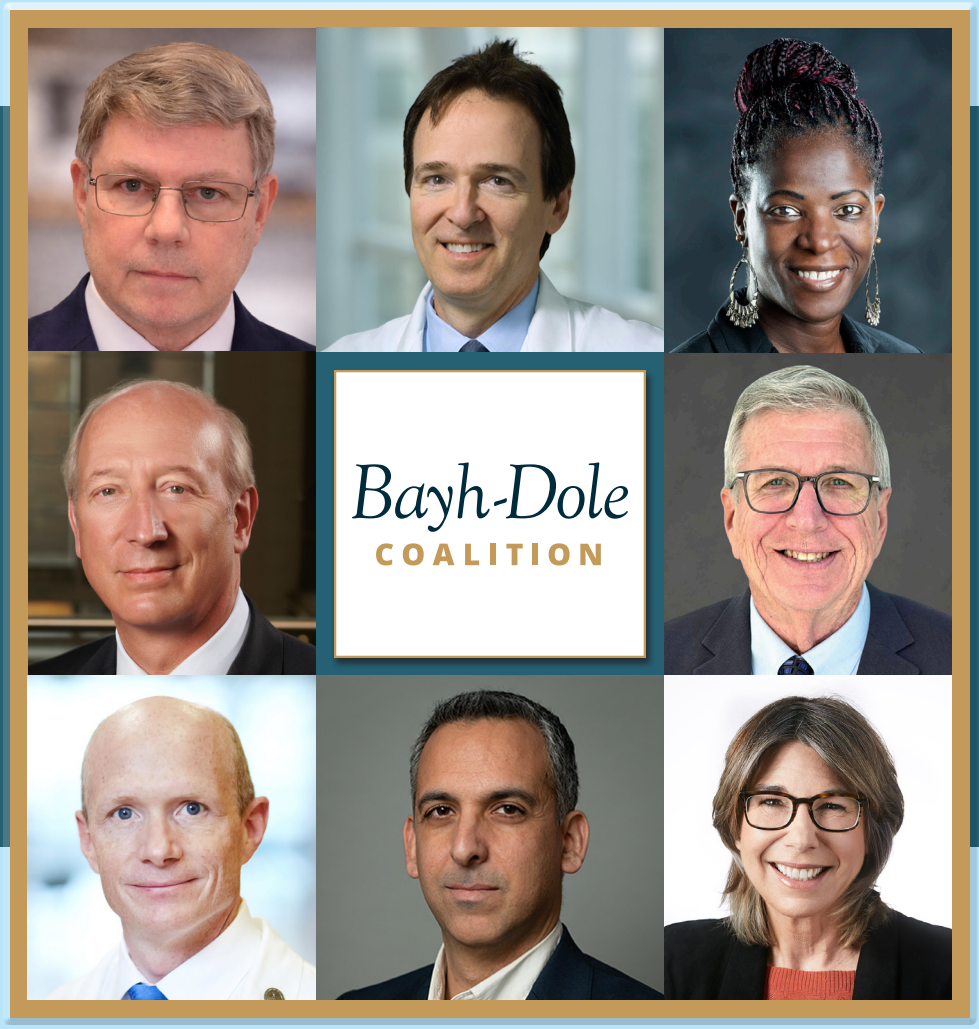
"Possibly the most inspired piece of legislation to be enacted in America over the past half-century was the Bayh-Dole Act of 1980... More than anything, this single policy measure helped to reverse America's precipitous slide into industrial irrelevance."

– *The Economist Technology Quarterly, 2002*



2026 FACES OF AMERICAN INNOVATION

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Table of Contents

The Bayh-Dole Act: Unlocking American Innovation

In 1980, at a moment of economic uncertainty and political division, Congress passed a law that would quietly transform American discovery and establish the United States as the undisputed innovation leader.

At the time, universities, small companies, and federal laboratories across the country were making important inventions with federal funding, yet few of those breakthroughs ever reached the public. The government claimed ownership of these inventions, but lacked the incentives and expertise to license them for commercialization. Of the roughly 28,000 patents held by the federal government in the late 1970s, less than 5%[1] had been licensed for further development. Not a single drug[2] had been brought to market from the National Institutes of Health portfolio under that existing system.

Senator Birch Bayh of Indiana came to understand this problem after his staff met with Ralph Davis, who was managing the technology transfer office at Purdue University. Davis explained how Purdue scientists were making discoveries with the help of grants from the Department of Energy, but the inventions sat on the 'bureaucratic' shelf because the government wasn't moving to commercialize them.

The problem became personal for Bayh in the late 1970s when his wife, Marvella, was battling a recurrence of cancer. As she underwent treatment and advocated for cancer awareness, Bayh saw firsthand how long it could take for promising scientific discoveries to reach patients. Even when federally funded breakthroughs were made, they often stalled before becoming usable therapies — delayed not by a lack of scientific progress, but by a lack of incentives to develop them further.

At the same time, the broader global and economic context was equally concerning. The United States was lagging in international competitiveness — Europe was introducing twice as many[3] new drugs in comparison, and Japan and Germany were eclipsing our lead in fields historically dominated by America. As a result, American manufacturing was declining, productivity was slowing, and policymakers were searching for ways to better translate the nation's research investments into economic growth.

The country could no longer afford to let taxpayer-funded discoveries sit idle when they had the potential to improve lives, strengthen industries, and restore American competitiveness — and Bayh was determined to do something about it.

After learning of a shared interest in the issue, Bayh reached across party lines — during a particularly polarized and divisive presidential election year — to work on a solution with Senator Bob Dole of Kansas.

