

SMALL BUSINESS INNOVATION RESEARCH

SBIR

2016 TIBBETTS AWARDS

SBIR HALL OF FAME

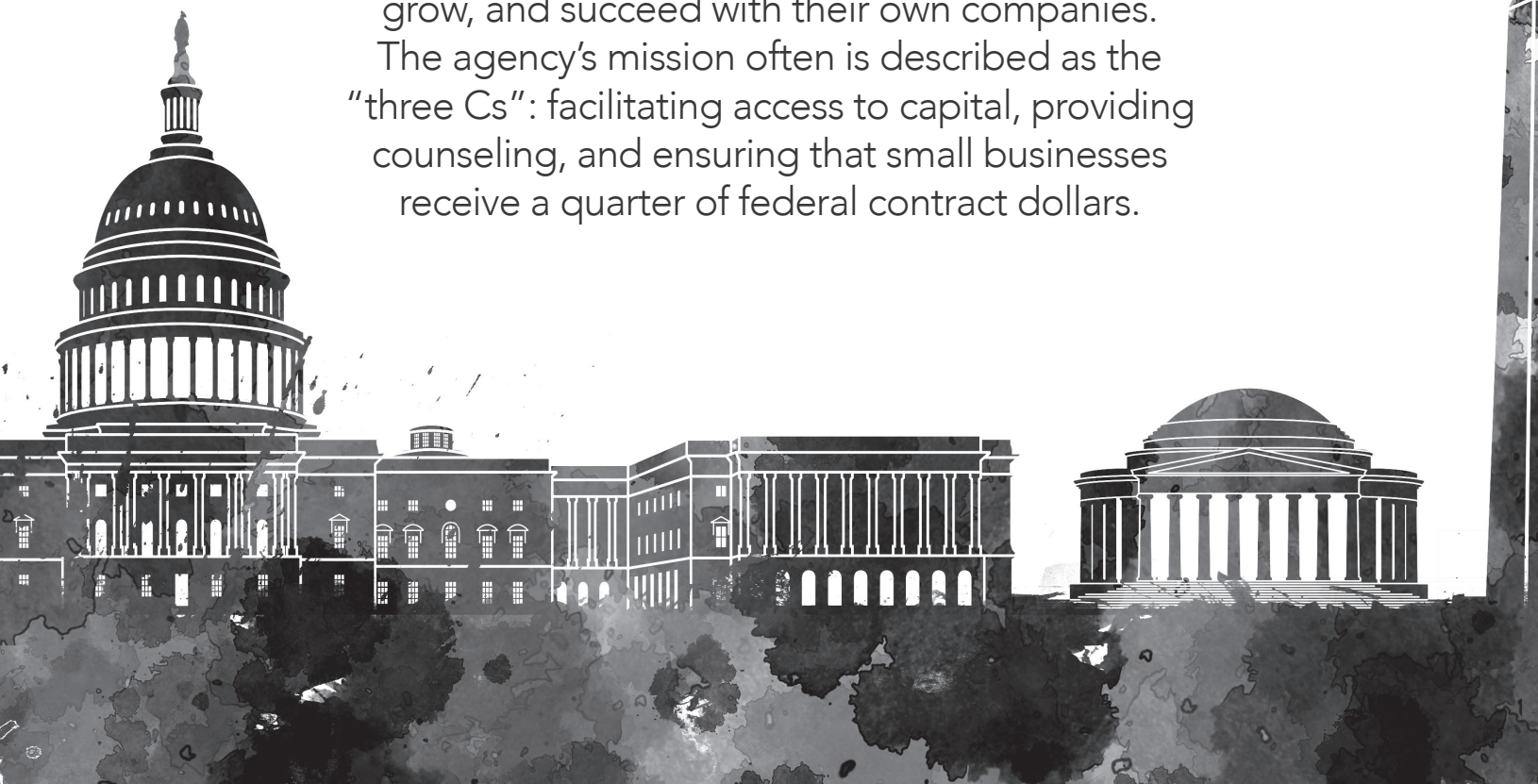
Tuesday, January 10, 2017
White House Eisenhower Executive Office Building, Washington DC



CONGRATULATIONS TO THE RECIPIENTS OF THE

2016 Tibbetts & SBIR Hall of Fame Awards

Created in 1953, the U.S. Small Business Administration (SBA) helps Americans to start, grow, and succeed with their own companies. The agency's mission often is described as the "three Cs": facilitating access to capital, providing counseling, and ensuring that small businesses receive a quarter of federal contract dollars.



One key way the SBA accomplishes these goals is through two programs: the Small Business Innovation Research (SBIR) and the Small Business Technology Transfer (STTR) programs. Through these competitive programs, SBA ensures that the nation's high-tech, innovative, small businesses are a significant part of the federal government's research and development (R&D) efforts.

These programs have helped tens of thousands of small businesses over the years. Today, we recognize the cream of the crop—those companies and individuals across the country that have used their SBIR/STTR funds to advance technological innovation and stimulate economic growth.

Tibbetts Awards

Named after Roland Tibbetts, who was instrumental in developing the SBIR program, the Tibbetts Awards are presented annually to those who are beacons of promise and models of excellence in high technology. Winners are selected based on the economic impact of their technological innovation, and the extent to which that innovation served federal R&D needs, encouraged diverse participation, and increased the commercialization of federal research. There are two types of Tibbetts Awards: awards for businesses that have received SBIR Phase I or Phase II awards, and awards for individuals and organizations who have supported the SBIR Program.

SBIR Hall of Fame

The SBIR Hall of Fame recognizes companies and individuals with a long period of extraordinary success in research, innovation, and commercialization within the SBIR program. To be eligible for the award, a nominee must have won a SBIR award and continued to contribute significantly to the goals of the SBIR program.

