ILLINOIS INNOVATION INDEX

2022 R&D Index

Illinois' Capacity for Innovation
& Economic Growth

Powered by ILLINOIS SCIENCE & TECHNOLOGY COALITION

WHY R&D MATTERS TO US

Illinois' universities and the innovation community not only survived, but in some cases even thrived during the COVID-19 pandemic, exhibiting resiliency while adapting to meet the challenges and opportunities of a new era. The impact of developments in therapeutics, diagnostics, and medical research at Illinois' leading academic health centers, universities, federal labs, and innovative companies underscore that there has never been a more important time for critical thinking, research, and scientific discovery. Yet these groups still face headwinds in areas where further investment and support can help ensure future success.

The 2022 Illinois Science and Technology Coalition Research & Development Index reveals some critical areas that have been hard hit by the pandemic, but it also showcases the tenacity that permeates through many of these key sectors. Over the past decade, commercialization at Illinois universities has strengthened, and COVID-19 has not stopped that upward trend in performance. Meanwhile, Illinois businesses have found ways to thrive despite having to completely reimagine what work life looks like during a pandemic.

Research & Development (R&D) matters more now than ever because the truly life-saving efforts of researchers is evident during the dark times that our nation faces in the wake of nearly 900,000 deaths attributed to this crushing virus. Illinois Science and Technology Coalition has for decades been a champion for the Illinois Innovation Community, highlighting community successes and working to support collaborations across the research spectrum of private and public sector partners. The Index contains summary statistics from published data sources for R&D activity that precede the onset of the pandemic. The Index also includes more recent success stories and examples from Illinois industry investments, universities, federal labs, and collaborations between partners, including impactful innovations during the pandemic.

The research community has been steadfast in its work to create novel solutions to address current needs and tackle long range globally significant challenges. In pursuit of these aims, Illinois universities, Federal Financed R&D Centers (FFRDCs), and companies are working together to create a more robust research and commercialization ecosystem.

Illinois' R&D community has delivered on promises to help discover lifesaving medical technologies, address climate change through new clean energy solutions, advance manufacturing through digital transformation, feed the world through life science and agriculture innovations, and advance science and engineering for the quantum economy.

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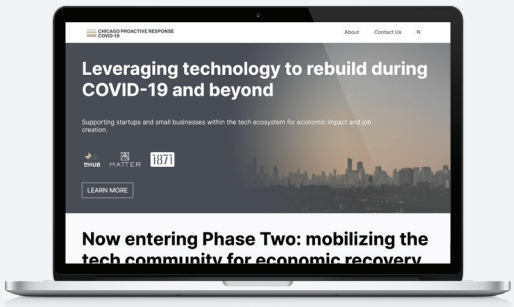
Illinois' Universities are investing more in research than they ever have before. Illinois' business community has allocated a larger amount of capital for developing new products and enhancing customer service, especially within the medical space. Illinois federal labs are attracting record investments in new scientific fields and increasing partnerships with higher education in commercialization. This Index will analyze trends within industry research and development, university research, FFRDC's in the state, and joint ventures between Illinois universities and private companies.



MHUB MATTER 1871

CHICAGO INNOVATION CENTERS RECEIVE FEDERAL GRANT TO REINVIGORATE SMALL BUSINESSES

The U.S. Economic Development Administration (EDA) announced in May of 2021 that mHub, Matter, and 1871, would be co-recipients of a $2.78 million grant to help stimulate economic recovery from the ongoing pandemic. mHub, Matter, and 1871 all serve as collaborators on the Chicago Proactive Response (CPR) to COVID-19 and have helped identify these 300+ smaller startups with relevant expertise on problems caused by the pandemic. If those companies were being financially impacted by COVID-19, all three startup incubators opened their doors to them for free. The partners will provide a continuous learning system for entrepreneurial training, small business digitization support, technical and prototyping support for hardtech innovation, a regional manufacturing and business services supplier network, and entrepreneurial development programs. Partners have a commitment to support under-resourced businesses and narrow the equity gap for female founders and entrepreneurs. U.S. Senator Dick Durbin commented on the importance of this grant stating, "As we continue to grapple with the economic challenges of the COVID-19 pandemic, we must ensure that small businesses and startups are not left behind.

Abbott

ABBOTT SCIENTISTS LEAD IN COVID-19 DIAGNOSTIC TEST DEVELOPMENT

With lives at stake, every moment counted as Abbott scientists set out to develop molecular and antibody tests for the coronavirus. At the onset, Abbott mobilized multiple teams of infectious disease and diagnostic experts—some of the same scientists who worked on our HIV, Zika and flu tests and who have years of experience. They needed to condense a process that usually takes years down to a matter of weeks and ensure reliability. The ID NOW COVID-19 was authorized by the FDA under an emergency use authorization for use in clinical settings for the detection of nucleic acid from SARS-CoV-2. By the end of 2021, Abbott was manufacturing more than 100 million COVID-19 rapid and PCR tests a month to help support increased need for testing around the globe. The Abbott Pandemic Defense Coalition is the first industry-led global scientific and public health partnership dedicated to the early detection of and rapid response to future pandemic threats. They are identifying, tracking, analyzing and testing emerging threats around the globe, including COVID-19 variants.

KEY FINDINGS

Total R&D Activity

- Illinois remained in 10th for R&D activity at universities, FFRDCs, businesses, and all other performers[1].
- Statewide R&D activity increased by 1.1 billion between 2018 and 2019 according to the most recent data available from the National Science Foundation (NSF).
- Nationwide growth since 2015 outpaces Illinois growth
- R&D Intensity in Illinois increased between 2018 and 2019 to 2.05%, while the national average intensity continued to grow as well.

Business R&D and Production

- Illinois ranked 9th nationally in Business R&D activity with $14.1 billion spent by Illinois companies on research in 2019[2], an increase of a little over $950 million compared to 2018.
- Illinois businesses funded 94.8% of Illinois industry projects in 2019, a 2% increase compared to the year prior, representing the second highest amount of 'in-house' investments by percentage among the top ten states in Business R&D.
- Business R&D intensity in Illinois lags behind the national rate of 2.62% with Illinois business R&D activities equaling just 1.76% of total industry output in the state.
- Illinois continues to rank 7th in the number of Science and Engineering (S&E) jobs filled and has stayed on pace with national growth on this measure.
- 7,085 new patents were issued to Illinois companies in 2020, including the 292 new issues that went to top patent producer Caterpillar[3].
- Patent production by Illinois businesses has increased steadily in the state by 4.37% annually since 2016.
- Illinois is headquarters to 4 companies among the top global companies in R&D[4] expenditures in 2018: AbbVie $4.98 billion (#33), Boeing $3.18 billion (#50), Abbott $2.24 billion (#67), and Caterpillar $1.91 billion (#82)
- Businesses Performed 60% of their U.S. R&D in 10 Metropolitan Areas in 2018, Chicago is #10 among US MSAs with $10.67 billion in 2018[5].
- Businesses with one to nine domestic employees (termed here as microbusinesses) spent $6.5 billion on research and development costs in the United States in 2018, there were 347 such companies in Illinois with a combined $112 million in R&D expenditures[6].

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- By private industry output Illinois remains the nation's 5th largest marketplace for companies, increasing by about 1.72% annually since 2015 to $799 billion in 2019.

University Research

- Statewide research funding at Illinois universities hit an all-time high in Fiscal Year 2020 at $2.76 billion[7].
- 61.3% of this past year's research activity was in the life sciences sector in Illinois, 12.8% in Engineering.
- Research funding has increased by 3.59% annually since 2016, a full percentage point under the national growth rate of 4.72%, though Illinois has held steady in 10th place among all states.
- Illinois has marginally outpaced national growth in S&E research space and moved up from 6th to 5th overall.
- Higher education research funding increases have achieved results as well, university patents went up to 302 in 2020, also a record high.

Research at Federal Labs in Illinois

- Argonne's research activity reached a record high in 2020 at $859 million, a $49 million increase over the 2019 level[8].
- Argonne was among the top FFRDCs in the nation, with $14.9 million in business partnerships in 2020, which was 1.7% of Argonne funding.
- Fermilab has continued to decrease its federal funding, with a loss of 3.67% of funding annually since its record high in 2011.

Industry and University Collaboration

- Illinois continues to rank 8th nationally in research funded by industry at the state's institutions of higher learning; $169 million in business support was provided in FY 2020, a $10 million decrease compared to the record high in 2019.
- The national cumulative annual growth rate in industry funded university research was 5.34% since 2016, which is only marginally higher than the Illinois rate of 4.46% over the same time span.
- Responding to increases in research funding Illinois has increased its number of co-assigned patents to 65.
- Illinois co-authored publications by industry-university collaborators decreased compared to 2018 by 45, and the state has fallen to 14th overall in the rankings for that measure.

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▲ *Photographed by Austin Neill*

TOTAL R&D ACTIVITY

Total R&D in the state is recorded as an investment in statewide gross domestic product by a non-profit, public institution, or private enterprise for the purpose of providing better quality resources, goods or services. According to the 2019-20 edition of the National Science Foundation's 'National Patterns R&D Resources' dataset[1] total R&D expenditures in the United States have increased from $605 billion in 2018 to $667 billion in 2019 and an expected $708 billion in 2020. In the NSF's newest release Illinois rounded out the top 10 states with $18.25 billion in activity for 2019, up by 1.1 billion since 2018. In the past year's dataset, 2018, Illinois R&D activity dropped primarily due to a lackluster year in the amount performed by businesses. Federal R&D support for Illinois Businesses dropped off considerably from 2017 to 2019 ($768 million to $84 million) but Businesses and other performers have continued to perform more R&D. From 2018 to 2019 total R&D activity in Illinois increased by 6.63%.