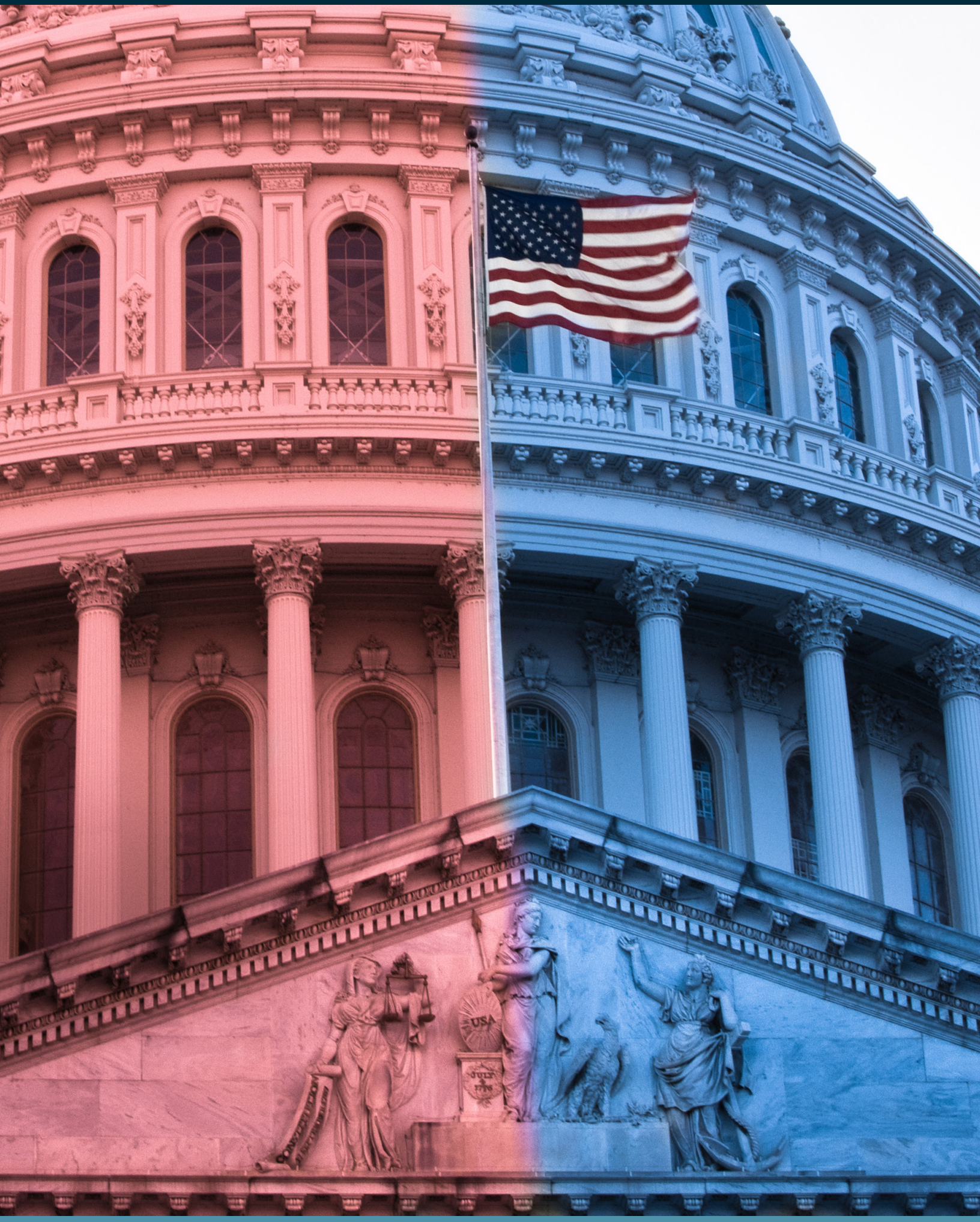
Together, they crafted legislation that would allow federal laboratories, nonprofit organizations, including universities, and small businesses to retain the patent rights to inventions made with federal funding. By enabling these organizations to license their discoveries to American industry for commercialization and reinvest the proceeds into further research, the law created a clear pathway from scientific breakthroughs to real-world impact — and a lifecycle to sustain future discoveries.

Passing the Bayh-Dole Act was far from easy. The bill faced strong opposition within the Carter administration and in Congress, and its fate remained uncertain until the final days of the legislative session.

After months of negotiation and a last-minute agreement in a lame-duck session of Congress, the legislation finally cleared its final hurdles and was signed into law in December 1980.

Since its enactment, the impact[4] of the Bayh-Dole system has been nothing short of extraordinary: $1 trillion contributed to the U.S. GDP, 6.5 million jobs supported, and more than 19,000 startups launched.

More than four decades later, the system continues to deliver returns — and the stories in this report represent just a small fraction. Bayh-Dole demonstrates how a bipartisan effort to solve a practical problem continues to generate benefits for society, the economy, and the future of American innovation.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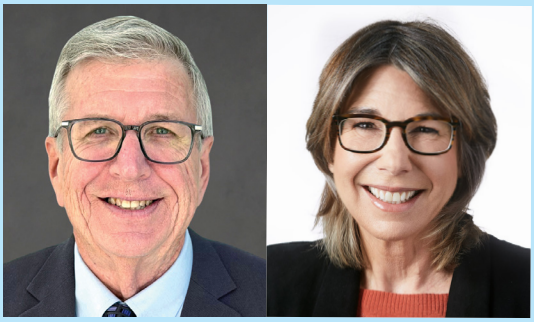


Eric Fossum and Sabrina Kemeny: The Camera That Changed the World

Two Inventors' Journey Taking Cameras from NASA Labs to Smart Phones

Eric Fossum and Sabrina Kemeny's journey began at the dawn of the space age. They were both born just days after the launch of Sputnik. From an early age, Fossum was captivated by science, invention, and the possibilities of exploration beyond Earth. That curiosity was reinforced through hands-on experience. As a middle school student in Connecticut, he participated in a weekend science program where students learned by doing. There, Fossum built a meteorology project to study wind flow and, remarkably for the time, was introduced to computer programming in 1970.

