



# TECH TRANSFER IN INDIANA:

**An Overview for the  
Life Sciences Industry**

NOVEMBER  
**2020**



## CONTENTS:

Foreword .....	2
Introduction.....	4
Tech Transfer at Indiana’s Research Universities .....	6
Tech Transfer at Indiana University .....	7
Tech Transfer at Purdue University .....	10
Tech Transfer at University of Notre Dame .....	12
Moving Technology to Market .....	15
Incubators and Graduation Facilities at Indiana’s Research Universities .....	15
Tech Transfer in Central Indiana and its Competitor Regions .....	16
Conclusion.....	19
Endnotes.....	20

## FOREWORD

With more than 2,000 companies generating more than \$10.5 billion in exports, Indiana is one of the world's most prominent places of life sciences activity. Yet our future position is not guaranteed. The rapid pace of technological innovation and the discovery of new and novel approaches to developing pharmaceuticals, producing devices, and improving health presents Indiana's life sciences ecosystem with both opportunities and risks. To ensure a bright future for Indiana, we must embrace this uncertainty by fully committing to and driving innovation within the life sciences community.

One way we can do this is through a renewed focus on tech transfer—the process by which research moves from the university lab to the market.

As home to three major research universities and thousands of research faculty seeking to better understand our world, Indiana has the critical assets necessary to drive innovation. This is particularly relevant for life sciences R&D in that the unique space and equipment required to carry out inherently complex research is often found in university labs. So, too, is the human capital and ingenuity that produces innovations of importance for both the economic and public health of our state. Indeed, Indiana universities or companies have played a critical role in tech transfer processes leading to the commercialization of insulin, treatment of prostate cancer, and reduction of cancer caused by the human papillomavirus among many others.

This report is intended to highlight the important role that tech transfer can and does play in Indiana by describing the

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*As home to three major research universities and thousands of research faculty seeking to better understand our world, Indiana has the critical assets necessary to drive innovation.*

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approaches used by Indiana University, Purdue University, and the University of Notre Dame in pursuing it. The important role of incubators and graduation facilities at our research universities is also summarized in order to begin a conversation around tech transfer in Indiana and its competitor regions.

As the following pages make clear, IU, Purdue, and Notre Dame have each made significant investments in pursuit of tech transfer. For example, Purdue Research Park, which was established in 1961, is emblematic of Purdue's approach and long-term dedication to the application and commercialization of scientific discoveries. As home to the country's largest medical school, IU is a significant driver of NIH-funded research in both Bloomington and Indianapolis. Notre Dame has meanwhile made a series of strategic moves and investments to support a growing tech transfer portfolio.

I would like to thank Nora Doherty, Executive Vice President, BioCrossroads and Nathan Ringham, Director of Research and Insights, Central Indiana Corporate Partnership for researching, developing, and writing this report. It provides information that we hope begins a conversation, while also recognizing the tech transfer offices at each of the universities who work tirelessly to ensure the research carried out by their faculty has the best opportunity to positively impact the world. Our research universities are an important element in our innovation economy and tech transfer is the means by which they can drive change. We appreciate the contributions to be made from our major research universities and those that support tech transfer activities.

Thank you,

A handwritten signature in black ink that reads "Patricia A. Martin". The signature is stylized, with a large, looped initial "P" and "A" followed by the last name "Martin".

Patricia A. Martin  
President and CEO  
BioCrossroads

## **Recognition for Research and Technology Transfer:**

### **Indiana University**

Simran Trana

*Associate Vice President, Innovation and Commercialization Office*

### **Purdue University**

Brooke Beier

*Vice President, Office of Technology Commercialization*

### **University of Notre Dame**

Bryan Ritchie

*Vice President and Associate Provost for Innovation*

## INTRODUCTION

Indiana is fortunate to be home to three universities with very high levels of research activity—Indiana University (IU), Purdue University, and the University of Notre Dame. These “R1” universities are home to expert faculty and critical research assets that play a vital role in driving innovation.<sup>1</sup> In their respective 2019 fiscal years, IU, Purdue, and Notre Dame together brought in nearly \$1.4 billion to fund their research efforts.<sup>2</sup> Research, be it in the university setting or elsewhere, is the basis of all discovery and advancement. While all research is significant, the public frequently interacts with the results of university research through a process known as technology transfer.

Tech transfer is the process by which research-driven discoveries move from the laboratory such that they can be commercialized and accessed by the marketplace. According to the AUTM Foundation, a nonprofit dedicated to advancing technology transfer worldwide, “hundreds of inventions, from polio vaccine to the barcode, to high-powered microscopes and Honeycrisp apples” are commonplace examples of tech transfer.<sup>3</sup>

Insulin is another well-known example of successful tech transfer. Originally developed in a university lab by Dr. Frederick Banting and colleagues, insulin was licensed to Indiana’s own Eli Lilly & Company in 1922 by the Governors of the University of Toronto. Researchers at IU similarly developed a cure for testicular cancer, while Purdue researchers made multiple advancements in plant sciences and biofuels, and a Notre Dame professor’s basic research in the chemistry department paved the way for the development of neoprene.<sup>4</sup> Nationally, the economic impact of tech transfer is

significant. According to one recent report, between 1996 and 2015, the licensing of university and institutional research for industry use contributed up to \$1.3 trillion in industrial output (about 3.5 times Indiana’s GDP in 2019) while employing 5.9 million people (about 2 times the total Hoosier workforce).<sup>5</sup>

BioCrossroads has long worked to facilitate and strengthen ties between the state’s research universities and the private sector to further growth within Central Indiana and the state more broadly. As a research-driven organization, one of the first reports that informed BioCrossroads’ strategy sought to understand how Indiana could leverage university research to accelerate innovation.<sup>6</sup> In more recent years, BioCrossroads commissioned multiple studies attempting to better appreciate the broader role of the research and development activities of the state’s research universities, how the universities fund such activities, and how specific university capabilities can address industry technology needs.<sup>7</sup>

As tech transfer plays an important role in furthering R&D in life sciences, it is considered to varying degrees in each of these reports. This is undoubtedly due to the fact that tech transfer is of particular importance to the life sciences given the unique and complex research required to further innovations in the industry—a fact underscored by new research recently summarized in the Harvard Business Review finding that biopharmaceutical companies are increasingly relying on technology licensing in order to remain competitive.<sup>8</sup>

Given the importance of tech transfer to the industry, BioCrossroads developed



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*Given the inherently complex nature of life sciences research, university-driven tech transfer plays a key role in discovering the new cures, treatments, and other applications that enable industry growth.*

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this report to inform discussions aimed at ensuring the long-term competitiveness of Indiana's life sciences sector. Additionally, as the home to three R1 universities, Indiana has the research assets needed to generate economic activity at a level beyond what the state's population might otherwise suggest. Indeed, the state's much larger (by population) neighbors in Ohio and Michigan also have three R1 universities, while Illinois,

with a population nearly double that of Indiana, is home to four such institutions.

