Should the Federal Government Fund Basic Research?

May 1, 2025

Bayh-Dole
COALITION

Watch the webinar here: https://youtu.be/tl0YQXCJ2x8

Joseph P. Allen (00:00:00)
Hi, I'm Joe Allen. I'm the executive director of the Bayh-Dole coalition. Hi, I'm Joe Allen. I'm the Executive Director of the Bayh-Dole Coalition, and thanks for joining our webinar this afternoon: "Should the federal government fund basic research?" Eighty years ago, as World War II was drawing to a close, President Roosevelt posed a question to Vannevar Bush, who had created the world's greatest research engine that played a key part in our victory. Bush had expanded federal research funding to include universities to get the best minds of industry, academia and government working together to help win the war. There were concerns that with the war effort winding down, and millions of GIs set to return home, that the country might revert back into the Great Depression. So the President asked if the government should continue to fund research as a way to help grow the economy, increase scientific knowledge and fight diseases that killed more people than were lost in the recent battles, while maintaining the appropriate roles of the public and private sectors.

(00:00:53)
Bush replied in this epic paper, *Science: The Endless Frontier*, that the government should fund basic research, which led to the creation of the National Science Foundation and increased funding for the National Institutes of Health. You can read this report with other foundational documents on the Bayh-Dole Coalition's Digital Library. Bush also believed that the best management for resulting discoveries was in the hands of their creators,. But instead, the government took inventions to Washington, where they largely gathered dust. Presidents Kennedy and Nixon recognized the system wasn't working, but it wasn't until the Bayh-Dole Act passed 35 years later that the federally funded inventions began frequently turning into new products, creating new jobs, companies and even industries, which helped fuel a renaissance of American innovation. President Trump recently tasked Michael Kratsios, the Director of Science and Technology Policy, withdrawing upon Vannevar Bush's vision, to present recommendations for realizing a new golden age of American innovation. Specifically, the President asked, how can the U.S. secure its leadership in critical and emerging technologies? How can we revitalize America's science and technology enterprise? And how can we ensure that scientific progress and technological innovation fuel economic growth, leading to better lives for all Americans? So today, we're going to continue these issues, along with whether Vannevar Bush's blueprint still makes sense today, when our nation faces a crushing national debt, and as the appropriate role of the federal government is again being debated.

(00:02:27)
We have three experts to help lead our discussion. Laura Peter is the Executive Director of the Office of Research Commercialization at the University of North Carolina at Charlotte. Laura previously served as the Deputy Under Secretary of Commerce for Intellectual Property and the Deputy Director of the U.S. Patent and Trademark Office. Vinit Nijhawan is the Director of MassVentures, the Commonwealth's strategic venture capital organization. Prior to that, Vinit headed Boston University's Office of Technology Development. He's also the only non-UK member of the Royal Academy of Engineering's Enterprise Committee. Brian O'Shaughnessy is the Chair of IP Transactions and Licensing Group at Dinsmore, a national full service law firm. He's a past president of the Licensing Executive Society of the U.S. and Canada, and is also Chairman of the Bayh-Dole Coalition. We also welcome any questions that people want to ask the attendees; just type them into the chat feature at the bottom of your screen, and we'll get to as many of them as time allows. So let's get things started. As we discussed, Vannevar Bush's recommendation the government support basic research was really a major change in the government's role, and as President Roosevelt had asked, it was really done to help create scientific knowledge and also, more important, just as importantly, to also help grow the economy and give tangible benefits to American taxpayers. So we're now looking in Washington at a lot of debates about what's the role of the government. We have a huge national deficit. So let's start off with a basic question, does Vannevar Bush's vision in 1945 still makes sense in 2025? And Brian, if you don't mind, I'll ask you to kick things off.

Brian O'Shaughnessy (00:04:09)
Sure. Thanks a lot, Joe. Appreciate it. Welcome everybody. Glad to be here and glad to be amongst such a distinguished panel. So Joe, I think one of the beauties and the brilliance of the Vannevar Bush report actually lies in its commissioning document. The letter from FDR to Vannevar Bush specifically cited the developments that occurred during the war, and necessitated by the war, that he wanted to see us continue. So there was a sense of

urgency in FDR's commissioning letter to Vannevar Bush. And he specifically calls out, how do we continue the advancements that we've made in weaponry and mechanization that were achieved during World War II? But also, how do we attack disease states? How do we continue to contribute to the health and well-being of our people? He his third question was, how do we continue to foster the support of research organizations? And fourth, he asked, how do we support the development of scientific talent amongst our people? And specifically, what can we do to address the fact that so many people who would otherwise have been getting degrees in science and engineering and medicine were pulled away for the war effort, and so consequently, there was a big gap in graduates from our universities in those essential disciplines. So Roosevelt specifically said to Vannevar Bush, how do we how do we keep this pattern of development going?

