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UNIVERSITY CITY SCIENCE CENTER

**AN ECONOMIC CATALYST FOR
GREATER PHILADELPHIA**



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THE ECONOMY LEAGUE OF GREATER PHILADELPHIA AND ECONCONSULT SOLUTIONS.



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The Economy League is a civic catalyst that brings together leaders and organizations to address the most challenging issues facing Greater Philadelphia. Built on our foundation of independent, high-quality analysis and practical insight, we spark new ideas, develop strategies, and galvanize action to enhance the region's global competitiveness. Learn more at economyleague.org.



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INTRODUCTION

The University City Science Center has been a key driver of growth and a source of stability for the Greater Philadelphia region's technology sector since its founding in 1963. A dynamic hub for innovation, entrepreneurship and technology development, the Science Center offers programs that provide support for firms at all stages of the business life cycle. Over the past half-century, the Science Center has leveraged its diverse suite of targeted programs and initiatives alongside its considerable portfolio of office and lab space to help power University City's ongoing evolution into a leading hub for innovation.

THE 442 LIFE SCIENCES, HEALTH IT, AND EMERGING TECHNOLOGY FIRMS THAT HAVE ORIGINATED AT, PASSED THROUGH, OR RECEIVED INCUBATION SERVICES FROM THE SCIENCE CENTER SINCE ITS INCEPTION HAVE CREATED THOUSANDS OF JOBS, GENERATED MILLIONS OF DOLLARS IN EARNINGS, AND CONTRIBUTED BILLIONS OF DOLLARS TO GREATER PHILADELPHIA'S ECONOMY.

Flanked by world-class research institutions and hospitals, including the University of Pennsylvania, Drexel University, and The Children's Hospital of Philadelphia, the Science Center is rooted in the spirit of collaboration and community building. Its 31 shareholders include colleges, universities, and research institutions in Pennsylvania, New Jersey, and Delaware that value and support the Science Center's contribution to moving ideas to the marketplace. With shareholders as far north as Lehigh University and as far south as Delaware State University, the Science Center's impact as a community builder extends beyond University City to the Greater Philadelphia region.

Today, the Science Center is at an inflection point. Through a partnership with Wexford Science + Technology, it is significantly expanding its physical assets and rebranding them as uCity Square. The

Science Center name endures and refers to its work as a tech-based economic development organization. This milestone offers a logical vantage point from which to examine the Science Center's economic impact and its decades of work supporting innovation and entrepreneurship in the region.

In its role as an innovation intermediary, the Science Center supports innovation all the way from idea to IPO and beyond through an expansive range of programming, support services, and infrastructure. The 442 life sciences, health IT, and emerging technology firms that have originated at, passed through, or received incubation services from the Science Center since its inception have created thousands of jobs, generated millions of dollars in earnings, and contributed billions of dollars to Greater Philadelphia's economy.



Above: Employees of Angle plc, at work in their lab in the Science Center's Port business incubator.

THE REGIONAL ECONOMIC IMPACT OF SCIENCE CENTER INCUBATION SERVICES

SCIENCE CENTER INCUBATOR RESIDENT AND GRADUATE FIRMS EMPLOY 12,000 PEOPLE IN GREATER PHILADELPHIA.

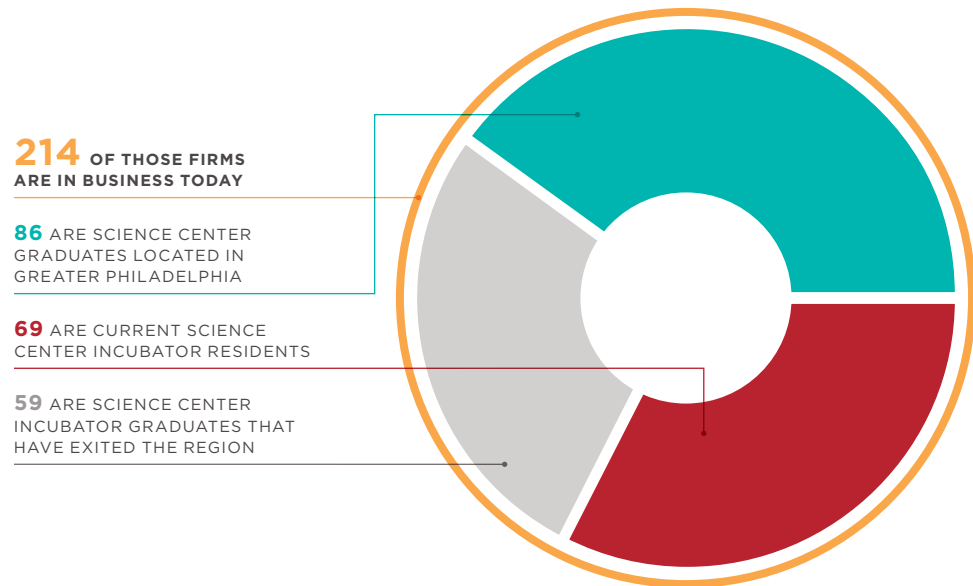
Today, the 155 firms in Greater Philadelphia that have benefited from Science Center business incubation services directly employ 12,000 people.¹

Jobs at firms incubated at the Science Center are high-skilled and high-wage, commanding an average salary of \$103,000—nearly double the region’s median annual wage of \$52,000.² Combined, these jobs pay \$1.4 billion in salaries and wages each year.

SCIENCE CENTER INCUBATOR GRADUATE AND RESIDENT FIRMS SUPPORT A TOTAL OF 40,000 JOBS IN GREATER PHILADELPHIA, OR ONE OUT OF EVERY 100 JOBS IN THE REGION.

Each job at a Science Center-incubated resident or graduate firm indirectly supports additional jobs. Adding the 12,000 people in the region directly employed by Science Center incubator graduates and resident firms to the estimated number of people who work at businesses that contract with or otherwise serve these firms or their employees results in a total regional employment impact of 40,000 jobs—just over 1% of the region’s workforce. These jobs pay \$3.7 billion in salaries and wages each year.

THE SCIENCE CENTER HAS PROVIDED INCUBATION SERVICES TO 442 FIRMS SINCE IT WAS ESTABLISHED IN 1963.



12,000 PEOPLE WORK AT SCIENCE CENTER INCUBATOR RESIDENT AND GRADUATE FIRMS IN GREATER PHILADELPHIA

28,000 JOBS IN THE REGION ARE INDIRECTLY SUPPORTED BY SCIENCE CENTER-INCUBATED FIRMS AND THEIR EMPLOYEES

40,000 TOTAL EMPLOYMENT IMPACT

\$3.7 BILLION IN SALARIES AND WAGES

SCIENCE CENTER-INCUBATED FIRMS IN GREATER PHILADELPHIA DRIVE \$12.9 BILLION IN ANNUAL ECONOMIC ACTIVITY—MORE THAN 2% OF THE REGION’S TOTAL ECONOMIC OUTPUT.

The total economic activity in Greater Philadelphia directly and indirectly supported by the Science Center’s business incubation efforts is equal to \$12.9 billion, or 2.2% of the region’s total economic output. Direct economic activity generated by the 155 Science Center incubator resident and graduate companies in the region totals approximately \$7.1 billion each year. The labor-intensive work and expensive equipment and materials used by Science Center resident and graduate firms and businesses within their supply chains translate into a significant overall economic contribution.

ANNUAL OUTPUT OF SCIENCE CENTER BUSINESS INCUBATION IN GREATER PHILADELPHIA

\$12.9 BILLION

TOTAL OUTPUT



\$103K

WAGE IMPACT

\$103,000
AVERAGE SALARY

JOBS AT SCIENCE CENTER-INCUBATED FIRMS ARE HIGH-SKILLED AND HIGH-WAGE, COMMANDING AN AVERAGE SALARY OF \$103,000—NEARLY DOUBLE THE REGION’S MEDIAN ANNUAL WAGE OF \$52,000.

¹ In-region businesses include active incubator residents and graduates as well as graduate firms that were purchased or merged and still operate in the region.

² U.S. Bureau of Labor Statistics, 2014.



THE SCIENCE CENTER'S CONTRIBUTION TO REGIONAL ECONOMIC DEVELOPMENT

The Science Center has long been known for its ability to complement University City's cluster of world-class academic and medical institutions by helping entrepreneurs and startup companies translate cutting-edge research into market-ready products and services.

According to the Brookings Institution, the Science Center has been a driving force behind the area's progress in "leveraging its assets in teaching, research, and medicine to become a hub of innovation and entrepreneurship."³ Today, Brookings recognizes University City as one of the nation's leading Innovation Districts—"geographic area[s] where leading-edge anchor institutions and companies cluster and connect with startups, business incubators and accelerators."

The Science Center's business support services, commercialization and entrepreneurship initiatives, incubation programs, and community-building contributions play a critical role in helping firms navigate the early stages of growth. This support paves the way for significant regional economic growth and breakthrough advances that help save and improve lives around the globe.

Globalization has increasingly made the generation of new ideas the cornerstone of a thriving, sustainable economy. Goods can be manufactured at a low cost nearly any place in the world, making innovation the primary means of creating value and growth in developed economies. In fact, economists attribute nearly 50% of annual GDP growth in the U.S. to increases in innovation.⁴ In metropolitan areas, business growth and wealth creation will be driven by talent and innovation that build on regional cluster strengths and competitive advantages.

The innovation ecosystem is a critical part of Greater Philadelphia's economy. Area firms in the life sciences and technology sectors sell to national and global markets, serving as a reliable and consistent source of economic stability. The resiliency of the region's biomedical cluster—a major component of the area's innovation economy—was demonstrated during the major economic upheaval of 2008–2009. In the wake of the Great Recession, employment within the industry cluster shrank by 16 percent, as market-driven consolidation within the pharmaceutical industry put many jobs in the region at risk.^{5,6} While the recession did reshape the region's biomedical landscape, by 2014 area employment in the industry rebounded to pre-recession levels. This remarkable recovery was aided by support provided by innovation intermediaries like the Science Center, which continues to occupy an essential position within Greater Philadelphia's economic development landscape.



ECONOMIC IMPACT

\$12.9 BILLION

**SCIENCE CENTER-
INCUBATED FIRMS
IN GREATER
PHILADELPHIA
DRIVE \$12.9 BILLION
IN ANNUAL ECONOMIC
ACTIVITY.**

³ Katz, Bruce and Wagner, Julie. "The Rise of Innovation Districts: A New Geography of Innovation in America." The Brookings Institution. May 2014.

⁴ Hamilton Project at the Brookings Institution. "A Dozen Economic Facts about Innovation."

⁵ "Industry Profiles—BioMedical." Philadelphia Works, Inc.

⁶ "The Greater Philadelphia Life Sciences Cluster 2009: An Economic and Comparative Assessment." Milken Institute.

HELPING MOVE THE REGION FORWARD

The Science Center’s focus on catalyzing commercialization and supporting entrepreneurs helps fill an important gap within the early phases of a new business and aligns directly with region-wide economic development strategies endorsed by key civic and economic development organizations across Greater Philadelphia. The Economy League of Greater Philadelphia, the Greater Philadelphia Chamber of Commerce, and the CEO Council for Growth, along with other mission-driven organizations including the Philadelphia Education Fund, all work to advance regional agendas that place an emphasis on efforts that support entrepreneurial activity and drive innovation.