To that end, the report provides background information on how IU, Purdue, and Notre Dame engage in tech transfer as well as describing approaches used by these universities and other institutions to facilitate commercialization of research-driven discoveries and innovations.

## TECH TRANSFER AT INDIANA'S RESEARCH UNIVERSITIES

The State of Indiana played a prominent role in formalizing university tech transfer processes, as Indiana's Birch Bayh led efforts in the United States Senate to create and pass the "University and Small Business Patent Procedures Act of 1980," commonly known as the "Bayh-Dole Act." As Senator Bayh recalled in 2010, when marking the 30th anniversary of the act's passage,

*Bayh-Dole began one day in 1978 when I received a call from Ralph Davis who ran the technology transfer office at Purdue University. When Ralph told me that potentially important discoveries made on campus were being prevented from fully benefiting the taxpayers supporting the research, he had my full attention. When he said that Purdue's experience was shared by universities and small companies across the nation, I told him to let me know what needed to be done.<sup>9</sup>*

Among other things, Bayh-Dole clarified patent rights and other processes associated with discoveries and innovations derived through federally funded research. In doing so, universities and other nonprofits were able to retain ownership of innovations developed with federal research funding, enabling universities to generate revenue from the commercialization of discoveries made in their labs. Today, Bayh-Dole continues to encourage Indiana's research universities to engage in commercializing the discoveries made by researchers working on their respective campuses. While the specific processes by which IU,

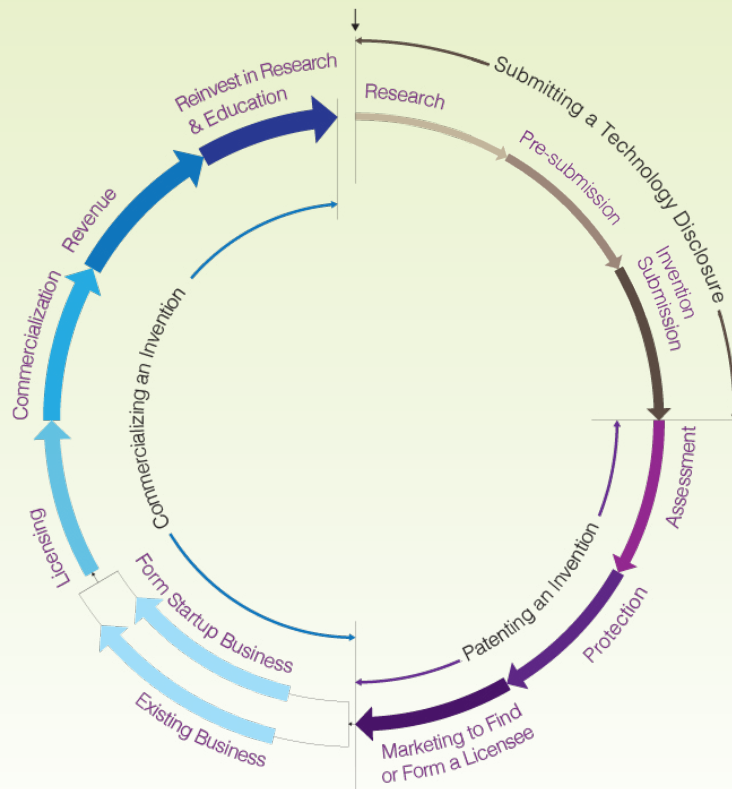
Purdue, and Notre Dame participate in tech transfer vary, all university-based tech transfer generally follows the steps illustrated in Figure 1.

As shown in Figure 1, which comes from the Massachusetts Institute of Technology, tech transfer of course begins with research—the foundation of innovation. As these efforts appear to yield promise, most researchers are required to disclose their efforts with the institution at which they are employed. Disclosures are commonly required as the institution generally has a significant ownership stake in the invention resulting from the research. This disclosure process naturally leads to several steps associated with limiting the invention's use via patenting or other intellectual property protections. Once the invention is legally protected, commercialization of the innovation can begin in earnest with marketing efforts intended to find and secure a business partner.

After securing a business partner, be it an existing business or a new start-up, a licensing agreement of some form is generally required. This licensing agreement enables the partnering business to make use of the invention for an agreed upon period in exchange for payments made to the owner of the invention. The payments are typically made from revenue generated via the use or sale of the invention. As illustrated in the figure, a portion of these payments, ideally, is used to fund additional research, leading to new inventions, thus creating a virtuous cycle of innovation. It takes a significant investment of time, talent, and financial resources to see this cycle through—investments at each of Indiana's research universities continue to make.



**Figure 1: Tech Transfer Process – From Research to Revenue<sup>10</sup>**



## Tech Transfer at Indiana University

In 1820, just a few years after Indiana was granted statehood, the state legislature established what would become Indiana University. At its flagship campus in Bloomington, nearly 44,000 students, including 10,000 graduate students, are taught by a faculty that includes more than 1,100 with research appointments. In addition to the Bloomington campus, IU has eight regional campuses around the state, including Indiana University–Purdue

University Indianapolis (IUPUI), which itself is home to a high degree of research activity.<sup>11</sup> IU operates with an annual budget of around \$3.7 billion across all campuses, and is supported by an endowment totaling nearly \$2.5 billion (as of 2019).

Tech transfer at Indiana University is overseen by the Innovation and Commercialization Office (ICO), which falls under the purview of the Vice President for Research. The university's tech transfer process begins when IU researchers

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## *Indiana University facilitates tech transfer through multiple programs and initiatives housed at schools on both the Bloomington and Indianapolis campuses.*

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submit a “research discovery innovation” disclosure with the ICO.<sup>12</sup> From there, an ICO commercialization manager conducts due diligence to assess the potential market for the invention or discovery. ICO uses this information to determine next steps, which could include creating a marketing and commercialization plan, facilitating relationships with potential business partners, and assisting with licensing.

IU facilitates faculty access to external funders while also administering several programs that provide the university’s own dollars to help launch research projects that may culminate with tech transfer. For example, the Translational Research Pilot Grant, sponsored by the Johnson Center for Innovation and Translational Research at IU Bloomington, provides up to \$25,000 in support of scientific research that ultimately lends itself to commercialization. This is one of many funding opportunities administered by programs housed in the College of Arts and Sciences, Kelley School of Business, or other colleges and schools on the Bloomington campus. Likewise, programs on the IUPUI campus support researchers working in Indianapolis, including at the Indiana University School of Medicine, the nation’s largest medical school.