(00:06:07)
And I think, you know, from the the remove that we have today, it's easy to forget that at the beginning of World War II, there were no antibiotics. If you got an infection, you were likely dead. There was no such thing as radar. The Germans had discovered radar, and that's why they bombed England at night. England, unfortunately, at the beginning of the war, had not discovered radar, and they had to bomb during the day, with the result that many of England's bombers, and ultimately American bombers, got shot down. The V2 spy planes, we only discovered the technology that made those high atmosphere reconnaissance planes possible by capturing that technology from the Germans. And so there was a lot of development that took place during the war, because it had to; there was a sense of urgency. And it was an all-of-government approach, an all-of-America approach, to mustering together the resources that we had and putting them into the fight, if you will. So Roosevelt recognized that we had achieved great things in a very, very short period of time, and he was very eager to hear from Vannevar Bush how we could continue that pace of development and how we could continue it into the future.

(00:07:33)
Vannevar Bush's report — as Joe said, Vannevar Bush was instrumental in leading a lot of the research and development that took place during the war effort. Prior to that, he'd been the Dean of Engineering at MIT, so he knew a thing or two about research and development. And I think he wrote an incredibly prescient report, *Science: the Endless Frontier*, where he argues, in effect, that it is the role of government to fund basic research. There is only so much we can expect the private sector to do. But just as the government has a role in laying down the infrastructure for virtually every aspect of life in America, every aspect of commercial transactions in America, whether it's building roads, airports and train lines to extending that into basic research. And so it was Vannevar Bush's premise that the government had a very, very important role to play in building that infrastructure out and funding basic research, because we couldn't expect the private enterprise to do that. The research is too speculative. The return on investment is highly uncertain, and it just requires a great diversity of talent and resources. And so his argument was that the government should continue to fund basic research, not necessarily bringing it back into the exclusive realm of the military, as was often the case prior to World War II, but to do it through the universities and the research institutes that had already been founded. Now interestingly, England took a fundamentally different approach after the World War. After World War II ended, England kind of went back to the way things were before. The various branches of the military took full control of further research and development, and most of the funding that went into those sorts of things went to the military, not to their universities. We took the approach where we were going to, as a government, fund that work within our universities and research institutes. And as a result, our universities took off. And so we had, I think, a much more diverse perspective and approach taken to the research. Now, oftentimes that research was being done hand in arm, hand in glove, with with the military. But the fact that we sanctioned the notion that the government had a very important role to play, I think, kept that engine of innovation going. Vannevar Bush notably said early in his report, basic research is the pacemaker of technological advancement, and I think that's really, really fundamental to what we're talking about here, that we have to have government engaged in funding basic research so that it can lead to technological innovation, which then leads to products, which improve the lives of us all and enhances our national security. So Joe, I'll stop there and let you move on.

Joseph P. Allen (00:11:12)
That was a great, great introduction. So, Vinit, Laura, what do you think? Does Vannevar Bush's vision still make sense today?

Laura Peter (00:11:18)
Oh, my goodness. I think the that his recommendations remain just as vital today as they did when they did so long ago, and perhaps even more so. You know, like Brian, I root my thoughts and policy advocacy really in our Constitution and in our history, and our founding fathers thought that building an innovation economy was so important that they put in the protection of authors and inventors directly into the Constitution. And in my view, Vannevar Bush's recommendations are a direct continuation of, how do we keep our innovation economy going and vital? As you mentioned, we do have significant fiscal challenges, and the core insight that Bush provided does endure. Sustaining investment in basic research is critical to our national security, our public health and our innovation economy. It is what powers and fuels our innovation economy. It does not drain our economy. The breakthroughs that we enjoy today — life saving vaccines, transformative technologies like the internet and artificial intelligence — well, these are the direct result of decades of government supported research. And again, like Brian noted, the this research takes tens of years. It doesn't have the turnaround that a private company often needs to see in order for it to survive. And the only way that that great research can continue on is with sustained support from our government. And history shows us that these strategic investments in science and innovation do actually fuel new areas and new industries, and open up new frontiers for entrepreneurs, so that the private individuals can build on the basic research and bring those products to market and raise the standard of living for all of us and for generations. I think having the government fund basic research allows our researchers to try to help solve the grand challenges of our day. Those big issues that private industry often doesn't have the energy or the risk tolerance to go after. And in terms of budget constraints, it is important to prioritize investments that deliver long term dividends, and careful stewardship of our resources is essential. But we also have to recognize that if we don't invest in research, that would be a false economy, because we would lose so much ground and time, allowing the research to slip away. So in my view, continuing to support research is an investment in America, in American leadership, in resilience, in opportunity and our innovation economy.

Joseph P. Allen (00:14:18)
Vinit?