Kemeny's path to science was different, but driven by the same sense of curiosity. The daughter of immigrants, she grew up with a practical mindset and a deep love of astronomy, inspired by figures like Carl Sagan — and reinforced by hours spent peering through her telescope.

Their paths converged at Columbia University, where Kemeny, then an electrical engineering graduate student, joined Fossum's research group. There, she began working on imaging technologies that would soon take both of them far beyond the classroom. When the opportunity arose to join NASA's Jet Propulsion Laboratory (JPL) at the California Institute of Technology (Caltech), Kemeny described it as a "dream come true." Fossum didn't hesitate either — he later recalled deciding to leave academia for NASA in "one heartbeat."

At JPL in the early 1990s, they found themselves at the forefront of a new era in space exploration. NASA engineers were building cameras to photograph Saturn, Jupiter, and other distant planets, producing images of staggering beauty. But the dominant image sensor chip technology at the time — the charge-coupled device (CCD) used at the heart of digital cameras — required near-perfect signal transfer across the chip, making space cameras costly, power-intensive, massive, and very sensitive to the harsh radiation of space.

Fossum arrived at JPL as an expert in CCDs, and solving that challenge became Fossum's mission. Soon thereafter, NASA had a new mandate: "faster, better, cheaper." That meant cameras also had to shrink from the size of a refrigerator to something closer to a coffee cup while consuming far less power.

Fossum and Kemeny began to see that incremental improvements would not be enough. What if the solution wasn't to refine the existing technology, but to replace it entirely? The idea was to build a camera the way you build a computer chip.

Today, CMOS image sensors are everywhere — in billions of smartphones, laptops, cars, medical devices, and security systems.

Instead of relying on specialized CCD manufacturing recipes, Fossum proposed using standard CMOS semiconductor technology, the same platform used to manufacture microprocessors. If it worked, it would integrate nearly all of a camera's functions — control, image capture, signal processing and more — onto a single piece of silicon.

At the time, many experts doubted the approach. Earlier versions of similar concepts had failed. Even within JPL, there was resistance. CCD technology was deeply entrenched.

But Fossum, Kemeny, and a small team pressed forward, inventing and developing the CMOS active pixel sensor with intra-pixel charge transfer, which allowed each pixel to process its own signal. While Fossum led much of the underlying scientific vision and technical approach, Kemeny's contributions were more hands-on. She focused on the physical layout, assembly, and testing of the chips — solving the challenge of fitting both light-sensitive elements and circuitry into an extremely small pixel area.

By 1993, the team had demonstrated not only a new kind of sensor, but a fully integrated "camera-on-a-chip." What had once required bulky, delicate systems could now be miniaturized, digitized, and manufactured at scale.

It was a breakthrough born in the space program, but NASA wasn't moving to adopt the technology quickly. So Fossum and Kemeny became advocates for the CMOS image sensor and worked to bring it into the private sector.

Sensing the opportunity, and frustrated by the pace of adoption by larger U.S. electronics companies, the pair made a bold decision to start a new company in 1995, Photobit. While Fossum continued to play a key technical role, Kemeny led the business side of the venture and took primary responsibility for securing the intellectual property needed to commercialize the technology.

Then, a BusinessWeek feature brought national attention to the fledgling company, and industry inquiries surged. Photobit expanded from a home-based operation into an established enterprise, hiring engineers and securing contracts across multiple sectors.

Through Bayh-Dole, Caltech had patented the technology and controlled licensing. Kemeny led negotiations with the university to secure rights for Photobit. She pushed strongly for an exclusive license, arguing that without exclusivity, it would be impossible to attract investment or build a viable company. Despite initial resistance, she successfully negotiated the agreement — marking the first time a JPL-developed technology had been licensed back to its inventors.

This intellectual property position proved essential. As Kemeny later emphasized, the patent portfolio and exclusive license enabled Photobit to secure financing and move forward as a startup.

Like many ventures, Photobit's early years were typically stressful. The pair was running the startup out of their home with two young children running around. Meanwhile, Fossum maintained his job at JPL for the first year to provide a steady income, though his responsibilities were modified to avoid conflicts of interest.

Some of Photobit's earliest funding came from two NASA Small Business Innovation Research (SBIR) grants. These grants served as critical seed funding, allowing the company to begin development and demonstrate the commercial potential of the technology.

Collaborations with other existing and startup companies also provided early funding. One collaboration helped replace dental X-ray film with digital sensors, reducing radiation exposure for patients. Another enabled swallowable "pill cameras" that could image the human body from within, while a third was used to improve driver safety in automobiles.

But as the late 1990s unfolded, a new category of devices began to emerge: portable consumer electronics. The idea of putting a camera into a mobile phone was still experimental. Sensors had to be small, low-power, and inexpensive — exactly what Photobit's CMOS image sensor technology offered.

As camera phones began to take shape, demand for compact, low-power image sensors exploded. Photobit positioned itself at the center of this emerging market, developing both custom designs and standardized products. The company embraced a fabless model, leveraging external manufacturing while focusing on design and innovation.

While Photobit had quickly grown to 135 employees with a portfolio of over 100 patents, competition also intensified. Large semiconductor firms entered the space and prices fell. To scale production and compete globally, in 2001 Photobit sold its assets to Micron Technology, who hired all of Photobit's employees.

In the years that followed, camera phones became ubiquitous. Micron — building on Photobit's technology — became one of the world's leading suppliers of image sensors. The technology spread rapidly across the industry, adopted by major global players and embedded in billions of devices. NASA was able to purchase off-the-shelf CMOS image sensors from this growing industry and flew CMOS cameras on missions including JPL's Mars Perseverance Rover and Helicopter.