abbvie

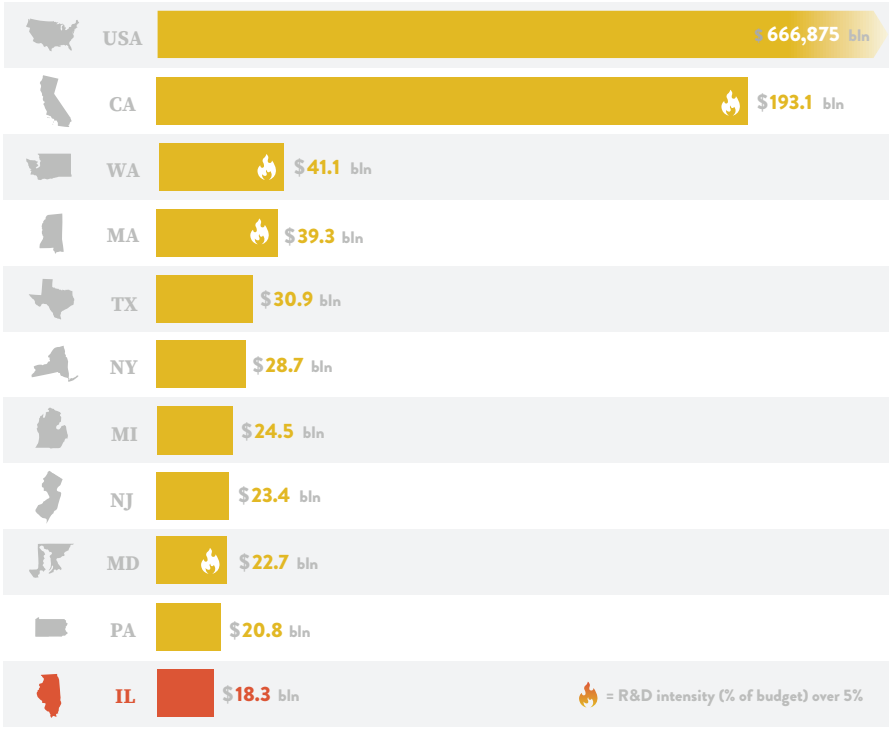
ABBVIE EMERGES AS THE LEADING R&D COMPANY IN THE STATE OF ILLINOIS WITH $5 BILLION IN ANNUAL R&D INVESTMENT, INCLUDING RESEARCH IN VIROLOGY, SMALL MOLECULE AND ANTIBODY THERAPEUTICS TO FIGHT COVID-19

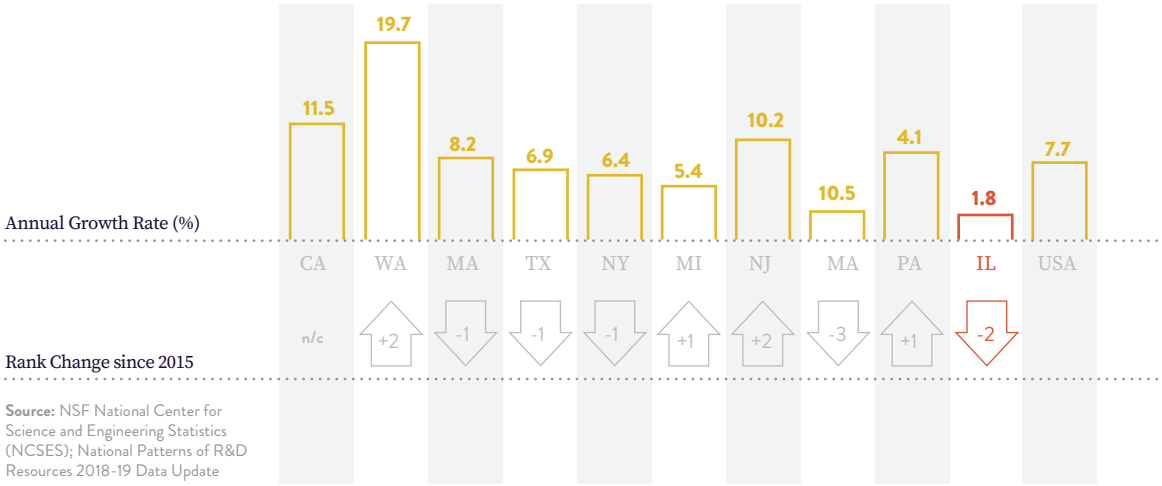
Since AbbVie was founded as a biopharmaceutical company in 2013 as a spin-off of Abbott Laboratories, the company has invested $50 billion in the pursuit of developing world-class medicines. AbbVie is now the leading company in Illinois in R&D annual expenditures. These investments have created new pathways towards treating more than 60 different illnesses and conditions, including COVID-19. Since the emergence of the pandemic, AbbVie has taken steps to study the efficacy of its products in treating COVID-19, including the use of anti-lymphoma drug, Ibrutinib. They've also partnered with the NIH, FDA, CDC, and other major pharmaceutical companies across the globe as a member of the 'Accelerating COVID-19 Therapeutic Interventions and Vaccines' (ACTIV) working group. The virus prompted AbbVie to enter into numerous external partnerships with researchers doing important work to develop antiviral treatments. AbbVie created a research team tasked with the job of discovering new treatments for COVID-19. "When we heard about the pandemic in the early days, we realized that we had an opportunity to work with our existing technology to produce antibodies to help stop the spread of COVID-19. There's a lot of pressure to find an antibody that will be successful because it's so urgently needed to help save lives, and as a scientist, I couldn't imagine a more important application of our expertise," noted AbbVie Senior Principal Research Scientist Jane Seagal.

Total R&D

Funding
by State 2019

Top 10 States





Source: NSF National Center for Science and Engineering Statistics (NCSES); National Patterns of R&D Resources 2018-19 Data Update

Growth Rate

The Illinois innovation community has seen 2.55% in R&D growth annually since 2015, the lowest growth rate among the top 10 states, explaining why Illinois dropped from 8th on the list in 2015, to 10th in 2019. For comparison, New Jersey and Washington both saw total R&D grow by more than 10% annually since 2015, with Washington's R&D activity increasing from $20.0 billion to $41.1 billion, primarily due to significant increases in industry R&D activity. The story is similar in Illinois where

increases in business research funding totals contributed to 80% of the total overall increase in R&D activity in the state between 2015 and 2019, and the average state saw 82.9% of Total R&D growth attributed to Businesses in the state spending more. Nationwide total R&D growth rates have outpaced Illinois' growth rate also, with an annual increase of about 7.73% since 2015, and year-over-year growth of 4.62% since the Great Recession started in 2009.

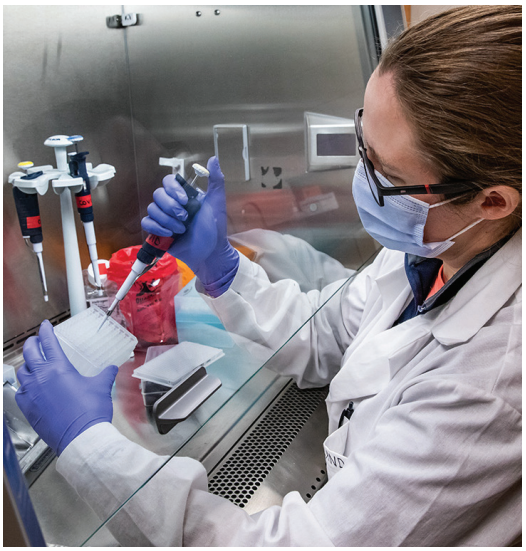
R&D Intensity

Illinois ranks 27th in R&D as a percentage of gross domestic product (GDP), also known as R&D intensity, according to the NSF and the Bureau of Economic Analysis (BEA)[9], falling 5 spots since 2015. R&D in Illinois comprised about 2.05% of its GDP in 2019[1], which is lower than the national rate of 3.12%. The top three states in R&D intensity in 2019 were New Mexico, Massachusetts, and Washington, all of which have rates exceeding 6.5%. Massachusetts drew in more than $6 billion in Federal R&D, more than Illinois and Washington combined. This accounted for a significant portion of its total intensity. Illinois and Washington had comparable levels of federally funded R&D suggesting that contributions from other sources, beyond just the federal government's grant making agencies, can form the foundation of a rich innovation environment with enough university and industry buy-in.

SIU Southern Illinois University
CARBONDALE

SIU SCIENTISTS ARE RESEARCHING CANNABINOIDS AND COVID-19 WIDENING RURAL HEALTH DISPARITIES

The Cannabis Science Center at Southern Illinois University - Carbondale is researching whether cannabinoids like CBD or CBG could bind to the spike protein of the COVID-19 virus and prevent it from infecting cells. Preliminary research has left scientists at the center feeling optimistic about the potential medicinal benefits of cannabinoids, according to Dr. Buck Hales. During the pandemic, SIU College of Medicine has led research in the impact of COVID-19 on rural populations. Dr. Wiley Jenkins, the Division Chief of Epidemiology and Biostatistics at SIU Medicine, published an article on the twin epidemics of opioid drug addiction and coronavirus that would exacerbate each other in rural areas. The research recommended removal of barriers to preventative healthcare access. The research community at SIUC has been especially active this year. More than $44.7 million has been brought in during FY 2021 in the form of grants and contracts for researchers throughout the Southern Illinois system; which includes campuses in Edwardsville, Carbondale, and the Medical School in Springfield. The School of Education was rewarded with $20 million of that funding from external grants, which went towards providing services like early childcare to families during the pandemic. The SIU Medical Campus in Springfield brought in an additional $16.5 million in external rewards for research on top of that $44.7 million. Gary Kinsel, Professor and Vice Chancellor of Research at SIU provided the rationale for why these grants are so important concluding that, “These research dollars provide both graduate and undergraduate students opportunities to experience career-relevant, faculty-mentored research, service and scholarly work outside routine classroom instruction and undergraduates get opportunities often reserved for grad students elsewhere. Ultimately, such experiences can have life-changing impacts on the future ambitions of these students.”



UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

UNIVERSITY OF ILLINOIS SYSTEM LEADS SALIVA TESTING FOR COVID-19 AND TREATING THE ILLINOIS COMMUNITY

The SHIELD test-and-trace system is a non-invasive, fast and reliable saliva-based test as well as the companion mobile application to deliver test results, developed at the University of Illinois Urbana-Champaign. The test has been successfully used since the summer of 2020. SHIELD Illinois was created to share the SHIELD system across the state. The test is now in use or being launched at numerous other colleges and universities, community colleges, public community testing sites, private companies and—thanks to funding from the state—more than 1,000 K-12 schools. Shield T3 was created to spread the technology outside of the state, and it is in use at a number of other universities, in school systems in Baltimore and Washington, D.C., and at private companies and other organizations outside Illinois. UIC has been a trial site for two national clinical vaccine trials, including the first trial conducted in the city. The trials matched the diverse demographics of the city and included strong representation of groups that were had been particularly affected by the pandemic. University of Illinois President Tim Killeen honored 28 key leaders of the system's COVID-19 response with the Presidential Medallion. The medallion is the highest honor that the system president can bestow.

BUSINESS R&D

According to the BEA[9] Illinois' economy remains among the most active in the nation, with close to $900 billion dollars in total GDP in 2021, resulting in a real GDP growth rate of around 6.4% from 2020 to 2021. This growth rate is allowing Illinois to close the gap with other economic powerhouses in the United States. Illinois' GDP alone is higher than most countries in the world and is roughly on par with nations as large as Turkey and the Netherlands. Recent business R&D efforts have helped to generate these industry results. According to the most recent data available from the National Science Foundation Business Enterprise Research and Development Survey (BERD)[2], Illinois ranked 9th nationally in Business R&D activity with $14.1 billion spent by Illinois companies on research in 2019[1], an increase over $950 million compared to 2018. Illinois Businesses attracted $729 million in research paid for by others in 2019, slightly down from 2018's total of $943 million. This means that more Business R&D has been funded in-house over the last two years, increasing from 88.5% in 2017 to 94.8% in 2019. In 2018 just over $84 million of Illinois' Business R&D activity was funded by the federal government, falling further to $74 million in 2019. Illinois ranked 31st among the 50 states in the amount of R&D projects (a) performed by a company, and (b) funded with federal financing, with most high dollar awards going to California ($4.7 billion), Missouri ($2 billion), New Hampshire ($1.3 billion) and Virginia ($1.3 billion).

