supporting the
SOUTHEASTERN PENNSYLVANIA LIFE SCIENCES INDUSTRY

By Anthony P. Green, Ph.D. and RoseAnn B. Rosenthal

RoseAnn B. Rosenthal is president and CEO of Ben Franklin Technology Partners/SEP. (roseann@sep.benfranklin.org).

Anthony P. Green, Ph.D., is vice-president, Technology Commercialization: Life Sciences of Ben Franklin Technology Partners/SEP (anthony@sep.benfranklin.org) and **Ben Franklin** director, The Nanotechnology Institute.

Acknowledgements

The Ben Franklin Technology Partners is an initiative of the Pennsylvania Department of Community and Economic Development and is funded by the Ben Franklin Technology Development Authority.

The Building 100 Innovation Center, Ben Franklin's headquarters at The Navy Yard Clean Energy Campus, was created by Ben Franklin, the Delaware Valley Industrial Resource Center and the Philadelphia Industrial Development Corporation as a catalyst for renewed attention to the region's physical sciences and engineering strengths.

"When you're finished changing, you're finished." – Ben Franklin

INTRODUCTION

Pennsylvania's life science industry is an economic powerhouse employing more than 79,000 people directly and generating annual wages of $7.2 billion. An unmatched concentration of global biopharmaceutical, medical device, and diagnostic companies; world-class academic and private research organizations; capital and talent; facilities and infrastructure; and nationally-recognized health care delivery systems – in both urban and rural settings – it's all here in Pennsylvania. (Life Science Leadership Advisory Council: Life Sciences Leadership for the Next Decade, May 2012).

In Southeastern Pennsylvania, the concentration of life sciences activities is an even more important contributor to the regional economy through its research institutions, and pharmaceutical and biotechnology (biopharmaceutical) companies. With basic research, supported by over $1 billion in R&D funding in 2011 to the $250M in venture capital to the region also in 2011, collectively, the region's life science community ranks with Boston and Silicon Valley as a powerhouse of innovation and now accounts for 15 percent of the economic activity and one in six jobs in the Greater Philadelphia region (Milken Study, 2009; Greater Philadelphia 2012 Regional Report, Select Greater Philadelphia).

THE ORIGINS OF A CLUSTER

The academic origins of the industry in Southeastern PA trace to the establishment of the University of Pennsylvania in 1740, The Philadelphia College of Pharmacy and Science in 1821, and the Wistar Institute in 1982. The growth of the chemical industry in the 1800s amassed new resources and talent that provided a foundation for the new pharmaceutical industry, with William H. Rorer in 1910 and Merck Sharpe & Dohme in 1953; then onward to the creation of the region's first biotechnology company, Centocor, in 1979.

THE FIRST 30 YEARS OF INNOVATION & GROWTH

Technology innovation, job creation and economic development are inextricably bound and require continuous evolution of models for service delivery. Ben Franklin Technology Partners/SEP has successfully addressed this challenge. Now celebrating its 30th anniversary, this article summarizes BFTP/SEP's success supporting the region's life sciences industry – a dominant technology sector in Southeast Pennsylvania. Catalyzing efforts to rebuild Pennsylvania's economy through science and technology focused on a regional agenda that prioritizes science, technology, entrepreneurship & innovation as a growth strategy, BFTP/SEP executes its mission through a comprehensive framework for regional growth: Capital, Knowledge, and Networks with a commitment to implementation, through funding, engagement, education, and advocacy.

The region's emerging biotechnology industry was given further impetus in 1982 via the first economic development effort directed to leverage the area's intellectual and commercial assets as part of a statewide, technology-based economic development strategy. Now known as the Ben Franklin Technology Partners of Southeastern PA, BFTP/SEP initially invested $20 million to support the formation of University Centers of Excellence and provided the first state funding for biotechnology enterprises, $9.5M into over 100 companies, among them companies such as Centocor and Cephalon.

Ben Franklin Technology PArtners
Southeastern Pennsylvania
CELEBRATING 30 YEARS

Ben Franklin Technology Partners of Southeastern Pennsylvania is a national, award winning organization for ***Stimulating Entrepreneurial Potential****, through entrepreneurship, technology and innovation. Celebrating our 30th Anniversary, Ben Franklin has provided the* ***Capital, Knowledge and Networks*** *that help innovative enterprises compete in the global marketplace, generating wealth and supporting regional economic growth.*

Centocor and Cephalon's history are informative to the growth of the region: each grew to become major revenue and employment generators, culminating with Centocor's purchase by Johnson & Johnson in 1999 for $4.9B and Cephalon's acquisition by Teva in 2011 for $6.8B. The Centocor story has been well documented (see *Miracle Medicines: Seven Life Saving Drugs and the People Who Created Them*, Robert Schook, pp. 192-241; 2007).