Today, CMOS image sensors are everywhere — in billions of smartphones, laptops, cars, medical devices, and security systems. Around seven billion[5] cameras are produced each year, and they enable everything from autonomous vehicles and social media to robotic surgery. Fossum and Kemeny's technology also powers video calls, like Zoom or Microsoft Teams — a $10 billion[6] industry used by nearly two-thirds[7] of Americans online.

The Bayh-Dole Act established the conditions for the discovery's success. It allowed a federally-funded invention, originally developed to meet a government need, to be patented, licensed, and entrusted to those best equipped to transform it into new products few had imagined possible.

What began as a solution for photographing distant planets has transformed how humanity sees and shares its own world.

Colleen Scott: A Tenacious Path from Olympic Ambition to Cancer Innovation

Colleen Scott's journey is defined by an unwavering persistence and a determination to translate scientific discovery into medical progress.

Before she ever stepped into a laboratory, Colleen Scott was already experimenting. Even as a young child in Jamaica, she was constantly asking questions to understand how the physical world around her worked. However, in her small town, no one was able to address her curiosities. That curiosity would become the foundation of her life's work.

She was also an athlete with Olympic ambitions. In Jamaica's fiercely competitive track culture, Scott trained with intensity, learning the discipline and persistence required to compete at the highest level. That same perseverance would later define her scientific career.

Her talent earned her a track and field scholarship to Auburn University for the long and triple jump events. Upon her arrival to campus, she set her goals to become a Southeastern Conference (SEC) champion and graduate with honors. She was successful in both, becoming a two-time SEC conference champion in the long jump, multiple time runner-up in the triple jump, and also graduated *cume laude* with a Bachelor of Science in chemistry. She chose chemistry as her major because it allowed her to explore math, biology, and physics within a single framework.

Scott describes herself as someone who has a hard time quitting anything she believes in — a mindset shaped on the track and carried into the lab, where failure is often a prerequisite to discovery.

She began her Olympic aspiration by trying to qualify for the 1996 Olympic Games in Atlanta. While she was unsuccessful, she was evermore determined to compete in the Olympics after watching the games from her apartment in Auburn, Alabama, just a few hours from the action. She continued to train and years later, narrowly missed the 2004 Olympics for triple jump by a single centimeter. By then, however, something had shifted. The physical and mental toll required to compete had accumulated, and she recognized it was time to move on from athletics. Her focus and commitment turned fully to science, and she never looked back on that decision.

Scott went on to pursue a PhD in chemistry from the University of Pittsburgh before earning a position at Southern Illinois University, where her husband also worked. Around that time, she also became a mother, marking a new chapter both personally and professionally.

At Southern Illinois, her mentor Dr. Daniel Dyer introduced her to dye chemistry, the role of intellectual property in academic research, and the idea that scientific work can and should become real-world innovation.

Her trajectory changed dramatically when Dr. Dyer was diagnosed with brain cancer. As his condition worsened, he shared all of his knowledge and research in progress with Scott. When he passed away, she was left with a choice — and a responsibility. Though her background was in organic chemistry, Dyer's work bridged organic and analytical chemistry, so she chose to carry his work forward, mastering new techniques and pushing beyond her comfort zone. She continued his research and submitted a patent at Southern Illinois on dyes.

She ultimately moved to Mississippi State University, where faculty are actively encouraged to patent their work and engage in the technology transfer system. Over time, she submitted more than 10 invention disclosures, building a strong foundation for real-world application. Her work on the dyes truly soared thanks to grants from the National Science Foundation and the state of Mississippi.

Scott and her team studied how materials interact with light across the electromagnetic spectrum, focusing on the infrared region — particularly, the shortwave

infrared (SWIR) region due to its potential benefits in medicine and healthcare.

Infrared light penetrates tissue more deeply than light of visible and ultraviolet wavelengths and carries less energy, making it less likely to cause cellular damage. This combination allows light to pass through skin and underlying tissue more effectively, opening the door to imaging organs beneath the surface with greater clarity. In particular, SWIR wavelengths improve contrast, enabling clearer visualization of features that are difficult to detect with conventional methods.

Scott's work led to the development of a new class of SWIR dyes for bio-sensing and imaging. Compared to standard fluorescent dyes, these dyes can absorb low energy light that penetrate deep within tissues, producing clearer signals. In practical terms, the dyes can reveal what surgeons often miss: tiny clusters of cells, elusive tumor margins, and disease hidden from conventional imaging.

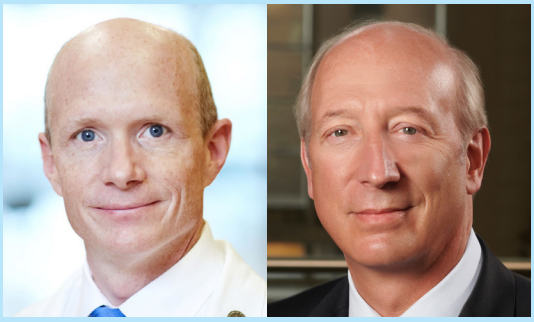
The potential impact in cancer surgery in particular is significant. Surgeons face the challenge of distinguishing tumor tissue from healthy tissue. Removing too little risks recurrence, while removing too much can significantly damage organs. Currently, surgeons often rely on estimation of the boundaries of a tumor, and surgery is followed up with chemotherapy and/or radiation. Scott's dyes aim to eliminate that uncertainty by selectively highlighting diseased tissue while leaving healthy cells dark. Her approach provides real-time, precise visualization of tumor margins and potential metathesis.