Vinit Nijhawan (00:14:19)
I might take a different approach to answering that question. So let's look at the results of this groundbreaking, you know, policy. So our university sector, particularly our research universities, and I would say both public and private, are very unique in the world. And you know, I have experienced direct experience in Canada and the UK. And you know, what makes them unique, to a great extent, is *Science: The Endless Frontier* and the federal government funding of these universities and basic research. Secondly, an unintended consequence was the first venture capital firm in the world was founded out of World War II by a Harvard professor and a MIT President. Maybe the last time they really got together in a significant way. And that was called American research and development. One of its story investments was a spin up from MIT called Digital Equipment Corporation, which, when I moved to Boston in 1987 from Canada, Digital Equipment Corporation had 450,000 people working for it. It led in every area of technology and computing, right, which eventually diffused out to other parts of the country. How can we look at the results of this groundbreaking policy and now say that we shouldn't be doing that? It would be such a mistake. We are a leader — both in our universities but also in commercializing from the research that's being done these universities — because of our private sector, because of venture capital, again, an industry that we totally dominate worldwide. Others are trying to copy us, but nobody can touch the venture capital industry that we have. And the venture capital industry increasingly is looking for new opportunities to invest in technologies, and those are coming from universities.

Joseph P. Allen (00:16:44)
Listen, one of the other things that this has changed — many things have changed since 1945 — but early in the 50s and 60s and even 70s, the government was the largest source of funding of research in the United States. That's no

longer true. Now industry is the biggest funder. So why can industry start funding basic research? Why does the government need to keep funding research? Why can't industry pick this up if it's so important to the economy?

Brian O'Shaughnessy (00:17:09)
Well, I'll take that, if you don't mind, Joe. There's a book out there that I can recommend to everybody. It's called jump starting America. It's written by two MIT economists, and they cite, very glowingly, to the Vannevar Bush report multiple cases throughout the book. But the thing that they note is the 'free rider' problem. The problem with basic research is that it's so basic that it doesn't have an intended application. There is no ROI that can be pointed to and say, this is what's going to come out the other end of the pipe. And so you would be investing in research where you don't even know whether or not the research is going to lead to a product that's consistent with your core competency. And so private sector just can't justify that with their shareholders, because if they did and they produced research, for example, that wasn't necessarily within their core competency and wasn't something they were going to pursue, might not be something that is going to be of advantage to them. Now, of course, we can argue that a proper patent regime might help them to monetize the basic research, but most companies are not in the business of just monetizing research. They're in the business of funding research that will advance their business. And so the prospect that you're going to be funding the development of other companies and perhaps even some competitors isn't very appealing, and it's hard to justify in the C-suite. So I think that we we have to recognize the fact that basic research, there is a unique skill set there. Our universities have it in abundance, the ability to conduct research at a very, very sophisticated level. However, that is a very narrow skill set, and it stops after the basic invention has been developed, if you will. We now may not know how it's going to be applied. As Laura says this, these things often take decades to develop into useful products. And so then I think that is the genius of the Bayh-Dole Act, is that it facilitates a mechanism whereby the basic research that's funded by the government can then be turned over, if you will, through a collaborative enterprise, through a transaction to the private sector, and the private sector can then deploy its unique skill set, which is the development of research into useful products. So I'll stop there and let Vinit or Laura continue.

Vinit Nijhawan (00:20:08)
Yeah, I might jump in. So, you know, industry is making investments in basic research, right? I mean, the numbers I saw in 2022 were that industry supports around 37% of basic research funding, versus 40% for the federal government. But here's, and that the industry, a portion of it, has been increasing. But here's the thing, knowledge, and obtaining knowledge and the growth of knowledge is not linear, it's exponential. Ray Kurzweil, you know, famously said this, right, thirty years ago. And when you have exponential growth and knowledge, guess what? The pie gets bigger and bigger very fast. So there's just no way that industry will ever be able to be the only source of basic research funding. The federal government is going to have to be a source. And also, Joe, you know, the federal government's investment in basic research has been going down steadily since the 70s. You know, we peaked at around 1% of the GDP, where, I don't know where we are now, but we're below half a percent. And if anything, we should be thinking about coming back up to 1% of the GDP federally funded basic resource fund.

Laura Peter (00:21:32)
Well, I'll hop in here, and I have had the delight of working not only in the private sector, but also in the university sector. And what loops out to me very strongly is that the core value and the mission of private industry versus universities is different, as you both have alluded to. Private companies are naturally focused on near-term results and shareholder value, and they need to be able to produce a product to sell, to keep going. There are some companies that have some groups that work on blue-sky type research, but it's much more limited and targeted. Universities, on the other hand, are really out there to increase knowledge, to share knowledge, which is, it's an extremely important role of the university sharing knowledge throughout the whole community so that other researchers can build upon the research that's being done. And companies tend to hold that in more of a proprietary manner. So the outcome of the types of research, while they most both may be considered basic, I don't think the value that drives them is the same. And of course, the results have about researchers not going to be the same because of that. So I think government fulfills this, fills this really critical gap, helping universities sustain this very broad research that can then evolve over time, help bring about some of these solutions to difficult problems, and

then hand them off to private industry, who actually can take it and commercialize it and bring it to market a lot better than a university or the government can.