The Science Center directly supports these economic development objectives, specifically in the realms of business growth and talent development, by leveraging regional competitive advantages—namely Greater Philadelphia’s life science/health care clusters and world-class research institutions—to attract long-term investment and unlock regional economic prosperity through five primary approaches:



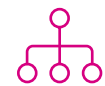
BUSINESS INCUBATION

HELPING ENTREPRENEURIAL COMPANIES GROW AND THRIVE



CONNECTIONS TO CAPITAL

ENHANCING REGIONAL TECHNOLOGY TRANSFER CAPABILITY AND INCREASING AVAILABILITY OF GROWTH CAPITAL



COMMUNITY BUILDING

EXPANDING GREATER PHILADELPHIA’S INNOVATION COMMUNITY



EDUCATION AND WORKFORCE DEVELOPMENT

BUILDING A PIPELINE OF SPECIALIZED KNOWLEDGE WORKERS WITHIN STEM INDUSTRIES



INFRASTRUCTURE FOR INNOVATION

PROVIDING THE PHYSICAL ASSETS THAT ALLOW INNOVATION CLUSTERS TO FLOURISH

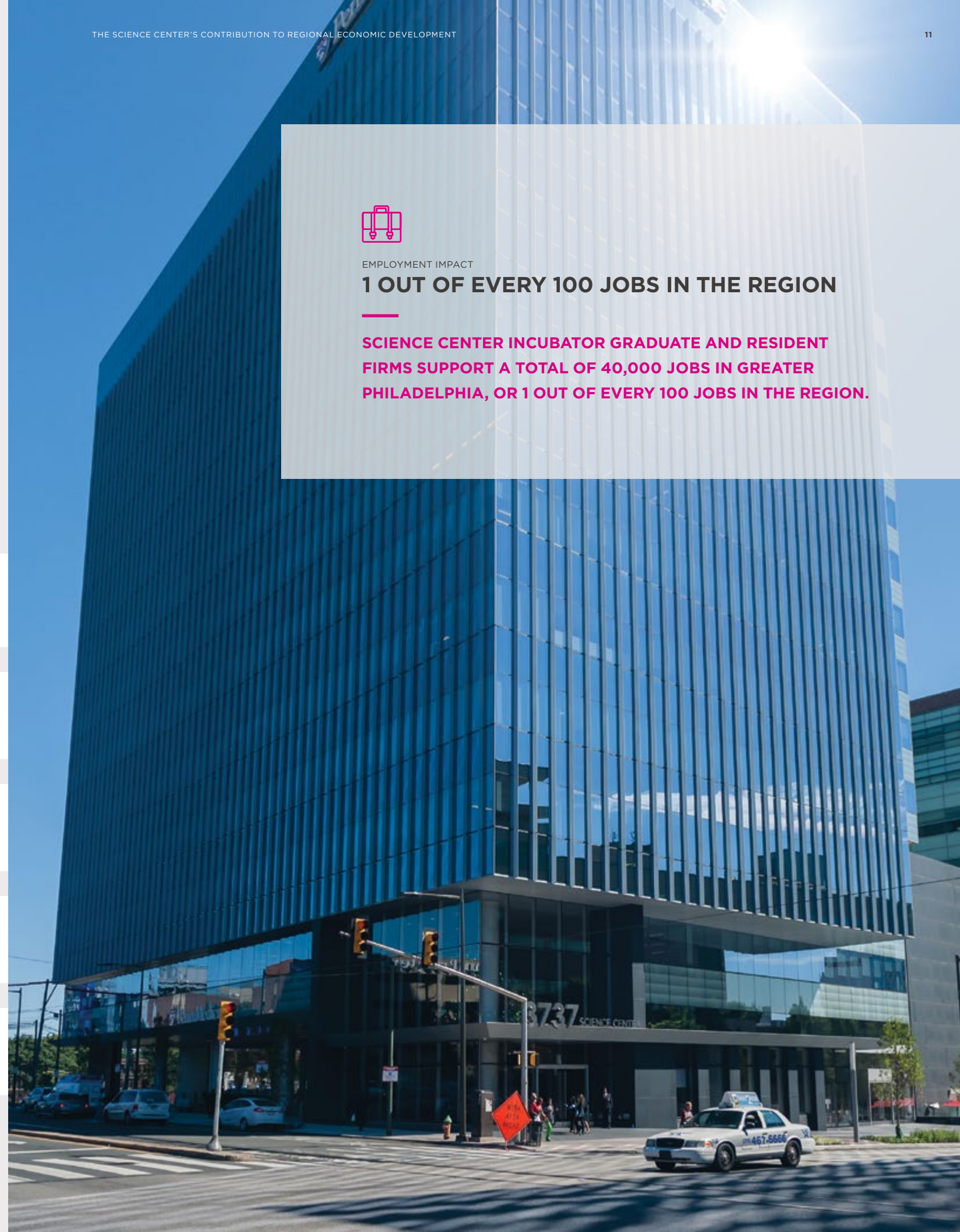
Right: 3737 Market Street is home to organizations including Penn Medicine University City and Spark Therapeutics.



EMPLOYMENT IMPACT

1 OUT OF EVERY 100 JOBS IN THE REGION

SCIENCE CENTER INCUBATOR GRADUATE AND RESIDENT FIRMS SUPPORT A TOTAL OF 40,000 JOBS IN GREATER PHILADELPHIA, OR 1 OUT OF EVERY 100 JOBS IN THE REGION.



BUSINESS INCUBATION

Since the Science Center was founded in 1963, it has provided business incubation services to 442 firms. **Today, 214 of these firms are still in operation, with 155 located within the 11-county Greater Philadelphia region.**^{7, 8} The Science Center’s incubation services help early-stage companies bridge the “valley of death”—the period of negative cash flow that startups often endure before their product brings in revenue from customers. For startups in the life sciences sector, long and capital-intensive research and development processes, high dependence on external federal processes and limited availability of venture capital make the journey through this stage of growth particularly difficult to navigate. Tech startups face many similar challenges in seeking investment, finding the right people, and determining how best to scale the business.



Helping Global Innovators Find a Home in Greater Philadelphia

THROUGH THE PORT BUSINESS INCUBATOR’S GLOBAL SOFT LANDING PROGRAM, the Science Center increases the global profile of Greater Philadelphia’s life sciences and technology assets. The Science Center leverages connections and partnerships with agencies and organizations including the U.S. Department of Commerce’s Economic Development Administration, the Commonwealth of Pennsylvania’s Department of Community and Economic Development, and Select Greater Philadelphia to help international companies establish a foothold in the region. The success of the Global Soft Landing program has led the International Business Innovation Association (InBIA) to designate the Port incubator as an InBIA Soft Landings International Incubator for its work helping international companies enter the local market. The Port is one of only 27 business incubation programs around the world that have earned this designation.

The Science Center’s **Port** business incubator supports entrepreneurial activity by providing emerging ventures with office and lab space as well as the connections to expertise and capital they need to succeed and grow. Formally established in 2000, the Port gave name to the incubation services the Science Center had been offering for decades. Today the Port is home to a rotating roster of more than 30 startups. The Port is complemented by **ic@3401**, a newer incubation program that the Science Center operates in partnership with Drexel University, which accommodates approximately 30 additional early-stage companies.

Through both the Port and ic@3401, innovators are connected to expertise, capital, and networks including the Science Center staff and board of directors, investors, attorneys, accountants, marketing companies and media outlets. Combined, these resources provide a platform for early-stage ventures to grow and generate downstream benefits for the region’s economy in the form of jobs, salaries and wages, tax revenues, and economic growth.

Below: The Science Center is located along the Market Street corridor in West Philadelphia.



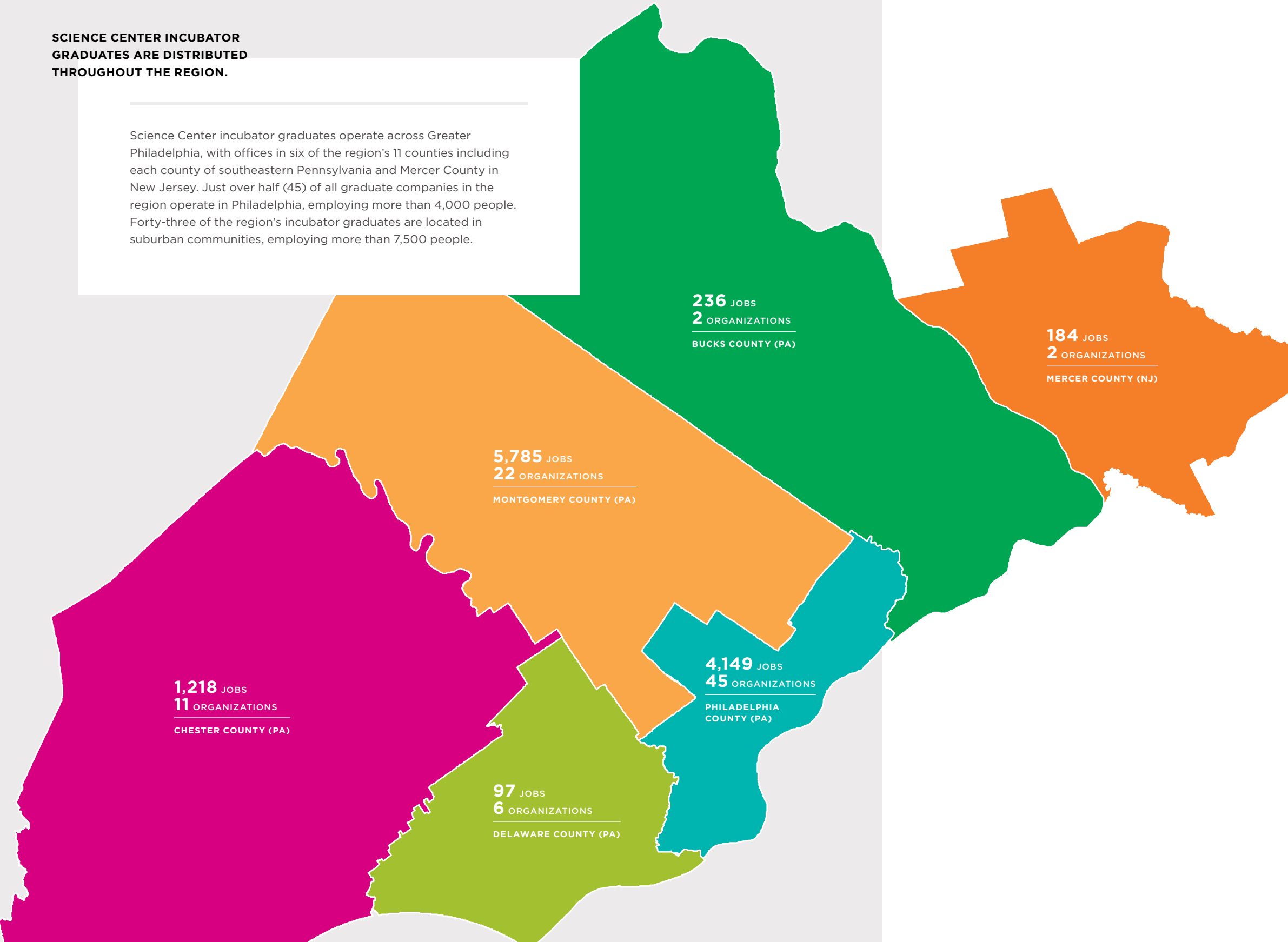
FISCAL IMPACT
\$55 MILLION

EMPLOYEES OF SCIENCE CENTER-INCUBATED FIRMS PAY \$20 MILLION IN PHILADELPHIA WAGE TAXES AND \$35 MILLION IN PENNSYLVANIA INCOME TAXES EVERY YEAR.