While cancer imaging is the most immediate application, the technology's potential extends further. Scott's dyes have also attracted interest from companies exploring its use in optical systems such as advanced lenses that filter specific wavelengths of light. Her team has since developed second-generation dyes that are easier and less costly to produce, an essential step toward additional real-world applications.

Scott's technology is still in development, but the SWIR imaging dyes have already earned recognition through research awards. The process is long and uncertain, demanding the same resilience Scott developed as both an athlete and a scientist. Scott describes herself as someone who has a hard time quitting anything she believes in — a mindset shaped on the track and carried into the lab, where failure is often a prerequisite to discovery.

The path forward for Scott and her invention relies on the system established by the Bayh-Dole Act. As Scott collaborates with medical researchers to evaluate efficacy and validate the dyes for potential clinical use, the MSU technology transfer office continues to file patent applications and seek out licensing partners with established medical companies who have the funds, resources, and risk-tolerance to advance the technology through clinical trials and eventually into the marketplace.

Scott's journey from the running tracks of her youth to the cutting-edge of molecular imaging is a testament to the power of redirected discipline. She's now working to provide surgeons with the literal "vision" needed to transform cancer treatment — and thus help the entire field of medical imaging take a monumental leap forward.



Randall Bateman and David Holtzman: Two Scientists Transform Alzheimer's Detection in a Race Against Time

Doctors Bateman and Holtzman turned decades of Alzheimer's research into a simple blood test that could detect the disease earlier than ever before — changing the trajectory of diagnosis and treatment and offering patients hope.

Randall Bateman and David Holtzman did not set out to build a company, reshape Alzheimer's diagnostics, or challenge decades of scientific consensus. Like many of these innovators, their story begins with something far simpler: curiosity.

For Holtzman, that curiosity took root early. He grew up around medicine — his mom was a nurse and his neighbor a veterinarian — and was drawn to the idea that understanding biology could help people.

Bateman's path was different but no less formative. Raised on a farm, he developed a fascination with how complex systems worked, an instinct that would later guide his approach to unraveling disease.

What united them was a shared desire to understand the brain — and, ultimately, better understand Alzheimer's, the devastating illness that affects millions[8] of families.

The pair met in 2000 when Bateman was matched for residency at Barnes-Jewish Hospital at Washington University Medical Center in St. Louis. Holtzman, Bateman's attending physician at the time, was already studying amyloid plaques — sticky protein deposits in the brain linked to Alzheimer's disease — in his lab. One day while on rounds, Bateman noticed a paper in Holtzman's white coat pocket on mice developing plaques in the brain. It piqued Bateman's interest and sparked a conversation between the two.

Over a meal in the house staff soup and roll room, Bateman asked a question that would change the direction of their careers: *Why do Alzheimer's patients have amyloid plaques?* He wanted to understand if it was the result of overproduction, or if the brain was failing to clear them away.

It was a deceptively simple question. But at the time, it had no clear answer.

More importantly, there was no way to measure it in living humans. Scientists could observe plaques after the fact, but they lacked the tools to understand how they formed in real time. That gap had stalled progress in the field for years.

After some months of pondering, Bateman saw a way forward. Drawing on techniques he had learned in undergrad, he proposed measuring the production and clearance of amyloid proteins directly in the human brain. The idea was ambitious — and risky. It would require adapting experimental methods never before used in this context.

Upon receiving funding from a pilot program, the pair got to work. But the early days were anything but easy. Bateman often ran experiments between overnight hospital shifts, working through exhaustion with no guarantee the approach would succeed. When it came time to transition from animal subjects to humans, Bateman volunteered to be first with Holtzman collecting the sample of spinal fluid.

Slowly, the pieces came together. And to their own surprise: the pair was able to successfully measure how fast amyloid beta, the main constituent of amyloid plaques, are produced and cleared in the human brain for the first time.

The breakthrough caught the attention of some pharmaceutical companies developing Alzheimer's treatments, so the pair continued their work. In partnership with one company, they were able to show that a class of molecule that could lower the production of amyloid beta in cells and animals, could also do so in people. The results provided critical insight into the biology of Alzheimer's and opened a new avenue for understanding and potentially treating the disease.

But if the pair's discoveries were going to help patients, they needed to move beyond the lab. Academic research could generate insights, but translating those insights into tools physicians could use required infrastructure, investment, and sustained focus.

Under the Bayh-Dole Act, Washington University at St. Louis (WashU) was able to patent Bateman and Holtzman's underlying methods and biomarker technologies. Then in 2007, Bateman and Holtzman took a step neither had originally planned: they helped co-found C2N Diagnostics[9] and licensed their patents from the university.

The company was created to do what academic labs could not — scale the science, validate it rigorously, and bring it into real-world use. With experienced leadership in place, C2N began working with pharmaceutical companies, applying the biomarker technology to clinical trials and drug development.

For years, C2N's focus remained on cerebrospinal fluid, obtained through spinal taps. These tests were effective at detecting signals, but were invasive and difficult to scale.

Then came another question: *Could the same signals be detected using blood?*

This idea challenged decades of scientific thinking. The brain is separated from the bloodstream by the blood-brain barrier, and many researchers assumed that meaningful differences in amyloid levels simply could not be measured in blood.

WashU, and later C2N, decided to challenge that assumption.

Using highly sensitive mass spectrometry techniques, they began analyzing blood samples. What they found was unexpected: there were measurable differences in amyloid beta levels between individuals with and without Alzheimer's pathology.

If the results were real, it meant something profound. Changes in the brain caused by Alzheimer's, which was long detectable only through expensive scans or invasive procedures, might be identified with a simple blood draw.

Even the team was skeptical. Rather than rushing to publish, they repeated the experiments again and again across large cohorts. More than 500 samples and multiple independent clinical validations later, the results held. Only then did Bateman present the findings publicly.