Students have opportunities to engage in research-driven entrepreneurial endeavors across centers and programs housed in schools on both the Bloomington and Indianapolis campuses. These include Shoemaker Innovation Center (Bloomington), JagStart Student Entrepreneurs (IUPUI), Enactus (IUPUI);

and Business of Medicine Program (Kelley School of Business/IU School of Medicine).

Once a research-driven innovation is ready to move to market, the university can offer support through IU Ventures, a nonprofit affiliate of IU focused on supporting entrepreneurship throughout the IU ecosystem. IU Ventures falls under the purview of IU’s Office of the Vice President for Government Relations and Economic Engagement, which more generally facilitates the university’s efforts to support innovation across the state.

IU Ventures specifically oversees the IU Philanthropic Venture Fund, the IU Angel Network, and the Quarry. The IU Philanthropic Venture Fund leverages donations made to the IU Foundation to support investments in companies that have licensed technology from IU or companies with IU-connected leaders. Similarly, the IU Angel Network links high net worth individuals with an IU connection such that they can make early stage investments in companies led by IU alums, faculty, staff, or students. The Quarry supports IU faculty in efforts to explore commercialization through grant funding, mentoring, and other services that aid in launching new companies based on innovations made on an IU campus.

With its large, statewide presence, IU is also home to many additional unique assets that serve as a source of innovation, generating ideas that enable tech transfer. These assets include, for example, the Indiana Clinical and Translational Sciences Institute (CTSI) which is housed at the IU School of Medicine. A

## Indiana Clinical and Translational Sciences Institute (CTSI)<sup>13</sup>



partnership between IU, Purdue, and Notre Dame, CTSI provides funding, lab space, and other infrastructure necessary to support life sciences researchers in moving their discoveries into clinical and other settings to improve the health status of individuals. This includes engaging community members and organizations in interventions that, while not always commercial in nature, can lead to important discoveries, nonetheless.

According to IU's Innovation and Commercialization Office, since 1997, IU research has led to more than 4,800 global patent applications, generating more than \$145 million in licensing and royalty income.<sup>14</sup> Life sciences companies that have either recently licensed technology from IU or launched with the goal of commercializing such technology include Assembly Biosciences, Anagin, and Marcadia.

IU RESEARCH SINCE  
**1997**



GLOBAL PATENT  
APPLICATIONS  
**>4,800**



GENERATING LICENSING  
AND ROYALTY INCOME  
**>\$145M**

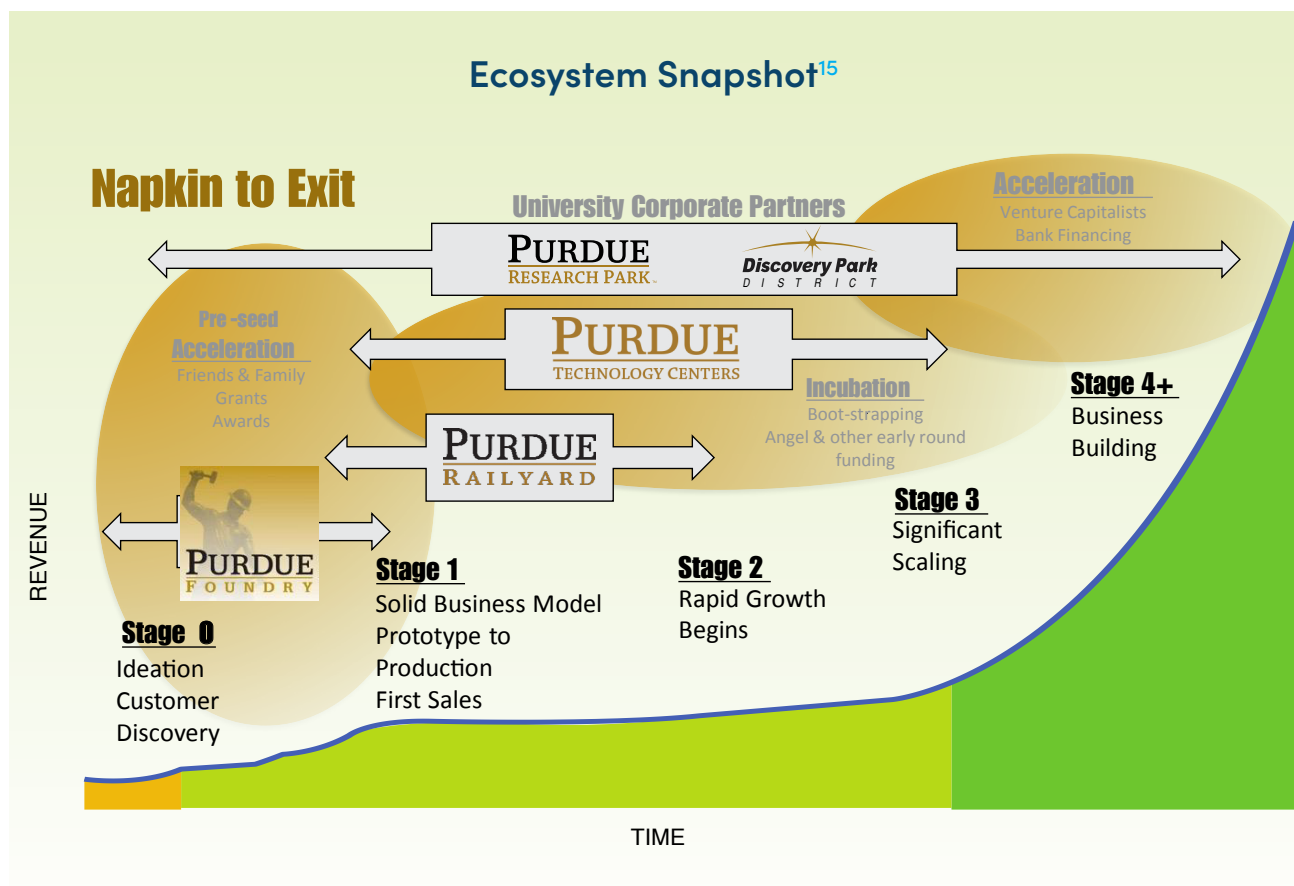


## Tech Transfer at Purdue University

In 1869, seven years after President Abraham Lincoln signed the Morrill Act which enabled states to use public lands for colleges of agriculture and mechanic arts, Purdue University was established by the Indiana General Assembly. Purdue's location in West Lafayette was chosen following the donation of \$150,000 by area resident John Purdue. Today, Purdue is home to more than 33,000 students, including nearly 10,000 graduate students, who are taught by a faculty of more than 3,000, including more than 1,800 with research appointments. In addition to the main campus in West Lafayette, Purdue has campuses in Fort

Wayne and Hammond while the School of Engineering and Technology enables Purdue to maintain a presence in Indianapolis at IUPUI. System-wide, Purdue operates with a \$2.5 billion budget annually, with the vast majority of expenditures taking place in West Lafayette. The university is supported by an endowment of more than \$2.6 billion.