CATERPILLAR IMA ILLINOIS MANUFACTURERS' ASSOCIATION

IMA NAMES CATERPILLAR'S 797F 'COOLEST THING MADE IN ILLINOIS

In 2020, the Illinois Manufacturing Association's (IMA) had its annual "Maker's Madness" tournament, which gave online voters a chance to select their favorite innovations within the state. Among the 260 products nominated, 2020's tournament winner was the 797F Large Mining Truck, manufactured in Decatur, IL by Caterpillar, an ISTC partner. Caterpillar is the largest generator of patents in the State of Illinois annually and many of those patents go to engine specifications, creating more efficient fuel injector systems, and new methods for detecting inefficiencies and fuel leakages. The 797F delivers industry-leading fuel-efficiency and productivity, and it can carry 400 tons of payload. Voters chose the truck due to its game-changing 4,000 horsepower 20-cylinder diesel engine, which also features several patented component parts that ensure efficient engine performance. Tina Czerwinski, Caterpillar's Decatur facility manager, was thrilled about the award, saying, "This acknowledgement is a direct reflection of the men and women who show up every day to make the best products in the world for the customers we serve." Caterpillar invests more than $2 billion annually in R&D developing products and is the leading patent producer in the State of Illinois. The Caterpillar Technical Center in Mossville, Illinois (near Peoria, IL) is a leading location for engineering and research and displays a wall of company patents. Yanchai Zhang is an electronics engineer at the Mossville Tech Center, where he is an inventor of over 35 patents during her 15-year career, "patented technology can provide a competitive advantage that makes our customers more successful".

The Digital Manufacturing Institute

MXD ANNOUNCES NEW R&D FUNDING FOR CYBER SECURITY AND SUPPLY CHAIN MANAGEMENT

Since its founding in Chicago by the U.S. Department of Defense to strengthen American manufacturing, MxD has awarded more than $120 million to more than 85 research and development projects across 35 states. Further, about 12,000 guests visit each year for tours and meetings in a typical year to showcase manufacturing innovation. MxD's primary focus is solving advanced manufacturing related problems and investigating how to improve the resiliency of businesses' defenses against cyber attacks. More recently, logistical issues have been front and center as the preferred topic of requests for proposals. MxD announced $1.5 million in funding in September 2021 for digital manufacturing and cybersecurity R&D projects. MxD projects will include dynamic production scheduling, cybersecurity for operational technology, and supply chain digital twins. One project area is exploring how dynamic scheduling within factories and plants can be better implemented.

Inputs

In 2019 Illinois businesses contributed more than $14.1 billion in statewide R&D activity. This returns Illinois to a level closer to its record high in this category of $14.4 billion in 2017. Illinois ranks 9th in the nation behind Pennsylvania and above North Carolina in the amount spent by in-state companies on R&D. Business R&D has increased by 2.65% annually in Illinois since 2015, the lowest among the top 10 states in Business R&D activity. By reported business R&D intensity, a measure of a state's business R&D funding over its total industry output, Illinois also lags behind the national rate with business R&D making up just 1.76% of output, compared to a 2.62% rate nationally. Both the national business R&D intensity rate and Illinois' rose slightly from 2018 to 2019. Illinois is second behind Washington among the top 10 states in the percentage of business R&D funding performed in-house (94.8%). The

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efforts of these businesses and their employees has led to a significant growth in the innovation of several sectors including electrical equipment and appliances, medical equipment and food tech. Meanwhile the state continues to rank 7th in Science & Engineering employment numbers. Illinois has stayed on pace with the national growth rate in this metric.

Business R&D

Input & Output Indicators Illinois

	Value	IL State Rank (5 year change)	Annual Growth Rate (%)	
INPUTS				
Business R&D Expenditures 2019	$14.1 bln	9 -1	1.7 IL	8.5 USA
S&E Employment 2019	270,460	7 n/c	2.5 IL	2.9 USA
OUTPUTS				
Patents 2020	7,085	7 n/c	4.4 IL	7.1 USA
Private Industry Output 2019	$799 bln	5 n/c	1.7 IL	2.6 USA

Source: NSF National Center for Science and Engineering Statistics (NCSES); US Patent & Trademark Office (USPTO), accessed via the Wellspring Scout Data Platform

Four companies that have corporate headquarters in Illinois placed in the top 100 most active companies in ***Worldwide R&D*** in 2018; AbbVie, Boeing, Abbott, and Caterpillar. An additional 6 Illinois companies were named as top 200 U.S.-based companies in R&D activity. The Strategy& group's 'Global Innovation 1000' study provides a list of the 1,000 most active companies in R&D each year among those companies that choose to disclose these numbers. AbbVie was Illinois' most active R&D participant nationwide in 2018, spending $4.98 billion on research efforts, 18th most overall among US based companies (33rd worldwide). AbbVie recently reported that since the inception of the company in 2013, AbbVie has invested $50 billion in R&D for the pursuit of developing world-class medicines. Other leading Illinois companies included Boeing with $3.18 billion (24th in the nation, 50th globally), Caterpillar with $1.91 billion (31st in the nation, 82nd globally), and Abbott with $2.24 billion (28th in the nation, 67th globally). Outside of the top 100 companies globally there are several other Illinois based companies making significant worldwide R&D investments; John Deere at $1.37 billion (46th in the nation, 114th globally),

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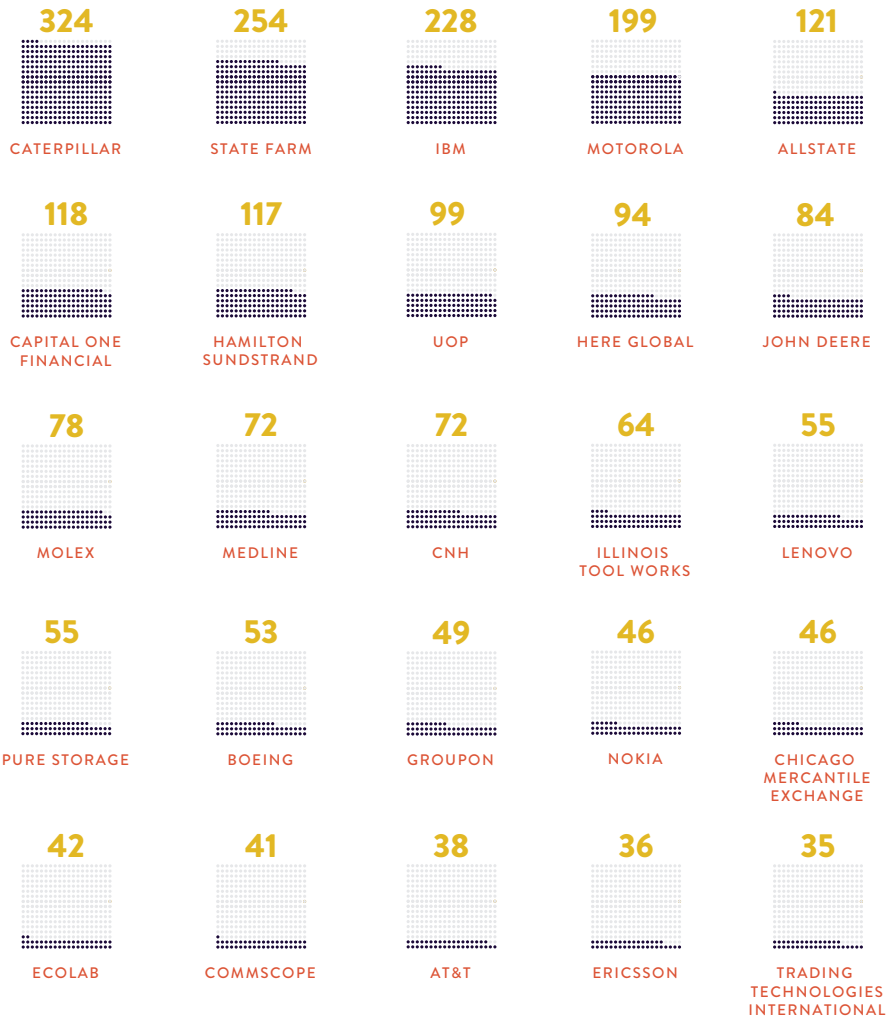
Baxter at $620 million (90th in the nation, 242nd globally), Motorola Solutions at $570 million (95th in the nation, 251st globally), Mondelez International at $370 million (123rd in the nation, 353rd globally), Walgreens Boots Alliance at $250 million (175th in the nation, 507th globally), and Illinois Tool Works at $230 million (189th in the nation, 544th globally). Walgreens Boots Alliance, headquartered in Deerfield, Illinois, was formed in 2014-2015 when Walgreens bought a controlling stake in Swiss-based beauty products and pharmaceutical wholesaler, Alliance Boots. According to the data produced by Strategy& Walgreens increased their spending on R&D more than any other company headquartered in the state over the past 5 years, with 28.5% annual growth in that time span. AbbVie was the next fastest growing, at 12.4% year over year growth from 2014 to 2018 and has also increased its activity each year since its inception. Abbott Laboratories saw their R&D activity increase significantly from 2017 to 2018 by 57.2%. Motorola Solutions, headquartered in Chicago, and Illinois Tool Works, headquartered in Glenview, each achieved an increase in R&D activity from 2017 to 2018 as well.