⁷ The Greater Philadelphia region includes 11 counties in three states: New Castle County in Delaware; Burlington, Camden, Gloucester, Mercer, and Salem Counties in New Jersey; and Bucks, Chester, Delaware, Montgomery, and Philadelphia Counties in Pennsylvania.
⁸ The 155 in-region companies include 86 incubator graduates and 69 incubator residents.

SCIENCE CENTER INCUBATOR GRADUATES ARE DISTRIBUTED THROUGHOUT THE REGION.

Science Center incubator graduates operate across Greater Philadelphia, with offices in six of the region's 11 counties including each county of southeastern Pennsylvania and Mercer County in New Jersey. Just over half (45) of all graduate companies in the region operate in Philadelphia, employing more than 4,000 people. Forty-three of the region's incubator graduates are located in suburban communities, employing more than 7,500 people.



Accommodating Established Companies in University City

NOT EVERY COMPANY NEEDS dedicated incubation services. The Science Center has attracted established companies in a variety of sectors that also have a positive impact on the regional economy and innovation ecosystem. These firms choose to locate at the Science Center to accommodate worker location preferences, to facilitate access to collaborators, and to tap into the robust innovation ecosystem that the Science Center has cultivated over the last five-plus decades. Moving forward, the expansion and rebranding of the Science Center's physical footprint as uCity Square will present even more opportunities to attract major established life sciences and tech companies.

Drawing on two decades of gene therapy research at The Children's Hospital of Philadelphia, **Spark Therapeutics** is developing potentially one-time, life-altering treatments for debilitating genetic diseases, from hematologic and neurodegenerative disorders to blindness. When it was time to select a location for its offices and labs, Spark—which was not incubated at the Science Center—nonetheless chose 3737 Market Street on the Science Center's legacy campus, where its more than 125 employees occupy two floors. Since its 2013 launch, Spark has secured more than \$400 million, including one of the most successful initial public offerings of 2015. Spark Therapeutics contributes to the high density of startup talent, experience, and collaborative community at the Science Center.

Another established company on the Science Center legacy campus, **NRG Energy** is transforming the way Americans consume power by offering its customers the ability to choose specific power plans and generate savings based on their energy preferences and needs. Energy Plus was among the first tenants in 3711 Market Street and was acquired by NRG Energy, Inc. in 2011. NRG Energy chose to stay in the building and now occupies an entire floor of 3711 Market Street, with 150 employees including management, sales, marketing, customer service, legal, and IT staff.

CASE STUDY:

ADAPTIMMUNE AND THE SCIENCE CENTER

Helping global innovation find a home in Greater Philadelphia.

In 2011, UK-based biopharmaceutical company Adaptimmune was ready to enter its cancer immunotherapy products into clinical trials and establish a U.S. office. Executive Vice President Gwendolyn Binder-Scholl, Ph.D., selected the Science Center's Port business incubator as the landing place for the growing firm. Since then, Adaptimmune has established key partnerships, completed a successful IPO, and graduated from the incubator. As Adaptimmune's growth continues, the company is committed to expanding its presence in Philadelphia.

KEY TAKEAWAYS

Support services facilitated by the Science Center allowed the two-person U.S. headquarters of Adaptimmune to get off the ground.

Adaptimmune participated in the Global Soft Landing Program, which helps international companies establish a foothold in the region's life sciences and technology markets.

The Science Center's location gave Adaptimmune access to collaborators.

After exiting the Port in 2015, Adaptimmune chose to remain in Philadelphia—a testament to the region's strong bioscience sector.

"THEY PROVIDED ALL OF THE SUPPORTING RESOURCES SO WE COULD JUST GET TO WORK."

—GWENDOLYN BINDER-SCHOLL, Ph.D., EXECUTIVE VICE PRESIDENT, ADAPTIMMUNE

With a prior connection to the University City bioscience community from a three-year stint researching T-cell receptors at the University of Pennsylvania under Professor Carl June, Dr. Binder-Scholl saw Philadelphia as the clear choice when she was asked to find a home for Adaptimmune's expansion into the U.S. in 2011. Dr. Binder-Scholl notes that "the convenient location between New York and Washington, DC makes it easier to participate in investor meetings, regulatory meetings, and conferences." Dr. Binder-Scholl had evaluated the Science Center as a place to locate research operations; she was "very attracted by the plug-and-play nature from a laboratory as well as an office space perspective."

Adaptimmune's U.S. office initially consisted of Dr. Binder-Scholl and an administrative assistant. After moving the two-person team into the Science Center, Dr. Binder-Scholl found it "extremely helpful to have the infrastructure support and to be around other entrepreneurs who

provided moral support." Because of its overseas affiliation, Adaptimmune was qualified to enter the Science Center's Global Soft Landing Program, a specialized designation within the Port business incubator that supports emerging international companies as they establish footholds in the U.S. market.

As Adaptimmune's U.S. team grew to 25 employees, the Port's flexible infrastructure coupled with business services—including connecting the company to human resources, accounting, and legal assistance—provided continued support. Dr. Binder-Scholl explains, "They provided all of the supporting resources so we could just get to work." The Philadelphia bioscience community, Dr. Binder-Scholl says, "is growing, and almost every month there's some sort of meetup in the city where you can get educated." She cited examples including the Science Center's Lunch for Hungry Minds program, which "focused on a different scientific topic each month,

which helped us keep our minds open to other fields," as well as law firm Pepper Hamilton, which "routinely held helpful corporate and regulatory law briefings."

As Adaptimmune's initial landing place, the Science Center played a key role in the company's trajectory of growth. Once Adaptimmune reached a certain stage of development, the company exited the Port but has remained in Philadelphia at the Navy Yard—a sure sign of the region's healthy bioscience sector.

Dr. Binder-Scholl believes in the continued success of the Greater Philadelphia region's life sciences hub, saying "the affordability and access to a strong workforce adds to our region's competitiveness to attract life sciences companies." She further explains, "In Philadelphia you are going to see continued growth of biotech. We are very happy to be in Philadelphia." ■



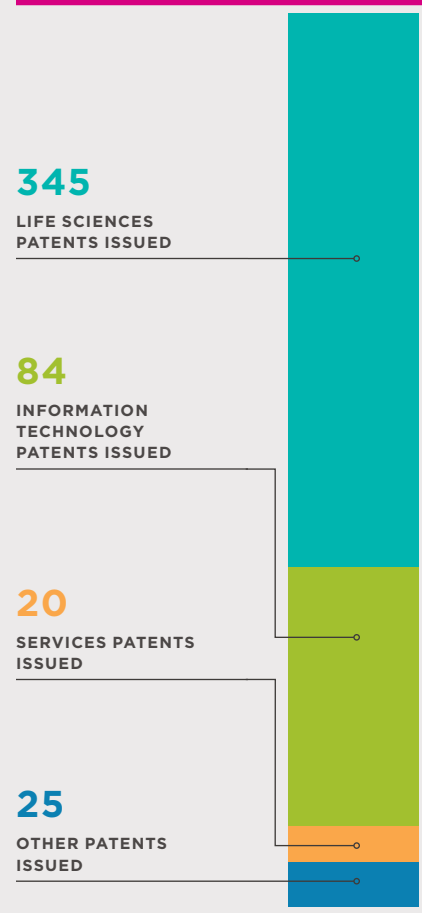
CONNECTIONS TO CAPITAL

Helping entrepreneurs and researchers access funding and navigate the commercialization process is at the heart of the Science Center’s mission. Through partnerships with universities, hospitals, and investors—as well as through targeted programming—the Science Center helps connect early-stage firms to capital. This is critical to driving business growth and wealth creation at the regional level. As the Economy League’s World Class Agenda acknowledges, “focusing on maintaining and growing strategic early-stage and proof-of-concept funds can help to leverage later-stage investments and generate more innovation and entrepreneurial success stories.”⁹

Patents Issued to Science Center-Incubated Firms in the Region

PATENTS ARE A FORM OF INTELLECTUAL PROPERTY. The region’s innovation capacity can be assessed in part by determining the number of patents granted to area researchers, institutions, and firms. They represent the ability to generate new products with market potential and indicate the nature of the region’s pool of entrepreneurs. For intellectual property-driven fields like biotechnology, patents often are the launching pad for a startup firm, attracting venture capital and securing licensing rights. By connecting entrepreneurs to the expertise required to navigate the patent process, the Science Center accelerates the launch of these new companies.

474 PATENTS ISSUED SINCE 1963



The **QED** Proof-of-Concept program offers funding and business development support for early-stage life science and digital health technologies with commercial potential. Twenty-one of the region’s premier academic research institutions are involved in the program and provide matching funds. Firms from across the region are represented on the program’s selection and advisory teams. Since 2010, QED has awarded more than \$4.8 million to researchers to help develop technologies into market-ready products.

Phase 1 Ventures (PIV) helps entrepreneurs test the business feasibility of high potential technology in a low-risk environment. PIV bridges the gap that occurs when a technology is ready to enter the market but has yet to attract management or financing. Ultimately the goal is for companies to graduate from PIV as investible, independently managed enterprises that generate jobs and economic growth.

Launched in 2014, the **Digital Health Accelerator** (DHA) supports early-stage digital health companies with funding, office space, professional mentorship and introductions to key healthcare stakeholders in the Greater Philadelphia region. The seven companies in the inaugural DHA class have gone from prototype to commercialization, attracting almost \$4 million in follow-on investment, generating revenue, and creating 53 new jobs in just one year.

QED, PIV and the DHA help bridge the gap between research and commercially viable innovations. Together, these programs work to accelerate tech transfer and innovation by increasing the attractiveness of emerging technology and early-stage companies for follow-on investment by public and private investors. This activity is important to regional growth—according to the CEO Council for Growth, “in today’s knowledge-based economy, technology transfer is a critical element of regional economic development, providing a mechanism for leveraging university research to promote industry growth.”¹⁰

“FOCUSING ON MAINTAINING AND GROWING STRATEGIC EARLY-STAGE AND PROOF-OF-CONCEPT FUNDS CAN HELP TO LEVERAGE LATER-STAGE INVESTMENTS AND GENERATE MORE INNOVATION AND ENTREPRENEURIAL SUCCESS STORIES.”