Joseph P. Allen (00:23:23)
Well, listen that that those are great points, which actually leads into my next question. You know, one of the one of the flaws with our system for 35 years was, we were disseminating the science for free, but also the government had taken the inventions and was also trying to disseminate them for free. So you have the 'free rider' problem that Brian talked about. So let's focus on where government's funding basic research, mainly our universities and federal laboratories. What kind of stage are resulting inventions? I mean, are they products? I mean, what kind of risk is involved there under our system? Who picks up that risk? And also, how do you get around the 'free rider' problem? You know, one of the things we had before we passed Bayh-Dole was we had 28,000 government inventions sitting on the shelf because no one wanted to put their money into developing them, because somebody else could get the same rights. So how do we then, how do we, if the government's going to fund basic research, how do we ensure that resulting ideas that may have commercial potential — that 'may' is a big question, most of them don't, but somebody has to put their own money into it — ow do we get from funding the basic research to actually getting products out that actually are going to make lives better here and around the world?

Vinit Nijhawan (00:24:34)
So I think, I don't know if any of you have read this thin volume from the guy named Stokes, and he's got this wonderful quadrant where he sort of, you know, shows basic research use-inspired research, and, you know, applied research. You know, universities have always been in the business of basic research. But increasingly, they're getting into the business of use-inspired research, and the difference between the two is starting to blur. And I think we have to understand that, because when Vannevar Bush wrote that paper, it was pretty distinct, right? And, you know, just to explain what that means, you know, Niels Bohr epitomizes basic research. It was just curiosity driven, and it wasn't after solving any problems. Louis Pasteur, on the other hand, always worked on things that were real problems in the world, but, you know, provided some basic understanding of microbiology. So I think this use-inspired research, which universities are increasingly doing, and a lot of younger faculty are interested in it, this is resulting in impact to society much sooner than it used to, right? And then I would combine with it, the efficiency of research is increasing all the time, right? The tools, the knowledge of, you know, how to do experiments quicker, automation, robotics. So I think we're actually on the cusp of a massive explosion of use-inspired research emanating from universities that'll get picked up by private capital and by private industry.

Laura Peter (00:26:35)
Well, I'm gonna agree with you, to some extent, but I also think that a lot of what is coming to pass right now is built on the basic research that was done twenty, thirty years ago. If I think about quantum, quantum mechanics, in that whole area, that was being researched in a very basic way 25, thirty years ago, and is now just starting to move into actual use in semiconductors and other kinds of materials, which is incredibly exciting. I do agree with you very strongly that the use of artificial intelligence tools and other kinds of tools like that are going to accelerate getting those higher-level developed research projects out to the market sooner, because you won't have to do all the trial and error over such a long period of time. But there's a place still for that basic research so that we get the next quantum, we get the next moonshot, we get the next cancer cure.

Brian O'Shaughnessy (00:27:42)
I would agree with all of that. I think, you know, I like to say that one of the beauties of the Bayh-Dole Act is it created that virtuous cycle that allows the university sector to interact with the private sector. Some of the money that is derived from the monetization, the licensing of the basic research, then gets licensed out to the private sector, which then is incentivized to continue to fund that research within the university, which then enables the university faculty member to remain in an academic setting with the potential of earning just as much as they might earn in the private sector, if not even more. And thereby there's an incentive to stay. There's funding for their graduate students and their postdocs, which means that we have a net positive inflow into this country of intellectual capital in the form of foreign students who come to America to take advantage of this virtuous cycle, to have their graduate studies funded by some of that private sector research funding. And then, of course, they've

developed a relationship with the private sector, so when they finish their postdoc, they can seamlessly move right out into the private sector, if that's their desire. So this virtuous cycle is just a continuously developing cycle that really fuels the talent that we have within this country. And so I think one of the things that's a little bit unrelated here, but nonetheless directly related to the virtuous cycle is, how do we create a system that makes it appealing and possible for those wonderful people who have come to America to gain that knowledge, to stay here and to continue to contribute to our economy and to our national security? So it's all of the whole and it ties into our immigration laws and policies. But I think, you know by the time we've put somebody through graduate school and postdoc school and we've trained up an incredibly talented individual, we really want to think hard about how we keep that person here contributing to the growth of this country.

Joseph P. Allen (00:30:04)
Well, this is a great discussion. Let's go back to another fundamental question. You know, a lot of times people say, Vannevar Bush wrote *Science: The Endless Frontier*, created the National Science Foundation. If you look at the Digital Library on the Bayh-Dole Coalition website, there's a five-year gap there, and that the debate over the National Science Foundation was who owns inventions, and that debate's still going on today. Vannevar Bush mentioned, thought, that if an invention came out, it should be owned by the people that made it. That's the best people to manage it. Senator Kilgore of West Virginia felt that if the government funds research, it should be freely available for everybody. It should be in the public domain. That's the way you get innovation out there. And that fight remained, like I said, for 35 years. So let's talk about the role of patents. If we say, okay, the government should fund basic research, things coming out there are going to be early-stage, there's going to be a lot of risk there. Can they be commercialized? And there's still people advocating this today. I mean, one of the big fights is, you know, the government puts all these billions of dollars into research. Why should companies get any rights to it? Why shouldn't it be in the public domain? Why shouldn't everyone be able to use it? Are patents important in this system? And if so, why?