In the pages that follow, we profile each recipient and their achievements. Individually, these profiles evince remarkable ingenuity, resolve, and success. As a whole, they demonstrate a remarkable range of benefits – locally, regionally, and nationally – and sustain the conviction that America's future is as bright as its past.

INDIVIDUAL OR ORGANIZATION NOMINATION

Individuals/organizations are evaluated on the basis of unique, long-term service, creation and/or initiation of new programs, and/or advocacy of the SBIR programs.

SBIR/STTR FIRM

Companies are evaluated on how they leveraged the SBIR investment and program to stimulate technical innovation, generate business impacts, and spur broader social and economic benefits.



Maria Contreras-Sweet



Maria Contreras-Sweet was sworn in as the 24th Administrator of the U.S. Small Business Administration (SBA) and as a member of President Obama's cabinet on April 7, 2014.

The SBA is charged with supporting America's 28 million small businesses, which create a majority of U.S. jobs and employ half of our nation's private-sector workforce. The Agency oversees the world's largest seed fund and the largest middle market fund of funds, as well as a \$120 billion loan portfolio. It also directs the world's largest business counseling network and one-quarter of the federal procurement activity to small businesses. As a business leader, California state

cabinet official and entrepreneur, Contreras-Sweet's achievements in bringing efficiencies and modernization to large scale organizations have earned her international acclaim. Her drive to bring SBA into the digital age, and expand into broader domestic and global markets, has yielded record results in lending and contracting for small businesses. Contreras-Sweet started three businesses, including a community bank in downtown Los Angeles, focused on small and mid-size businesses where she served as its executive chairwoman for seven years.

Prior, Contreras-Sweet served as the California cabinet Secretary of the Business, Transportation and Housing Agency,

where she oversaw 44,000 employees, a \$14 billion budget, and 14 state departments, including the departments of Transportation, Highway Patrol, Housing, Financial Institutions, Corporations, Real Estate, and the DMV. She also oversaw the creation of the Department of Managed Health Care and its Office of the Patient Advocate. During the state's energy crisis, she was asked to serve on the board of California's electrical power grid, CA-ISO, and helped to stabilize the volatile energy market amid the state's rolling blackouts.

At the age of 24, Contreras-Sweet served as a district manager for the U.S. Census Bureau, hiring and managing 700 employees. She was then recruited by Westinghouse and joined their commercial division's 7UP/RC Bottling Company, at the time the largest 7UP bottler in the world, where she later became an equity partner. During her tenure, they posted double the national average sales and she helped lead California's legislative negotiations for the creation of the Beverage Container Recycling and Litter Reduction Act.

Contreras-Sweet is a founding director of The California Endowment, a \$3 billion foundation dedicated to improving the health status of Californians. She served on the Boards of Blue Cross of California and numerous nonprofit organizations.

Contreras-Sweet sees entrepreneurship as a force that can change lives and lift whole communities around the world. Entrepreneurship helps people realize dreams and brings dignity to those who embrace its challenges.



Mark Walsh

Associate Administrator

Mark Walsh was sworn in as the head of Investment and Innovation for the Small Business Administration in December of 2015. He oversees all SBIC, SBIR, Accelerator/Incubator, and other growth activities at the SBA.

This is his first government position. Prior, he had a 30+ year career in technology, media, venture capital, and angel investing. He was CEO of a high growth public company (VerticalNet NASDAQ: VERT), was a senior executive at GE, AOL, and HBO, and has invested in and/or served on the board of a number of high profile public and private companies, including BlackBoard (NASDAQ: BBBB), Nutrisystem (NASDAQ: NTRI), half.com (bought by eBay), TheStreet.com (NASDAQ: TST), IndustryBrains (bought by Marchex-NASDAQ: MCHX), Day Software (bought by Adobe) and many, many others. He got into the collision of technology and politics early, serving as the first chief technology advisor to the Democratic Party in 2002, running the internet efforts for the John Kerry presidential campaign in 2004 and was the founding CEO of Air America Radio, which brought Al Franken, Rachel Maddow, Marc Maron, and Chuck D (among others) to the progressive airwaves.

Walsh was the chairman of the board of his college alma mater, Union College, and of the Entrepreneurial Center at the University of Maryland, and received his MBA from Harvard University. He has served on a number of prominent not-for-profit boards, including the Bipartisan Policy Center (where he was chair), the Philadelphia Orchestra, the New York Theatre Workshop, and many others.



John Williams

**Director of Innovation and Technology
SBA, Office of Investment and Innovation**

John Williams is Director of Innovation and Technology for the Office of Investment and Innovation (OI) within the Small Business Administration (SBA). Mr. Williams' primary responsibility is to serve as senior principal for the Federal policy implementation and programmatic oversight of the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs across all 11 participating Federal agencies.

Prior to joining the SBA in December 2014, Mr. Williams served as the Director of the Navy SBIR and STTR programs. While at the Navy, Mr. Williams conceptualized the Transition Assistance Program (TAP), an 11-month program to educate and assist Navy Phase II awardees in the Technology Transition process. Commercialization of technologies developed under the SBIR and STTR programs was a major focus of his work. Through Mr. Williams' leadership, the Navy led the way in supporting the acquisition and transition of SBIR/STTR seeded technologies, awarding more Phase III contracts than the rest of the DoD combined. His career with the Navy spanned 27 years, including positions at the Naval Surface Warfare Center, the Naval Sea Systems Command, and the Office of Naval Research.

As a result of his endeavors and distinguished leadership, Mr. Williams has been recognized via prestigious accolades such as the Tibbetts Award and Hammer Prize, and has been a featured speaker at The National SBIR Conference, Navy *Opportunity Forum*[®], Defense Energy Summit, NCET2, Cleantech Open, and The National Academies (NAS, NAE, IOM & NRC).