Top 25 Patent Producing Companies

Illinois 2020



Source: US Patent & Trademark Office (USPTO), accessed via the Wellspring Scout Data Platform

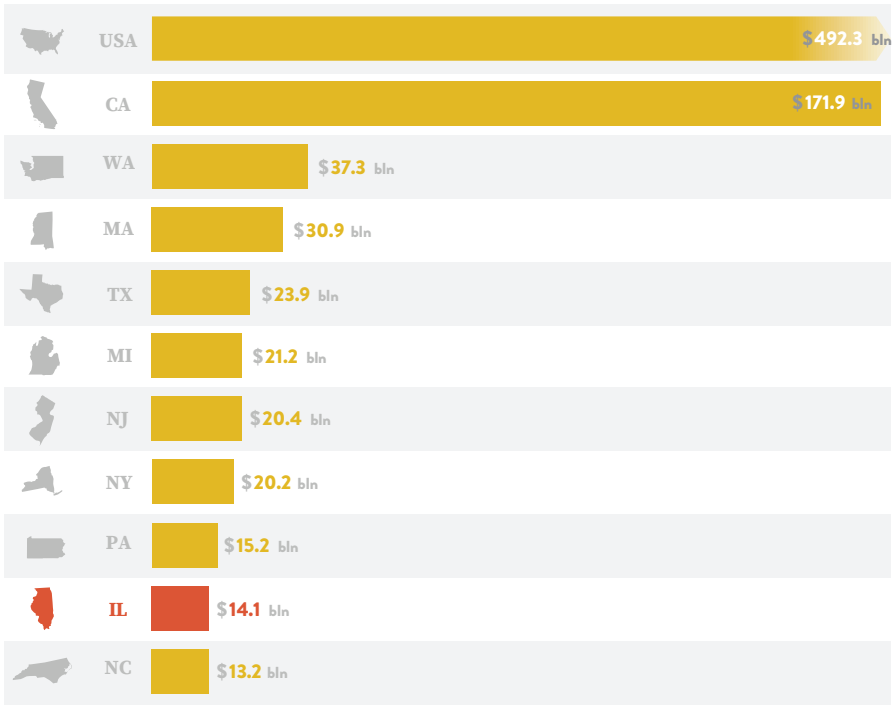
Outputs

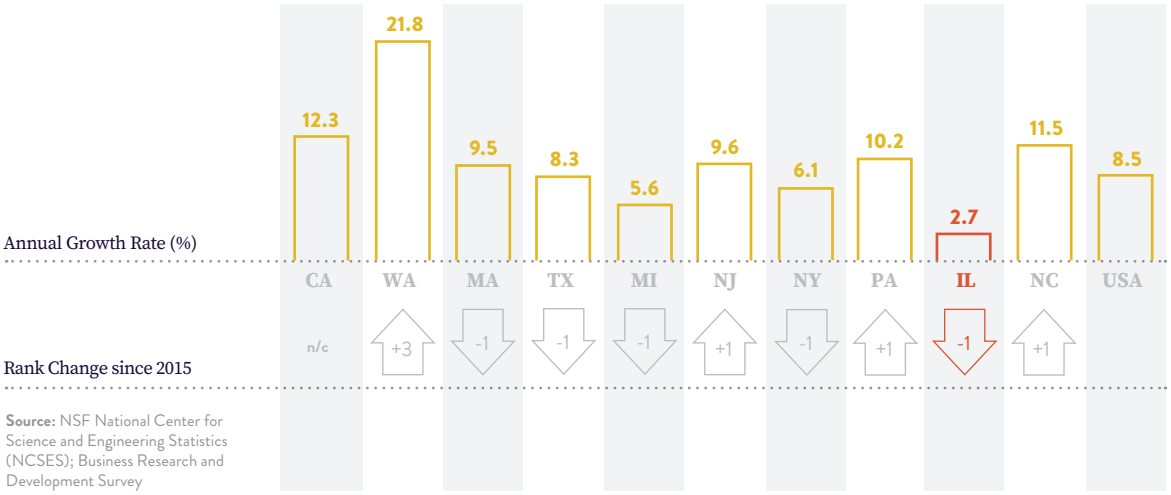
In 2019 Private Industry Output, which does not include the gross compensation of employees, subsidies and gross operating surplus as GDP does, was $799 billion. Businesses in Illinois provide the majority of R&D with about 77% of total R&D in 2018 coming from private enterprises. These businesses' investments help stimulate the economy and deliver helpful products to market, revitalizing their industries with new processes, machines, and methods. Since 2015 Illinois has continued to rank 5th in Private Industry Output, growing by 1.72% annually in that time span. According to data collected by the U.S. Patent and Trademark Office (USPTO) and Wellspring[3] Illinois' leading patent producing companies and their employees applied for more than 7,000 patents in the state, with ISTC members Caterpillar and Lenovo both appearing in the top 25.

Business R&D

Funding by State 2019

Top 10 States ($ billion)





Source: NSF National Center for Science and Engineering Statistics (NCSES); Business Research and Development Survey

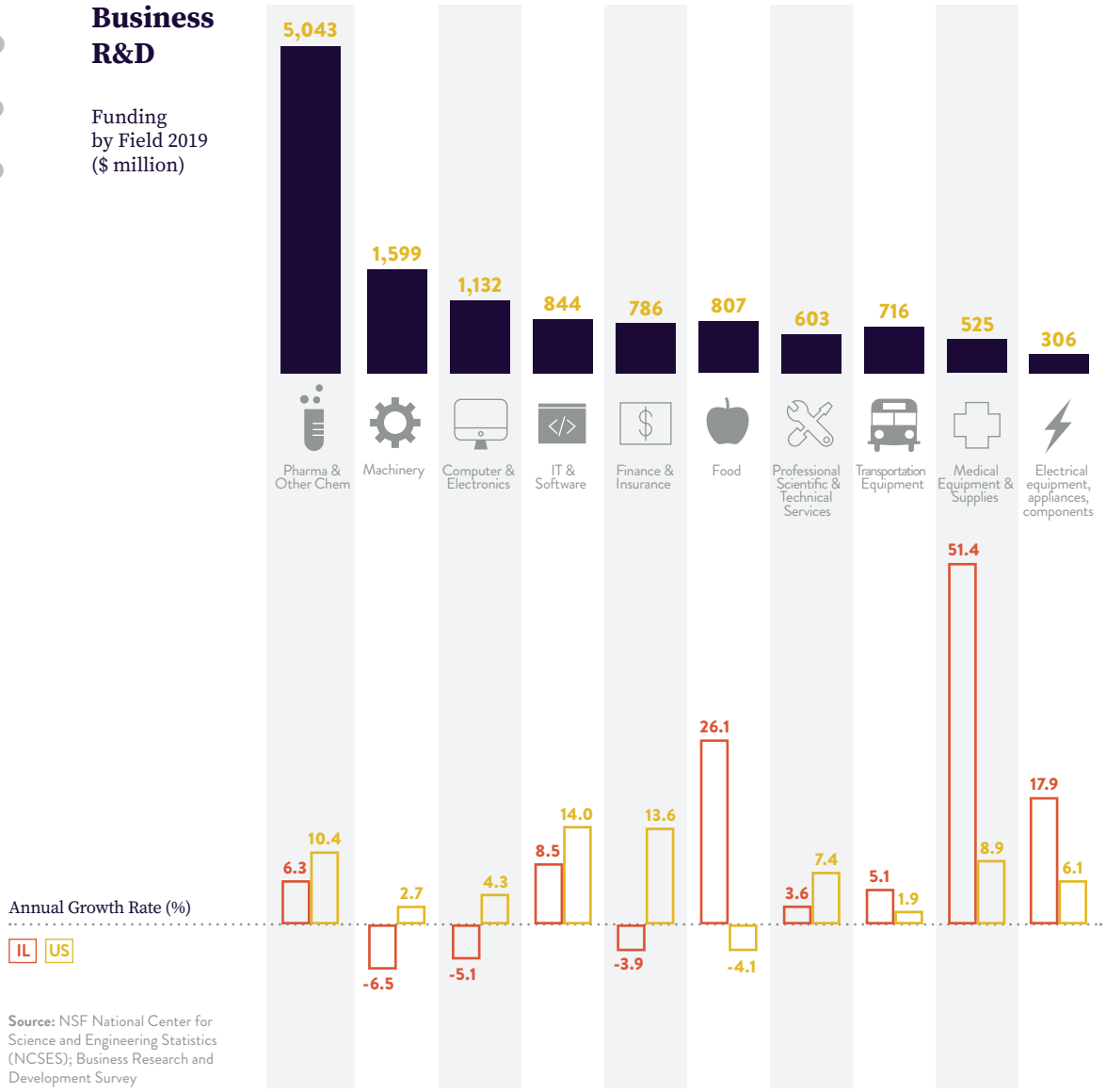
By Industry

The Illinois business community contributes to R&D activity in several key industries with companies in manufacturing fields representing just over 80.3% of all activity. The NSF's industry by industry breakdown of R&D projects includes only those projects financed internally by the businesses of each respective state. Nationally, Information Technology (IT) and Telecommunications research represent the highest amounts spent on R&D. But, in Illinois, due to the number of major healthcare companies calling the state home, Chemical and Medicinal research expenditures are the leading field. Research into pharmaceuticals and other chemicals used in paint adhesive, fertilizer and soaps has increased significantly in Illinois over the last five years. Fiscal Year 2018 saw Illinois Companies in the chemical manufacturing sectors register $4.09 billion in research activity. This total increased to $5.04 billion for fiscal year 2019, a 23.4% increase year over year2. This made Illinois manufacturers and companies the 5th most active in the nation among those in the sector, ahead of Connecticut. Other leading R&D industries in the state include Machinery ($1.60 billion; 2nd Nationally behind only California), Medical Equipment and Supplies ($525 million; 6th nationally), Finance and Insurance ($786 million; 3rd Nationally), Food ($807 million; 1st Nationally), Computer and Electronic Products ($1.13 billion; 9th nationally) and Electrical Equipment ($306 million; 4th nationally). Semiconductor technology R&D is considered a sub-unit of the Computer and Electronic Products category and in 2019 Illinois ranked 20th among reporting states at $73 million, which will likely significantly increase as new data is released for 2020 and 2021. By comparison, California businesses spent $16.34 billion on semiconductor research (more than Illinois companies spent on R&D overall) and an additional $2.62 billion on semiconductor machinery.

Our Illinois industry leaders such as ADM and Mondelez, and Kraft Heinz have put Illinois in the lead in food related R&D at $807 million, more than most of the rest of the nation combined. R&D within the food sector has grown by 26.11% annually since 2015 in Illinois, while it has actually decreased at the national level and, as a result, Illinois went from 4th in food in 2015 to 1st in 2019. Meanwhile Motorola and State Farm made significant contributions in their relevant sectors; Illinois business R&D in electrical appliances was at $306 million, up by over $40 million since 2018, and finance and insurance related R&D sat at $786 million, up by more than $45 million since the previous year. In the finance and insurance sector the state ranks 3rd among all states. Illinois has far outpaced national Business R&D annual growth rates in three other large sectors since 2015 as well; Electrical equipment and components (17.97%% vs. 6.12%), Transportation equipment (5.05% vs. 1.90%), and Medical Equipment/supplies (51.37%% vs. 8.98%).