Brian O'Shaughnessy (00:31:22)
I think they absolutely are. Joe, you mentioned a little while ago. You know, what is the developmental stage at which this basic research often comes out of universities? Is it a product, or is it just an invention? I would say the vast majority of the time, it's an invention in the form of, somebody has identified something, some development, some improvement, some discovery. And as we've discussed, we don't know yet how it's going to be applied. So it's not a product by the time it comes out of the university. And usually when the university has patented it, as I say, the application is a long ways off and very, very uncertain. And so the beauty of the Bayh-Dole Act is that we make that technology, the fruits of that basic research, available to the private sector to do what the private sector does best. And that is, tinker with it and try to turn it into a product that consumers will actually buy, and that will actually do something of benefit to the consuming public. And that, as Laura correctly pointed out, is oftentimes a decades-long process. Just by way of example, OLED technology was patented about 30 years ago, and only now is it becoming very common, and it's in many of the screens that the people who are our audience are watching this webinar. But that technology was developed back in the 80s, and it's taken a long, long time for that to be developed into something meaningful and useful. So the private sector takes a great deal of risk. They put a great deal of talent and time and treasure into developing it into a product. And as you noted, developing it into a successful product is by no means a certainty, and so they're taking the risk. And so the fact that they're willing to do that is a huge benefit to the American public, because at the end of that exercise, we all get a product that either improves our health and well-being, our national security, or oftentimes individual prosperity, by making a new industry which creates new jobs and which creates income.

Vinit Nijhawan (00:33:46)
Go ahead, Laura.

Laura Peter (00:33:49)
I was going to say, well, you know, as the former deputy director of the USPTO, I feel very, very strongly that patents are very, very important to the system and very, very important to universities and technology transfer. I want to make one point, though, and that is that university technology transfer offices are not profit centers. They're

not designed to be profit centers. They're designed to help researchers lock down and claim their innovation in a way that they can be commercialized, that they can go out to the market. And there was an article written fairly recently with a very strong anti-patent narrative, saying, you know, why should there even be tech transfer offices? And my response is that they totally missed the point. The point is about claiming and assetizing the research in a way so that it will be more amenable for the private industry to pick that up and invest in it, to actually make the commercial product when it's ready. So, you know, we have all these companies that have come out of universities, Google, Gatorade, Genentech, MRI technology, Honeycrisp apples, all were created an under university auspices, but because of their patenting, they could go out to the private sector, and the private sector said, 'ah, there's actually something I can invest in.' It's not a university paper. It's actually a patent, a deed, if you will, to that research, and I think that's what makes it so valuable.

Joseph P. Allen (00:35:28)
Vinit?

Vinit Nijhawan (00:35:29)
Yeah, let's not, let's not forget that the majority of this federal government funding of universities does result in open source sharing of knowledge in the form of papers. It's only a few of these things that end up becoming inventions, and it's those things that hold the promise of commercial success that the universities go off and patent. At least, you know, it's always hard to know when it's that early what's going to be successful or not. But there's this promise of success. The other thing to understand is, you know, as a venture capitalist of deep tech investments here in Massachusetts, the patent is a component of what we look at, you know, when we're thinking about investing in a spin-out from university. The other thing we're looking at are the inventors. So the patents are only as good as the inventors. The inventors typically are the faculty who generally will not leave the university, but they're also graduate students and postdocs, and these graduate students and postdocs are the ones that leave. So the knowledge transfer that comes along with the patent that gets licensed from the university is critical in the success of commercializing these patents. And we can't underestimate, and I don't think anybody's ever quantified, how many of these postdocs and graduate students since the Bayh-Dole Act have gone out and made huge economic impact, both in their startups and in industry in general.

Joseph P. Allen (00:37:09)
Well, listen, it's amazing, this initiative between this, because we just got a question from the audience which goes into what you were just talking about. There's been a recent report out which links the Americans' tremendous growth, growth in our gross domestic product, to our investment in basic research. So if they want me to ask the panel, do you agree that the government's investment in basic research has been a driver of the GDP? And could it conceivably be even better if we went back and invested at higher levels? So do you see government's investment in basic research as a driver of the U.S. GDP, which is no small thing?

Vinit Nijhawan (00:37:49)
Yeah, I mean, I think I discovered the same report when I was preparing for this panel. So the Science Coalition has come up with a report that says every dollar invested by the federal government in biomedical research results in $2.56 in economic benefit to the U.S. That's pretty significant. You know, there are other reports that suggest that federal government basic research funding has provided a return of 150 to 300% since World War II. I mean, I think the answer is yes.

Laura Peter (00:38:29)
Yeah, and I've seen similar numbers that the suggestion is that the rate of the return is between 20 and 30% annually in terms of economic growth in new industries and jobs and so on. And you know, how do you quantify the breakthroughs in health that have been funded by the NIH and the investments of defense-related research and quality of life and global leadership. So while we can assign a dollar to job creation in new industries, and the stock market going up based upon federally funded research that's gone to the private sector, I don't think you can put a price on our way of living.