Mr. Williams is a member of the Senior Executive Service (SES), with a degree in Mechanical Engineering from the University of Maryland College Park, and a Masters in Engineering Management-Marketing of Technology from George Washington University.

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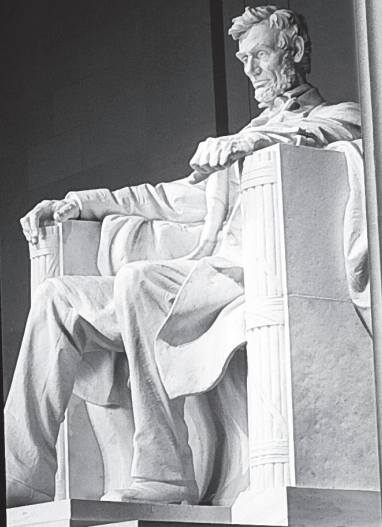
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Atlantia Offshore Limited

Atlantia was founded in 1979 by husband and wife team, Joe and Pat Blanford, to provide full engineering services related to the design of shallow-water, low-tech platforms in the offshore oil industry. These fixed offshore minimal-production platforms were marketed to independent gas and oil companies operating in the Gulf of Mexico and North Sea. During the early years of the company, Joe Blanford was Atlantia's only fulltime employee. As Atlantia gained success in the shallow-water market, the company identified one persistent technical issue in the deep-water segment of the industry: no viable cost-effective technologies existed to commercially develop small remote fields in deepwater. Mr. Blanford brought on as partner, Dr. Steve Kibbee, to shift the focus of the company away from shallow water to deepwater products.

Atlantia first became aware of the SBIR program in 1990 when Steve Kibbee saw a brochure about SBIR at an oil industry trade show and decided to apply to the SBIR program in an attempt to raise much needed financial support for its changing research direction. Atlantia pursued funding for only one research project—the SeaStar® technology—receiving one Phase I and one Phase II award through the DOE SBIR program. The SeaStar Tension Leg Platform (TLP) is a deepwater platform that enables economic production of smaller oil and gas fields, several of which are now operating in water depths up to 4300 ft. The SBIR awards alone provided at least 1-2 months of revenues that were instrumental in keeping necessary staff employed during the development of SeaStar®. In 1992 the company received a patent for its SeaStar® TLP.

According to Kibbee, before the SeaStar® technology, Atlantia earned approximately \$10 million in revenues and employed approximately ten people. After the early commercialization of this technology, revenues jumped to



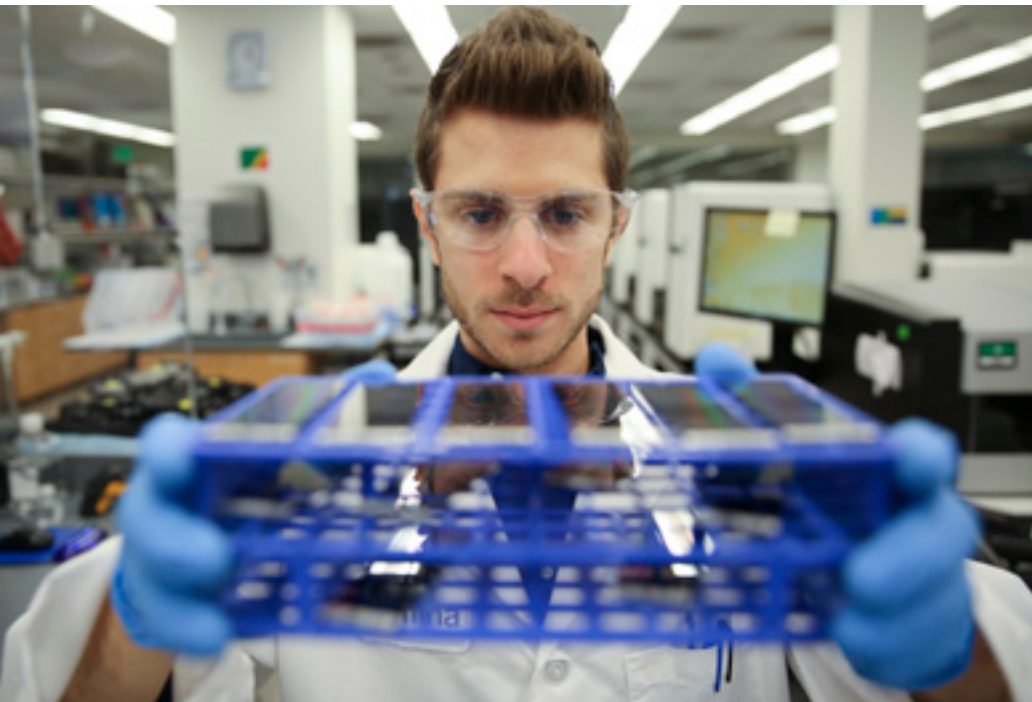
\$100 million and employment rose to over 100. Given the success of the SeaStar® technology, Atlantia found itself as a small company trying to sell a big product to big companies. While successful, Atlantia recognized that it could benefit from help in marketing on a grander scale in the international market. In 2001 Atlantia's partners decided to sell the company to IHC Caland, a Dutch holding company with a group that specializes in offshore oil services, dredging, and shipping.

Approximately \$700 million in revenues have been generated for Atlantia related to the SeaStar® TLPs. Additionally, approximately four patents were granted directly from the SBIR research, and more than 100 foreign and U.S. patents have been granted to Atlantia based on its deepwater technologies that directly or indirectly stemmed from the initial SBIR research in the early 1990s.