The initial reaction was silence. In a field shaped by decades of negative results, the claim was difficult to accept. But as others replicated the work, skepticism gave way to recognition. A new possibility had emerged: a blood-based test for Alzheimer's disease amyloid plaques.

C2N Diagnostics moved quickly to translate the discovery.

Building on years of research, the company developed the first clinically available blood test for Alzheimer's amyloid plaques, transforming what had once been a complex and costly process into something far more accessible. Their work helped establish an entirely new category of diagnostics, one that continues to evolve as new technologies build on their foundation.

For decades, Alzheimer's has typically been diagnosed after symptoms appear, if at all, when the disease has already progressed significantly. Earlier and more accurate detection changes that equation. Patients identified sooner can access treatments earlier, participate in clinical trials, and plan for the future with greater clarity.

Emerging therapies are already showing promise in slowing disease progression. In some cases, patients diagnosed early and treated promptly have experienced little to no cognitive decline over multiple years.

Still, challenges remain. Despite the ability to scale testing to millions, access is low and uneven. Insurance coverage for these diagnostics is still evolving, limiting how widely they can be used. As with many breakthroughs, the final step — ensuring broad adoption — depends not only on science, but on systems that support it.

Yet the arc of Bateman and Holtzman's journey reflects the very purpose of the Bayh-Dole Act: to ensure that federally supported research does not remain confined to the laboratory, but is translated into products that serve the public.

What began as a question between two scientists has become a tool that is changing how and when Alzheimer's is diagnosed.

For the millions of patients and families facing the disease, that difference offers them time — time to seek treatment, to plan, and increasingly, to hope.

Carmel Majidi: An Engineer Who Takes Inspiration from Nature

A new material tackles one of computing's biggest challenges

When Carmel Majidi was growing up, conversations often revolved around how things worked. His mother was a mechanical engineering professor who studied composite materials, while his father worked as an engineer designing heating, ventilation, and air conditioning systems. Watching them approach problems methodically and creatively made engineering seem less like a distant profession and more like a natural way to understand the world.

As an undergraduate at Cornell University, Majidi joined a research program supported by the National Science Foundation. The goal was simple: approach engineering problems from the perspective of nature.

One of the examples that fascinated him most was a playground swing. At first glance, a child pumping a swing seems effortless and instinctive. But when Majidi began to analyze it, he realized it was actually a mechanical system that could be studied mathematically. For Majidi, it was a revelation. Everyday actions — walking, running, swinging — reflect elegant engineering principles.

Majidi carried this fascination with bio-inspired design into graduate school at the University of California, Berkeley. There, he joined a research group studying one of nature's most remarkable feats of engineering: the gecko's ability to climb walls. Gecko feet are covered with microscopic hairs, which allow geckos to adhere using weak molecular forces — strong enough collectively to hold the animal's weight, but easy to release with each step.

This work reinforced a pattern that would define Majidi's career: studying natural systems and translating their principles into engineering innovations.

After completing his PhD, Majidi continued exploring the frontier between materials science and robotics during postdoctoral research at Princeton and Harvard.

Traditional electronics and machines rely on rigid components — hard metals, stiff circuit boards, solid mechanical parts. But biological systems are different. They are flexible, soft, and resilient. Majidi became interested in a fundamental question: What if electronics could behave more like soft biological tissue? That question led him toward a new class of materials, ones that could stretch, bend, and move without breaking while still conducting electricity.

By combining the adaptability of soft materials with the performance of metals, Thubber enables more efficient and reliable cooling in systems where traditional materials fall short.

In 2011, Majidi joined the faculty at Carnegie Mellon University. There, he began building a research program focused on soft electronics and soft robotics, machines and devices designed to move more like living organisms than traditional machines. It was during this work that he began experimenting with an unusual material: liquid metal.

Majidi wondered whether liquid metals could be embedded inside soft materials to create circuits that could stretch and bend. Early experiments were promising, but also frustrating. Liquid metal could leak, breaking electrical connections, or react with other metals, causing corrosion.

But Majidi persevered and a breakthrough came when he changed the problem entirely. Instead of trying to confine liquid metal within channels, he dispersed microscopic droplets of it throughout a soft elastomer, creating a type of stretchy, rubber-like material that snaps back to its original shape, even after it's bent or stretched.

The result defied expectations. The material behaved like rubber — stretchable, flexible, and resilient — but

it also conducted heat and electricity like a metal. Even when stretched or deformed, the droplets maintained conductive pathways. The material could be composed mostly of metal by mass and still move like a soft solid. Majidi began describing it as a new class of material: "metallic rubber."

The discovery opened the door to entirely new possibilities for flexible electronics, wearable devices, and soft robotic systems. But one application quickly stood out. As modern processors become more powerful, they generate enormous amounts of thermal energy. Managing that heat is critical. If chips become too hot, they slow down or even fail.

Majidi's liquid-metal rubber offered a solution. Because it is soft and compliant, it can maintain continuous contact with surfaces even as components heat up, expand, contract, or vibrate. At the same time, the embedded metal droplets enable efficient heat transfer.

The thermally conductive version of the material earned a memorable name: Thubber: short for "thermally conductive rubber."

Scientific discoveries often remain confined to laboratories. But in this case, the path to real-world impact was built into the system. Through the framework established by the Bayh-Dole Act, Carnegie Mellon was able to patent the technology and license it for commercial development.