Centocor moved to the Philadelphia suburbs in 1981 from the University City Science Center and with the success of groundbreaking drugs Remicade (now $7B in annual revenue) and ReoPro, J&J has continued to maintain significant operations in Malvern and Springhouse with over 2000 employees. Its senior management, the "University of Centocor," have ascended into key leadership positions within J&J or remained in the region to lead new companies: former Centocor President Dave Holveck became president of Johnson & Johnson Development Corporation before becoming president of Endo Solutions, a $2B public company headquartered in Chadds Ford, Pennsylvania; VP for Finance Dominic Caruso is now J&J CFO; former CFO Bruce Peacock went on to become COO of Cephalon as well as two additional start-up companies in the region; and Chris Molineaux, VP Communications, moved to J&J Corporate Communications before assuming his current position as president of Pennsylvania Bio.

Morphotek is a biopharmaceutical company focused on the discovery and development of therapeutic antibodies for the treatment of cancer, inflammatory and infectious diseases. They have grown from four to more than 100 employees since Ben Franklin first invested in 2000, and is growing rapidly. In 2010, the region celebrated when Morphotek broke ground on a new $80M, 60,000 sq. ft. pilot manufacturing plant in Chester County to develop drugs for clinical trials.

GROWTH OF AN INDUSTRY… GROWTH OF A CLUSTER

As the biotechnology industry began to develop and grow, so did BFTP/SEP's approach to its engagement. From playing a catalytic role by funding University Centers of Excellence that attracted federal R&D funding, BFTP/SEP moved on to funding joint industry/university research projects, seeding emerging biotechnology enterprises, and funding and supporting the creation of concentrations of industry formation across the region, producing the Commonwealth's first statewide report on the bio/life sciences sector in 1997; investing in the formation of BioAdvance Ventures, a private regional fund catalyzed by Tobacco Settlement proceeds; and created as part of the state's increased investment in the bio sector manifest with the formation of three, regional life science greenhouses, and actively sponsoring industry events and PA Bio, the industry's advocacy organization.

SUCCESS STORY: MORPHOTEK

Morphotek was founded on technology licensed from Johns Hopkins that improves the efficacy of existing biopharmaceuticals or creates new biopharmaceuticals. BFTP/SEP invested a total of $200,000 in seed capital in Morphotek in 2000 and 2001, and helped refine the business plan and private investment pitch. The result of these efforts was the 2007 acquisition by the Japanese company, Eisai Pharmaceuticals for $325M. Since that initial investment, Morphotek has grown from four to over 180 employees.

As important as the monetary compensation was, equally important and often overlooked was the decision by Eisai to keep the company and its jobs here in Southeast Pennsylvania, an unusual event in this age of company consolidation and retrenchment. As a result, Morphotek recently invested $80 million to build a new 60,000-square-foot FDA-compliant pilot plant facility. This will enable Morphotek to maximize the efficiencies of its product development process and move closer to its goal of becoming a fully integrated biopharmaceutical company. The facility, located across from its Exton, PA headquarters, opened in August 2012, leading to an estimated 90 new jobs. The impact to the region allows us to trumpet: What grows in Philly stays in Philly.

The Pennsylvania Biotechnology Center of Bucks County was launched by the Hepatitis B Foundation, Delaware Valley College and Drexel University in 2006, with a focus on research and entrepreneurship. Ben Franklin supported the development of the Center and is a primary partner.

Clients represent innovations in biopharmaceuticals, devices, and diagnostics. Of these, the most critical has been our investments in emerging companies. Always in partnership with private investors, early funding for companies such as Centocor and Cephalon were joined by successes such as Adolor, Viropharma, Immunicon, and Morphotek (see Success Story and Table 2), which have created hundreds of high-wage jobs, successfully commercialized their technologies, and gone public or been acquired while remaining in the region.