—WORLD CLASS GREATER PHILADELPHIA BUSINESS GROWTH AGENDA



⁹ “World Class Agenda.” Economy League of Greater Philadelphia, 2013.
¹⁰ “Technology Transfer and Commercialization in Greater Philadelphia.” CEO Council for Growth, 2014.

CASE STUDY:

INVISIBLE SENTINEL AND THE SCIENCE CENTER

Connecting residents to mentors and talent in the innovation ecosystem.

It's all about the power of the network. Nick Siciliano, CEO of Invisible Sentinel, began his career as a consultant for his undergraduate mentor's Science Center-based company, Integral Molecular. Today, the molecular diagnostics company that he founded with partner Ben Pascal in 2006 shares the 9th floor of 3711 Market Street with Integral Molecular, another graduate of the Port business incubator. While Invisible Sentinel was initially attracted to the Science Center because of this early relationship, the company has remained due to the value of the connections and exposure provided by the Science Center. **Situated within an ecosystem of scientists, engineers, and entrepreneurs, Invisible Sentinel regards their Science Center location among University City's pool of talent and mentors as "the epicenter of biotechnology in the Philadelphia region."**

KEY TAKEAWAYS

■ **The Science Center helped Invisible Sentinel** secure state funds to support R&D and manufacturing operations through the Commonwealth of Pennsylvania's Redevelopment Assistance Capital Program.

■ **While Invisible Sentinel was exploring new opportunities** to bring its molecular diagnostic technology to market, the Science Center connected the company to mentors who could provide real-world experience.

■ **The Science Center facilitated introductions** to government officials and the media.

■ **When Invisible Sentinel outgrew the Port,** they made the decision to remain at the Science Center in dedicated space—the sixth company to do so in six years.¹¹

"ICONS IN THE INDUSTRY MAKE UP OUR EXECUTIVE COMMITTEE. WE WOULD NOT HAVE THE PRIVILEGE OF WORKING WITH THEM WITHOUT THE EARLY EXPOSURE THAT THE SCIENCE CENTER FACILITATED."

—NICK SICILIANO, CEO, INVISIBLE SENTINEL

In 2006, Nick Siciliano and Ben Pascal established Invisible Sentinel at the Science Center's Port business incubator with the vision of designing rapid, easy-to-deploy, and affordable molecular diagnostics technology to detect pathogens that cause illness in hospitals and other clinical settings. Regulatory hurdles and mandatory clinical trials made commercialization in health care settings expensive and time consuming. These time and cost requirements proved to be barriers to enter the clinical marketplace. These setbacks, coupled with the difficulty of raising capital during the downturn of the economy in 2008–2009, led the young entrepreneurs to pivot and seek alternatives to clinical applications.

Throughout these early-stage challenges, the Science Center's Port business incubator was there to help. Science Center staff facilitated connections to business service providers who assisted the company with establishing its R&D facility at the Port in 2009. While Invisible Sentinel was going through an exploratory process to find other industries to apply their technology, the Science Center provided the exposure that helped attract experienced professionals to advise the company. Many of these relationships continue

to this day. Indeed, Invisible Sentinel's Executive Chairman Paul Touhey is the former CEO of FujiRebio Diagnostics, Inc., and a former member of the Science Center's Board of Directors. As Siciliano explains, "Icons in the industry make up our executive committee. We would not have the privilege of working with them without the early exposure that the Science Center facilitated."

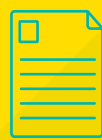
A sweeping food safety regulatory change in 2011 offered an opportunity for Invisible Sentinel to pivot their product into food safety. The Food Safety Modernization Act emphasized science-based preventative controls to achieve higher food safety standards. Invisible Sentinel established their products to detect foodborne pathogens and improve the quality of wine and beer in a way that was easy to deploy and simple to interpret. The success of the simple molecular diagnostics tool launched the expansion of Invisible Sentinel's manufacturing facility for food diagnostics at the Science Center in mid-2012. Invisible Sentinel now works with popular wine and beer manufacturers including Jackson Family Wines, Victory Brewing Company, and Yards Brewing Company. The company's growing

global reach, with new customers in Europe, South America, and Australia and New Zealand, helps strengthen Greater Philadelphia's export market.

The founders of Invisible Sentinel were able to bring the company from concept to commercialization with the support of the Science Center. By August 2014, the company graduated from the Port and relocated its headquarters and manufacturing facility to a larger custom-built, dedicated space in the same building, where they doubled their number of employees from 2014 to 2015 and are projected to double their company size again in 2016. The Science Center leveraged state funds through the Redevelopment Assistance Capital Program, allowing Invisible Sentinel to triple the size of their manufacturing facilities in support of high-priority manufacturing job growth initiatives.

Invisible Sentinel is dedicated to growing their business in the region, says Chief Business Officer Ben Pascal. "We're proud to be a Science Center resident and we've made a commitment to the City of Philadelphia. The region has been good for us, and we see no need to change a winning formula!" ■

¹¹ The six companies that have graduated from the Port and elected to stay at the Science Center include Avid Radiopharmaceuticals, Bio Nano Genomics (since moved to California), Integral Molecular, Invisible Sentinel, Optofluidics and Pulsar Informatics.



COMMUNITY BUILDING AND WORKFORCE DEVELOPMENT

The Science Center occupies a key role in cultivating and nurturing the region's innovation community, helping bring together researchers, academic administrators, entrepreneurs, public and private investors, and many other key stakeholders.

Below: A networking component is built into all Quorum programs and events.

Right: Middle school students participate in a lab tour with a FirstHand mentor from Invisible Sentinel.



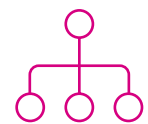
Quorum, the entrepreneurs clubhouse, convenes the members of the region's innovation ecosystem via programmed events, informal meetups and a coworking lounge. Quorum was established in response to the need for dedicated space for organized workshops, trainings, and networking as well as informal conversations and interactions identified in the CEO Council for Growth's 2007 *Accelerating Technology Transfer in Greater Philadelphia* report prepared by the Economy League.

Today, Quorum is the first introduction to the Science Center for many, offering programming and events that draw in more than 8,500 people a year. Early-stage companies including Hootboard, Setvi, Colabination, and Generocity have touched down in Quorum and used its free coworking space while they ramped up operations.

With an eye towards long-term workforce development, the Science Center's **FirstHand** initiative uses art and design to spark middle-school students' interest in science,

technology, engineering, and math (STEM) disciplines. FirstHand provides opportunities for students from under-resourced area schools to design experiments, test hypotheses and develop projects to present to the community. Participants work side-by-side with scientists and researchers at Science Center resident companies, gaining exposure to career opportunities and mentorship from professionals whom they otherwise would not be able to reach. In 2015, nearly 600 students participated in more than 3,300 hours of FirstHand programming, and 31 scientists from 15 Science Center resident companies mentored students in their company labs.

This kind of coordinated effort to prepare workers for employment in STEM fields is critical to increasing living standards and promoting opportunity in the region over the long term. Personal experience in a lab environment working on exciting and creative science and technology projects helps spark interest in STEM fields among students and educators at under-resourced schools, which in turn will help build the regional STEM workforce pipeline.



CASE STUDY:

AVID RADIOPHARMACEUTICALS AND THE SCIENCE CENTER

Providing space to grow, a place to convene, and connections to the bioscience ecosystem.

Avid Radiopharmaceuticals, founded by Daniel Skovronsky, M.D., Ph.D., the former Scientific Director at the University of Pennsylvania's Center for Neurodegenerative Disease Research, develops technology to help diagnose the pathology of Alzheimer's and other neurodegenerative diseases. Originally located in a single lab in the Science Center's Port business incubator, the company has since expanded its footprint to occupy a custom-designed office and lab space nearly five times that size at 3711 Market Street on the Science Center's legacy campus. Acquired by Eli Lilly & Company in 2010 in a deal worth up to \$800 million, Avid now operates as a wholly-owned subsidiary of the Indianapolis-based global pharmaceutical company.

KEY TAKEAWAYS

Avid is a pioneer in the development of molecular imaging agents for neurodegenerative diseases, and the Science Center has accommodated the flexible and staged growth of Avid as its portfolio of imaging products has advanced and expanded.

Avid has occupied a number of different spaces within the Science Center, from a single lab in the Port business incubator when the company was in its infancy to the 24,500 square feet of custom-fit office and lab space it occupies today.

The Science Center was able to help custom build the specialized accommodations required for Avid's onsite manufacturing of radiopharmaceuticals for clinical trials.

Avid represents Eli Lilly's first and only presence in Pennsylvania.

"OUR COMPANY'S STORY OF DEVELOPMENT WOULDN'T BE THE SAME WITHOUT THE SCIENCE CENTER PARTNERING WITH US THROUGH THESE DIFFERENT PHASES OF GROWTH."

—MICHAEL KRAUTKRAMER, VICE PRESIDENT OF OPERATIONS, AVID RADIOPHARMACEUTICALS

As Avid has grown over the past decade, the Science Center has been a strong support for the company, providing both Port business incubator services and space to the growing company. As Vice President of Operations Michael Krautkramer says, "Our company's story of development wouldn't be the same without the Science Center partnering with us through these different phases of growth." During its startup phase, the company also benefited from working in a collaborative environment among other early-stage firms. As Krautkramer puts it, the Science Center's Port incubator at 3624 Market Street where Avid progressed through its early growth stages had a "vibe of entrepreneurship—people working crazy hours in tight spaces to meet their goals as they tried to grow as an organization."

The Science Center's support continued as Avid outgrew its space in the incubator. By the time Krautkramer joined the firm in 2009, the company had expanded to employ more than 30 people. Later that year, Avid became the first startup to graduate from the Port and move into dedicated office and lab space at 3711 Market Street. The space was designed and fitted with Avid's specialized manufacturing needs in mind, including custom-made protective amenities to permit the safe production of radiopharmaceuticals used for diagnostic brain imaging of the pathology of Alzheimer's and other neurodegenerative diseases. As Krautkramer

explains, "We have custom radiosynthesis equipment in manufacturing cells lined with lead bricks to do the type of research we do—hence the reason that the floor below Avid had to be reinforced with steel beams. In that way, working with the Science Center and Wexford as a tenant in their building, it's great to have that partnering kind of relationship when you have these really special needs. They understand and support it."

Beyond their custom office and lab space, Avid takes advantage of the Science Center's flexible shared spaces as a platform for collaboration. "We've used the Quorum space for some of our meetings where we wanted to create an off-site feeling," Krautkramer says. Avid also uses shared meeting spaces to connect with the community. "We've used rooms in the Science Center to gather different stakeholders to talk about the local challenges of providing for Alzheimer's disease patients and their families," explains Krautkramer.

Avid's FDA-approved product Amyvid is used in clinical trials around the world. As with many research and development firms, company growth is unpredictable. Krautkramer explains, "In a field like Alzheimer's disease where there are still uncertainties, being able to grow in stages has helped Avid and is a testament to the commitment of the Science Center to help startup companies achieve their development goals." ■

AVID TIMELINE

2004

FOUNDED BY CEO DR. DANIEL SKOVRONSKY

2006

AVID ENTERS PORT

2009

COMPANY EXPANDS TO OVER 30 PEOPLE AND MOVES TO DEDICATED OFFICE AND LAB SPACE AT 3711 MARKET STREET

2010

AVID WAS ACQUIRED BY ELI LILLY FOR UP TO \$800M

2016

AVID HAS OVER 100 EMPLOYEES AND CONTINUES TO GROW



INFRASTRUCTURE FOR INNOVATION

University City has seen a tremendous amount of development since 2000. The Science Center, with more than two million square feet of lab and office space on its 17-acre legacy campus, has played a major role in powering the neighborhood's transformation along with the neighboring universities, hospitals and private developers.