Business R&D

Funding by Field 2019 ($ million)



Source: NSF National Center for Science and Engineering Statistics (NCSES); Business Research and Development Survey

ADM RENEWS COMMITMENT TO SUSTAINABILITY, CARBON CAPTURE

ADM is committed to leveraging their leadership role in the supply chain to help create a more resilient and sustainable global food system. ADM announced in 2021 the successful completion of the Illinois Basin—Decatur Project (IBDP), a carbon capture and storage (CCS) project designed to evaluate and test the technology at commercial scale in Decatur, Illinois. The first-of-its-kind project was primarily funded through the Midwest Geological Sequestration Consortium (MGSC) by the U.S. Department of Energy—National Energy Technology Laboratory to store one million metric tons of carbon dioxide over a period of three years, the equivalent of annual emissions from about 200,000 passenger cars according to EPA calculations. Working together through the MGSC, the Illinois State Geological Survey at the University of Illinois designed, implemented, and monitored the project and ADM was the host and operator. Carbon Capture and Storage (CCS) is one of the foremost strategies towards potentially reducing climate change due to the role that CO2 emissions play in absorbing the sun's energy and trapping heat in the atmosphere. The 6-year long project was what an U.S. Department of Energy official called "an important milestone, not only for the Illinois Basin—Decatur Project, but also for the advancement of CCS to combat the climate crisis." More than 2,000 visitors from 30 countries have come to the site throughout the project to learn more about the process and technology. Also in line with its pledges on sustainability ADM has been a leader in promoting alternatives to meat. Leticia Goncalves, their president, noted that "In the last 12 months, the number of plant-based meat, cheese and dairy products available to consumers has more than doubled. Innovation driven by future-forward brands like Air Protein, Future Meat Technologies, Nature's Fynd, in partnership with larger industry players such as ADM, are transforming the way we will feed a growing global population sustainably." The main way they have facilitated this development is by providing market research into how to commercialize plant-based alternatives that have become increasingly popular over the last few years.

UNIVERSITY R&D

Illinois is a leader in higher education research. University faculty, staff, and students work in tandem to push scientific discovery and to develop new innovations for commercialization. In 2020 the NSF's Higher Education Research and Development Survey (HERDS)[7] found that over $86 billion was spent on research at institutions of higher learning, an increase of nearly $7 billion since 2018, and a 3.31% increase since 2019. The NSF reported that this increase since 2019 is the lowest single year increase since FY 2015[7]. Annually, University Research activities have expanded by 4.72% since 2016. The primary source for R&D funding at institutions of higher learning in the United States remains the federal government (53.5% of all expenditures) although the share of funding provided from institution's own sources has increased steadily over the last decade. In FY 2011, just 19.1% of total funding was provided by the institutions performing the research themselves but in 2020 that total percentage had increased to 25.4%. Also increased from FY 2019 were R&D expenditures funded by businesses ($123 million, or 2.4%), state and local governments ($85 million, or 1.9%), and nonprofit organizations ($56 million, or 1.0%) in FY 2020.

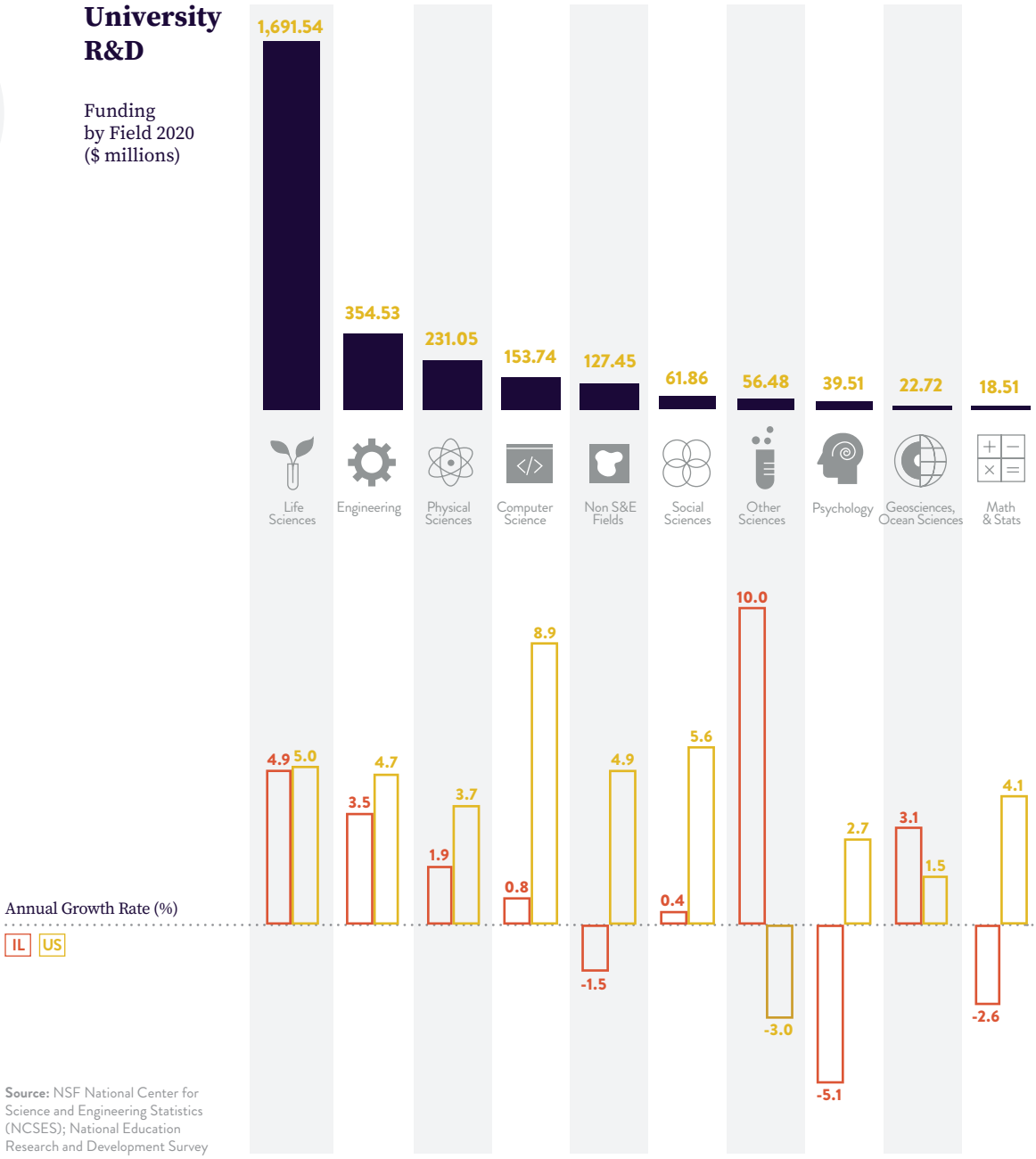
UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

UIUC CONTINUES IN FLAGSHIP ROLE AS THE STATE'S PUBLIC RESEARCH ENGINE

The University of Illinois Urbana-Champaign (UIUC) is a world leader in engineering, agriculture, and natural science research publications. According to one standard ranking of world universities, produced by National Taiwan University (NTU), UIUC is 38th in the United States by research output. That same ranking group, that looks at total number of journal articles published and weights their scoring based on how many citations a paper generates, also rated UIUC as the 31st best university for agricultural research in the world. The flagship public research institution in the state committed to $689 million in research and development activity during fiscal year 2020, a total that has been rising each year since 2014 and ranks as the 38th highest spending total by an institution in the United States. Federal commitments for research at the school reached $388 million in FY 2020, the highest single year amount at UIUC since FY 2013. The University of Illinois system, beyond being a university committed to excellence in partnerships, has also figured heavily in the response to Covid-19. 3 University researchers were recipients of NSF Rapid Response Research grants which are intended to facilitate the creation of quicker diagnostic mechanisms to detect Covid-19. The Grainger College of Engineering was a huge early contributor to ventilation and PPE research as well. Through a partnership with electronic manufacturer Belkin the Grainger team created Illinois RapidVent, an easy to access ventilator for people with acute and severe Covid-19 respiratory symptoms. UIUC professors also contributed to the original SHIELD Testing framework and saliva test that began being used to detect community transfer in the summer of 2020. The adjoining SHIELD Mobile app has since been used to manage and mitigate the spread of the virus throughout the state. 28 professors and employees in the University of Illinois system were deservedly awarded presidential honors for their work in combatting the pandemic just this past summer.

University R&D

Funding by Field 2020 ($ millions)



Source: NSF National Center for Science and Engineering Statistics (NCSES); National Education Research and Development Survey

By Field

Nationally 57.5% of University Research is done in the Life Sciences sector ($49.7 billion); the Engineering sector was the second most active in 2020 at $13.7 billion (15.8% of the total). The story is very similar in Illinois where 61.3% of all activity is in the life sciences sector with Engineering receiving 12.8%. Illinois has seen a surge in multi-disciplinary and interdisciplinary research projects, which are included in the Other Sciences category, increasing by 10.04% each year since 2016 to a record high of 56.48 million in 2020, moving the state from 7th overall in that

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'catch-all' sector to 4th in 2020. In most other fields Illinois has lost ground compared to the average state due to slight drops in funding allocated towards research projects in soft sciences like Psychology and Social Sciences, and a decline in Mathematics research of -2.56% annually since 2016. Most alarming is the state's fall in the Computer and Information Sciences (CIS) rankings. When CIS was first coded separately from Mathematics in 2016, Illinois ranked 5th overall but due to the rise of New York (6.9% annual growth since 2016), Georgia (13.1%), and Massachusetts (11.2%), Illinois has fallen to 8th with just .8% annual growth in the sector since 2016. Part of this stagnation is likely due to the conclusion, in 2021, of the National Center for Supercomputing Applications (NCSA's) partnership with the University of Illinois Urbana-Champaign that resulted in nearly 1.1 billion dollars in direct economic impact to the State of Illinois' economy. On the bright side, in higher dollar research areas the state has stayed on pace with national growth and Illinois continues to rank 8th in both Life Sciences and Physical Sciences.

UIC UNIVERSITY OF ILLINOIS AT CHICAGO

THE UNIVERSITY OF ILLINOIS-CHICAGO INCREASING RESEARCH AND ADDRESSING HEALTH AND WELLNESS CHALLENGES IN URBAN COMMUNITIES

As Chicago's only public research university, real-world problems are solved through innovation and discovery. In fiscal year 2020 the University of Illinois-Chicago increased their R&D funding to $412.1 million including $21.6 million in NSF grants and contracts. This represented a 7.6% increase over the previous year. These contributions helped UIC place 67th among all U.S. based universities in research productivity. Peoria, Illinois-based OSF HealthCare is partnering with the University of Illinois Chicago to establish the Community Health Advocacy (CHA) applied research program to address health and wellness challenges in urban communities. The projects will focus on new primary care models, using data science and automation to provide healthcare efficiency, and leveraging technology to provide precision medicine that can improve prevention and early treatment, particularly for racial and ethnic minority groups at increased risk for chronic health conditions. The University

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of Illinois at Chicago is one of the founding members of the Chicago Biomedical Consortium (CBC), which is working to stimulate collaboration among scientists at Northwestern University, The University of Chicago, UIC, and others to accelerate discovery that will transform biomedical research and improve the health of humankind.