The Purdue Research Foundation (PRF) is responsible for protecting Purdue's intellectual property and promoting entrepreneurial activities on behalf of the university. As such, PRF manages several initiatives that play an active role in facilitating tech transfer. Within PRF, the Purdue Office of Technology



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## *In its efforts to promote entrepreneurship across the university, the Purdue Research Foundation oversees commercialization activities and other initiatives that facilitate tech transfer.*

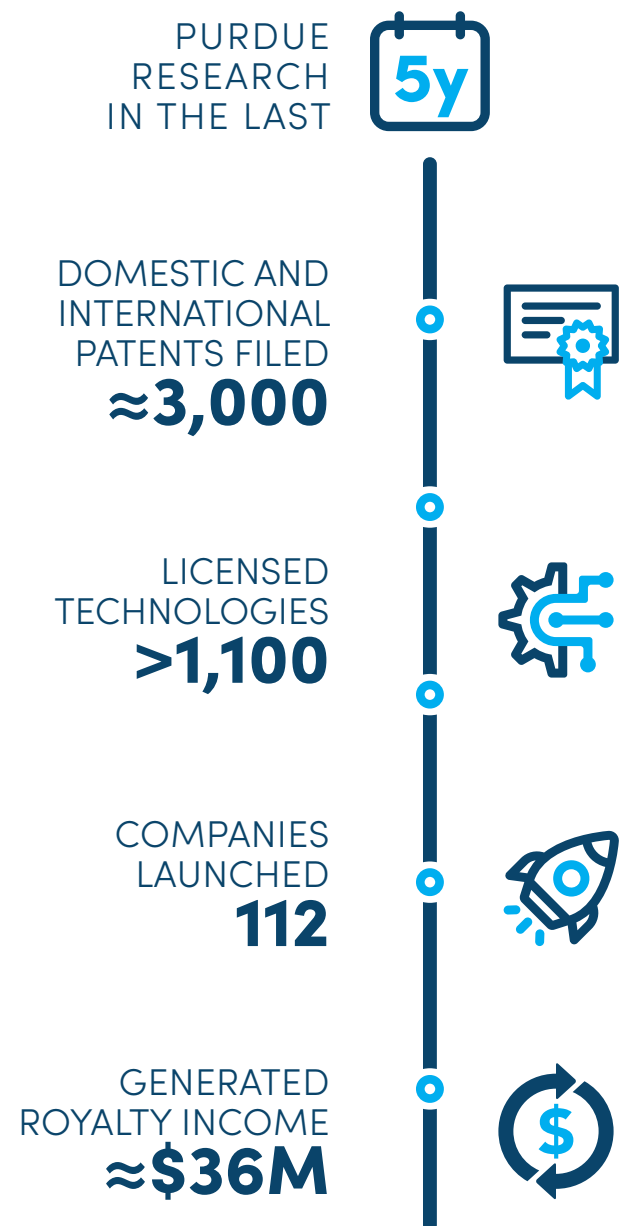
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Commercialization (OTC) oversees the university's tech transfer process, which begins with Purdue researchers filing a disclosure notifying the university of their innovation. The OTC assesses the innovation, translating it into an invention and developing a commercialization strategy while simultaneously pursuing intellectual property protection. The OTC also assists in securing business partners capable of taking inventions to market, including managing licensing agreements.<sup>16</sup> When licensing a technology, Purdue makes use of five standard agreements which eases the commercialization process.<sup>17</sup>

The OTC and PRF additionally assist Purdue faculty in accessing funding. PRF directly administers four funds, each of which supports Purdue commercialization efforts. These include the Trask Innovation Fund, which provides short-term funding to support commercialization efforts; the Ag-celerator fund, which is focused on plant sciences; the Purdue Start-up Fund, which invests gifts to the Purdue Research Foundation in Purdue-related commercialization activities and the Foundry Investment Fund, which is focused on human and animal health and plant sciences.

In addition to the OTC, PRF also manages the Purdue Foundry, Purdue Research Park, Discovery Park District, and Purdue Technology Centers, all of which comprise an ecosystem of place-based efforts that enable access to R&D facilities, shared and private office spaces, and other services that support entrepreneurs and researchers looking to take their ideas to the market.

While the Purdue Research Park maintains locations outside of West Lafayette, its locations near the Purdue University campus provide easy access to engage students in commercialization activities.



At the Purdue Foundry, located just west of Purdue's campus in the Discovery Park District, MBA students from Purdue's Krannert School of Business provide market research and financial forecasting support. Discovery Park is also home to the Burton D. Morgan Center for Entrepreneurship which supports both faculty and students in entrepreneurial endeavors, including business model competitions and innovation challenges for Purdue students.

While Purdue is probably best known for its engineering and agricultural expertise, the university is also home to several initiatives focused on the life sciences. In fact, Purdue researchers focused on the life sciences have launched or licensed their discoveries to multiple companies focused on

pharmaceuticals or medical devices. Such companies include Endocyte Inc., which was acquired by Swiss pharmaceutical giant Novartis AG for \$2.1 billion in 2018.

Purdue's efforts aimed at encouraging commercialization and fostering an entrepreneurial spirit are tracked by the OTC with data on disclosure filings, patent activity, licensing agreements, start-up activity, royalty income, and other measures readily available online. This data shows that over the last five years Purdue researchers have filed nearly 3,000 domestic and international patents, licensed more than 1,100 technologies, launched 112 companies, and generated nearly \$36 million in royalty income.<sup>18</sup>



## UNIVERSITY OF NOTRE DAME

### Tech Transfer at University of Notre Dame

The University of Notre Dame was founded in 1842 by a 28-year old French Priest on land donated by the Bishop of Vincennes. In the 175-plus years since, Notre Dame has become one of the nation's best-known institutions of higher education thanks to its history of academic and athletic excellence. Today, nearly 13,000 Notre Dame students, including almost 4,000 graduate students, are taught by 1,400 faculty members on its campus near South Bend, Indiana. The university has an annual budget of \$1.3

billion and is supported by an endowment of more than \$11.3 billion.