Our current portfolio of 37 life science companies reflects the increasing diversity of the sector with innovations in medical devices, drug delivery, and diagnostics, as well as the related growth of the newest health services sector: healthcare IT management and analytics. Investment in an emerging enterprise is the start of a close relationship with the company…one in which our goals and the goals of our client are highly aligned. As a result, we focus our efforts to provide the input, advice, and resources that will help our client achieve important milestones and attract follow-on investment and strategic market partners.

LOCATION, LOCATION, LOCATION

Many early biotech companies found a receptive start-up location at the University City Science Center in West Philadelphia, the nation's first urban research park. With funding and mentoring from Ben Franklin and easy access to the university community in space that met their specialized needs, a new generation of biotechnology companies got underway. Soon their numbers began to reshape the landscape as new corporate parks along the Route 202 highway around Philadelphia emerged to accommodate their expansion.

The growth and diversification of the region's life sciences sector spurred the formation of concentrations of company formation, networking and support resources across the region. The early private investment in suburban office and research parks along Route 202 created a dispersed pattern of location options across the five-county region.

Following the market's lead, public policy initiatives emerged to leverage this investment and address service gaps with the goal of further accelerating new company formation. BFTP/SEP supported the first of these through a partnership in 1996 with the Delaware Valley College, a 116-year-old college with its roots in agriculture; Thomas Jefferson University; and the Hepatitis B Foundation. The result was the formation of the Ben Franklin Innovation Center on the campus of the Delaware Valley College in Doylestown, Bucks County.

The Innovation Center provided on-site services to the companies forming and residing at the Center. Driven by the vision of Dr. Timothy Block, this early effort, over the years, grew into its own free standing facility, developed with funding from the U.S. EDA, the Commonwealth of PA, and program support from BFTP/SEP. Today, the Pennsylvania Biotechnology Center in Doylestown is a 62,000-square-foot building that sits in a tax-advantaged Keystone Innovation Zone and houses over 30 biotechnology companies. Its enterprises have created over 900 jobs and over $500M in company valuation.

Doylestown and its biotech community were soon joined by other programs to support early-stage technology companies, including Pennsylvania's Keystone Innovation Zones (KIZs) in 2007 and five additional incubators focused on life sciences. The KIZs and incubators accommodate growing concentrations of activity through public/private partnerships that target services at the very earliest phases of company formation and provide a pipeline to BFTP/SEP and other regional seed investors. Their programming provides emerging companies with easy and multiple connections to the support network and multiple opportunities to collaborate, coalesce, and compare lessons learned.

More recently, regional nodes of technology companies have been complemented with a surge in university programs to support translational research, among them the University City Science Center's QED program and Drexel University's Coulter Foundation Program in biomedical engineering. The 12-year-old, Commonwealth-funded Nanotechnology Institute, formed and overseen by a partnership of BFTP/SEP, Drexel University, and the University of Pennsylvania, focuses on the intersection of nanotechnology and the life sciences and has been effective in focusing resources on the critical proof of concept phase of development.

Today, another concentration of life sciences is emerging at the "new" Philadelphia Navy Yard, our home since 2007. A target of Department of Defense closures 20 years ago, with the resultant loss of over 8,000 jobs, the Navy Yard today is home to over 10,000 employees. An important element of its reuse strategy provides locational options to capture growing and expanding life sciences and health care companies. The 2013 move of GlaxoSmithKline's (GSK) 1,800 employees to a new Navy Yard facility and Iroko Pharmaceuticals' dedication of its new headquarters designed to accommodate 200 employees have the strategy off to a strong start.

BFTP/SEP AND THE LIFE SCIENCES/HEALTH CARE SECTOR TODAY

BFTP/SEP deploys its programs and services through the lens of Capital, Knowledge, and Networks (See Figure 1). Each is designed to provide resources and custom solutions to companies, whether it is with pre-seed, seed or growth capital; hands on, dedicated mentoring and advice; and/or connections to research, investment, and business development resources – all with the expectation that our efforts will accelerate commercialization, improve chances for success, and increase job creation for the region.

Our approach, to seed, link, integrate and leverage innovation assets, recognizes the different cultures, realities, and expectations of the various contributors to an innovation ecosystem even as we maintain our focus on the entrepreneur – the ultimate driver of economic growth. These contributors include:

- Research universities seeking ways to license and commercialize their technologies and provide support for entrepreneurial activities;
- Start-up enterprises trying to figure it all out;
- Large corporations defining what innovation means for them and how to fill their pipeline;
- Angel investors and venture capital firms seeking viable investment opportunities in companies that can articulate an exit strategy;
- Community-based institutions seeking ways to engage in emerging growth sectors;
- Value chain enterprises and service providers needing a robust pipeline of business opportunities; and
- Public policy makers interested in outcomes: new companies, new jobs, and new revenues.