Atlantia received the Tibbetts Award in 1997 for its SBIR-related success and believes that receiving this award generated considerable publicity for Atlantia, improving its marketing potential. Touting such SBIR successes, especially by the U.S. government, can be instrumental in providing a visible "stamp of approval" on companies such as Atlantia that can create a competitive advantage in their markets.

Since being acquired 16 years ago, Atlantia has been completely integrated into SBM Offshore. Atlantia benefited from SBM's global reach and SBM benefitted from Atlantia's presence in the U.S. market and deepwater expertise.

Illumina, Inc.



Illumina, Inc. is the global leader in genomics—an industry at the intersection of biology and technology. At the most fundamental level, the company enables the ability to read and understand genetic variation. Illumina strives to make its solutions increasingly simple, more accessible, and always reliable. As a result, discoveries that were unimaginable even a few years ago are now becoming routine—and are making their way into patient treatment.

Illumina was founded in April 1998 by David Walt, Ph.D., CW Group (Larry Bock), John Stuelpnagel, D.V.M., Anthony Czarnik, Ph.D., and Mark Chee, Ph.D., based on core technology developed at—and then exclusively licensed from—Tufts University. After receiving its first SBIR award in 1999 through the Department of Health and Human Services SBIR program, Dr. Mark Chee became the source for SBIR related activities at Illumina serving as the principal investigator on most of the early SBIR awards. When Illumina was a startup, SBIR helped to promote a diverse approach to R&D at the company

by providing flexibility in pursuing projects outside the mainstream of immediate research objectives. SBIR contributed to Illumina technologies including Illumina's Genotyping system, Pyro-sequencing project, and gene expression profiling.

SBIR at Illumina should not be understood as focusing on peripheral research; instead, it allowed a focus on higher-risk research that was positioned further from the market projects that resulted in dramatic improvements in the core technology. There has been a very big payoff from SBIR projects at Illumina through its Genotyping, Parallel arrays, and gene expression profiling technologies. The first two are integral parts of Illumina's main product lines today and have returned many times the original investment in revenues for the company.

The company's SBIR-funded genotyping project became the technical foundations for a critical product line, its HiSeq X Sequencing Systems. The Illumina technology has been enormously important for cutting end-user costs.

SBIR funding was used to start work on the foundation research for Illumina's sequencing system and used to determine the best way to implement design of the array-based system. Positive results during the SBIR-funded research quickly led to substantial subsequent company investment.

Additionally, SBIR-funded work in gene expression profiling led to other significant Illumina technology that created the base for Illumina's product lines covering whole genome expression arrays. These arrays generate superb data and are a highly successful commercial product that would not have been possible without SBIR.

From the beginning, Illumina aspired to transform human health. Its initial products enabled researchers to explore DNA at an entirely new scale, helping them create the first map of gene variations associated with health, disease, and drug response. Illumina's tools convert data generated from human genome sequencing into medically relevant information, linking genetic variation and genetic function to specific diseases, improving the community's ability to discover drugs, and permitting diseases to be detected earlier, and with greater accuracy and specificity.

In January 2014, Illumina announced a milestone in life sciences by introducing a system that researchers can use to sequence the genetic code of a human for approximately \$1,000. Illumina has since enabled sequencing at an unprecedented scale. Collectively this offers a much deeper understanding of genetics than ever before. These advances will trigger a fundamental shift in health care and beyond. Today the company has grown to over 5,000 employees globally and generated revenues of \$2.2 billion in 2015.

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INDIVIDUALS



Robert Brooke



It is no secret that many of the nation's top high tech small businesses are founded in Virginia and provide sought-after solutions to the U.S. military through SBIR-funded technologies. As the sole state representative in charge of SBIR/STTR support at the Center for Innovative Technology (CIT), Robert Brooke fosters this transition and he also assists these companies in reaching beyond the government sector.

Mr. Brooke has been a champion of the SBIR program for fifteen years, actively developing new programs and training to meet the changing needs of the tech community and help businesses forge relationships with key partner organiza-

tions. To advance the goals of SBIR, he has provided special mentoring and events for MACH37 Cyber Accelerator, Small Business Development Center & Procurement Technical Assistance Center networks, universities, and incubators. In 2015, Virginia companies received 300 SBIR/STTR awards worth over \$117M. Of this, CIT's programs helped companies secure 201 awards worth over \$87M.

In an effort to expand on commercialization plans that target only the Department of Defense (DoD), Mr. Brooke assists companies in identifying new Phase III opportunities within the commercial marketplace. He has planned and imple-

mented special rural outreach efforts with underrepresented areas to develop customized outreach, and hosts one of the only Advanced "Phase III" focused conferences in the country to facilitate more effective transition and commercialization of SBIR-funded technologies. He has conducted specialized training to help companies learn to apply to non-contracting agencies such as National Institutes of Health (NIH) and National Science Foundation (NSF) in order to reduce reliance on contracting agencies like DoD.

Through his annual Advanced SBIR Forum, Mr. Brooke helps past DoD award winners look for new Phase III opportunities, while cross promoting other state programs that have been developed with similar goals. In 2015, he hosted 10 workshops across all regions of the state, and 10 SBIR webinars to ensure CIT's ongoing presence across the Commonwealth. That same year, his programs assisted 300 individuals, including 55 university researchers and 245 Virginia-based small tech firms.

Mr. Brooke seeks to increase SBIR/STTR participation by women and minority groups in Virginia, and has developed specialized programs with that end goal. He also provides guidance in the development of SBIR and STTR matching grant programs by the state. While companies within Virginia know they can turn to Mr. Brooke for support, his reputation goes beyond the state's borders, as his training programs are attended by over 100 non-Virginia based companies annually.

William A. Gern, Ph.D.