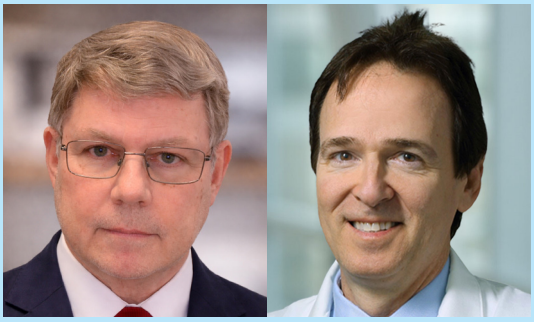
Majidi recognized that for the material to make a difference, it had to move beyond the lab. Along with his PhD student, Navid Kazem, he co-founded Arieca[10], a start-up that licensed the technology from the university and began developing Thubber for practical use.

Since then, Arieca has built a growing portfolio of patents and attracted interest from industries ranging from computers and servers to electric vehicles. Majidi, meanwhile, continues to explore new applications of liquid metal through his research at Carnegie Mellon.

Today, thermal management is emerging as one of the most critical[11] bottlenecks in modern computing. As artificial intelligence systems grow more powerful, the hardware that supports them must process unprecedented amounts of data at ever-increasing speeds. That performance comes at a cost: heat. Left unmanaged, it can throttle performance, shorten device lifespans, and drive up energy consumption across entire computing networks.

By combining the adaptability of soft materials with the performance of metals, Thubber enables more efficient and reliable cooling in systems where traditional materials fall short. Even small temperature improvements translate into outsized economic savings — every 1°F drop in chip operating temperature can lower a data center's total power bill by roughly 4%. That result helps reduce energy use, improve performance, and extend the life of everything from data centers to electric vehicles to next-generation electronics.

For Majidi, the journey reflects a consistent theme that began with observing the natural world: the most effective solutions often come from bridging boundaries between disciplines, between materials, and between research and real-world application. What began as curiosity about how nature solves mechanical problems eventually resulted in a breakthrough technology with the potential to reshape how we manage heat in an increasingly digital world.



Robert Dannals and Martin Pomper: Making the Invisible Visible in the Fight Against Prostate Cancer

Two scientists followed their curiosity across disciplines, helped redefine radiopharmaceuticals, and ultimately transformed how doctors detect and treat prostate cancer.

Robert Dannals' journey into medical innovation began with a moment of fear shared by millions of Americans.

As a child growing up on Long Island during the Cuban Missile Crisis, he watched as the world stood on the brink of nuclear catastrophe. The power of nuclear technology was terrifying, but Dannals was intrigued. He began researching the technology and asking questions: what exactly is nuclear energy, and how does it work? Soon, those questions evolved into a more hopeful one: could something so destructive also be used for good? In school, he wrote a paper on the peaceful uses of nuclear technology, and one idea stood out to him: medicine.

That question — how to transform something destructive into something lifesaving — would shape the next four decades of his career.

During his undergraduate years at Johns Hopkins University, Dannals met one of the pioneers he had read about as a high school student: Dr. Henry Wagner, often called one of the fathers of modern nuclear medicine. Wagner offered a simple piece of advice: question everything. It became a guiding principle for Dannals throughout his undergraduate, master's, and Ph.D. training.

Across campus, another scientist was asking a complementary question: how could chemistry reveal what medicine could not yet see?

Martin Pomper's path began with an inspiring and demanding high school chemistry teacher. He pursued chemistry and biochemistry as an undergraduate, then combined his scientific interests with medicine through an M.D.-Ph.D. at the University of Illinois in organic chemistry. There, he began thinking that glutamate, an amino acid that functions as a transmitter in the brain, may underlie certain neurodegenerative disorders.

After he moved to Johns Hopkins for a junior faculty and neuroradiologist position, Pomper continued to use chemistry to study neurotransmission and brain disorders with positron emission tomography (PET), with a particular interest in glutamatergic neurotransmission.

In the mid-1990s, Pomper came across two separate scientific papers — one describing inhibitors of an enzyme in the brain that produced glutamate, the other identifying that same enzyme as prostate-specific membrane antigen, or PSMA, which is over-expressed in prostate cancer.

Pomper saw the connection between the two — and realized that if small-molecule imaging agents could target that enzyme, prostate cancer itself could be illuminated. He had initially tried to develop imaging agents targeting the brain enzyme, but those compounds couldn't cross the blood-brain barrier — so Pomper pivoted to prostate cancer, an area of significant unmet medical need.

At the time, Pomper had no access to models of prostate cancer, limited funding, and only early-stage resources. Still, he moved forward with designing and testing compounds, refining ideas, and pursuing experiments wherever he could to prove the concept might work.

Radiopharmaceuticals, including the corresponding PSMA-targeted radiotherapeutics, once overlooked for decades, are now at the center of a rapidly growing industry, attracting billions in investment and supporting scores of companies worldwide.

The urgency of the problem became clear through a collaborator who saw its consequences firsthand. Dr. Patrick Walsh, a pioneering prostate cancer surgeon at Johns Hopkins, often had to operate without knowing exactly where trace amounts of the cancer may already have spread. Patients underwent invasive procedures that sometimes could have been avoided, if only physicians could see more clearly.

Years of iteration and collaboration followed. Some of Pomper's early imaging compounds showed promise, but not enough clarity to change clinical practice. Then came the breakthrough. One compound stood apart. When tested, it lit up only cancer cells — clearly, precisely, and in real time. That compound would become DCFPyL and later, PYLARIFY®.

But turning that compound into a technology doctors could actually use meant solving a very different problem. Early versions of the compound were hard to produce. The process took two steps rather than one, which creates problems for widespread dissemination of a new imaging agent. On top of that, the radiotracer was built with a radioactive element that begins to decay immediately after the compound is synthesized. Every extra minute spent making it meant less of it remained. If the process took too long or didn't produce enough, it simply wouldn't work for patients.