Addressing these expectations is a long-term play, in ever-changing circumstances, that requires consistent attention and resources, a flexible framework, committed regional leadership engagement, and professional staff to create an adaptable organization that can anticipate and respond to future challenges and opportunities.

Today, Ben Franklin's mission of regional growth through technology-based entrepreneurship and innovation remains the same as it was 30 years ago; and the basic premise of rooting entrepreneurial growth within the region's assets continues to demonstrate validity (see Figure 2): It's the "how" that has changed. Ben Franklin today is:

- Seeding emerging technology enterprises that have gone on to become leading technology employers and partnering to create private investment pools for seed and early-stage investment;
- Providing the facilities, business and technical advice, mentoring, coaching, and the networks that help emerging and growing enterprises thrive;

FIGURE 1. WHAT WE DO: Seed, Link, Integrate and Leverage Innovation Assets

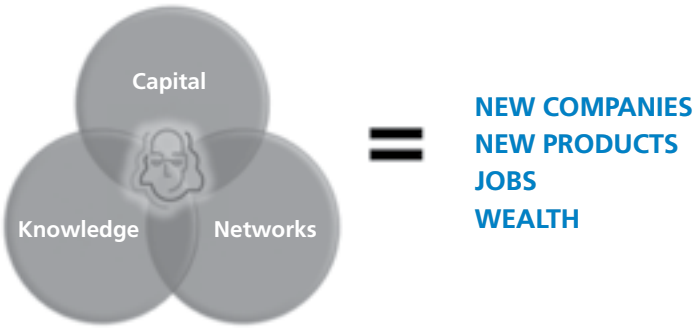
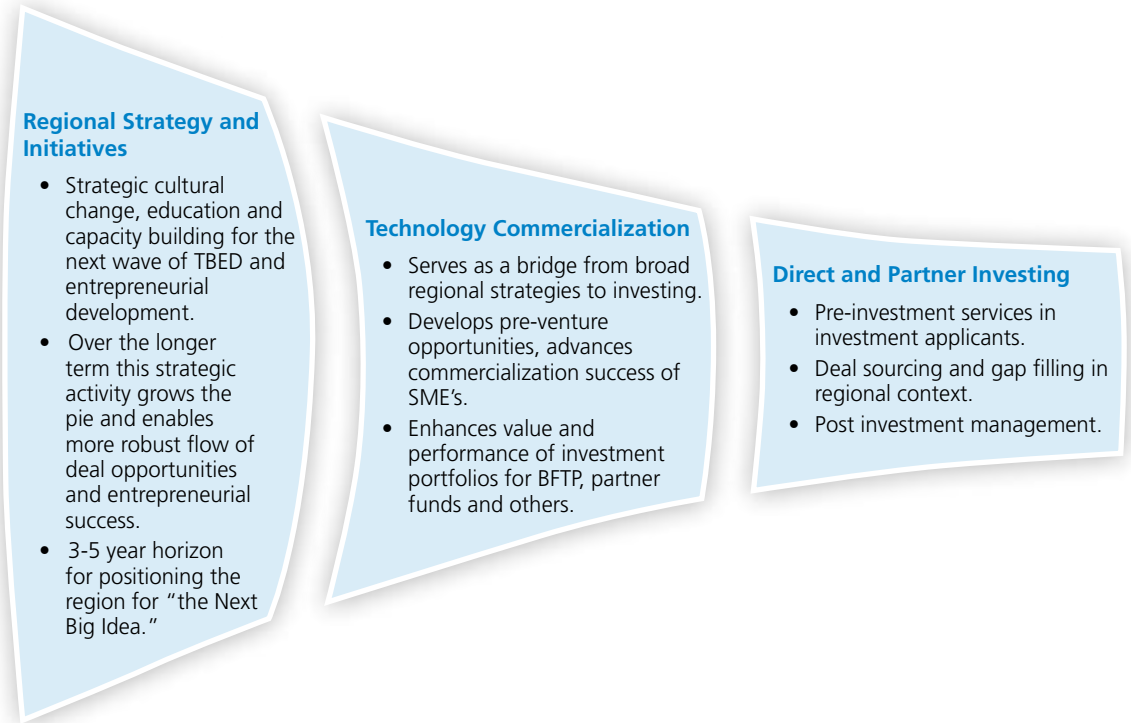