Looking ahead, the Science Center is leveraging its history as the nation's oldest and largest urban research park as it joins forces with Wexford Science + Technology to expand its footprint and rebrand its physical campus as uCity Square. Plans for 4 million square feet in 10 new buildings in uCity Square include mixed-use development of lab and office buildings, residential apartments, and retail.

Emerging Trend: Graduate Companies Electing to Remain at the Science Center

BETWEEN 2009 AND 2016, six companies that outgrew the Port business incubator chose to transition into dedicated space on the Science Center's legacy campus, and five remain part of the Science Center community today. These startups are contributing to Philadelphia's economic vitality; together they employ more than 200 people. The development of uCity Square will ensure that these companies, and others like them, will have room to grow—in both size and economic impact.

Today, five Port graduates remain at the Science Center.

Avid Radiopharmaceuticals 116 employees



Invisible Sentinel 36 employees



Integral Molecular 31 employees



Pulsar Informatics 25 employees



Optofluidics 5 employees



= 5 JOBS



Above: The Science Center's first building at 3401 Market Street is home to the ic@3401 incubation program.

Though physical infrastructure is only part of the Science Center's recipe for job creation and economic development, the massive increase in scale planned for the coming years will set the stage for considerable expansion of its impact. Physical assets are a critical part of the innovation ecosystem. As the Brookings Institution puts it, the new geography of innovation consists of "the public and privately-owned spaces—buildings, open spaces, streets and other infrastructure—designed and organized to stimulate new and higher levels of connectivity, collaboration and innovation."¹² With uCity Square, future residents of the Science Center's incubator will have an expanded array of options when deciding where to locate and scale, and established firms will be able to find a new place to link to the innovation ecosystem.

THE NEW GEOGRAPHY OF INNOVATION CONSISTS OF "THE PUBLIC AND PRIVATELY-OWNED SPACES—BUILDINGS, OPEN SPACES, STREETS, AND OTHER INFRASTRUCTURE—DESIGNED AND ORGANIZED TO STIMULATE NEW AND HIGHER LEVELS OF CONNECTIVITY, COLLABORATION AND INNOVATION."

—THE BROOKINGS INSTITUTION

¹² Katz, Bruce and Wagner, Julie. "The Rise of Innovation Districts: A New Geography of Innovation in America." The Brookings Institution, 2014.



A COMMUNITY OF INGENUITY

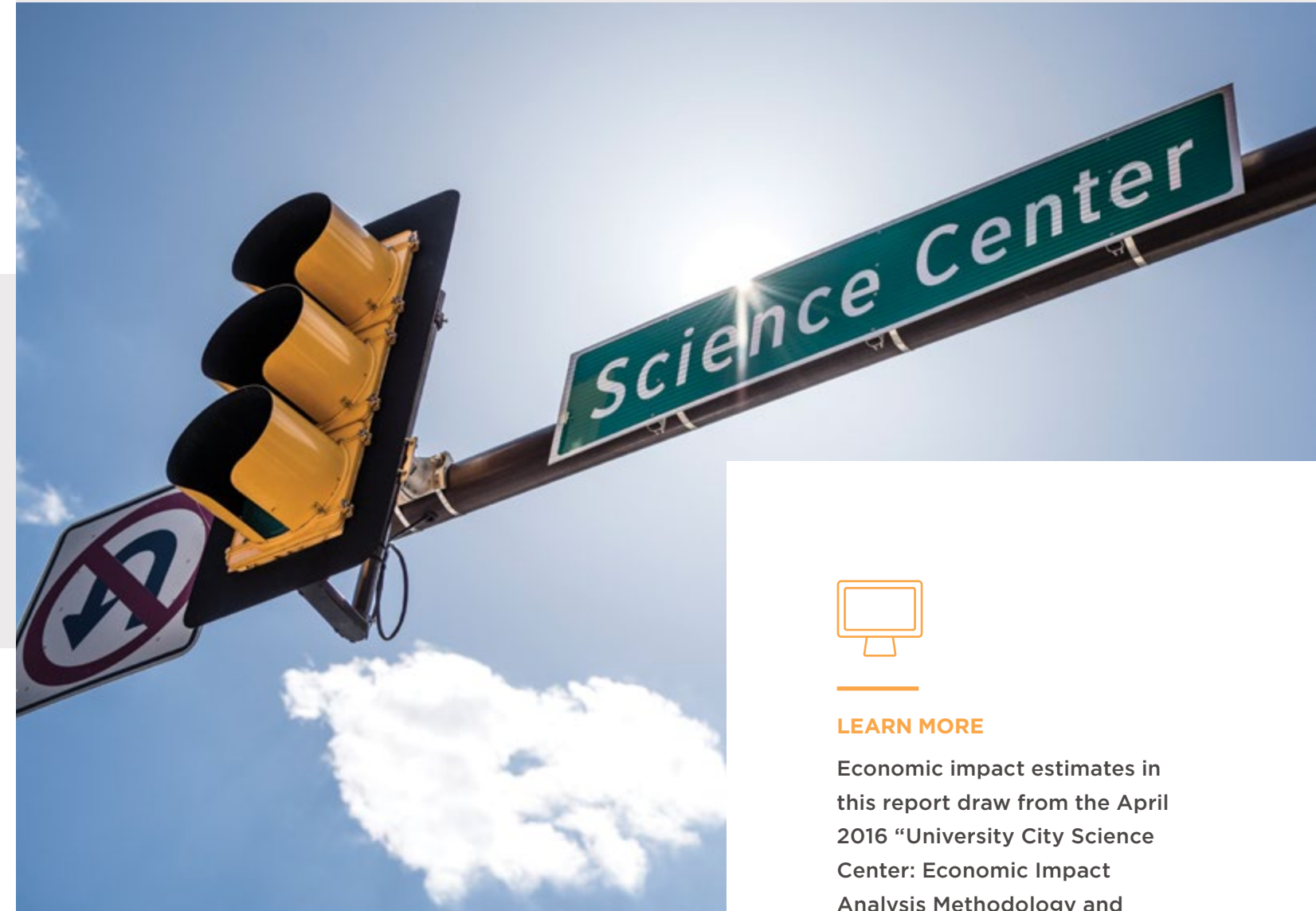
ENCOMPASSING THE SCIENCE CENTER'S LEGACY CAMPUS ALONG MARKET STREET AND 4 MILLION SQUARE FEET OF ADDITIONAL DEVELOPMENT, uCity Square will be a true mixed-use community comprised of offices and lab space for companies of all sizes, while adding more residents and neighbors to the area with shopping, dining, housing and jobs. This dynamic environment will support innovation and collaboration between the private sector and top-tier research institutions. It will also create a runway for even more startups and growing companies as they scale.

CONCLUSION

Greater Philadelphia is home to some of the world's leading life sciences and technology research. Translating the region's assets into business and wealth creation requires strong and productive connections between researchers, academic and medical institutions, entrepreneurs and firms, and government and nonprofit economic development players.

An effective intermediary is critical to facilitating and sustaining these connections. Through its dynamic portfolio of support services and office and lab space for scientists, entrepreneurs and startups, the Science Center provides a platform for cultivating and enriching the innovation ecosystem in Greater Philadelphia. The impact and reach of the Science Center continues to extend throughout the region and beyond.

—
**THE IMPACT AND REACH
 OF THE SCIENCE CENTER
 CONTINUES TO EXTEND
 THROUGHOUT THE REGION
 AND BEYOND.**



LEARN MORE

Economic impact estimates in this report draw from the April 2016 “University City Science Center: Economic Impact Analysis Methodology and Findings” economic impact study, available online at sciencecenter.org/downloads/EIS.

The economic impact study was produced by the Economy League of Greater Philadelphia and Econsult Solutions, Inc. on behalf of the University City Science Center.



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uCitySquare.com



**Economy
League**

GREATER
PHILADELPHIA

2016

University City Science Center: An Economic Catalyst for Greater Philadelphia

ECONOMIC IMPACT ANALYSIS METHODOLOGY AND FINDINGS

JUNE 2016

PREPARED FOR THE UNIVERSITY CITY SCIENCE CENTER

BY THE ECONOMY LEAGUE OF GREATER PHILADELPHIA AND ECONCONSULT SOLUTIONS, INC.

1. Background

The Economy League of Greater Philadelphia and Econsult Solutions, Inc. worked with the University City Science Center to collect employment data for Science Center incubator graduate and resident firms and used IMPLAN input-output modelling to estimate economic impacts associated with Science Center incubator graduate firms located in Greater Philadelphia and current incubator residents.

This analysis quantifies the aggregate, current (as of February 2016) economic impacts of organizations that: 1) are located within the Greater Philadelphia region (11 counties including New Castle County in Delaware; Burlington, Camden, Gloucester, Mercer, and Salem Counties in New Jersey; and Bucks, Chester, Delaware, Montgomery, and Philadelphia counties in Pennsylvania); and 2) received incubation services and/or were early-stage organizations that received growth benefits from being located at the Science Center, or are current residents of the Science Center's Port business incubator or the Innovation Center @3401 (ic@3401).

Quantifying the impact of the jobs created by companies that have exited from or currently participate in the Science Center's incubation programs captures the ripple effect these jobs have on employment growth, labor income, and contributions to the regional economy.

2. Collecting Data

The first step in the data collection process was to create a list of all of the firms that have received Science Center incubation services as well as firms that received a benefit from being located at the Science Center before the 2000 launch of the Port business incubator. Data was drawn from a variety of sources dating to 1968.

Information on current incubator resident and graduate firms was gathered by Science Center staff. Once identified, the following information was determined for each firm:

- current address;
- total employment as of February 2016;
- primary type of good or service it produces.

This analysis categorized graduate firms according to the six possible outcomes listed below.

The outcomes for individual incubator graduate organizations include:

- It exited, but remained at the Science Center in dedicated space as a non-incubator resident.
- It exited and moved within the region and is still operating as the same corporate entity.
- It exited and moved within the region, but later ceased operations.
- It exited and moved within the region, was later purchased by (or merged with) another organization, and employment associated with the graduate stayed in the region.
- It exited and moved within the region, was later purchased by (or merged with) another organization, and employment associated with the graduate company left the region.
- It exited and left the region.

To determine the current aggregate economic impact of Science Center business incubation services in Greater Philadelphia, the project team narrowed the list of companies used in this analysis to current resident firms at both the Port and ic@3401 as well as graduate firms currently operating in the region.

For the region's graduate organizations, current employment levels were obtained by contacting the firms and by searching the Hoover's database.