In recent years, Notre Dame has significantly increased its efforts related to tech transfer following the creation of the IDEA Center in 2017. Under the leadership of the Associate Provost for Innovation, the IDEA Center offers both a physical space—Innovation Park—at which entrepreneurs can work as well as a “Commercialization Engine” that supports Notre Dame researchers in tech transfer. As at other universities, the Commercialization Engine begins with a disclosure of an innovation developed by



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***Prior to the IDEA Center opening in 2017, the university launched a total of 33 companies since its founding in 1842. Since 2017, Notre Dame has started an additional 64 companies, underscoring the university's recommitment to innovation.***

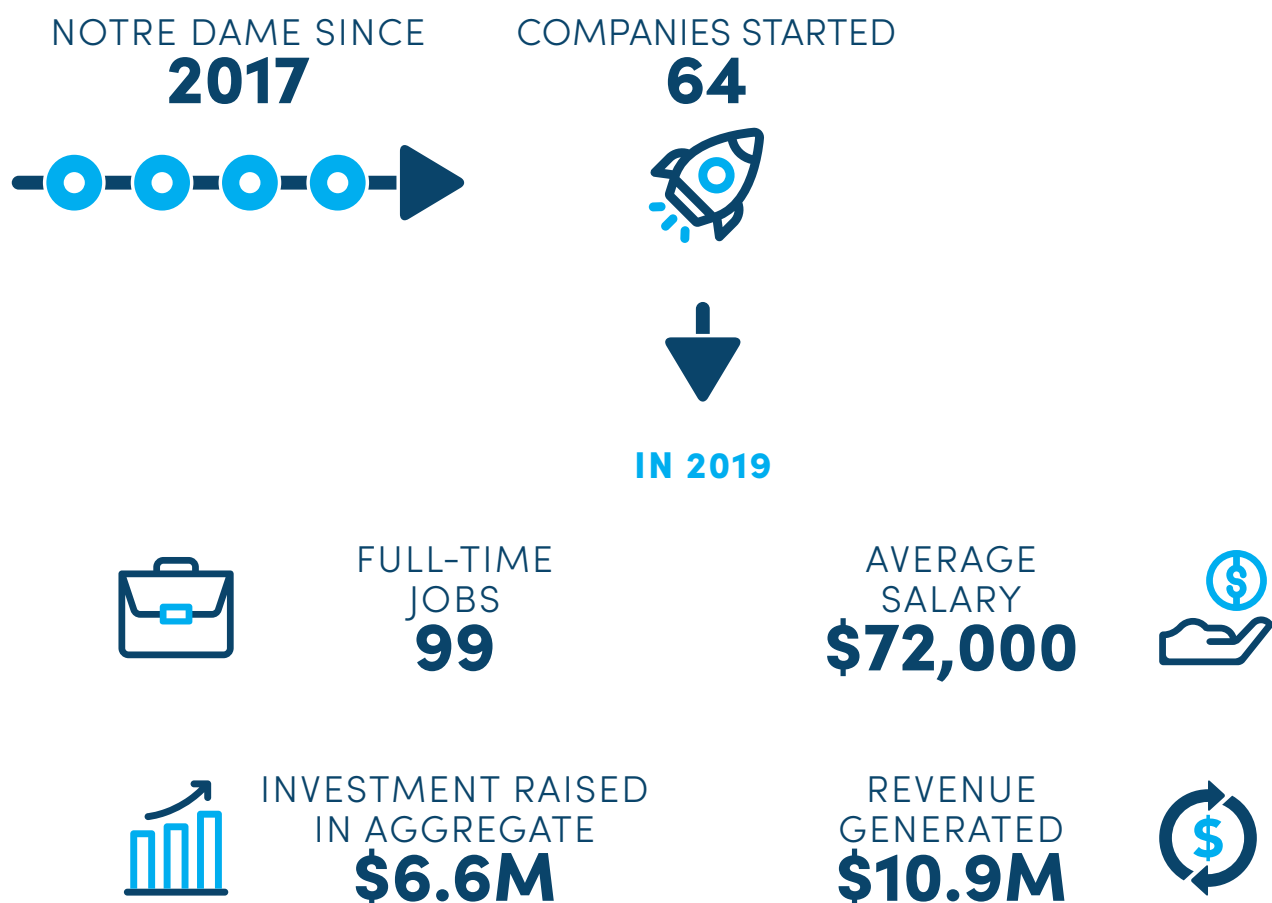
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a university researcher. From there, the university's tech transfer process takes place through six phases spread across three stages: 1) risk assessment, 2) de-risking, and 3) enterprise acceleration. These phases include assessing the innovation's market potential, developing an intellectual property protection strategy, and identifying and partnering with a licensee, be it an existing business or startup.<sup>19</sup>

The IDEA Center's Commercialization Engine also facilitates access to outside funding, including federal grants and venture funding, while directly administering three funding sources. These include the De-Risking Fund, which helps early projects advance such that they can raise start-up capital, and the Venture Fund, which provides such start-up capital to early-stage companies. Additionally, the



*The IDEA Center at the University of Notre Dame*



Commercialization Engine administers the Student Commercialization Grant Program which allows Notre Dame students to pitch for up to \$2,500 in grants to help them test ideas with commercial potential.

Notre Dame students can also access funding through the IDEA Center's McCloskey New Venture Competition. The McCloskey Competition provides more than \$400,000 in prizes to teams pitching new ventures that have generated less than \$500,000 in revenue and raised less than \$500,000 in funding. While the competition is focused on Notre Dame students, teams can include faculty, alumni, and community members provided that a current Notre Dame student is on the team. This serves

as an incentive for Notre Dame faculty and researchers to engage promising students in their own efforts and/or embrace and support the ideas of students.

Notre Dame's rededication to innovation and entrepreneurship has begun yielding quick results. Prior to the IDEA Center opening in 2017, the university launched a total of 33 companies since its 1842 founding. Since 2017, however, Notre Dame has started an additional 64 companies. In 2019, these 64 companies offered 99 full-time jobs paying an average salary of \$72,000 (22% more than the average Indiana salary). These 64 companies also reported raising an aggregate of \$6.6 million in investment and generating \$10.9 million in revenue.<sup>20</sup>

## MOVING TECHNOLOGY TO MARKET

Among the most significant milestones in the tech transfer process, is the decision to actively move a technology to market. Doing so is frequently done with the aid of a graduation facility such as an incubator.