Brian O'Shaughnessy (00:39:11)
Yeah, and I would say that you know, Joe, again, the beauty and the wisdom of the Bayh-Dole Act is that it really put that basic research investment on steroids in terms of the return on investment. Because now the universities have the ability to patent that technology, to take title to it, which then gives them the right and the opportunity to license it out to the private sector. And to your point earlier, Joe, you know, we've seen this movie before. We know how it ends. We know what happened pre-Bayh-Dole. There's not going to be anything different if we were to change this structure and go back to the way we were. The federal government was incredibly unsuccessful at turning those inventions into useful products. Prior to Bayh-Dole, not a single drug, FDA-approved drug, had come out of a university lab subsequent to Bayh-Dole. In the 45 years since Bayh-Dole, there have been close to 300 FDA-approved drugs. So the results speak for themselves. And Laura ticked off just a few examples of other Bayh-Dole successes. The list goes on and on and on for pages and pages and pages. The amount of income, if you will, that comes back to Americans through the Bayh-Dole Act has been put at $1.7 trillion, I think, by the AUTM study. And so the return on investment under the Bayh-Dole Act has been huge, whereas prior to that, where the federal government didn't monetize, didn't know how to monetize, and wouldn't monetize on an exclusive basis, which meant that for most of private sector, they weren't going to take a license anyway. So now we have the ability to change all that, and the Bayh-Dole Act has been an enormous success.

Joseph P. Allen (00:41:18)
Well, let's also talk about another thing that's changed since World War II, is we're now facing our probably, I think, our greatest challenge since the war, from China. You know, China is not only an economic threat, they're a military threat, and they are very much committed to passing us in science and technology. In fact, they've adopted the Bayh-Dole model. They're putting billions of dollars in their own universities. So what are the stakes here? You know, again, we need to look at this with clear eyes, our taxpayers are hard-pressed. This is a lot of money. We need to make sure there's a return on investment. But what are the stakes here if, in fact, the U.S. should actually lose its lead in science and technology and and what can we do to assure that that doesn't happen?

Vinit Nijhawan (00:42:04)
You know that, and I don't know what, whether it was serendipity or intentional, that the U.S. invested a disproportional amount of federal government funding into the life sciences. You know, as opposed to say, DOE or, you know, material signs or other things. And the net result is that, you know, e're half the market for any product or service in the life sciences, right? And many of these new drugs and medical devices, you know, have been invented here in the U.S. That's changing very rapidly. So until about a decade ago, China was copy-catting, you know, our drugs, you know, generic drugs. Not anymore. You know, now they they're rapidly bringing new drugs to the market that are novel, that are being invented in China. And so this lead that we've had in biology is rapidly getting eroded. We talked about quantum law, so I've invested in a quantum computing company out of MIT, which I think will be the next Digital Equipment Corporation. Quantum is really going to be critical to the future economic growth of every country. And I can say that we are not necessarily in the lead right now, but we can be if the same ways, you know, we came from behind in other industries, our universities were critical for coming from behind. And I think that opportunity exists in quantum. We do not want to lose a quantum raise to China.

Laura Peter (00:44:09)
I cannot agree with you more. I mean, I think the Bayh-Dole model is at the heart of our innovation ecosystem, and it's absolutely helped us to maintain our global leadership by encouraging innovation in universities to quickly move out and incentivizing moving out into the private sector, where it can be translated into real world applications. And what if we get this wrong? Well, economically, we risk losing our competitive edge, and that could lead to slower economic growth, fewer high paying jobs — they say people in the tech center sector earn about 40% higher pay than people in the non-tech sector, for example — and those jobs would continue the to decline. And it would also lead to a decline in global investment in America, in American technology. So economically, it would hurt. And then, of course, on the national security front, the risks are even more significant if we lose our edge in quantum and in cyber, all of these other extraordinary military and intelligence capabilities, which I've gotten to learn a little bit about here at UNC Charlotte, and we have to keep ahead of the game, to ensure that we have a secure and safe environment so that we can continue our way of life.

Brian O'Shaughnessy (00:45:34)
Yeah, and I would add to that, Joe that, as you know, better than most, Vinit mentioned that China has traditionally been a bit of a xopycat? Well, they've copied the Bayh-Dole Act. They've recognized the brilliance of the Bayh-Dole Act, and they put in one of their own now, even though a lot of their industry is still state-sponsored industry and very centrally controlled, they nonetheless have realized the importance of pairing the private sector with the university academic centers. And so they are facilitating that move toward a little bit more of a market based economy, which is a little bit more tolerant of risk. And so if they were to, for example, implement a version of Bayh-Dole that follows the original intention of the Bayh-Dole Act itself, then that could contribute to their surpassing us in many of these technologies. We know that the Chinese government is making no bones about the fact that technology advancement is the version of today's military, it is what's going to lead to their greater national security, and they're surpassing the U.S., whether it's economically or militarily, but the two are tied together in a way like they've never been before, and their ability to piggyback off what we've done is something to be concerned about. It's something that we need to pay attention to, and all the more reason why we should stay true to the original intention, the original plan of the Bayh-Dole Act, and to continue to have the federal government fundamentally, very, very diligently involved in basic research.