For companies that went through a merger or acquisition and currently have offices in the region, employment figures for 2016 were calculated using industry- and region-specific employment growth rates. These rates were calculated using data from the Quarterly Census of Employment and Wages from 1990 through 2015. This dataset was then limited to the 11-county region and the industries of interest, identified by North American Industry Classification System (NAICS) codes. The sum of the total employment by industry for the complete 11-county region led to the calculation of year-over-year growth rates for the complete region for each industry. These growth rates were then uniquely applied to each company, matched by NAICS code and applied beginning in the year after acquisition through 2015. For companies in NAICS 5417, 1992 growth rates were applied for growth from 1989 through 1992 given that data were unavailable to calculate growth rates from 1989-1991.

Data collection efforts found that 442 companies that have benefited from the Science Center's business incubation services since its founding in 1963. Today 214 of these firms remain in operation and 155 have offices in the Philadelphia region. Of the 155 firms in-region, 86 are Science Center incubator graduates, 37 are current residents of the Port incubator, and 32 are current residents of ic@3401. As of February 2016, these firms employed 11,898 people in the region. The full list of companies and employment counts is available in Appendix A.

3. Estimating Economic Impacts

The total economic impact of Science Center incubator graduate and current resident organizations was determined using the Minnesota IMPLAN Group's (MIG) IMPLAN input-output model for the 11-county Greater Philadelphia region. IMPLAN represents an industry standard approach to assess the economic and job creation impacts of economic development projects, the new business creation, and public policy changes. The study area data used in the IMPLAN model come from several federal government sources including the US Bureau of Economic Analysis, the US Bureau of Labor Statistics, and the US Census Bureau.

The role of input-output models is to determine linkages across industries in order to understand how the change in economic activity in one industry impacts the rest of the economy. This analysis estimates three types of impacts associated with Science Center incubator graduate and current incubator companies:

- Direct impacts that occur as a direct result of the 155 in-region incubator graduate and current incubator companies;

- Indirect impacts, which include spending on materials, equipment, and professional services by the in-region incubator graduate and current incubator companies, and;
- Induced impacts, which include spending that is supported by labor income paid to workers as a result of direct and indirect employment in industries such as food, entertainment, housing, retail, and transportation.

The combination of direct, indirect, and induced impacts constitutes the total spending output. Total economic impact, therefore, is the sum of the direct economic activity, the indirect effects (purchases of materials and services), and induced effects (worker re-spending) of that direct activity.

The IMPLAN model for this analysis was created specifically for the Greater Philadelphia region study area by using the MIG's modeling software to adjust national input-output coefficients using 2013 employment, wage, and income estimates by economic sector for the 11 counties. An IMPLAN model created for a regional economy like that of Greater Philadelphia produces economic multipliers for employment, income, value added and economic output for individual economic sectors, with the size of each sector's multiplier determined by the structure of the local economy.

The total economic impacts were then determined by taking the current employment figures for each of the incubator graduate and current incubator companies and assigning them to one of the 440 economic sector categories in IMPLAN, and then inputting the industry-level employment into IMPLAN in order to calculate total output, indirect and induced impacts, and employment multipliers. The model results were used to derive the average annual salary per employee by adjusting the IMPLAN model's result for direct labor income (i.e., labor compensation consisting of wages and salaries, fringe benefits, and proprietors' income) to remove fringe benefits, converting the 2013 figures to 2015 dollars and then dividing by current direct employment.

4. Findings of the Economic Impact Analysis

While the full effect of the Science Center's diverse programming is difficult to capture, it is possible to quantify the impact of the jobs created by companies that graduated or currently participate in the Science Center's incubation programs and the ripple effect these jobs have on employment growth for the region. Each of the nearly 12,000 jobs at the 155 existing companies currently operating in the Philadelphia region that have benefitted from Science Center business incubation services generate more than two additional secondary jobs. Considering the full impact of both the direct approximately 12,000 jobs and the additional jobs they generate, the Science Center's business incubation efforts have led to the creation of 40,000 jobs, or 1.1% of the current regional workforce.

4.1. Employment Impact

The 155 companies currently operating in the Philadelphia region that have benefitted from Science Center business incubation services directly employ nearly 12,000 people. Estimating the number of jobs indirectly supported by the activities of these firms requires the use of an employment multiplier. Employment multipliers represent the number of jobs created as a result

of employment in a particular industry. A multiplier of three suggests that for every employee hired in a given industry, two additional jobs are created in other industries, for a total of three jobs added to the region.

The Science Center’s incubator graduate and resident organizations are largely concentrated in sectors that have higher-than-average employment multipliers (e.g., life sciences, information technology, and professional and scientific services). Many of the sectors represented by the 155 Science Center incubator graduate and current incubator firms are “traded sectors,” meaning that they sell goods and services outside the region. Selling outside of the region brings money into the region, which generates more jobs. This chain of influence includes additional jobs in non-traded sectors.

In order to understand sector-level impacts in greater detail, the overall employment multiplier can be broken down into multipliers for select industries. Across the incubator graduate and resident industries, the employment multipliers vary from 1.42 in civic and professional organizations to 5.68 in pharmaceuticals. The high multiplier for pharmaceuticals is due to the amount of economic activity the companies in this sector generate.

The overall regional employment multiplier for Science Center-incubated organizations is 3.39, indicating that on average a job at one of the 155 in-region Science Center incubated organizations results in 2.39 additional jobs introduced to the regional economy. Thus, the direct employee count of 12,000 jobs swells to over 40,000 jobs when the multiplier effect of the direct jobs is captured.

TABLE 1 – EMPLOYMENT IMPACT OF SCIENCE CENTER BUSINESS INCUBATION IN GREATER PHILADELPHIA

Philadelphia Region Science Center-Incubated Organizations	155
Employment	
Direct	11,898
Total	40,313
Employment Multiplier	3.39
% of Region	1.11%

Source: IMPLAN, Science Center, Econsult

TABLE 2 – EMPLOYMENT MULTIPLIERS FOR SELECTED INDUSTRY SECTORS IN GREATER PHILADELPHIA

Sector	Direct Employment	Regional Employment Multiplier
Pharmaceuticals	4,461	5.68
Software Publishers	613	4.47
Electromedical Manufacturing	300	2.94
Scientific R&D Services	491	2.57
Financial Services	2,463	2.43
Custom Computer Programming Services	2,867	2.01
Professional and Technical Services	165	2.00
Private Educational Services	232	1.43
Civic and Professional Organizations	149	1.42
Science Center, Total	11,898	3.39

Note: Numbers do not sum as only sectors with more than 100 employees are represented

Source: IMPLAN

4.2. Labor Income

The highly skilled jobs at Science Center incubated companies in Greater Philadelphia command an average wage of approximately \$103,000 per year. The approximately 12,000 jobs at the 155 in-region, Science Center-incubated companies pay a total of \$1.4 billion in labor income each year. The approximately 40,000 total direct and secondary jobs created in the region pay a combined income of \$3.7 billion annually.

TABLE 3 – LABOR INCOME IMPACT OF SCIENCE CENTER BUSINESS INCUBATION IN GREATER PHILADELPHIA

Philadelphia Region Science Center-Incubated Organizations	155
Labor Income	
Direct	\$1.4 billion
Total	\$3.7 billion
Average Salary	\$103,000

Source: IMPLAN, Science Center, Econsult

To estimate the average wage for jobs at Science Center-incubated organizations, the IMPLAN calculation of direct employee compensation was divided by the total number of direct employees. This calculation yielded a figure of \$103,000 for jobs at graduate and resident companies. These average wage levels are high because much of the direct employment occurs in two sectors that have above-average wage levels: pharmaceutical manufacturing and custom computer programming services.

TABLE 4 – AVERAGE WAGE CALCULATIONS

Category	All Science Center-Incubated Organizations
Labor Income (\$ millions)	\$1,418
Employment	11,898
Wage and Salary as a % of Labor Income	86.6%
Average Wage per Direct Job	\$103,000

Source: IMPLAN, City of Philadelphia, Econsult

Data in IMPLAN for the region is derived from actual employment, income and output data from US Bureau of Economic Analysis, the US Bureau of Labor Statistics, and the US Census Bureau for the counties covered by the model. High employee earnings for pharmaceutical manufacturing in the Greater Philadelphia region is consistent with the fact that this sector is a major part of the regional economy, is very productive (i.e., capital intensive with a high level of output and earnings per worker), and requires the use of highly educated scientific and technical workers who command above-average salaries. In addition, start-up companies in the pharmaceutical manufacturing sector are competing in a regional labor market and will therefore have to pay prevailing market-rate salaries to attract the skilled workers they need. Finally, about 19% of the labor income estimated by IMPLAN is proprietors' income; while the amount of money received by a self-employed person may seem high in gross terms, they generally pay all of their benefits out of this income.

4.3. Economic Output

Economic output is a measure of economic activity in a set area over a set period of time. To determine the annual spending on goods and services—or the total economic output—of a firm or firms in a region, both the final purchases and the intermediate inputs are combined. The total annual impact measures the gross output of the 40,000 regional jobs directly and indirectly supported by the Science Center's business incubation efforts at approximately \$13 billion, or 2.2% of the region's total economic output. Science Center-incubated organizations themselves account for \$7.1 billion in total expenditures, and \$5.8 billion in spending is attributable to firms that directly and indirectly serve Science Center-incubated firms and their workers.

TABLE 5 – OUTPUT OF SCIENCE CENTER BUSINESS INCUBATION IN GREATER PHILADELPHIA

Philadelphia Region Science Center-Incubated Organizations	155
Output	
Direct	\$7.1 billion
Total	\$12.9 billion
Percent of Region	2.18%

Source: IMPLAN, Science Center, Econsult

4.4. Value Added

It is possible to isolate the direct economic contributions of a company or group of companies by filtering out purchases they make from other firms or contractors. In aggregate these contributions, known as value added, by the region’s firms make up Greater Philadelphia’s gross domestic product (GDP). Employee compensation and net revenue combine to yield the value added at the 155 Science Center graduate and resident firms active in the region. These firms directly contribute \$2.4 billion to the regional economy every year. The contribution of the firms supported directly and indirectly by Science Center graduates and residents adds \$5.9 billion in value to Greater Philadelphia’s economy annually, or 1.7% of regional GDP.

TABLE 6 – VALUE ADDED OF SCIENCE CENTER BUSINESS INCUBATION IN GREATER PHILADELPHIA

Philadelphia Region Science Center-Incubated Organizations	155
Value Added	
Direct	\$2.4 billion
Total	\$5.9 billion
Percent of Region	1.68%

Source: IMPLAN, Science Center, Econsult

4.5. Graduate and Incubator-Resident Firm Impact

Graduate companies are responsible for the majority of the Science Center-incubated workforce and economic impact. Of the 155 in-region companies, 86 are graduates while the Science Center currently houses 69 organizations in the Port and ic@3401. The 86 graduate organizations employ nearly 11,700 individuals, an average of 135 employees per company as compared to the 231 individuals employed by the 69 current incubator resident organizations, an average of approximately three employees per organization. Graduate organizations produce 2.4 additional jobs for each direct job (a total employment multiplier of 3.4), nearly \$1.4 billion in wages annually and \$12.9 billion in annual output, accounting for 2.18% of the region’s total economic output.