While there are numerous incubators across the country operating using a variety of models, according to one widely-cited study an incubator is “a shared office space facility that seeks to provide...a strategic, value-adding intervention system (i.e. business incubation) of monitoring and business assistance.”<sup>21</sup> This same study notes that when thinking about incubators it is important to focus on the incubator as a physical place as well as a “network of individuals and organizations including the incubator manager and staff, incubator advisory board, incubatee companies and employees, local universities and university community members, industry contacts, and professional services providers such as lawyers, accountants, consultants, marketing specialists, venture capitalists, angel investors, and volunteers.”<sup>22</sup> Indeed, incubators are in essence a hub in which many actors come together to

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*When thinking about incubators, it is important to focus on the incubator as a physical place as well as a network of individuals and organizations.*<sup>22</sup>

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support the development of new ventures in order to increase their likelihood of success.

The first incubator is believed to have been created in Batavia, New York in 1959. While more incubators were founded in the years following, it was not until several developments in the 1980s, including passage of the Bayh-Dole Act, that incubators became a key component of state and local economic development strategies that frequently focus on “job creation, urban economic revitalization, and the commercialization of university innovations.”<sup>23</sup>



### Incubators and Graduation Facilities

#### Incubators and Graduation Facilities at Indiana's Research Universities

To support commercialization of innovations at their respective universities, IU, Purdue, and Notre Dame each support incubators and graduation facilities. However, the way in which the universities go about doing so varies by institution. Reflecting its

more diffuse approach to tech transfer, IU supports graduation facilities throughout the state that are generally operated by organizations that are independent of the university. Conversely, at both Purdue and Notre Dame, the divisions of the universities that oversee tech transfer also directly operate incubators or other graduation facilities.

With campuses throughout the state, IU naturally has relationships with incubators and graduation facilities statewide. These include Dimension Mill in Bloomington, The Union 525 in Indianapolis, the Indiana IoT Lab in Fishers, and WestGate at Crane in Odon. While IU supports each of these facilities financially, none are directly administered by IU. Dimension Mill and the Indiana IoT Lab are independent nonprofit organizations, while The Union 525 is a locally owned for-profit, and WestGate at Crane is part of the Purdue Research Foundation. The university's engagement with these incubators is overseen by IU's Office of the Vice President for Government Relations and Economic Engagement, a division of the university that is distinct from that which oversees tech transfer.

In the life sciences context, IU is more directly involved with the Indiana Center for Biomedical Innovation (ICBI). Through its School of Medicine and, more specifically, CTSI, IU launched the ICBI in 2016 to support the commercialization of healthcare-related discoveries. ICBI is located at IU Health Methodist Hospital, and is comprised of eight laboratories that include a walk-in cold room, a tissue culture room, a microscope room, a room for flow cytometry in addition to office spaces and conference rooms. ICBI is led by an executive team comprised of leadership from CTSI, the IU School of Medicine, and IU Health.

At Purdue, the Purdue Research Foundation manages incubation facilities in West Lafayette at the Purdue Foundry. The Foundry is located in the 143,000 square foot Convergence Center for Innovation and Collaboration on the 400-acre

Discovery Park District on the western edge of Purdue's flagship campus. Outside of West Lafayette, there are Purdue Research Parks in Indianapolis (near the Indianapolis International Airport), Merrillville, New Albany, and WestGate near the Crane Naval Surface Warfare Center. According to the Purdue Research Foundation, its network of Research Parks are "technology-based business incubators designed to create a dynamic entrepreneurial business environment, to attract high-technology companies and to launch new startups."<sup>24</sup> Tenants have access to IT, HR, and marketing support in addition to assistance with commercialization processes as well as a variety of office spaces (co-working, drop-in, and private offices). As a land grant school with a long and successful history educating engineers and other applied scientists, it stands to reason that the mission of the Purdue Research Parks is intrinsically linked to the broader mission of the university.

Notre Dame's Innovation Park serves as its incubator. Innovation Park opened in 2009 with 55,000 square feet of space in which students, researchers, and entrepreneurs can collaborate. Today, Innovation Park takes up 80,000 square feet, serving as the home to over 60 companies and offering a range of services and assets, including wet and dry lab space, prototyping services, and other incubation facilities. In addition to Innovation Park, entrepreneurs working in and around Notre Dame and South Bend can also find incubation services at Ignition Park. Located where the Studebaker plant once stood, Ignition Park is being developed by the City of South Bend to support businesses that outgrow Innovation Park.



## Central Indiana and its Competitor Regions

### Tech Transfer in Central Indiana and its Competitor Regions

While it is clear that IU, Purdue, and Notre Dame have made significant investments in their tech transfer and incubation strategies, the state's primary place of economic activity—Central Indiana—would almost certainly benefit from strengthened and more strategic connections to the innovations resulting from university research. Aside from ICBI, which is focused solely on discoveries coming out of the IU School of Medicine, none of Indiana's R1 universities operate an incubator or other graduation facility in downtown Indianapolis.

In the years ahead, as Indianapolis continues to compete in the tech-driven, global economy, it will likely do so at a disadvantage in that the state's cutting-edge academic research and tech transfer processes generally take place outside of Central Indiana. Indeed, this possibility is perhaps best underscored by the most high-profile national economic development competition in recent memory: the fight for Amazon's HQ2. It is notable that among the 20 cities that were finalists for Amazon's second headquarters Indianapolis was the only city whose metro area does not include the flagship campus for at least one R1 (or equivalent) university.<sup>25</sup>

The presence of the IU School of Medicine in Indianapolis and IUPUI more generally certainly enables the city to create some

linkages between the academic and corporate communities. However, given that Indiana has three R1 universities no more than two- and half-hours away from Indianapolis, it seems as though more could be done to strategically strengthen and formalize ties between the state's primary places of economic and research activity.

Regions with which Indianapolis regularly competes—St. Louis, Pittsburgh, Columbus, Detroit—all have or are developing infrastructure that facilitates connections between major researcher universities and the cities' business communities.