FIGURE 2. THE BFTP/SEP CONTINUUM



- Seeding, supporting, and launching new initiatives and events in the region that are strengthening our innovation infrastructure and ecosystem;
- Developing new pathways to accelerate intellectual property discovered in universities and federal laboratories to the marketplace;
- Helping existing manufacturers and research development companies to source and provide funding to execute the specific technical and business assistance they need to move a concept to the marketplace quickly, leveraging their existing capacity to generate new revenues;
- Working with leading technology corporations to identify open innovation partners and approaches that can help fill their new product pipeline; and
- Collaborating with institutions and diverse constituencies to develop regional core competencies into robust economic development strategies that leverage our strengths to address regional challenges to future growth and prosperity.

TABLE 1. Life Sciences Financing 2001 – 2012

Financing Vehicle	No. Companies	Amount funded
Direct Company Support		
Investments	47*	$ 19,824,428
Technology Engagement Grants	91	$ 947,521
Technology Commercialization Loans	5	$ 299,445
Nanotechnology Institute NanoApplication Fund Loans	4	$ 200,000
Direct Company Support Total	**147**	**$ 21,271,394**
Funding to Institutional Researchers	**No. Projects**	
Nanotechnology Institute: Sponsored Research Match	5	$ 230,121
Nanotechnology Institute: Translational Research Grants	53	$ 6,556,930
Coulter Foundation/ Drexel University funding	7	$ 100,000
Institutional Researcher Grants Total	**65**	**$ 6,887,051**
Total Life Sciences Support 2001 – 2012		**$ 28,158,445**

*Individual companies: does not include 37 follow-on funding investments

TABLE 2. Life Science Portfolio Acquisitions or Significant IPOs

Company	Exit
Acuity	Acquired by Opko
BioRexis	Acquired by Pfizer
Centocor	IPO and acquired by J&J
Cephalon	IPO and acquired by Teva
Immunicon	IPO and acquired by J&J
Morphotek	Acquired by Eisai
NuPathe	IPO
Orthovita	IPO
Protez	Acquired by Novartis
Topaz	Acquired by Sanofi
ViroPharma	IPO

CAPITAL: DOLLARS TO LAUNCH

The Life Sciences and Health Care sector presents particular challenges: Length of time for approval and commercialization of drugs, devices, and diagnostics; tremendous regulatory hurdles and turbulent regulatory environment; extraordinary costs; and retraction of capital markets today and the resultant impact on the flow of risk capital to this sector. Nonetheless, BFTP/SEP continues to work with our region's talented innovators.

Since 2001, BFTP/SEP has provided over $70M to over 650 companies, of which $21M has been used to support 150 companies in life sciences (see Table 1). These companies have leveraged follow-on capital of $78M, a ratio of 3.7:1, and have created or retained over 3,800 jobs. Equally important, of the companies funded between 2002 and 2006, over 75 percent are still in business and 91 percent have secured follow-on funding. Many companies have gone on to IPO or acquisition (Table 2). With an additional $16M in grants through our university/industry partnership programs ($6.9M in life sciences), BFTP/SEP has provided over $28M in early-stage life science funding to the region. Our current life sciences/health care portfolio of 34 companies represents a commitment of $12.5M (Table 3), co-invested with private investors and venture funds (see Table 4).

KNOWLEDGE: SMALL AND EMERGING COMPANY ASSISTANCE

The life science companies in the region benefit from BFTP/SEP's programs to support technology commercialization. In addition to direct financing, BFTP/SEP supports early, emerging and growth companies through:

- Hands-on, **customized assistance** to portfolio companies.
- Assignment of **Portfolio Managers** to provide strategic input to advance company success.
- The **BFTP/SEP Almanack Series and Annual Venture Showcase** present portfolio companies to the investment community for potential funding or programs.
- **Success Teams** for companies to learn and share experiences.
- Access to resources at the region's research institutions, both to help small companies and help institutions collaborate with companies. This is accomplished through our **Tech Commercialization Network**, a consortium of 25+ universities, government, and private partnerships to help companies gain access to resources not available internally. As shown in Table 1, we have funded 91 projects since 2001 in Life Sciences.