Dr. William Gern has been instrumental in helping small high tech businesses in the state of Wyoming achieve success within the federal SBIR/STTR programs. He founded the Wyoming SBIR/STTR Initiative (WSSI) in 1996 at the University of Wyoming (UW), and created the WSSI Phase 0 program shortly thereafter, the first of its kind in the state and one of the first in the U.S. During the first year of operation, the WSSI assisted local small businesses with securing more SBIR/STTR awards than the previous thirteen years combined. These awards total more than \$54 million in federal funding, and have resulted in the University submitting 633 patent applications, while creating numerous spinoff tech companies using University licensed technologies. Several of these spinoffs have been sold to Fortune 500 companies.

Dr. Gern also initiated the UW Wyoming Technology Business center (WTBC) incubator system which is now operating in three sites across the state, helping SBIR/STTR companies to achieve growth and commercial success. His history with SBIR/STTR has made Wyoming one of the fastest growing states in terms of high tech startup activity and has been instrumental in fostering the economic development of the region. The economic development programs under Dr. Gern's control have generated nearly \$750 million in capital impact and 20,000 new jobs in the last 20 years - in a state with just over 550,000 people. The Laramie community alone has gone from being home to six tech firms in 2000 to boasting approximately 60 in 2016.

The Phase 0/00 programs created under Dr. Gern's direction have become a model for programs across the nation. State and university SBIR/STTR programs have frequently called upon UW for guidance and assistance in setting up similar programs with the goal of increasing the number of SBIR/STTR proposals submitted. Dr. Gern, working



with state government, Cheyenne LEADS, the Wyoming Business Council, the National Center for Atmospheric Research (NCAR) and the University of Wyoming, helped launch the NCAR-Wyoming Supercomputing Center, which provides advanced computing services to scientists studying a broad range of disciplines in the geosciences broadly defined.

Many of the SBIR/STTR successes under the direction of Dr. Gern have brought about positive economic impact in Wyoming, providing jobs and opportunities

across the state. Under Dr. Gern's leadership as the Vice President for Research and Economic Development, the University of Wyoming has been following a three pronged approach: Grow the research enterprise, harvest technology, and support the creation and growth of technology-related businesses while supporting existing small businesses in Wyoming.

David Linz



Dave Linz's reputation transcends far beyond the borders of his home state, Wisconsin. By helping to bring SBIR-funded innovations to the marketplace, he is making a name for himself around the country as a champion of the SBIR/STTR program. Mr. Linz created **SBIR Advance** – a state matching fund that has provided 42 grants to date to Wisconsin SBIR/STTR award recipients, helping companies achieve their commercialization goals and Phase III success. He understands the importance in helping scientists think like entrepreneurs, and through the use of Lean Startup best practices, has coached hundreds of aspiring tech entrepreneurs and Principal Investigators on the importance of validated business models, sound commercialization plans, and defining the target customer.

Not only has Mr. Linz helped companies craft meaningful SBIR/STTR proposals to various government agencies in order to secure necessary research and development funding, he also looks at the broader picture and ultimate goal of bringing these technologies to market. Over the last eleven years, he has helped 600 high-technology companies to raise nearly \$23 million in capital investment. His commitment to helping clients focus on customer needs has resulted in over 60 new jobs across top Wisconsin industries including manufacturing, healthcare, IT, agriculture and energy.

Mr. Linz has been instrumental in growing the Milwaukee SBIR/STTR landscape by forming alliances with local business development organizations such as

BizStarts Milwaukee, BREW (water technology company) Accelerator, Milwaukee 7 Investment Fund and Entrepreneur Initiative, and the Mid-West Energy Research Consortium WERC Bench Accelerator. Most recently, he helped to bring the 2017 Health and Human Services (HHS) National SBIR conference to Milwaukee.

In order to keep the SBIR program viable, Mr. Linz understands that scientists and engineers must also think like business owners. To that end, he has mentored the National Science Foundation (NSF) I-Corps teams and has adapted those lessons to one-on-one coaching within the state. His I-Corps experience helped to launch the Iadvance Seed Fund, a first-of-its-kind program for the University of Wisconsin, and the SBIR Advance Lean Startup commercialization training program.

Launched in 2013 with the Wisconsin Economic Development Corporation (WEDC) Secretary and CEO and the State's Lieutenant Governor, Iadvance and SBIR Advance have become models for Mr. Linz's Lean Startup programming. These proven methods are now being expanded into a new training program, SBIR Ready, newly funded by SBA under the Federal and State Technology Partnership (FAST) program. SBIR Ready is designed to increase the capacity and pipeline for SBIR projects by hands-on training of teams of post-docs and early career scientists and engineers, including under-represented populations. It is because of individuals like Dave Linz that the SBIR program continues to thrive and seed the development of next generation technologies.

Lore-Anne Ponirakis

The Office of Naval Research (ONR) SBIR program is responsible for seeding the development of many in-demand technologies used today by the Department of the Navy (DoN) and other branches of the U.S. military, resulting in hundreds of small businesses achieving commercial success. As the SBIR Program Manager for ONR, Lore-Anne Ponirakis has been the stabilizing force underpinning the program's success since 1999. During FY2016, she managed approximately 300 Phase I and Phase II contracts worth nearly \$50 million.

Ms. Ponirakis is passionate in her drive and commitment to technology innovation by small businesses and provides mentorship, guidance, and support to SBIR companies and program officers. She leverages a subsequent Phase II policy to maximize the use of SBIR funds and non-SBIR funding to provide a bridge to transition. Her highly effective working relationships within ONR have contributed to the DoN SBIR/STTR Program leading the Department of Defense (DoD) with a 64% commercialization rate and results in \$75 million in new product sales to the U.S. military every year.