- Located at the Cortex Innovation District, BioSTL drives the St. Louis area's life sciences industry. A critical component of BioSTL's strategy is BioGenerator, which provides capital, lab space, and other support to bioscience researchers and entrepreneurs. While it receives support from corporate and philanthropic partners, BioSTL and BioGenerator was launched by leaders at Washington University in St. Louis in conjunction with Saint Louis University, the University of Missouri–St. Louis, and BJC HealthCare (an area hospital system).<sup>26</sup>
- With both Carnegie Mellon University (CMU) and the University of Pittsburgh (Pitt) located within the city limits, the City of Pittsburgh benefits from an entrepreneurial ecosystem supported by two R1 universities. This ecosystem includes CMU's Project Olympus Incubator Program which has launched 204

companies raising more than \$576 million in funding since the program began in 2007. Meanwhile, Pitt's "Blast Furnace" serves as an accelerator to support student-launched businesses while the university's Institute for Entrepreneurial Excellence serves businesses throughout western Pennsylvania via small business development centers.<sup>27</sup>

- In Columbus, The Ohio State University (OSU) has long been involved with Rev1 Ventures, recently serving as a major investor in a \$15 million life sciences fund. While Rev1 Labs is located on OSU's Science and Technology Campus, OSU is currently in the midst of working with the City of Columbus to develop a new innovation district that will include an interdisciplinary research facility that will provide space to wet lab and computational researchers across 305,000 square feet.<sup>28</sup>
- In 2019, the University of Michigan announced plans to develop the Detroit Center for Innovation. Located 40-some miles away from Michigan's flagship campus in Ann Arbor, the Detroit Center for Innovation serves as a rededication to the state's largest city. With construction planned to commence next year, the Detroit Innovation Center will provide research, educational, and other facilities—including an incubator—over 14 acres with the goal of furthering economic development in Detroit.<sup>29</sup>

Because there is no formal strategy tying university tech transfer efforts to Central Indiana, it can be argued that Indianapolis lags its peers when it comes to realizing the economic impact of tech transfer. An

Indianapolis-focused tech transfer strategy would enable academic researchers to get closer to the market and corporate R&D groups, facilitating clearer views of both market opportunities and what is required for companies to compete in today's fast moving business environments. In other words, new Indianapolis-focused tech transfer strategies should result in wins for the state's universities as well as the state and regional economy.

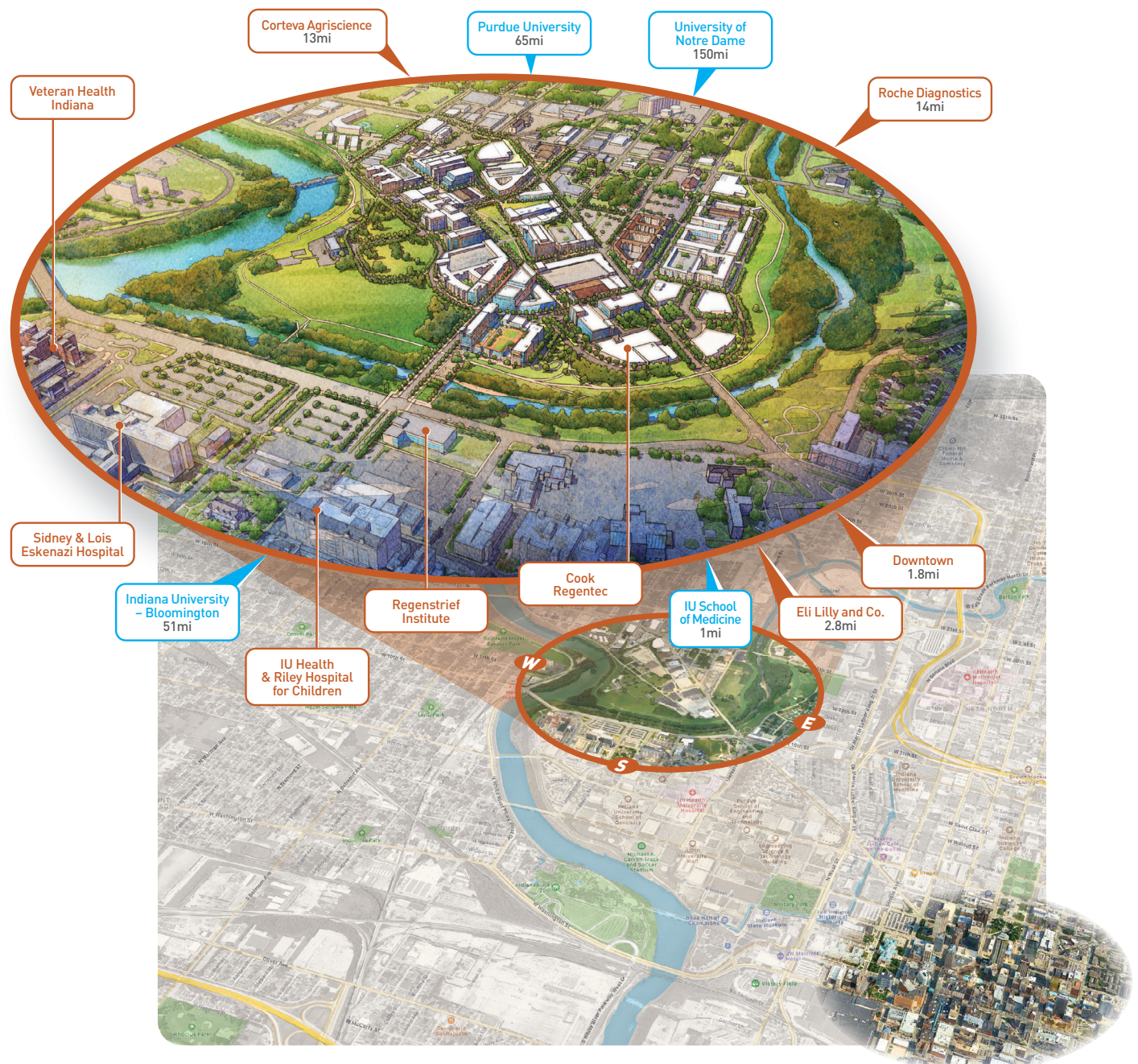
While there are any number of places in or near downtown Indianapolis at which one of Indiana's universities could launch an incubator, 16 Tech provides a natural location for such an initiative. Located on the northwestern edge of downtown, the 16 Tech Innovation District will be a place at which entrepreneurs, researchers, and others collaborate and innovate. Innovation 1, 16 Tech's first building, officially opened this year with the IU School of Medicine, Indiana Biosciences Research Institute, and the Central Indiana Corporate Partnership and its branded initiatives serving as the district's first tenants.

Located near IUPUI, the IU Medical School, and several large hospitals, 16 Tech is a logical place for Indiana University to consider establishing an incubator. With its access to downtown, proximate to the corporate offices of large companies like Eli Lilly, Cummins, Salesforce, Rolls-Royce, and others in R&D intensive industries, there is reason for any researcher from any university, including Purdue and Notre Dame, to want to be near downtown Indianapolis generally, if not 16 Tech specifically.