This is where Dannals and his team made the difference. For decades, Dannals had focused on taking lab discoveries and turning them into reliable tools doctors could use. His team stepped in and developed what would become the commercial radiosynthesis of DCFPyL. The initial clinical study using the two-step method yielded only about 3% of usable material — far too little to be practical. Dannals simplified the process to a single step, improved the starting materials, and increased yields nearly tenfold, to about 30%.

The results were transformative. The process became fast enough — just over an hour — to stay ahead of the compound's natural decay. For the first time, the radiotracer could be produced reliably, in enough quantity for multiple patients, using systems already in place at medical facilities.

When oncologists first saw the images, the clarity was unlike anything they had seen before. For the first time, they could pinpoint with confidence prostate cancer's location and spread.

But bringing DCFPyL to patients would still require something more: large-scale investment for full clinical validation and approval by the U.S. Food and Drug Administration (FDA). Pomper met with the CEO of a company that would prove to be up to the task, Progenics Pharmaceuticals. Pomper emphasized the value of their asset but estimated that delivering it to patients would require a significant financial commitment. Without that investment, the discovery would stall.

The CEO attended a meeting of the Prostate Cancer Foundation, where Pomper presented DCFPyL images to a roomful of urologists and medical oncologists. They raved at the findings, asking, "Why can't we use this for our patients now?" Pomper pointed to the back of the room where the Progenics CEO sat and said, "Don't ask me. Ask him."

On the spot, the CEO committed to moving forward with DCFPyL. The question quickly shifted from if the technology would be used, to how soon — and the answer depended on a system designed to move discoveries out of the lab and into the world.

Through the Bayh-Dole Act, Johns Hopkins had been able to patent the underlying technology and license it to Progenics, who launched a development effort that would carry the technology through clinical trials, regulatory review, and ultimately to patients. Without that framework, the discovery might have remained in the lab.

Since receiving FDA approval in 2021, PYLARIFY® has benefited over 760,000[12] patients and paved the way for a new field within nuclear medicine.

Today, it is used worldwide to detect prostate cancer with unprecedented precision — helping physicians determine whether cancer has spread before surgery, guiding treatment decisions, and, in many cases, sparing patients unnecessary procedures.

What began as a breakthrough in the lab has helped catalyze an entire field. Radiopharmaceuticals, including the corresponding PSMA-targeted radiotherapeutics, once overlooked for decades, are now at the center of a rapidly growing industry, attracting billions in investment and supporting scores of companies worldwide.

Decades earlier, a young student had asked whether something as powerful and dangerous as nuclear technology could be used for good. Today, the answer is a clear yes. By making the invisible visible, Pomper and Dannals changed how physicians detect and treat cancer, and how patients can beat it.

Epilogue

Bayh-Dole continues to transform federally funded research into innovations that improve and save lives. Protecting this system is essential to ensuring the next generation of breakthroughs reaches the people who need them most.

The Bayh-Dole Act works. After more than four decades, that's not a claim that needs much defending — the evidence is everywhere.

It's in the blood test that can detect Alzheimer's disease earlier than ever before. In the tools that help doctors diagnose and remove cancer with a precision that wasn't possible a generation ago. In the materials powering modern computing, and in the camera technology that started in a NASA lab and ended up in the pocket of nearly every person on Earth.

The five stories featured in this report are not just about useful inventions. They represent something larger: a system designed to ensure that research funded by American taxpayers actually reaches the people it was meant to help.

Before Bayh-Dole, most[13] discoveries made in federally funded labs stayed there. The law changed that, and the results[14] have been remarkable: $1.9 trillion contributed to U.S. industrial output, upwards of 580,000 inventions disclosed, and over 200 novel drugs and vaccines developed.

None of this happened automatically. It took carefully built partnerships between universities, federal laboratories, entrepreneurs, small businesses, and the private sector — making the United States the most innovative nation in the world.

At the same time, ongoing efforts to reinterpret the Bayh-Dole framework and question its return on investment underscore the need to remain vigilant. Preserving the law's core principles — and continuing to share the stories that demonstrate its value — will be essential to ensuring that researchers and institutions can continue to deliver results for the American people.

The path forward is clear. By building on a system that works, rather than undermining it, we can continue to unlock new discoveries, strengthen our economy, and improve lives at home and around the world. Bayh-Dole has proven its value time and again — and with continued support, it will remain a powerful engine of American innovation for generations to come.

Endnotes

[1] https://www.gao.gov/assets/rced-98-126.pdf#page=5

[2] https://bio.widen.net/s/7w5przpvkn/bio-toolkit---the-bayh-dole-act

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[4] https://autm.net/AUTM/media/SurveyReportsPDF/2024-US-AUTM-Infographic.pdf

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[13] https://www.gao.gov/assets/rced-98-126.pdf#page=5

[14] https://autm.net/AUTM/media/SurveyReportsPDF/2024-US-AUTM-Infographic.pdf

Bayh-Dole Coalition Executive Director Joseph Allen sitting alongside Senator Birch Bayh as his aide in the Bayh-Dole hearings

About the Bayh-Dole Coalition

The Bayh-Dole Coalition is a group of innovation-oriented organizations and individuals committed to celebrating and protecting the Bayh-Dole Act, as well as informing policymakers and the public of its many benefits.

About Joseph P. Allen

Joe is the executive director of the Bayh-Dole Coalition. As a professional staffer on the Senate Judiciary Committee to Sen. Birch Bayh (D-IN), he played a key role in the successful passage of the Bayh-Dole Act of 1980 and its subsequent amendments.

He later served as the director of the Office of Technology Commercialization at the U.S. Department of Commerce, which oversees the implementation of Bayh-Dole across all federal agencies. Joe chaired the Interagency Committee on Technology Transfer, where he helped agencies implement the Federal Technology Transfer Act and worked to insure that international science and technology agreements conformed to Bayh-Dole. He also served as president of the National Technology Transfer Center.