- Assistance with Open Innovation Strategies through **Tech Enterprise Solutions**, which works with companies to help advance their pipeline by identifying strategic partnerships with other companies or research institutions.
- Assistance with federal grant opportunities through the **Innovation Partnership** (IPart) program, which provides one-on-one counseling and business support services to clients seeking federal funding through the SBIR/STTR Programs.

KNOWLEDGE: TRANSLATING DISCOVERIES TO MARKET OPPORTUNITIES

Another seminal BFTP/SEP program is the establishment of University/Industry Partnership programs. These are comprehensive partnerships among research institutions and companies designed around a specific technology focus with the objective of accelerating technology commercialization.

Currently, BFTP/SEP is engaged in 10 regional programs either as direct manager or as a commercialization partner. Technology sectors include nanotechnology, energy, water, advanced textiles, energy-efficient building technology, and additive and advanced manufacturing. The flagship Nanotechnology Institute (NTI) is a nationally recognized, multi-institutional, non-profit organization whose unique mission is to accelerate nanotechnology commercialization through interdisciplinary translational research from academic laboratories to industry (see www.nanotechinstitute.org). Founded in 2000 by the University of Pennsylvania, Drexel University, and BFTP/SEP with funding from the Commonwealth of Pennsylvania's Ben Franklin Technology Development Authority, the NTI comprises 13 Southeastern PA research institutions with over 4,000 research faculty and over $1 billion of annual research expenditures.

The NTI's goal is to bridge the gap between nanotechnology research and commercialization and to leverage the region's life sciences strengths as a driver for the regional economy. Its unique features address the intellectual property issues of multi-institutional partnerships and a groundbreaking revenue return model. Activities include support to research faculty for late translational research, matching funds for sponsored research agreements, and loans to small companies that work with NTI institutions.

NTI's work has been recently published (*Nanotechnology Law & Business*, Fall 2011, 176-193) and in 2011 it received the IEDC Honorable Mention Award for "Partnership with Educational Institutions". As noted in Table 1, the NTI has awarded $7M to life science researchers and companies in all technology areas: therapeutics, diagnostics, and devices. Of these projects, over 20 licenses have been executed, including three multi-institutional technologies in intracellular probes, diagnostics, and nanofiber-based vascular grafts.

TABLE 3.
Current Life Science Portfolio Companies (all sources of funding)

Biopharmaceuticals	Diagnostics	Medical Devices
Ceptaris	Aviana Molecular*	Essential Medical
Corridor Pharmaceuticals	Bioconnect	EyeIC
DermaAvance Pharmaceuticals	BioNano Genomics	Gentis
Eagle Vision Pharmaceutical	Leversense	Infrascan
Jenrin Discovery	MicroMRI	Kerathin
Keystone Nano*	Molecular Detection	NeoForce Group
Midway Pharmaceuticals	Neuro Diagnostic Devices	Stabilize Orthopaedics
NexusPharma	Optofluidics*	Technical Vision*
Niiki Pharma	QLIDA	ZSX Medical*
Onconova Therapeutics	RealTime Tomography	
Prezacor	Sunstones*	
QR Pharma		
Relmada Therapeutics		
Retinapharma Technologies		
Therimunex*		

*Support from Technology Commercialization Loan Program or NanoApplication Fund Loan

TABLE 4. BFTP/SEP Funding and Venture Capital Partners (Partial List)

- Angle Technology Ventures
- Axiom Capital/Livingston Capital
- Battelle Ventures
- BioAdvance (the Pennsylvania Life Sciences Greenhouse)
- Cardinal Health Partners
- Domain Ventures
- Emerald Stage2 (a BFTP/SEP fund)
- Greater Philadelphia Alliance for Capital and Technologies (PACT)
- Harris & Harris
- LORE (Loosely Organized Retired Executives)
- Mid-Atlantic Angel Group (MAG)
- New Spring Capital
- Philadelphia Industrial Development Corporation
- Phoenix IP Ventures
- Quaker Partners
- Robin Hood Ventures
- Safeguard Scientific
- SR One Ltd
- University City Science Center
- Independent Angel Investors

SUCCESS STORY: BIOLEAP

Not all companies need direct investment or large amounts of funding to validate and accelerate the commercialization of their technology. For BioLeap, a molecular design company, a $4,000 Technology Commercialization Engagement grant enabled BioLeap to engage Nova Screen Biosciences Corp. to demonstrate proof-of-concept for its first candidate compound designed using its proprietary technology. Founded in 2004 in New Hope, PA, BioLeap's proprietary technology allows for improved identification and optimization of difficult to synthesize and formulate compounds. BioLeap used the project results to secure research contracts with GSK, Lycera, Unilever, Syngenta, DuPont, and SRI and successfully raised $8 million in investment from Quaker Partners, Adams Capital, and Syngenta.