Ms. Ponirakis has worked closely with a number of small businesses to bridge the gap from Phase II to successful transition using a subsequent Phase II model. This model allows for one contract award combining SBIR funding and the transition sponsors' funding. A few notable companies under this model with successful transitions are Knowledge Based Systems, Hydronalix, Daniel H. Wagner, Out of the Fog Research, Quantum Engineering and Design, Arete, and Boston Engineering. Instrumental in launching many new initiatives within the Navy, Ms. Ponirakis helped to create the DoN SBIR/STTR Program Manager's Database (PMDB), a comprehensive database complete with thousands of topic, proposal, and award records and over 900 users. She also championed the establish-



ment of the DoN Contracting Center of Excellence Pilot program, reducing the average time to award ONR SBIR Phase II contracts by 50 percent. She has funded numerous projects valued at over \$26 million, which transitioned into the Electromagnetic Railgun Innovative Naval Prototype program.

As a testament to her success, ONR-funded technologies have gone on to garner \$628 million in Phase III

contracts over the last decade. These technologies not only make for a stronger Fleet, but make our world a safer place through advances in energy and manufacturing, as well as human performance and robotics.

David L. Sikora



highlighted the strengths of the Air Force SBIR/STTR program.

The study concluded that even the least experienced companies can achieve major commercialization success with a high ROI from SBIR/STTR funds. In addition, it found that 58 percent of all Phase II contracts resulted in follow-on sales or services, while the total national economic impact was at least \$48 billion on the original \$4 billion SBIR/STTR investment; an ROI of about 12:1. At least 125 new companies were created to commercialize the Air Force-funded innovations, 180 technologies were licensed, and 447 small businesses were acquired by larger firms. All in all, nearly 17,000 new full-time jobs were created.

The verified positive outcomes of the Air Force SBIR/STTR Economic Impact Study have generated more favorable responses to the program, while the success stories and videos continue to be a source of inspiration for new start up small businesses. Because of Mr. Sikora's groundbreaking work, the DoD is now launching a much larger SBIR/STTR Economic Impact Study with his assistance, which will examine time-to-market results in more depth and detail over a longer time period. The study hopes to further illustrate the overall success of the DoD SBIR/STTR program and its continued contribution to the U.S. economy.

When David Sikora became the Air Force SBIR/STTR Program Manager, he determined that the most effective way to improve the program was to evaluate prior results. He then embarked on completing the very first comprehensive study of actual outcomes and resulting commercial successes of a major SBIR/STTR program, including military and civilian sales, and whether products were transitioned to DoD use or commercialized in the private sector. For the \$4 billion invested by the Air Force over 4,500 Phase II contracts, this study seemed like the perfect way to gauge government Return on Investment (ROI) and understand the overall importance and economic impact of SBIR/STTR funding.

The Air Force SBIR/STTR Economic Impact Study, as it was eventually named, was spearheaded by Mr. Sikora. He assembled a team of market researchers and together, they contacted all of the participating companies with an impressive 96 percent overall response rate. Success stories were compiled, both in print and video formats, that provided inspiration to other small businesses hoping to achieve success in the program. The results have been distributed to members of Congress, and used by organizations at hearings in support of Reauthorization. Although the logistics involved in completing the Economic Impact Study are admirable in and of itself, the results were equally impressive and

2016 TIBBETTS AWARDEES

ORGANIZATIONS



Fannin Innovation Studio



The path to commercialization for a life sciences research company remains arduous – and certainly not for the impatient. Even today, most innovative federally-funded life sciences research never gets commercialized, since experienced management support is needed at the earliest stages, even with the most promising life-saving technologies. Fannin Innovation Studio addresses the severe shortage of life sciences entrepreneurs with its unique “pooled management” model, which teams experienced in-house entrepreneurs with rising young managers.

Fannin partners with academic institutions and inventors to initiate the process, while leveraging SBIR/STTR funding to reduce early-stage technological risk. This model (<http://goo.gl/cFyPky>) has resulted in a suite of fifteen life sciences technologies, over \$30 million in private investment complementing SBIR/STTR-funded R&D, developmental partnerships with major publicly traded companies, and over 30 full-time jobs in Greater Houston including 28 R&D jobs with post-graduate professionals.

SBIR/STTR funding has helped seed many promising Fannin companies and

technologies, such as Pulmotect’s PUL-042 – a novel inhaled anti-infective drug that enhances the lung’s natural defenses to kill infecting organisms. Pulmotect’s technology, originally funded by the National Institutes of Health (NIH), has caught the attention of the Department of Defense (DoD) as promising protection against emerging pathogens and pandemics. BreviTest’s system is the first true point-of-care quantitative immunoassay targeting opioid and THC testing, Ebola serology diagnostics, tropical disease diagnostics, and other applications relevant to several federal agencies including NIH, National Science Foundation (NSF), Centers for Disease Control and Prevention (CDC), Department of Transportation (DoT), and NASA.

NIH-funded Atrapos is developing a first-in-class Stat5/6 inhibitor for the treatment of asthma, pulmonary fibrosis, and atopic dermatitis, while NSF-funded GuidaBot is developing a robotic arm to work within powerful MRI magnetic fields, to allow physicians to perform precise interventions using real-time MRI imaging. Other therapeutics and medical devices round out Fannin’s impressive suite of technologies and companies, which have received over

\$10 million in follow-on grants beyond SBIR/STTR funding.

Fannin is a strong SBIR/STTR champion, actively giving back to the program that is propelling its growth. Fannin-associated personnel serve as reviewers on SBIR/STTR study sections and present at SBIR/STTR conferences nationwide.

Fannin’s other core mission is to grow the pool of life sciences entrepreneurs through its apprenticeship/internship program (<http://goo.gl/gvDGXA>), the largest of its kind, with over 50 interns in 2016. Scientists and engineers receive up to six months of hands-on experience running biotech companies, including writing SBIR/STTR grant proposals. This innovative program grows the pool of experienced entrepreneurs while helping progress Fannin technologies.