Northwestern

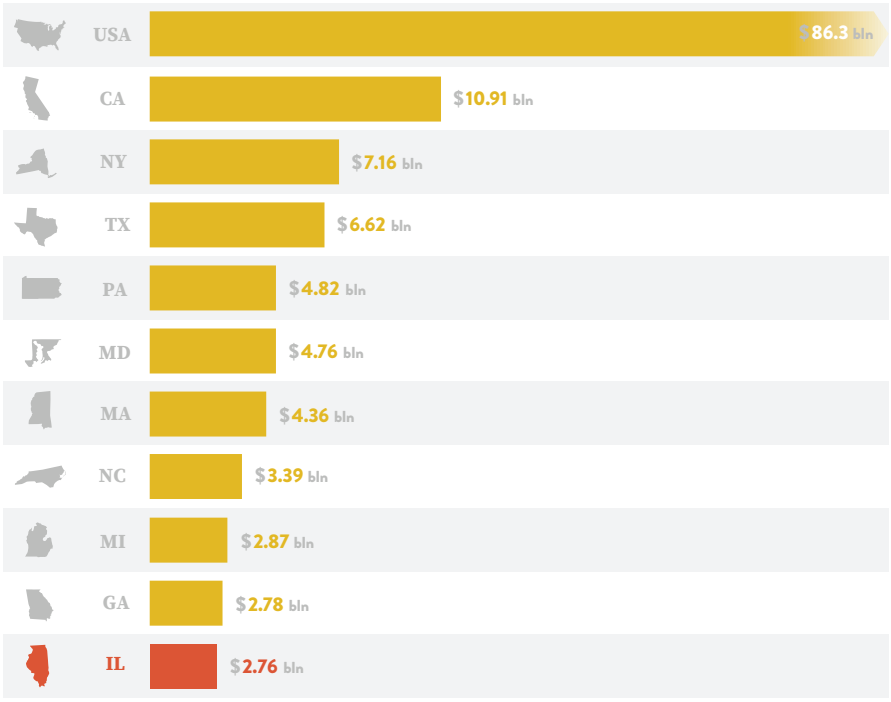
NEW NORTHWESTERN UNIVERSITY ACCELERATOR PROJECT PLANNED TO SUPPORT THRIVING RESEARCH ECOSYSTEM

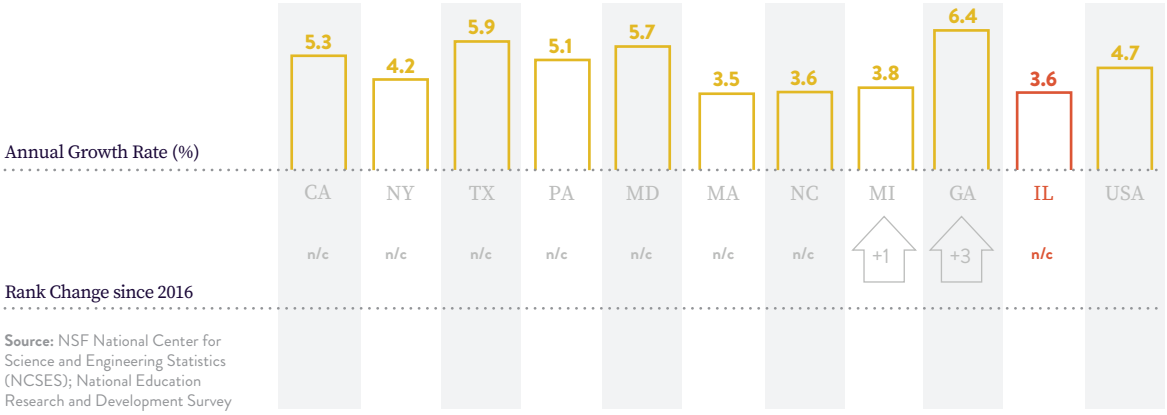
In August of 2021, Northwestern and the state of Illinois announced a plan to create a multi-million dollar accelerator in downtown Evanston. The project will include $50 million from the state's 2022 capital budget and an additional $25 million will come from Board of Trustees' Innovation and Entrepreneurship committee chair Kimberly K. Querrey. The goal of the project is to help founders and innovators in Evanston work in a collaborative environment and develop the foundations of a strong company. Northwestern's Kellogg School of Management, the Garage and Innovation and New Ventures (INVO) will work in tandem to provide high impact programming for researchers and faculty in this new laboratory space. Northwestern University leads in higher education research in Illinois with $887 million in total research awards to the university in 2020, the 29th highest total in the nation and a 127% increase over the past 10 years. Northwestern has been on the frontlines of the fight against COVID-19. Dr. Alexis Demonbruen and Dr. Thomas McDade led a team of researchers from Northwestern's Feinberg School of Medicine to discover a new, minimally invasive, at-home blood test to find the presence of Covid-19 antibodies. Northwestern also created a face mask, called 'Fitbit for the face' which can turn any face mask into a smart device monitoring the wearer's health. "FaceBit: Smart Face Masks Platform," was supported by the National Science Foundation's Grants for Rapid Response Research for addressing the COVID-19 pandemic.

University R&D

Funding by State 2020

Top 10 States ($ billion)





Source: NSF National Center for Science and Engineering Statistics (NCSES); National Education Research and Development Survey

University R&D

Input & Output Indicators Illinois

	Value	IL State Rank (5 year change)	Annual Growth Rate (%)
Research Funding 2020	$2.76 bln	10 n/c	3.6 IL / 4.7 USA
R&D Personnel 2019	39,985 people	8 -1	2.0 IL / 2.3 USA
S&E Research Space 2019	9,359 thousand sqft	6 +1	1.8 IL / 1.7 USA
INPUTS			
OUTPUTS			
S&E Publications 2019	14,199	7 -1	0.2 IL / 1.1 USA
University Patents 2020	302	10 +1	9.2 IL / 8.0 USA
Gross Licensing Income 2020	$160.9 mln	5 -2	-13.5 IL / -0.1 USA

Source: NSF National Center for Science and Engineering Statistics (NCSES); Associaton of University Technology Managers (AUTM)

Inputs

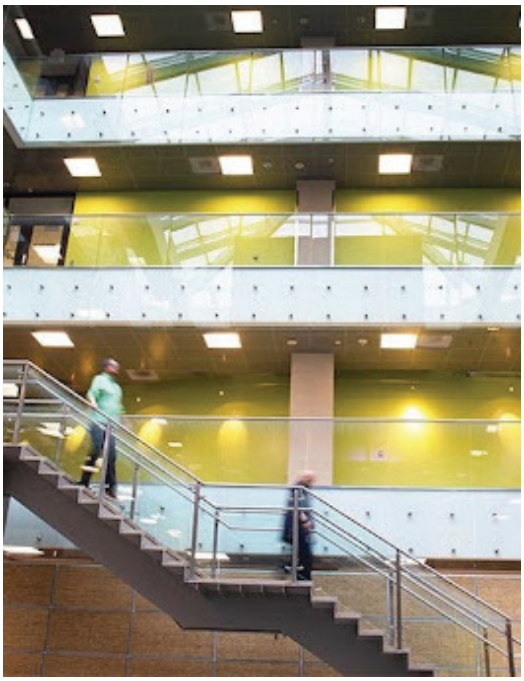
Overall, the Illinois university research ecosystem continued to receive a healthy influx of capital in 2020[7], with $2.76 billion in activity, up from $2.71 billion the year prior, a new record high for Illinois universities. Private and Public universities in the state spend a nearly even amount of capital on research projects which differentiates Illinois from most of the other top 10 states in research funding. Only Pennsylvania (4th overall with 4.82 billion in Higher Ed. R&D) saw equal amounts of research contributions from public and private universities in 2020. Since 2016, Illinois universities have invested more in research, both from their own sources and from outside sources, with an annual growth of 3.59% each year. While increases were substantial overall in both 2019 and 2020, nationwide investments continued to outpace the Illinois rise and, as a result, Illinois remained in the 10th spot overall in research investments, a spot it has been in since FY 2016. In particular, Illinois has been hurt by a drop off since 2016 in both state and local research investments (loss of -4.3% annually since 2016) and non-profit research investments (loss of

-.3% annually since 2016). In R&D Personnel Illinois ranks 8th and ranks 6th in Science & Engineering research. The U.S. national growth rate in the last 5 years has been nearly even to the Illinois rate.

Illinois has 14 universities in the top 500 higher education universities for R&D expenditures in FY 2020: Northwestern University (#29 with $875 million), University of Illinois Urbana-Champaign (#39 with $689 million), University of Chicago (#57 with $459 million), University of Illinois-Chicago (#64 with $412 million), Southern Illinois University-Carbondale (#218 with $42 million), Loyola University (#224 with $39 million), Illinois State University (#236 with $32 million), Illinois Institute of Technology (#240 with $29 million), Northern Illinois University (#253 million with $25 million), Southern Illinois University-Edwardsville (#280 with $18 million), Rosalind Franklin U. of Medicine and Science (#303 with $15 million), DePaul University (#379 with $7 million), University of Illinois- Springfield (#460 with $3 million), and Western Illinois University (#498 with $2 million)[1].

Outputs

Data year 2020 saw a significant drop off in the level of licensing income that Illinois universities were able to draw in from $310.7 million in 2019 to $160.9 million in 2020 according to the Association of University Technology Managers (AUTM)[10] due to a drop in licensing revenue at Northwestern with Pfizer's Lyrica losing its patent protection[11] in 2018. This was the lowest amount of gross licensing income that universities in the state received since a down year in 2015. University patent disclosures increased in 2020 to 302 total, placing the state 10th overall.



ILLINOIS INSTITUTE OF TECHNOLOGY

STATE ANNOUNCES MAJOR FUNDING OF WET LAB SPACE EXPANSION AT SEVERAL UNIVERSITIES

In October of 2021, the State of Illinois announced $15 million in capital grants as part of the Illinois Wet Lab Capital Program. Recipients of the grant included several ISTC member universities; Illinois Institute of Technology, Northwestern, Southern Illinois University-Carbondale, Southern Illinois University-Edwardsville, and the University of Illinois Research Park among them. $1.5 million will be allotted to each wet lab space recipient and at Illinois Institute of Technology that grant will be used to renovate 2,700 sq. ft. of existing space into what the university will call the Nerve Tissue and Organoid Innovation Laboratory (NOIL). This laboratory will serve as a hub for the rapidly growing neural technology research sector in Chicago. Illinois Tech also received an additional $5 million to enhance microgrid infrastructure on campus. This microgrid is among the nation's first smart grid loops, and provides power to several buildings on campus. Southern Illinois University Carbondale will use funding to develop the BioLaunch Core Facility, a multi-disciplinary program providing customized lab services and business development assistance to emerging and expanding biotechnology and value-added agriculture businesses.