NETWORKS: STRENGTHENING THE REGION'S INNOVATION INFRASTRUCTURE

The importance of an active, supportive *ecosystem* for spawning technology enterprises is widely recognized today and the value of public/private partnerships and of entities that perform enabling and integrating functions in this arena is just beginning to be understood and recognized.

Over the years, BFTP/SEP has initiated, funded, supported, and been the convener for a wide variety of large and small initiatives, industry reports, informational resources, and events that have resulted in more resources for emerging entrepreneurs; multiple options for anyone interested in this arena to connect; and a more varied, dense, and networked community. Our active participation in the life sciences community was recognized in 2011 with the Local Venture Impact Award of the Philadelphia Business Journal's 2011 Life Sciences Awards. As the industry continues to adjust to new realities, we expect to remain engaged and supportive of this critical economic engine.

SUCCESS STORY: INFRASCAN

InfraScan has developed a practical solution to the problem of early identification of intracranial hematomas, exploiting the unique light-absorbing properties of hemoglobin and the non-invasive, non-ionizing nature of Near-Infrared technology. The solution was based on the groundbreaking discoveries of the late University of Pennsylvania Professor Britton Chance and fully developed through the collaboration with Drexel University's School of Biomedical Engineering. The resulting device, the Infrascanner, is a patented, hand-held diagnostic imaging device based on a PDA platform to rapidly detect bleeding in the brain. An initial field study performed with over 300 patients showed the device to be highly accurate in detecting brain hematomas and as a quick, affordable complement to CT scanning to improve treatment of patients with traumatic brain injury.

Funded initially through a Coulter Foundation Grant and armed with $500,000 in BFTP/SEP funding in 2006 and an additional $250,000 in 2007, InfraScan was able to develop its prototype instruments, complete critical proof-of-concept trials and production plans and submit for 510(k) approval to the FDA in February 2008. Deployed by the Marine Corps in Iraq from 2008-2010, the positive results that accrued helped validate its clinical utility and FDA approval was secured in December 2011.

In addition to the capital it provided, BFTP/SEP's continued support and mentoring of InfraScan throughout this long process was critical to its success. Today, InfraScan is continuing to improve its first and second generation devices and expand the life-saving applications of its Near-Infrared technology. The company recently received Pennsylvania Bio's first PA Bio Patient Impact Award.

InfraScan Inc. is a medical device company that has developed a patented, Near Infrared (NIR) technology for detecting brain hematomas. The Infrascanner enables clinicians to effectively, conveniently, and accurately screen for intracranial bleeding in patients with head trauma.

SUSTAINING THE ABILITY TO CHANGE

"Innovation is the only way to address the global challenges that exist at the beginning of the third millennium," said Bayer Healthcare Chief Marijn Dekkers. The hallmark of a sustainable organization is its ability to change and re-evaluate its programs and services – to evolve, to innovate. Over 30 years, BFTP/SEP has undertaken continuous evaluation and in many cases, made substantive and long-lasting changes to help assure our future, which in turn, increases the chances for the life science industry in SEP to survive. Where once we based our revenue return on royalties, we now provide convertible debt; where once we provided small technology grants, we now provide small loans; and where once we funded single institutions, today we create multi-institutional partnership programs.

We are also sensitive to the evolution of technology sectors themselves: the emergence of software and IT technology applied to life sciences is revolutionizing the delivery of healthcare. BFTP/SEP's approach to this was to establish a separate but related seed fund venture fund, Emerald Stage2 Ventures (ES2), a private limited partnership that is a source of follow-on capital to emerging regional Information Technology enterprises and to which BFTP/SEP is the General Partner and lead Limited Partner. ES2 has now committed over $9 million to nine healthcare IT companies.

We are in a unique and challenging time for the life sciences industry. The confluence of changes in health care economics and policy, patent expiration of enormously successful drugs, the constant ebb and flow of trends in technology commercialization, and the consolidation of the life science industry – all combined with the significant capital requirements – present an enormous challenge to the industry. These are all difficult challenges individually – collectively, these challenges require new thinking and new programs with a consistent commitment to help meet these challenges – it requires innovation.