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fannininnovation.com

Larta Institute



If one of the ultimate goals of the SBIR program is to increase commercialization of federally-funded research, then it is safe to say that Larta Institute (Larta) could be considered the power source that propels grantees toward that end goal. Larta offers its specialized Commercialization Accelerator Program (CAP) to companies which receive SBIR/STTR funding across multiple federal agencies and assists them in a number of areas that foster growth and innovation, while helping them develop a plan for commercial success. Since 2004, Larta has assisted nearly 2,300 SBIR awardees across a variety of government agencies, with \$2.6 billion of private investment raised by its SBIR/STTR CAP companies. Through its trademark “network-centric” model, Larta brings domain-specific, tailored expertise to small high-technology businesses, a far cry from the “one-size-fits-all” framework of entrepreneurial assistance typically offered to SBIR/STTR grantees. Personalized feedback from industry provides grantees with strong connections to key players in the sectors they pursue, while enabling continuous

refinement and innovation in their business and revenue models. On average, 300-400 one-on-one industry advisor/client relationships are forged annually with the help of Larta’s engagement.

Utilizing the latest in technological innovation, Larta has built a sophisticated project management system tailored for the specific SBIR programs in which they work. In addition, Artificial Intelligence (AI) is utilized and optimized to track the grantees’ commercialization activity related and unrelated to the CAP.

Larta has invested and continues to invest its own resources to build, maintain, and expand a core network to provide industry perspectives and connections. For example, Larta’s FeedForward™ Sessions provide the platform for SBIR companies to pitch their 18-month strategic plans to industry and domain experts while receiving candid advice on their business and marketing models. The Ag Innovation Showcase brings the best in agricultural innovation and investors

together. Companies pitch to and connect with ag industry professionals who can provide insights into their commercialization plans.

Many in-demand technologies such as alternative energy, clean water, bio-based dyes in manufacturing, quicker diagnostics in disease management and more have come to fruition thanks to the work Larta is doing for SBIR/STTR grantees. By directly stimulating the growth of innovative companies with great ideas which receive federal funding, the goal of getting these breakthroughs to the commercial marketplace is accelerated while concurrently meeting the needs of the federal government. In this way, Larta exemplifies the spirit of SBIR and all that it is meant to achieve.

606 South Olive St.
Suite 650
Los Angeles, CA 90014
larta.org

Utah's SBIR-STTR Assistance Center (SSAC)



It is easy to understand why Utah was recently named the *#1 Fastest Growing Tech State* by **Business Insider** when you see the support provided by the state's SBIR-STTR Assistance Center (SSAC) to Utah's technology community. Since the Utah Science Technology and Research (USTAR) initiative launched the SSAC in 2008, Utah companies went from 47 total SBIR/STTR awards in 2007 worth \$15.7 million, to 64 awards worth over \$28.2 million in 2014. SSAC is integral to Utah's strong technology ecosystem, and provides training and consulting services for small technology businesses with the goal of increasing their ability to access this non-equity position funding through the federal SBIR/STTR programs.

The SSAC actively works with small business development centers, business resource centers, and utilizes other local resources to assist companies in all stages of development. Some of its partners include universities, angel groups, the Women's Tech Council, BioUtah, and Venturecapital.org. The center hosts over 20 in-person seminars and workshops annually across the state,

from SBIR 101 to agency-focused to writing tips. This assistance has resulted in a 27 percent Phase I win rate and a 47 percent Phase II win rate, totaling over \$19.5 million in federal funding across 31 companies to date.

Part of the success of the SSAC is the proven process it uses to engage small businesses. Well before submission, the staff works with clients to close any possible gaps, and assure market viability and a strong project plan. This one-on-one personalized approach helps companies to assess their position and technology as well as their team and approach in order to maximize their chances of winning an SBIR/STTR award.

The SSAC offers a search service to qualified companies where within 10 days of a solicitation release, the company is contacted with potential topic matches, assuring they have the maximum opportunity to move forward. The center also provides samples of all aspects of the proposal including budgets, budget justification, letters of support, equipment, facilities, biographical sketches, and more.

The SSAC team develops a Task Assignment Checklist with each solicitation, which outlines the requirements for submissions with referenced page numbers and links. This checklist is provided at no charge, as are the majority of services, to any Utah company. The SSAC also provides hands-on work during the proposal process, such as editing all documents with the eye of a reviewer, reviewing budgets and justification, and writing ancillary documents.

All of these activities and the unparalleled support provided by the SSAC are helping Utah companies reach their potential and maximize the ability to take advantage of this non-dilutive federal SBIR/STTR funding.

9750 South 300 West
Corporate Partnership Center
Suite 214
Sandy, UT 84070
ustar.org

2016 TIBBETTS AWARDEES

COMPANIES



23andMe



Who am I? Answering that question involves uncovering many different aspects of oneself, and thanks to the 23andMe Health+Ancestry Service, one of those aspects can include your DNA! The 23andMe Personal Genetic Service (PGS) provides information and tools for individuals to learn about their DNA. Customers place an online order for an easy-to-use saliva collection kit received by mail and return their sample to the lab. When results are ready, customers receive more than 65 personalized genetic reports online.

In addition to the direct-to-consumer personalized genome service offering, 23andMe conducts research to make meaningful genetic discoveries that could lead to successful treatment of disease. Eighty percent of the company's 1 million-plus customers have consented to participate in this research. 23andMe researchers and its collaborators can cross reference genetic data against information gathered through surveys administered to those individuals who have

consented to participate in research. Understanding the relationship between human genetics and the incidence of disease could improve preventative, acute, and long-term care of patients while saving consumers, insurers, and medical institutions money each year.