ILLINOIS INSTITUTE OF TECHNOLOGY Northwestern THE UNIVERSITY OF CHICAGO

THREE ILLINOIS UNIVERSITIES LEAD PUSH ON PERSONAL HEALTH AND FIGHT AGAINST PANDEMIC

Researchers at three Illinois institutions of higher learning; Northwestern, the University of Chicago, and Illinois Institute of Technology were announced as part of a larger group of universities nationwide performing studies into the feasibility of incorporating AI into health and wellness services. The NIH is providing almost $14 million to help promote the use of AI in determining the best diet and exercise programs for individuals in Illinois. Money will be dispersed between each member of the Illinois Precision Nutrition Research consortium. Personalization is key in the wellness industry and one sure-fire way to improve health outcomes nationwide is by effectively incorporating predictive software into diet planning. Britt Burton-Freeman, director of Illinois Tech's Center for Nutrition Research, says "differences in genetics, age, race, sex, and a variety of other factors mean that each person's body responds to diets differently." Through the collaboration of these universities biomedical data will be made more accessible for researchers so that questions specific to the health field can be more easily answered. Northwestern and UChicago have also been involved with the COVID-19 wastewater surveillance effort in Chicago to study how the virus has spread in urban areas. While the reliability of wastewater samples for this purpose is not as strong as other diagnostic practices, this procedure is a supplementary measure at identifying the magnitude of community based transmission in a given area.

SIU Southern Illinois University
CARBONDALE

UNIVERSITY OF ILLINOIS RESEARCH PARK AND THE SIU RESEARCH PARK RECEIVED AWARDS FROM THE US SMALL BUSINESS ADMINISTRATION TO SUPPORT INCREASED ACCESS TO SBIR FUNDING

The federal SBIR and STTR programs, often referred to as "America's Seed Fund," are sources of competitive undiluted funding for small business innovative research. The U.S. Small Business Administration awarded the Illinois FAST Center at EnterpriseWorks at the University of Illinois Research Park with federal funding to be the designated statewide technical assistance center for training, company consultation, and "sprint" modules to prepare applications. As part of the inaugural Small Business Innovation Research (SBIR) Catalyst prize competition, Southern Illinois Research Park in Carbondale was named as one of eight recipients of a $150,000 award in 2021. SBIR Catalyst prizes were created to provide support for clusters attempting to develop regional innovation ecosystems. The Southern Illinois Research Park plans to target outreach to rural entrepreneurs seeking to commercialize new concepts.

ILLINOIS INSTITUTE OF TECHNOLOGY

ILLINOIS INSTITUTE OF TECHNOLOGY CONTINUES TO GROW AND PROMOTE NEW INNOVATIONS IN THE BIOMEDICAL AND PATHOGENESIS SPACE

IIT has been home of the Pritzker Institute of Biomedical Science and Engineering since 1983. It serves as the umbrella for a number of innovation centers that operate across Illinois, with three on the campus of IIT in Bronzeville, just South of downtown Chicago. Those three research centers include the Engineering Center for Diabetes Research and Education (ECDRE), Medical Imaging Research Center (MIRC), and Center for Molecular Study of Condensed Soft Matter (uCoSM). In 2021, uCoSM completed research on the process of drug crystallizations and the use of x-ray scattering imagery technology to determine collagen structure. In collaboration with a number of other state universities, the ECDRE was formed in 2005 as the only engineering research center in the country focused exclusively on promoting positive outcomes for people with diabetes. The ECDRE team is led by Dr. Ali Cinar and performed research on the viability of bio-artificial pancreases, STEM Cell therapies for those with type-1 diabetes, and an exploration into whether or not nitric oxide (NO) is the acting neural modulator in the process of diabetic retinopathy, whereby an individual with diabetes gradually loses their sight.

RESEARCH AT FEDERAL LABS IN ILLINOIS

Argonne and Fermilab have continued to be hotbeds for R&D activity even as the pandemic has surged. Investments in FFRDCs hit a new high in 2020[8], with more funding coming from Federal sources than ever before. As the name suggests most research at FFRDCs is federally funded and Business partnerships have been on the decline since a record high in 2014, but government and non-profit funding has helped fill those gaps at several labs. Argonne National Laboratory, based out of Lemont, IL, is the largest FFRDC in the Midwest and received the 11th highest amount of funding among all national laboratories in the United States in 2020. Among University Administered FFRDCs Argonne was the 3rd most active in the nation by R&D activity in 2020 and funding towards research there has increased each year since 2017. Argonne received the 6th highest nominal amount of funding among all FFRDCs from business partnerships. These partnerships covered 1.73% of total R&D funding at Argonne in 2020, higher than the national average rate of .74%. Argonne's user facilities are regularly accessed by businesses and grant co-recipients at the Advanced Photon Source (APS) center and the Leadership Computing Facility. The $859.7 million spent at Argonne in the most recent data year represents a 6% increase from 2019, and since 2016 spending on research has increased by 4.1% annually.

Argonne NATIONAL LABORATORY

ARGONNE DOUBLES DOWN ON CRITICAL ENERGY SOLUTIONS AS IT LOOKS TO THE FUTURE

Argonne was named a primary recipient or co-recipient in three separate major grants by the Department of Energy's (DOE) Advanced Research Project Agency-Energy (APRA-E) group. These grants totalling $7.8 million will be used on research to find high-impact, novel solutions to the world's energy challenges as part of the Biden administration's climate goals. The first of these projects is a partnership between Argonne, MIT, Cal-Berkeley, and Brookhaven National Institute intended to discover a pathway towards 100% clean nuclear energy. Another project seeks to find a way to safely recycle some raw materials present in nuclear fuel that powers reactors. Argonne is seeking to move into a future with safe and clean nuclear energy and is being assisted in their pursuit by alternative energy producer and nuclear fission industry leader Oklo, a company based out of California. The final project receiving a grant involving Argonne was the most important of the three for the Illinois innovation community as UIUC was named as a co-recipient. The purpose of this grant is to promote research on the possibility of reducing carbon emissions in the ironmaking process, with an expressed goal of reaching zero emissions.

In Batavia, IL, Fermi's R&D funding reached a new low in 2020[8], though the FermiLab team remains a force in the particle physics space. Fermi hit a record high of $420.1 million in total research activity in 2011 but since then has seen their funding cut from the federal government by -3.67% annually, and funding from business partnerships has dropped even further by about -4.6% annually. They are one of only 5 FFRDCs to receive less funding in FY 2020 than they did in 2011, which could partially be explained by the opening and expansion of the Large Hadron Collider near Geneva, Switzerland. Fermi has partially repositioned itself in recent years as a leader within the quantum materials and supercomputing space and just this past year received a $115 million grant to create the Superconducting Quantum Materials and Systems Center in partnership with a number of other major universities and the Department of Energy.

Northwestern Northern Illinois University

FERMILAB ASSISTS IN RESEARCH AT NIU AND PREPARES FOR MAJOR STEP FORWARD IN QUANTUM INNOVATION WITH RESEARCHERS FROM NORTHWESTERN

FermiLab's researchers (independent and team) wrote more than 600 new journal articles this year in particle physics, qubits, supercomputing radiofrequency, and the new PIP-II underground particle accelerator. Among their many partners in work conducted this year were Northern Illinois University and Northwestern. At NIU the focus was on developing a safer and more effective proton computed tomography imaging technology. Proton radiography is being explored as a potentially safer alternative to X-Ray CT scans. This research was supported by a grant from the Department of Defense. FermiLab and researchers from Northwestern have begun work on the development of a new supercomputer as part of the Superconducting Quantum Materials and Systems Center (SQMS), a working group hosted at FermiLab. This venture will attempt to extend the lifetime of qubits, tiny superconducting particles, and build stronger quantum processors to push the United States ahead in quantum materials research.

UNIVERSITY-INDUSTRY COLLABORATION

Illinois universities and their staff set out to cultivate the STEM talent of tomorrow while also contributing to the present by providing high quality research and lab space to bright minds. In their pursuit of these goals, it is often in the best interest of institutions of higher learning to pursue funding opportunities passed through or sponsored by an external source; like a business or businesses. Collaborations between businesses and universities are symbiotic, and these connections promote efficiencies in the R&D process. Businesses benefit from university collaboration in a number of ways; they may profit from newly commercialized technology and knowledge generated by university research and gain access to unique research infrastructure, including facilities and equipment (Rybnicek and Konigsgruber 2018). In return, universities can benefit from additional funding, market insight, and the creation of new university IP—as well as resulting licensing income (Ankrah and Al-Tabbaa, 2015)[12]. Systematic reviews (Rybnicek and Konigs Gruber 10, 2018; Ankrah and Al-Tabbaa, 2015) of university and industry partnerships have yielded some common trends and strategies for success in these collaborative ventures. Foremost among the motivations for entering into partnerships, are the benefits they bring to industries in the form of cost savings, the ability to commercialize university-based technologies for profit, access to knowledgeable faculty/students to potentially hire, and the enhancing of corporate image in the pursuit of high-quality innovations[13], and at times, lifesaving research. Universities are motivated to partner with businesses to access funding for research, expose students to real world problem solving, and due to changing preferences among governmental authorities who wish to see more collaboration between higher learning institutions and companies. Success usually depends on the development of mutual trust between stakeholders regarding how results will be published, financial guarantees, geographic proximity, the marketability of potential research, the policy environment that encapsulates stakeholders, and the history of relationships between organizations and their employees/staff[13].

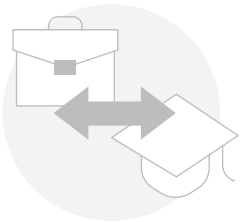
abbvie THE UNIVERSITY OF CHICAGO

ABBVIE CONTINUES BUILDING IMPACT PARTNERSHIP WITH UNIVERSITY OF CHICAGO

In June of 2020, AbbVie CEO Richard Gonzalez announced that the company would be pledging $50 million over five years to nonprofits with programming intended to bring lasting equitable changes to the health service sector. They've partnered with Direct Relief, the University of Chicago community health department (Urban Health Initiative), the National Urban League's Project Ready, and Year Up, among others. They also pledged to expand their employee donation match program for nonprofits and charities pursuing social justice and/or racial equity. Their goal is to solve the critical disparities in health outcomes that plague Illinois and the United States in general, particularly the ways in which certain diseases impact communities of color. AbbVie's partnership with the University of Chicago doesn't end with their combined efforts to pursue health equity. They have also joined forces to combat cancer and do cutting edge research on oncology. This partnership has yielded new insights into immuno-oncology, novel drug delivery approaches, and 3D screening technology. Through this partnership between AbbVie and UChicago, students and faculty are given the opportunity to work with bio-pharmacology experts, offering new knowledge on real world solutions happening every day in Illinois.