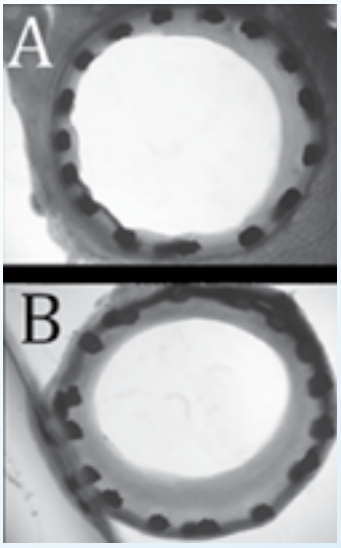
Innovation in all forms, job creation and economic development are inextricably bound. But innovation does not stop during poor economic times. Job creation and economic growth, by contrast, will: the lack of funds, and resolve to support not just innovation itself but those innovative programs that support innovation all but guarantees it. Leading these new ef-

Over 30 years, BFTP/SEP has undertaken continuous evaluation and in many cases, made substantive and long-lasting changes to help assure our future, which in turn, increases the chances for the life science industry in SEP to survive.

SUCCESS STORY: VASCULAR MAGNETICS, INC.

Dr. Robert Levy, a cardiologist at Children's Hospital of Philadelphia, has been studying mechanisms of heart valve disease for over 30 years. His recent advances to develop a revolutionary nanoparticle-based magnetically targeted drug delivery system for the treatment of peripheral artery disease have resulted in the creation of Vascular Magnetics, Inc., the first spin-out company from Children's Hospital of Philadelphia. In addition to significant funding from the NIH and the American Heart Association, Dr. Levy received $550,000 from the Nanotechnology Institute over five years and subsequently received an additional $200,000 from the University City Science Center's, Proof of Concept, QED Program.

NTI funding helped support critical proof-of-concept experiments to support and strengthen the company's Intellectual Property (five issued patents; eight applications). The QED funding helped advance the technology further and helped recruit a CEO for Vascular Magnetics, enabling the company to secure its first venture funding, $7M in Series A funding from the local venture firm Devon Park Bioventures in February 2012. The company, which is currently in pre-clinical discussions with the FDA, has identified key manufacturers for its stents and nanoparticles.



Vascular Magnetics Inc. has licensed a revolutionary nanoparticle-based magnetically targeted drug delivery system for the treatment of peripheral artery disease (PAD). This technology, developed by Dr. Robert Levy at Children's Hospital of Philadelphia, has received funding from NIH and the American Heart Association plus $550,000 in funding from The Nanotechnology Institute over five years and subsequently received an additional $200,000 from the University City Science Center's QED Program.

SUCCESS STORY: TECHNICAL VISION

Technical Vision is a Southampton, PA-based company whose objective is to develop a device to capture visually the environment of a visually-impaired person and deliver information in audio format. In 2008, BFTP facilitated and co-funded a project with Villanova University's Center for Nonlinear Dynamics & Control to provide a technical assessment of the vision system and specific recommendations to support further commercialization of the technology. The engagement resulted in improvements in the technology and allowed the company to develop an updated LaserCane™, an advanced laser-based device that will allow individuals who are blind and visually impaired to find their way forward by identifying obstacles on the ground and at chest and head levels. The success of this engagement led directly to the approval of a loan from BFTP/SEP.

The company has now made over 20 prototype support canes that it will loan to private service organizations in the U.S. and abroad to public agencies. Technical Vision started the process of registering with local, state, and federal procurement groups.

forts is Ben Franklin Technology Partners/SEP. In the rarified world where BFTP/SEP resides, where $25,000 is meaningful money, BFTP/SEP will continue to support early stage life sciences in the region, to foster new and innovative solutions to meet the current challenges. Efforts to increase the commercialization of technologies emerging from our research universities, to provide critical financial support to early stage companies, organically grow regional partnerships, and foster a renewed spirit of cooperation among ALL stakeholders, will assure the region and the nation continue to lead in the development of life saving technologies.

Efforts to increase the commercialization of technologies emerging from our research universities, to provide critical financial support to early stage companies, organically grow regional partnerships, and foster a renewed spirit of cooperation among ALL stakeholders, will assure the region and the nation continue to lead in the development of life saving technologies.