Joseph P. Allen (00:47:26)
Well, we started with talking about Vannevar Buch's vision. So let's close with that. One of the things that Vannevar Bush had recommended, which again, we didn't listen to for 35 years until the Bayh-Dole Act, was these inventions, particularly basic inventions, are best managed by the people that make them. And one of the, another question that you'll dig out all the time is, with the government's funding, research shouldn't be managed by Washington. So how important is it that the inventions be managed, particularly basic inventions, by the institution that's making them? How easy is it to recognize a breakthrough invention? I mean, do people know them when they see them? And the other thing that makes us different than China and the rest of the world is, under the Bayh-Dole Act, 70% of our inventions are licensed to small companies, and it talked about startup companies is a U.S. phenomenon, and even 50% of our new drugs come from small companies. So how important is the Bayh-Dole decentralized model to our success, versus a centralized model, where you're having well intended people in Washington try to actually manage these and and decide how it is going to be commercialized?

Vinit Nijhawan (00:48:38)
Yeah. I mean, you know, the proof is in the pudding, and it's pretty evident, as you just pointed out, that the decentralized model is superior. Now I will say that having, you know, run a tech transfer office of a major research university and medical center, frankly, as someone who knew nothing about tech transfer, you know, I came in and was probably the first non-PhD of a large U.S. research university when I took over the BU tech transfer office, you know, you realize that, that I think universities can actually improve the process of doing technology transfer. We were able to do it at Boston University by laser focusing on a motto that I created, which is, "maximize collisions, minimize friction." We recently did a survey of about 30 spin-outs here in Massachusetts, you know, who've all raised venture capital funding to get a sense of what their experience was in licensing the technology from the university. On average, it took 18 months to license technology from the university, and cost, on average, about $40 or $50,000 in legal fees. We got to change that. You know, the results of most of these licenses, if you actually look at their terms, they're not that different from each other. So having this long negotiation process is counterproductive.

Laura Peter (00:50:16)
So I'll leap in there. I'm astounded by by what you just quoted, because I'll tell you in in my shop, that doesn't happen. But then I was also experienced in the private world, and maybe relate to it a little bit differently. But I do think that the decentralized system is absolutely important to the commercialization of technologies, because each university knows their own technology better and knows the players that are potential licensees a lot better than a centralized government model that has to go out and and hope somebody lands in their backyard, kind of thing. So also, I know, I think, very strongly, that not every technology that is patented is necessarily going to be licensed, and you don't know when it's going to hit. So what you also asked, how do you know what a breakthrough technology is going to be? And I will tell you, I don't know that. Perhaps Vinit and Brian have a better way of measuring that, but I think that it takes time for an idea to percolate, and especially in the drug field, where you have to go through

clinical trials and all this other kind of stuff to prove a drug, maybe that's going to shorten that time, and it will shorten the time to where we can recognize what a breakthrough technology is.

Brian O'Shaughnessy (00:51:43)
Yeah, I'll quote our good friend Steve Susalka here, the executive director of AUTM, who is fond of saying: the number of licensees for most technologies coming out of universities is between zero and one, and the more difficult you make it, the closer it gets to zero. And so what we want to do is get our technologies out. I agree with Laura 110%. We know that most of the patented technology that comes out of universities probably isn't going to go anywhere, but you don't know that at the time that you have to file the patent application. And so, you know, you've got to hedge your bets. You've got to make the choices as best you can. But again, you know we're all engaged in in one respect or another the scientific method, and we know that if you run an experiment without changing a meaningful variable, you're going to get the same result. And we know what happened pre Bay-Dole technologies. Everything was centralized. Technologies didn't get commercialized. Now that we've decentralized it and put it back into the communities where it's most likely to do the most good, things have blossomed. Things have truly taken off. And I think it's important to bear in mind that, you know, every ecosystem is distinct amongst itself, and oftentimes, when a technology comes out of a university, the principal investigator is hired as a consultant in the company that gets spun out of the university, and one or two of his graduate students, or her graduate students, might go into that startup, and we might then have an ecosystem unto itself. So having it put in the hands of the local economy, where it's likely to do the most good, and the people who are most informed about that technology and its prospects have a hand in what happens with it, I think, as Vinit says, you know, we've seen the results, and they speak for themselves.

Vinit Nijhawan (00:53:48)
I might just add, Joe, that, in a way, universities are centralized themselves, right? And the universities are sitting on lots of unlicensed patents. You know, I don't know what the number is, but it's got to be in the in the tens of thousands, if not more. You know, we put a policy in place at Boston University that returned patents to faculty inventors if they weren't getting licensed or if we weren't investing in them. And that's even further decentralization, because nobody knows the value of what they have more than the inventors themselves. Now, will they have the resources or the wherewithal to go commercialize them? Don't know, but if there, but there's no value to the tech transfer office sitting on them either.