TABLE 7 – IMPACT OF SCIENCE CENTER BUSINESS INCUBATION IN GREATER PHILADELPHIA, BY ORGANIZATION TYPE

Category of Economic Impact	Graduate Organizations	Current Resident Organizations	All Science Center-Incubated Organizations
Number of Companies	86	69	155
Employment			
Direct	11,667	231	11,898
Indirect	13,415	229	13,664
Induced	14,539	232	14,771
Total	39,621	692	40,313
Employment Multiplier	3.40	3.00	3.39
Percent of Region	1.09%	0.02%	1.11%
Labor Income (\$ millions)			
Direct	\$1,389	\$29	\$1,418
Total	\$3,639	\$60	\$3,699
Percent of Region	1.58%	0.03%	1.61%
Output (\$ millions)			
Direct	\$7,000	\$78	\$7,078
Total	\$12,719	\$157	\$12,876
Percent of Region	2.15%	0.03%	2.18%
Value Added (\$ millions)			
Direct	\$2,376	\$45	\$2,421
Total	\$5,786	\$94	\$5,880
Percent of Region	1.65%	0.03%	1.68%

Source: IMPLAN, Science Center

Note: Numbers may not add up due to rounding.

4.6. Fiscal Impact

Science Center-incubated organizations make an important contribution to the City of Philadelphia and Commonwealth of Pennsylvania through tax revenues. Approximately one in three employees at Science Center-incubated organizations work in the city of Philadelphia. These workers pay \$16.7 million in city resident and non-resident wage taxes each year. Of employees who work in the Pennsylvania suburbs, 2014 census data shows approximately 12% live in Philadelphia and thus pay the resident wage tax rate. These workers contribute another \$3.5 million to city coffers, totaling \$20.2 million in annual Philadelphia City Wage Tax revenues. Nearly all of the in-region employees also pay state income tax, contributing \$34.9 million annually in tax revenue to the Commonwealth.

TABLE 8 – WAGE TAX CONTRIBUTIONS OF SCIENCE CENTER-INCUBATED ORGANIZATIONS

Taxing Jurisdiction	Employees	Effective Tax Rate	Total Tax Revenues
City of Philadelphia Wage Tax			
Employees of City Organizations	4,378	3.70%	\$16,705,000
Employees of Suburban Organizations	7,336	3.91%	\$3,494,000
			<u>\$20,199,000</u>
Pennsylvania State Income Tax			
All Pennsylvania Employees	11,714	3.07%	\$34,933,000

Source: IMPLAN, City of Philadelphia

Note: Numbers may not add due to rounding.

Careful consideration must be given to the specific tax structure of various jurisdictions in order to appropriately estimate fiscal impacts. To determine the economic and fiscal impacts in the Philadelphia region, Econsult developed a custom fiscal impact model that translates total economic impacts (as estimated by the IMPLAN model described above) into the commensurate tax revenue gains for the City and Commonwealth.

The analysis took the proportion of Science Center-related jobs to all Philadelphia city and suburban employees to determine an effective Philadelphia City Wage Tax rate. The analysis used US Census Bureau “On the Map” 2013 Commuting Flows data to determine county-based proportionate shares of employment. It was assumed that 52% of all employees of Philadelphia-based companies that receive or have received incubation services from the Science Center also live in Philadelphia, and that 12% of employees of companies in Pennsylvania’s Philadelphia suburbs live in Philadelphia. Similarly, 94% of employees of Pennsylvania-based companies in the region that receive or have received incubation services from the Science Center also live in Pennsylvania.

TABLE 9 – COMMUTER FLOW CALCULATIONS FOR WAGE TAX ESTIMATES

Company Geography	Number of Science Center Incubated Employees	Employees Residence:	
		Philadelphia	Pennsylvania
Philadelphia	4,378	52%	
Philadelphia Suburbs in Pennsylvania	7,332	12%	
Commonwealth of Pennsylvania	11,714		94%

Source: Census Longitudinal Employer-Household Dynamics, City of Philadelphia, Econsult

4.7. Location of Science Center Incubator Graduates in Greater Philadelphia

Science Center incubator graduates are distributed across the Greater Philadelphia region, with offices in six of the region’s 11 counties including each county of southeastern Pennsylvania and

Mercer County in New Jersey. Approximately half of these firms are located in suburban communities, though 63% of all regional Science Center graduate company jobs are currently in the suburbs.

TABLE 10 – GEOGRAPHIC DISTRIBUTION OF SCIENCE CENTER-INCUBATED GRADUATES

County	Number of Organizations ¹	Jobs	Organizations With >100 Employees
Bucks (PA)	2	236	3-D Pharmaceuticals (141)
Chester (PA)	11	1,218	Bentley Systems (470) CardioNet (300) Fujirebio ² (209) Morphotek, Inc. (185)
Delaware (PA)	6	97	None
Mercer (NJ)	2	184	Learning Ally (180)
Montgomery (PA)	22	5,785	Janssen Biotech ³ (3,000) SEI Investments (2,430)
Philadelphia (PA)	45	4,149	Astrolabe Analytica (620) Avid Radiopharmaceuticals (116) CGFNS (105) Monell Chemical Senses Center (120) Universal Building Services (2,554)

Source: Science Center

¹ Two companies have locations in multiple counties – BioAdvance is located at the Port (Philadelphia County) and also in Delaware County; Data-Core Systems has three locations: one in Philadelphia County and two in Bucks County.

² Fujirebio Diagnostics, Inc., a Japanese company, purchased a Centocor oncology diagnostics business line in 1998.

³ Janssen Biotech was formerly known as Centocor Ortho Biotech, Inc. The company was formed as a result of the 2008 merger between Centocor, a former Science Center incubator resident, and Ortho Biotech.

Table 1: Science Center Graduate Organizations

Graduate Company	County	State	Industry	Business Status ¹	2016 Employees
3-D Pharmaceuticals (acquired by Johnson & Johnson)	Bucks	PA	Pharmaceutical preparation manufacturing	Acquired - in region	141
ACI Clinical	Montgomery	PA	Management, scientific, and technical consulting services	In Business in region	55
Adaptimmune	Philadelphia	PA	Pharmaceutical preparation manufacturing	In Business in region	38
AlumiFuel	Montgomery	PA	Aluminum product manufacturing from purchased aluminum	In Business in region	1
Apcot Corporation	Philadelphia	PA	Custom computer programming services	In Business in region	10
Applied Clinical Intelligence, LLC	Montgomery	PA	Pharmaceutical preparation manufacturing	In Business in region	55
Astrolabe Analytica (acquired by Thomas Reuters)	Philadelphia	PA	Pharmaceutical preparation manufacturing	Acquired - in region	620
Avid Radiopharmaceuticals	Philadelphia	PA	Pharmaceutical preparation manufacturing	Acquired - in region	116
Bachem Bioscience, Inc	Montgomery	PA	Pharmaceutical preparation manufacturing	In Business in region	4
Ben Franklin Technology Partners	Philadelphia	PA	Civic, social, professional, and similar organizations	In Business in region	30
Bentley Systems	Chester	PA	Software publishers	In Business in region	470
Biomedical Research & Education Foundation	Philadelphia	PA	Scientific research and development services	In Business in region	1
Biometric Imaging	Philadelphia	PA	Pharmaceutical preparation manufacturing	In Business in region	11
BioRexis (acquired by Pfizer)	Montgomery	PA	Pharmaceutical preparation manufacturing	Acquired - in region	13
Campus Copy Center	Philadelphia	PA	Business support services	In Business in region	13
CardioNet	Chester	PA	Electromedical and electrotherapeutic apparatus manufacturing	In Business in region	300

¹ For "Acquired - in region" firms, a growth rate was applied to the employment at acquisition based on year-over-year growth rates within the relevant industry. Growth rates were not applied to acquired companies for which up-to-date employment information was available.

Table 1: Science Center Graduate Organizations

Graduate Company	County	State	Industry	Business Status ¹	2016 Employees
Career Pro (formerly Career Pro Resume Center)	Montgomery	PA	Management, scientific, and technical consulting services	In Business in region	4
CarePartners Plus (formerly National Center for Patient Interactive Research)	Montgomery	PA	Software publishers	In Business in region	6
Center for Applied Research	Philadelphia	PA	Management, scientific, and technical consulting services	In Business in region	15
Janssen Biotech (acquired by Johnson & Johnson; formerly Centocor)	Montgomery	PA	Pharmaceutical preparation manufacturing	Acquired - in region	3,000
Commission on Graduates of Foreign Nursing Schools	Philadelphia	PA	Civic, social, professional, and similar organizations	In Business in region	105
Community Accountants	Philadelphia	PA	Management, scientific, and technical consulting services	In Business in region	1
Controlled Chemicals (formerly Cryoguard)	Montgomery	PA	Scientific research and development services	In Business in region	3
Daedalus	Delaware	PA	Pharmaceutical preparation manufacturing	In Business in region	3
Data-Core Systems (3 locations)	Philadelphia, 2 offices in Bucks	PA	Custom computer programming services	In Business in region	110
Design Science Consulting	Philadelphia	PA	Miscellaneous professional, scientific, and technical services	In Business in region	30
Dilks Consulting	Philadelphia	PA	Management, scientific, and technical consulting services	In Business in region	3
DLC Solutions	Philadelphia	PA	Custom computer programming services	In Business in region	2

¹ For Acquired - in region companies: A growth rate was applied to the employment at acquisition using year-over-year growth rates for the industry. Growth rates were not applied to acquired companies for which up-to-date employee information was available.

Table 1: Science Center Graduate Organizations

Graduate Company	County	State	Industry	Business Status ¹	2016 Employees
DoseCue	Philadelphia	PA	Scientific research and development services	In Business in region	2
Econsult	Philadelphia	PA	Management, scientific, and technical consulting services	In Business in region	16 FT, 10 PT
ESCO Technologies, Inc.	Montgomery	PA	Miscellaneous professional, scientific, and technical services	In Business in region	9
Exocell	Philadelphia	PA	Scientific research and development services	In Business in region	9
ExpenseWatch (formerly Harriton Software)	Montgomery	PA	Software publishers	In Business in region	18
False Memory Syndrome Foundation	Philadelphia	PA	Individual and family services	In Business in region	8
Foreign Policy Research Institute	Philadelphia	PA	Scientific research and development services	In Business in region	10
Fujirebio (spinoff of Centocor)	Chester	PA	Scientific research and development services	In Business in region	209
Geewax, Terker and Co. LLC	Chester	PA	Securities, commodity contracts, investments, and related activities	In Business in region	20
Gentis Inc.	Chester	PA	Pharmaceutical preparation manufacturing	In Business in region	1
HaRo Pharm	Montgomery	PA	Pharmaceutical preparation manufacturing	In Business in region	2
Health Sciences Library Consortium	Philadelphia	PA	Information services	In Business in region	12
IHS Global Insight	Philadelphia	PA	Management, scientific, and technical consulting services	In Business in region	50
Innophase (acquired by Thermo Fisher Scientific)	Philadelphia	PA	Pharmaceutical preparation manufacturing	Acquired - in region	77

¹ For Acquired - in region companies: A growth rate was applied to the employment at acquisition using year-over-year growth rates for the industry. Growth rates were not applied to acquired companies for which up-to-date employee information was available.

