular graphical web browser and was the foundation for many Internet browsers in use today. It allowed users to see words and pictures on the same page and navigate with scrollbars and links. Student Marc Andreessen, who later went on to found Netscape, and staff member Eric Bina developed Mosaic at the National Center For Supercomputing Applications.

The **TIMS ELEMENTARY MATH PROGRAM** is an elementary school mathematics program for children in grades K–12. Developed at the University of Illinois at Chicago by particle physicist Howard Goldberg and mathematician Philip Wagreich, TIMS is at the forefront of current national efforts to improve the teaching and learning of mathematics and science in elementary schools.

Lejaren A. Hiller and Leonard M. Isaacson created the Illiac Suite, the first piece of **COMPUTER-COMPOSED MUSIC.** This composition changed the way people thought about music and its relationship to science.



Lejaren Hiller, ca. 1960
Courtesy of the University of Illinois Archives,
RS 11/15/10, Box 1, Folder Illiac I

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WITH THE UNIVERSITY OF ILLINOIS:

NIGHT VISION TECHNOLOGY

Physics Professor Dr. Siva Sivananthan developed **military infrared night vision technology** that helps keep our troops safe when they are in harm's way. Dr. Sivananthan was named a White House "Champion of Change" and his technology was featured in a national report as a successful product of federally funded scientific research.

WITHOUT

IMAGINE THE WORLD WITHOUT THIS INNOVATION:

- Dr. Sivananthan's night vision technology was used in the raid that took down Osama Bin Laden.
- The U.S. defense industry has incorporated the technology into tanks, drones, and fighter planes.
- The same technology is also being applied to the development of next-generation solar panels.

IMAGINE THE WORLD WITHOUT...

OTHER INNOVATIVE DISCOVERIES FROM THE UNIVERSITY OF ILLINOIS:

Professor Nick Holonyak, Jr. and his students demonstrated the first **QUANTUM-WELL LASER**, which enabled advances such as fiber optic communications, compact disc players, and new techniques in medical diagnosis and surgery.

MICROPLASMA LIGHTING developed by Professors Gary Eden and Sung-Jin Park is mercury free, more efficient, and higher quality than traditional fluorescent lighting and can be used in a variety of applications.

Professor Alan Feinerman led a team of students to develop ultra-low **THERMAL CONDUCTIVITY INSULATION PANELS** that led to novel improvements for more reliable and efficient transportation of temperature-sensitive products.

Students, faculty, and staff in the Institute for Sustainability, Energy, and Environment on the Urbana campus invented a **STORED SOLAR ENERGY COOKSTOVE** that cooks without fire or fuel, creates no emissions, and is viable worldwide.

Viewing a glass fissure computed in a 5-Million atom molecular dynamics nanoscale simulation.
Data from University of Southern California. Visualization by the Argonne Leadership Computing Facility and the UIC Electronic Visualization Laboratory (EVL), and viewed in EVL's CAVE2™ Hybrid Reality Environment.

The **CAVE™** virtual reality projection-based system, created by Professors Carolina Cruz-Neira, Dan Sandin, and Tom DeFanti, allows users to explore and experience environments for scientific visualization. **CAVE2™** expands on this technology to create a large-scale hybrid reality environment that provides scientists with new and more intuitive ways of interacting with data.

A **SMART WATER DISINFECTION KIT** developed by a team of interdisciplinary faculty from the Urbana campus is addressing worldwide water safety challenges, which account for more than 1.8 million deaths and 870 million cases of chronic malnutrition annually.

WITH

WITH THE UNIVERSITY OF ILLINOIS:

DRES

The Division of Disability Resources and Educational Services (DRES) on the Urbana campus was **the first post-secondary disability support service program in the world**. DRES was founded in 1948 as a result of Dr. Tim Nugent's belief that veterans injured in WWII should be able to reap the benefits of the GI Bill and attend college. The University of Illinois had many "accessibility firsts" that include everything from curb cuts in streets and sidewalks to buses with wheelchair lifts to wheelchair athletics.

Courtesy of the Division of Disability Resources and Educational Services

WITHOUT

IMAGINE THE WORLD WITHOUT THIS INNOVATION:

- DRES has helped thousands of students with disabilities earn college degrees and has made the Urbana-Champaign campus a leader in the area of post-secondary education for people with disabilities.
- Groundbreaking research at the University of Illinois led to the development of the first architectural accessibility standards that were later adopted by the American National Standards Institute.
- Under Dr. Nugent's leadership, the University achieved a number of significant "firsts" in serving people with disabilities:
  - First college-level adapted sports and recreation program
  - First study-abroad program for students with disabilities
  - First state-of-the-art residence hall integrating students with and without disabilities in a unique living-learning community

OTHER INNOVATIVE DISCOVERIES FROM THE UNIVERSITY OF ILLINOIS:

WHIPPED CREAM IN A CAN was an accidental invention of U of I student Charles Getz while working in the University's dairy bacteriology department.

Professor John Laughnan developed the **"ILLINI SUPERSWEET" SWEET CORN** hybrid that revolutionized the sweet corn industry. Supersweet hybrids account for 95% of the sweet corn sold in U.S. grocery stores and 30% of the worldwide corn market.

The Marching Illini was the first band to perform a **MARCHING BAND WORD DRILL**. John Philip Sousa described the group as the "world's greatest college band."

Marching Illini in "Illini" Formation, ca. 1939
Courtesy of the University of Illinois Archives,
RS 39/2/20, BUI—Stadium, 1930–39

The **ILLINOIS INNOCENCE PROJECT** at the University of Illinois at Springfield uses forensic evidence and behavioral science to exonerate people who have been convicted and imprisoned for crimes they did not commit. The eight exonerations the project has achieved to date have resulted in $8.5 million in taxpayer savings.

Scientific Animations Without Borders™ (SAWBO) is a program led by faculty, staff, and students on the Urbana campus that develops **ANIMATION SEQUENCES** to educate people around the world on topics such as agricultural advances and disease prevention.

Special effects for the 1977 movie *Star Wars* were made possible by **3D COMPUTER ANIMATION** that was developed at the UIC Electronic Visualization Laboratory (formerly called the UIC Circle Graphics Habitat).

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