Joseph P. Allen (00:54:36)
Right? Listen, we got two questions from the from the audience, which I want to get through real quick, one of which is from a reporter, and she asked, the threat of grant cuts at NIH — is that leading to there been rumors that the threats of grant cuts, cuts at NIH, are leading to a brain drain. Anybody want to comment on that?

Brian O'Shaughnessy (00:54:58)
Well, I was talking with somebody yesterday who's involved in the university sector, and she pointed out that just by virtue of the grant cuts or the some of the termination of grants and other things that we're seeing right now, they can actually pinpoint how many PhD degrees are not going to be granted this year because students, graduate students, are not able to finish their research. So I don't know that I'd call it a brain drain, per se, but we know that it's going to stunt development, and it's going to cause a great deal of hardship within academia. And some students who have worked very long, very hard for their degrees aren't going to be able to get them because they're not going to be able to finish their research, at least not finish it on time. So yes, it's a problem.

Joseph P. Allen (00:55:55)
Okay, here's another question we got, which is, this is another fundamental question. You know, one of the problems in our system is the famous valley of death. So our question is, should the federal government can, or should the federal government play a part in bridging that gap where university research stops and private sector commercialization starts? So, is there a role? Should the government play a role in helping to get some kind of bridge funding there to help get some of these technologies so the industry is willing to pick them up?

Laura Peter (00:56:26)
Let me leap in on this one because we, I have experience with something called NC innovation, and they are a state funded organization that is specifically targeting getting technologies out of universities across the valley of death, where they can go out into the private sector. And it's not the federal government, number one that's important. They're local to this area. They understand the area. They have executives and residents from this area who know the industries here, and they're actually helping to make a really big difference in connecting the private sector to the university researchers that have research that's about ready to go. So there's a place for a public partnership there, but I would suggest to you, it needs to be regionally based. It needs to be place based.

Vinit Nijhawan (00:57:17)
You know, I think as universities come under threat, either through, you know, there are overhead rates being reduced, or fewer research grants, they're going to be looking for ways to cut costs. And as Laura rightly pointed out, tech transfer offices are a cost center, and I expect you're going to start seeing layoffs happening amongst tech transfer people. It's already happened here in Massachusetts. Woods Hole Oceanographic [Institution] actually shut down their tech transfer offices and let everybody go. And so I think in any event, the federal government should be funding tech transfer activities. So I'm not talking about bridge funding for these technologies. I'm talking about the tech transfer operations themselves to cost centers, right? Because for every dollar you put into resource funding, you need to do some investment in transferring that.

Joseph P. Allen (00:58:20)
Yeah, I don't think a lot of people understand that the government under our system does not fund the tech transfer office, nor does it fund the university patent costs. Those will be funded by them, so they're, you know, again, this not a profit center, but there are costs to that. It's a service. Okay, listen, you guys have been a great panel. We have, like, one minute left. Anybody have any last thoughts you want to share?

Laura Peter (00:58:42)
Well, I'll just say thank you for inviting me, and I'm a very strong supporter of Bayh-Dole, and I hope that the audience has gotten a little bit of a taste on why it's so important, not only is history, but also how it's really enabled great technology to go to market and that we're still using today.

Joseph P. Allen (00:59:03)
Brian, Vinit?

Vinit Nijhawan (00:59:04)
I would add that, you know, people all universities also think that, hey, you know, we'll replace the federal government funding with industry sponsored research. But the reality is, over the past 30 years, the amount of funding from industry to universities has remained kind of flat, around 3% and I don't think that's going to be the panacea.

Joseph P. Allen (00:59:26)
Brian?

Brian O'Shaughnessy (00:59:27)
Yeah, I have to agree with that. I would just come back to saying that, you know, the bay double act has created an incredible virtuous cycle that allows the government to interact with the private sector in a way that we've never seen before, and it's produced remarkable results that speak for themselves. And I think the federal government should continue to be very, very active in funding basic research and enabling the Bayh-Dole Act to operate the way Congress intended.

Joseph P. Allen (00:59:55)
Well, listen you guys, this has been a fascinating hour spot so quickly. And also want to thank our audience. We will have this on our website, which is Bayh, B-A-Y-H, Dole, D-O-L-E, coalition dot O-R-G, all one word so you can see it [https://bayhdolecoalition.org/]. The session will be posted if you have people who want that missed it. And also, the other thing I ask you to, or make you aware of is, if you go on our website, look at the Digital Library.

It's amazing how many issues we're discussing right now were discussed in 1944, 1945, 1960. You know, we've been around the cycle before. We've actually, hopefully, learned some things at a great cost. So I think, as Brian said before, we don't want to keep relearning the same lessons again, but it's important also to look at our system. It should not be taken for granted that people are entitled to get billions of dollars of funding. There needs to be something coming out the other end. And I think our panel has really discussed a lot of the issues there. So again, thank you for your time. Thank you for our panel, and we'll look forward to doing another one of these events before too much longer. So everybody, have a great day. Bye.