Table 1: Science Center Graduate Organizations

Graduate Company	County	State	Industry	Business Status ¹	2016 Employees
Integral Molecular	Philadelphia	PA	Pharmaceutical preparation manufacturing	In Business in region	31
Intellicomm	Montgomery	PA	Custom computer programming services	In Business in region	13
Intelligence at Large (acquired by BTG International)	Montgomery	PA	Custom computer programming services	Acquired - in region	14
Invisible Sentinel, Inc.	Philadelphia	PA	Pharmaceutical preparation manufacturing	In Business in region	36
Japan Technology	Philadelphia	PA	Miscellaneous professional, scientific, and technical services	In Business in region	2
Jenrin Discovery	Chester	PA	Pharmaceutical preparation manufacturing	In Business in region	1
KGL Skin Study Center	Delaware	PA	Pharmaceutical preparation manufacturing	In Business in region	10
Kibow Biotech, Inc.	Delaware	PA	Pharmaceutical preparation manufacturing	In Business in region	8 FT, 3 PT
Learning Ally (formerly Recording for Blind and Dyslexic)	Mercer	NJ	Educational services	In Business in region	180
Longevity Biotech	Philadelphia	PA	Pharmaceutical preparation manufacturing	In Business in region	5
Medical Data Systems	Delaware	PA	Custom computer programming services	In Business in region	7
Mighty Engine (formerly Osiris)	Philadelphia	PA	Advertising and related services	In Business in region	10
Mitergy	Montgomery	PA	Pharmaceutical preparation manufacturing	In Business in region	1
Monell Chemical Senses Center	Philadelphia	PA	Scientific research and development services	In Business in region	120
Morphotek Inc.	Chester	PA	Pharmaceutical preparation manufacturing	Acquired - in region	185
National Disease Research Interchange (formerly National Diabetes Research Institute)	Philadelphia	PA	Scientific research and development services	In Business in region	40

¹ For Acquired - in region companies: A growth rate was applied to the employment at acquisition using year-over-year growth rates for the industry. Growth rates were not applied to acquired companies for which up-to-date employee information was available.

Table 1: Science Center Graduate Organizations

Graduate Company	County	State	Industry	Business Status ¹	2016 Employees
Nelum Sciences	Philadelphia	PA	Scientific research and development services	In Business in region	2
NeuroDX Development LLC (formerly Neurodiagnostic Devices)	Mercer	NJ	Surgical and medical instrument manufacturing	In Business in region	4
Nuvon	Philadelphia	PA	Software publishers	In Business in region	3
Optofluidics	Philadelphia	PA	Scientific research and development services	In Business in region	5
Opulus	Philadelphia	PA	Custom computer programming services	In Business in region	6
OxiCool, Inc.	Chester	PA	Air conditioning, refrigeration, and warm air heating equipment manufacturing	In Business in region	8
Palmer Group, Inc.	Philadelphia	PA	Securities, commodity contracts, investments, and related activities	In Business in region	4
Phila Association for Clinical Trials (acquired by Covance, Inc.)	Montgomery	PA	Scientific research and development services	Acquired - in region	2
Photonics, Inc.	Philadelphia	PA	Scientific research and development services	In Business in region	1
Physicians for Social Responsibility	Philadelphia	PA	Civic, social, professional, and similar organizations	In Business in region	4
PKPD, Inc. (acquired by KinderPharm LLC)	Chester	PA	Pharmaceutical preparation manufacturing	Acquired - in region	8

¹ For Acquired - in region companies: A growth rate was applied to the employment at acquisition using year-over-year growth rates for the industry. Growth rates were not applied to acquired companies for which up-to-date employee information was available.

Table 1: Science Center Graduate Organizations

Graduate Company	County	State	Industry	Business Status ¹	2016 Employees
Portfolio Associates, Inc.	Philadelphia	PA	Management, scientific, and technical consulting services	In Business in region	10
PrimBio Research Institute	Chester	PA	Pharmaceutical preparation manufacturing	In Business in region	7
Pulsar Informatics, Inc.	Philadelphia	PA	Pharmaceutical preparation manufacturing	In Business in region	25
Radiation Management Corporation	Philadelphia	PA	Pharmaceutical preparation manufacturing	In Business in region	5
Reality Technologies (acquired by Thomson Reuters)	Philadelphia	PA	Custom computer programming services	Acquired - in region	33
SEI Investments	Montgomery	PA	Securities, commodity contracts, investments, and related activities	In Business in region	2,430
Strategic Management Group (acquired by BTS Group)	Montgomery	PA	Custom computer programming services	Acquired - in region	47
Syngetics, Inc.	Philadelphia	PA	Custom computer programming services	In Business in region	2
Brightwood Career Institute (formerly Thompson Institute and Kaplan Institute)	Philadelphia	PA	Educational services	In Business in region	50
TRC Market Research (formerly TRC Holdings)	Montgomery	PA	Miscellaneous professional, scientific, and technical services	In Business in region	35
Uni-Coll Corporation (acquired by Sun Gard Corp.)	Delaware	PA	Custom computer programming services	Acquired - in region	66
Universal Building Services, Inc. (acquired by Aramark)	Philadelphia	PA	Technical consulting services	Acquired - in region	2,554
Vector Biolabs	Chester	PA	Pharmaceutical preparation manufacturing	In Business in region	9

¹ For Acquired - in region companies: A growth rate was applied to the employment at acquisition using year-over-year growth rates for the industry. Growth rates were not applied to acquired companies for which up-to-date employee information was available.

Table 1: Science Center Graduate Organizations

Graduate Company	County	State	Industry	Business Status¹	2016 Employees
VGX Pharmaceuticals (merged with Inovio)	Montgomery	PA	Pharmaceutical preparation manufacturing	Acquired - in region	18
Vitae Pharmaceuticals (formerly Concurrent Pharmaceuticals)	Montgomery	PA	Pharmaceutical preparation manufacturing	In Business in region	55
Znetics	Philadelphia	PA	Scientific research and development services	In Business in region	3

¹ For Acquired - in region companies: A growth rate was applied to the employment at acquisition using year-over-year growth rates for the industry. Growth rates were not applied to acquired companies for which up-to-date employee information was available.

Table 2: Science Center Incubator Residents/ic@3401 Members

Current Incubator Resident Company	Incubator Program	Industry	2016 Employees
Admire Capital	Port	Securities, commodity contracts, investments, and related activities	2
AG Strategic Design	ic@3401	Custom computer programming services	1
Alltham	ic@3401	Software publishers	1
ANGLE (formerly Parsortix)	Port	Scientific research and development services	5
Annapurna	Port	Scientific research and development services	2
Arzoo	ic@3401	Securities, commodity contracts, investments, and related activities	1
AUM LifeTech	Port	Scientific research and development services	1
BioAdvance	Port	Securities, commodity contracts, investments, and related activities	5
Biobots	Port	Scientific research and development services	8
Biomeme	ic@3401	Surgical and medical instrument manufacturing	10
Bioscript Science, Inc.	Port	Management, scientific, and technical consulting services	1
Carevive Systems	ic@3401	Software publishers	15
Choosito!	ic@3401	Software publishers	4
Cognizance Biomarkers	Port	Scientific research and development services	2

Table 2: Science Center Incubator Residents/ic@3401 Members

Current Incubator Resident Company	Incubator Program	Industry	2016 Employees
Coldlight	ic@3401	Software publishers	3
CytoVas	Port	Scientific research and development services	9
Deep Lake Holdings	Port	Scientific research and development services	1
Dreamit Ventures	ic@3401	Civic, social, professional, and similar organizations	10
enAble Games	ic@3401	Software publishers	2
Epismart Nutrition	Port	Scientific research and development services	1
epoXtal	ic@3401	Scientific research and development services	1
Evol Science	Port	Scientific research and development services	1
Fitly	ic@3401	Software publishers	3
Freenome	Port	Scientific research and development services	2
Fymed	Port	Scientific research and development services	1
Gearhart Law	ic@3401	Legal services	1
Grand Round Table	ic@3401	Software publishers	3
Graphene Frontiers	Port	Scientific research and development services	11
Haystack Informatics	ic@3401	Software publishers	3

Table 2: Science Center Incubator Residents/ic@3401 Members

Current Incubator Resident Company	Incubator Program	Industry	2016 Employees
HealthNEXT	ic@3401	Miscellaneous professional, scientific, and technical services	2
HealthShift (formerly Forward Thinker)	ic@3401	Custom computer programming services	3
Hyalo Technologies	Port	Scientific research and development services	2
Immunome	Port	Scientific research and development services	6
iPraxis	Port	Educational services	1
Keosys	Port	Software publishers	1
Kite Medical	ic@3401	Scientific research and development services	1
Lenima Field Diagnostics	Port	Scientific research and development services	2
LignaMed	Port	Scientific research and development services	3
Literacy Ace	ic@3401	Software publishers	2
MedCity News/Breaking Media	ic@3401	Internet publishing and broadcasting	1
Metasense Digital Marketing Inc.	ic@3401	Software publishers	1
Noble.MD	ic@3401	Software publishers	3
Oncocoetics	Port	Scientific research and development services	5

Table 2: Science Center Incubator Residents/ic@3401 Members

Current Incubator Resident Company	Incubator Program	Industry	2016 Employees
Optiflame	Port	Lighting fixture manufacturing	1
Orange Maker	Port	Scientific research and development services	4
OriMabs	Port	Scientific research and development services	1
Pad Porter	ic@3401	Management, scientific, and technical consulting services	1
Persistent Telecom Solutions, Inc.	Port	Management, scientific, and technical consulting services	1
Persona Partners	Port	Miscellaneous professional, scientific, and technical services	2
Peter Buchak	ic@3401	Software publishers	1
Phelix Therapeutics	Port	Scientific research and development services	8
PhenGen Biotech	Port	Scientific research and development services	1
Point.io	ic@3401	Software publishers	30
Pulse Inframe	ic@3401	Software publishers	1
RegDesk	ic@3401	Software publishers	2
REGENXBIO Inc.	Port	Scientific research and development services	1
RistCall	ic@3401	Software publishers	3

Table 2: Science Center Incubator Residents/ic@3401 Members

Current Incubator Resident Company	Incubator Program	Industry	2016 Employees
ROAR for Good	ic@3401	Software publishers	5
Robin Hood Ventures	Port	Securities, commodity contracts, investments, and related activities	1
RSC Worldwide	Port	Periodical publishers	4
SAB Tech	Port	Scientific research and development services	2
Sensory Technologies	ic@3401	Software publishers	2
Smart Activities of Daily Living	ic@3401	Software publishers	2 FT, 1 PT
SWELL	Port	Management, scientific, and technical consulting services	3
Telesis Therapeutics	Port	Scientific research and development services	1
Temple Office of Technology Commercialization and Business Development	Port	Educational services	1
UE LifeSciences	ic@3401	Surgical and medical instrument manufacturing	4
Viventia Bio US Inc.	Port	Scientific research and development services	2
Whose Your Landlord	ic@3401	Software publishers	2 FT, 2 PT