Inputs

In 2020, according to the NSF's HERDS dataset[1], Illinois ranked 8th in university research budgets provided by industry and business partners, as it has for the last several years. This total includes only sponsored research and grant associated dollars passed through companies, it does not include other contributions like gifts. Just under $169 million dollars was earmarked from businesses directly to Illinois universities in 2020. While this is slightly below the 2019 record high of $179 million, Illinois has still stayed level with national growth rates over the last 5 years, with an annual growth of 4.46% since 2016. In 2019, the Wellspring[3] Scout Data Platform established that businesses and universities in Illinois shared 18 research grants, placing Illinois 9th when compared to other states. Though this tally has seen decreases in recent years this does seem like a short-term impact, given that 2014 also saw a low total of just 14 shared grants.



University Industry

R&D Collaboration Indicators 2020

	Value	IL State Rank (5 year change)	Annual Growth Rate (%)	
Uni R&D Funded by Industry $ Thousands 2019	168,728	8 n/c	4.5 IL	3.3 USA
Shared Grants 2019	18	9 -2	-15.9 IL	-11.9 USA
INPUTS				
OUTPUTS				
Co-assigned Patents 2020	65	9 -1	2.5 IL	5.1 USA
Co-authored Publications 2020	239	14 -3	1.3 IL	8.6 USA

Source: NSF National Center for Science and Engineering Statistics (NCSES); Wellspring Scout Data Platform

DUALITY LAUNCH LEADS TO INAUGURAL SIX MEMBER COHORT

The first accelerator program in the nation devoted specifically to quantum science was launched in April of 2021 at the University of Chicago's Polsky Center for Entrepreneurship and the Chicago Quantum Exchange. UChicago helped found the program called Duality, along with the University of Illinois Urbana-Champaign, P33, and Argonne National Laboratory. These partners have a proven track record of success in commercializing small businesses in the deep tech space. Duality's first cohort includes a diverse set of founders and companies, five based in the United States and one based in the UK. The startups include Axion Technologies, Quantopicon, QuantCAD, qBraid, and Great Lakes Crystal Technologies. Also in the first cohort is Super.tech which is based out of Illinois and is led by Pranav Gokhale. Applications are now available for the second cohort. The goal of this program is to prepare founders, provide expertise, and find business success while also allowing them to keep the framework and intellectual property that they've already developed. Additionally, these partners are working towards making Chicago the primary hub for next generation deep tech innovators. The 12-month program also includes access to $50,000 in unrestricted funds and access to three of the eight federally funded quantum information science research centers in the United States. The program expand's Chicago's leadership in quantum computing. The Chicago Quantum Exchange (CQE) convenes leading academic researchers, top scientific facilities, and the most innovative industry partners in the world to advance the science and engineering of quantum information, train the next generation of quantum scientists and engineers, and drive the quantum economy. CQE connects researchers and institutions at the forefront of theory and experiments across a broad spectrum of quantum science research areas and includes partnerships with the University of Chicago, Argonne National Lab, Northwestern University, the University of Illinois Urbana-Champaign, and the University of Wisconsin-Madison.

Northwestern

RESEARCH HUB CREATED AT NORTHWESTERN THROUGH CORPORATE COLLABORATION

Northwestern University and Underwriters Labs announced last month that they will be forming a new research hub on the NU campus focused primarily on finding solutions to safety problems in digital information and AI. The hub will be called the Center for Advancing Safety of Machine Intelligence (CASMI) and represents an expansion on the previous existing partnership between the two entities. The CASMI plans to promote research on the human impact of machine learning, the health and safety implications of the AI design process, and other goals specific to safety science. Underwriters Labs will be contributing nearly $7 million to projects started at the hub over the next three years. The new Executive Director of the CASMI and Northwestern professor of computer science, Dr. Kristan Hammond, noted that "Machine learning is among the most transformational forces in technology today, but we're only beginning as a society to genuinely understand and evaluate how it affects our lives. Our partnership with Underwriters Laboratories will help us establish the clear understanding we need to develop these technologies safely and responsibly. Our goal is to go beyond platitudes and operationalize what it means for these technologies to be safe as they are used in the world."

Outputs

These partnerships between industry and higher education have resulted in a large number of patents in Illinois. Illinois universities licensed 65 patents to companies in 2020, an increase of 3 more patents compared to the year prior, though Illinois' five-year annual growth rate has lagged behind the national annual growth rate on this variable; 2.45% compared to 5.07%. Because of this lag Illinois fell from 8th on the list of business/university co-assigned patents (a spot it had held since 2016) to 9th. Shared research publications, an indicator of knowledge-based partnerships, saw a significant drop in 2020 here in Illinois; 35 less publications were made compared to 2019. Illinois' annual growth rate since 2016 increased by 1.3%, while other states have grown much faster and as a result the state has fallen from 11th in co-authored publications in 2016 to 14th in 2020.

Illinois Innovation Vouchers

This state legislation would give Illinois a critical tool to incentivize the creation of new R&D partnerships between corporations and Illinois Universities. ISTC helped create the Illinois Innovation Vouchers policy to assist businesses in funding university research by providing matching funds. Innovation Vouchers would be awarded to Illinois businesses to help offset the cost of an R&D or business assistance engagement with an in-state college or university. One major step the state could take would be to fund this program in order to help catalyze the relationship between the Illinois Higher Education and Business communities.

HORIZON ROSALIND FRANKLIN UNIVERSITY OF MEDICINE AND SCIENCE

HELIX 51 EXPANSION AND MOVE INTO ROSALIND FRANKLIN INNOVATION AND RESEARCH PARK

This summer, Helix 51, Rosalind Franklin's life sciences incubator, announced that they are preparing to move into its new Innovation and Research Park upon the completion of the park's construction. Helix 51 launched in 2020 and has since partnered with AbbVie and Horizon Therapeutics. Horizon joined the supporter network earlier in 2021. Tenants are given access to valuable wet-lab research space and supportive programming. Such programming includes internship opportunities, access to three in-house entrepreneurs, and business plan competitions. A motivating factor for the move is the high demand for research space among early-stage bioscience companies in the Chicago area. The move will help to reduce the waiting list of tenants seeking space. Currently, the Innovation and Research Park offers 32,000 sq. ft. in wet and dry labs, which is a major improvement for Helix 51.

Sterling Bay

PRYSM INSTITUTE LAUNCH

Sterling Bay launches Prysm Institute, a life sciences and biotech accelerator that will encompass a large portion of the forthcoming 53-acre Lincoln Yards life sciences lab space. The institute plans to serve both the small business community and established enterprises pursuing innovations in the life sciences space. The initiative is being led by Dr. James Gillespie and is already offering workshops intended to provide entrepreneurs with valuable insights from Prysm's team of seasoned industry veterans. Prysm's Equity for Equity focus is a primary initiative in their virtual efforts to lead Chicago's healthcare, life science, and technology sectors into a new, post-pandemic reality. Sterling Bay is certainly a company to watch moving into 2022 due to the promise of the Lincoln Yards expansion.

LOOKING FORWARD

The impact of the pandemic on our state's innovation economy has yet to be fully realized and like many other states, there are other factors unrelated to the pandemic that continue to be topics of concern for our state's R&D progress. Losses in federal funding have led to the reexamination of research priorities and the reprioritization of strategic goals in the face of funding downturns.

Market uncertainty has been either an obstacle or opportunity for partnership decisions between companies, universities, and government and studies have shown that innovation driven government administrations and agencies can be powerful catalysts in helping promote and fund collaboration, especially in uncertain times. In Illinois, we watched pandemic response teams across the state turn uncertainty into necessity as they directly connected emerging deep tech startups with industry leaders, filling expertise gaps and having immediate and necessary impact.

Through the pandemic, Illinois' R&D landscape has struggled to match the growth of many peer states, but despite growth that lags the national average, our strengths in Illinois' R&D landscape offer a pathway to growth. In our emergence from COVID-19, our ability to foster business innovation is critical to our economic recovery. There are resources that can help boost business R&D that continue to be underutilized and it's our world-class colleges and universities.

Beyond supplying the talent our companies need to thrive, Illinois' colleges and universities are a collective wellspring of R&D resources waiting to be tapped by forward-thinking companies. From cutting-edge labs and equipment, to research know-how and business acumen, higher education institutions across the state are primed to help companies in their region create the new products and services they need to boost their competitiveness.

Despite the clear benefits of these partnerships, they remain relatively underutilized in Illinois—with the state continuing to rank 8th in R&D partnerships

Illinois has had success through legislative action promoting R&D activities and helping Illinois' companies leverage college and university R&D resources, through the Illinois Innovation Vouchers Program, which was approved by the Governor in August 2021 and is part of the 2023 budget, awaiting approval. The R&D tax credit which was due to expire at the end of 2021 was extended through 2026 allowing a 6.5% credit on increases in R&D spending that occur within the state.

Wet lab space, which was historically in short supply, limiting life science research growth has seen increased funding as part of a statewide capital grants program. Adding these spaces provides both industry and university life science researchers with the room to expand and launch new collaborative research partnerships.

There are no quick fixes in positioning Illinois as a leading state for R&D and although we have seen a record number of investments, patents, and federal funding, we still continue to lag behind peer states.

There are steps that can be taken to continue to move the state forward. The most important of these is to continue to ensure stable, ongoing, funding to the state's public universities. This stable funding will allow Illinois' state universities to more effectively attract and retain faculty; invest in campus infrastructure, including research facilities; and improve the competitiveness of federal and nonprofit grant proposals. To support business-sector innovation, the state should make its R&D tax credit permanent. This credit has been shown to successfully promote R&D and would put Illinois back on an even playing field with many states that offer a permanent credit. The Innovation Voucher Program should also be funded. This state legislation would give Illinois a critical tool to incentivize the creation of new R&D partnerships. Innovation Vouchers would be awarded to Illinois businesses to help offset the cost of an R&D or business assistance engagement with an in-state college or university. Finally, there's power in partnerships. Collaboration across the state is key, not only between our colleges, universities, large corporations, and governments, but between cutting-edge startups and innovative non profit organizations. An interdisciplinary, diverse, equitable, and bold collaborative approach working across industries, counties, and best practices opens our eyes up to what's possible. Innovation is making the impossible possible.

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ABOUT THE DATA

Annual Business Survey, most recent addition can be found here

Business Enterprise Research and Development Survey, Most Recent edition (FY 2018) can be found here, and 2019 data is available upon author request

Higher Education Research and Development Survey, most recent (FY 2020) edition here

FFRDC Research and Development Expenditures Survey, most recent (FY 2020) edition here

National Patterns of R&D Resources, most recent (FY 2020) edition here

AUTM STATT Database

Wellspring Scout

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