Even amid a pandemic that raises questions about the future of office buildings, the need remains for life sciences to have physical spaces in which to work, including spaces for new ventures. As recently reported by Bloomberg CityLab, despite COVID-19, there is an ongoing boom in life sciences real estate because medical researchers simply (and obviously) cannot do their work from

home. From 2009 to 2019, the total amount of lab space nationwide increased to 29 million square feet from 17 million square feet. As this demand for lab space continues to grow, new and rehabilitated buildings alike are being constructed to serve both existing and new life sciences ventures—including new life sciences incubators.<sup>30</sup>



## CONCLUSION

While there will likely always be more that could be done to further the impact of tech transfer in Indiana, the state is exceedingly fortunate that IU, Purdue, and Notre Dame have each made significant investments that aid in driving innovation and economic growth. The degree to which such investments have been made can be clearly seen in the outcomes. From the thousands of patents originating at IU to the millions in royalty income generated by Purdue to the rapid increase in the number of startups associated with Notre Dame, it is clear that each university has dedicated time, talent, and funding to drive innovation.

The state is also fortunate that its top-tier universities have a strong history of collaboration, ranging from CTSI, a successful partnership among all three universities in pursuit of biomedical innovation that addresses healthcare challenges, to joint Purdue/Notre Dame Life Sciences “Demo Days,” at which early-stage companies associated with the two universities pitch for funding.

As the state seeks to rebuild its economy following the pandemic-induced recession, it is critical that leadership from all sectors of the economy continue to embrace collaborative approaches to driving innovation—this is particularly true for the life sciences given the unique and resource-intensive nature of life sciences research.

Now, perhaps more than ever before, the importance of and need for redoubled investments in life sciences research is abundantly clear. While the world waits for new treatments for and protections against a novel virus, people who live with unrelated chronic illnesses face disproportionate levels of risk because of COVID-19. As a leader in the life sciences industry with well-regarded and highly successful research universities, Indiana is positioned for growth in the years ahead provided that focus remains on both collaboration and innovation.

## ENDNOTES

- 1 Research universities in the United States are classified via the Carnegie Classification of Institutions of Higher Education. R1 universities award doctoral degrees while carrying out “very high research activity” as measured by research expenditures. More information on Carnegie Classifications can be found online at <https://carnegieclassifications.iu.edu/index.php>.
- 2 In their 2019 fiscal years, IU raised \$680.2 million for research across all campuses, [Purdue raised \\$520.6 million](#), and [Notre Dame raised \\$180.6 million](#).
- 3 AUTM Foundation. (n.d.). Technology Transfer and How It Impacts the World. Accessed at <https://autmfoundation.com/about/technology-transfer-impact/>.
- 4 TEconomy Partners, LLC. (2017). *The Importance of Research Universities: With Examples of their Functional Role and Impacts Within the State of Indiana*.
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- 6 Battelle Technology Partnership Practice. (2003). *Building Indiana’s Knowledge-Based Economy through Investments in Higher Education: Accelerating the University Innovation Engine*. Battelle Memorial Institute.
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- 9 Bayh, B. (2010 Dec. 1). Statement of Senator Birch Bayh on the 30th Anniversary of the Bayh-Dole Act. Retrieved from <https://libraries.indiana.edu/senator-birch-bayh-bayh-dole-act-2010>.
- 10 MIT Technology Licensing Office. (n.d.). *Technology Transfer Process*. Accessed at <https://tlo.mit.edu/learn-about-intellectual-property/technology-transfer-process>.
- 11 According to the Carnegie Classification of Institutions of Higher Education, IUPUI is considered an R2 university. Like R1s, such universities carry-out research, though they generally have fewer people doing so. Ball State University in Muncie, Indiana is also an R2 university.
- 12 Additional information on IU’s tech transfer process is available on the Innovation and Commercialization Office website at <https://research.iu.edu/innovation-commercialization/index.html>.
- 13 Indiana Clinical and Translational Sciences Institute. (2020). 2020 Annual Report: Improving Health from Individuals to Communities. Accessed online at <https://indianactsi.org/about/annualreport/>.

- 14 Martin, S. (2019 July 15). IU recognized again as global leader in patents from U.S. Patent and Trademark Office. Retrieved from <https://news.iu.edu/stories/2019/07/iu/15-international-ranking-patents-received-calendar-year.html>.
- 15 Moses, P. (2019, Sept). Purdue Research Park: World Class Park, Business, Economic Development (PowerPoint Slides). Accessed online at <https://uidp.org/wp-content/uploads/2019/09/UIDP-Academy-Workshop-Innovation-Districts-Research-Parks-Paul-Moses-Purdue-University.pdf>.
- 16 Additional information on Purdue's tech transfer process is available on the Office of Technology Commercialization website at <https://www.prf.org/otc/>.
- 17 Purdue's five standard licenses are described online at <https://www.prf.org/otc/licensing/index.html>.
- 18 Office of Technology Commercialization. (n.d.). OTC Metrics. Accessed at <https://www.prf.org/otc/about/otc-metrics/index.html>.
- 19 Additional information on Notre Dame's tech transfer process is available on the IDEA Center website at <https://ideacenter.nd.edu/commercialization-engine/for-researchers/learn/our-process/the-commercialization-engine/>.
- 20 Swisher, N. (2020 Jan. 16). IDEA Center Launches 32 Startup Companies in 2019. Accessed online at <https://ideacenter.nd.edu/news-events/news/idea-center-launches-32-startup-companies-in-2019/>.
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- 23 Ibid.
- 24 Purdue Research Foundation. (n.d.). Research Parks. Accessed at <https://www.prf.org/researchpark/locations/index.html>.
- 25 Toronto was the only non-US HQ2 finalist and, as such, is not home to an R1 university because the Carnegie Classification used to classify universities applies only to US-based institutions. However, the University of Toronto is generally considered to be among the world's best universities and would almost certainly meet the R1 standard if it were in the United States.
- 26 Additional information on BioGenerator is available online at: <https://biogenerator.org>.
- 27 Additional information on CMU's Project Olympus is available online at: <https://www.cmu.edu/swartz-center-for-entrepreneurship/education-and-resources/project-olympus/>. More on Pitt's efforts is available at: <https://www.innovation.pitt.edu/>.
- 28 More information on Rev1 Ventures and Rev1 Labs is available at <https://www.rev1ventures.com> while more on OSU's new innovation district can be found at <https://www.osu.edu/the-ohio-state-university-environments/innovation-district/>.



- 29 Additional information on the Detroit Center for Innovation can be found at: <https://detroitcenterforinnovation.com/>.
- 30 Sisson, P. (2020 Sept. 15). Here Comes the Life Sciences Land Rush. *Bloomberg CityLab*. Accessed at <https://www.bloomberg.com/news/articles/2020-09-15/life-sciences-labs-are-hot-covid-era-real-estate>.









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