In February 2015, 23andMe's Bloom Syndrome Carrier Status Test report was given marketing authorization by the U.S. Food and Drug Administration (FDA) through the de novo pathway, making it the first direct-to-consumer genetic test to meet FDA standards. In addition to the authorization to market the Bloom Syndrome Carrier Status test report, the FDA classified autosomal recessive carrier screening tests as class II, and intends to exempt such carrier status tests from premarket review under special controls. Following this classification, in October 2015, 23andMe launched a completely redesigned customer experience which includes more than 35 carrier status reports as well as enhanced tools and functionality.

Since 2010, 23andMe has received NIH SBIR funding to help improve the effectiveness of its data collection and analytics, and to enhance racial diversity in genetic research. 23andMe has received five NIH SBIR grants (mostly for the development of tools for evaluating the genetic information database that it is collecting). 23andMe has used SBIR funding to improve data quality, reduce errors, and demonstrate the accuracy of 23andMe's web-based approach to research. 23andMe has also had grants for allergy research, Exome research, pharmacogenomics, and expansion of minority inclusion in genetic studies, addressing a huge problem in genetics research.

899 West Evelyn Ave.
Mountain View, CA, 94041
23andme.com

Agile Mind, Inc.



Agile Mind was founded in 2002 to enhance one thing: the opportunity to learn. The company focuses on equity and high achievement in mathematics and science because of their importance to both the lives of students and the future of our nation. With Department of Education SBIR funding, Agile Mind developed 30 web-based visualizations to embed its high-school biology program. Since 2004, Agile Mind programs have served more than 4 million students and 35,000 educators, over 80% of whom live and work in underserved areas. Its mission—and its promise—is to provide the programs, tools, and the instructional improvement systems needed to transform student achievement through exemplary, sustainable teaching practices.

Agile Mind's core product — a comprehensive next generation system for teaching and learning — supports student engagement and achievement in middle- and high-school mathematics and science. The interactive and animated visualizations address concepts

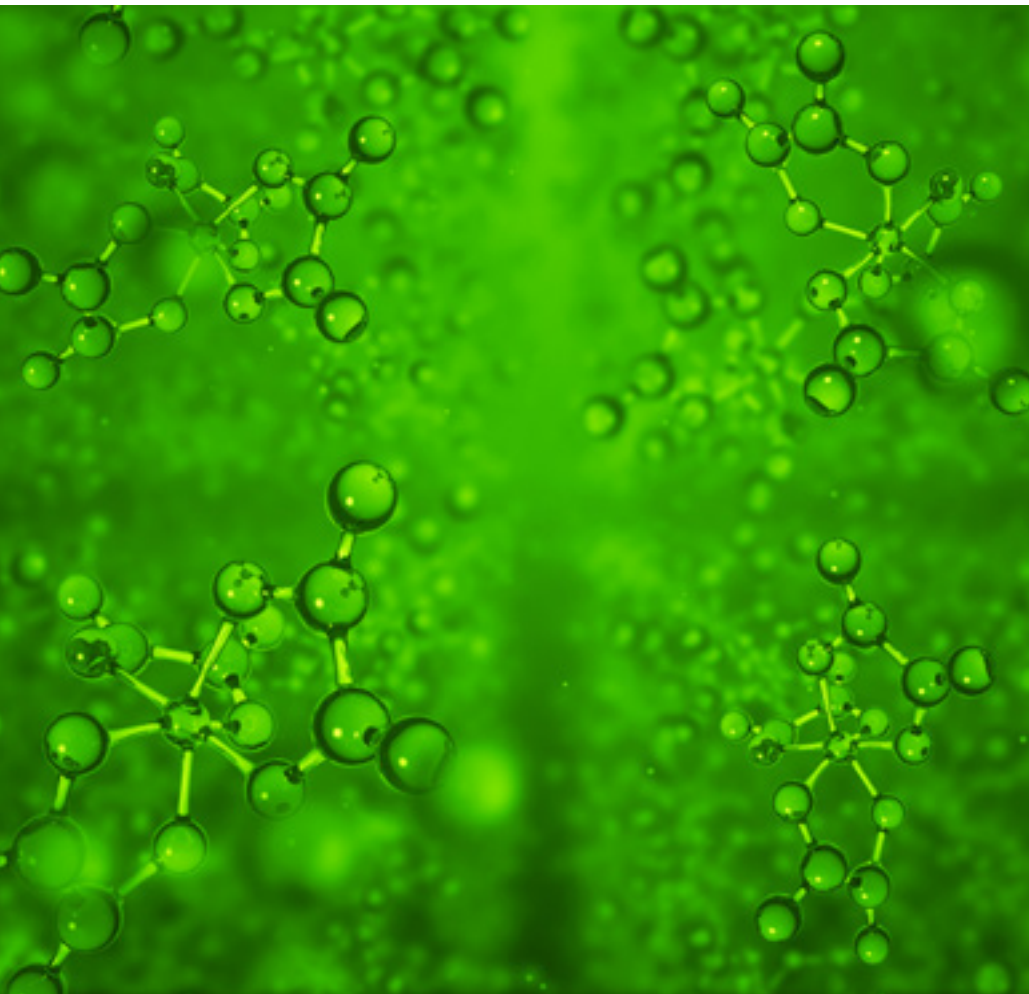
central to state and national standards. Among the key features of the visualizations are imagery that explicitly makes real-world connections to key content; multiple representations to support deeper understanding of concepts; and automated and customized feedback from the software to student to support learning. The visualizations provide opportunities for discovery-based learning of real-world experiments and phenomena that ordinarily would not be possible in classroom settings.

Agile Mind is dedicated to broadening student access, achievement, and persistence in challenging, contemporary mathematics and science courses and to honoring and supporting the practice of teaching, particularly for those educators who teach students least well served in mathematics and science. Core to Agile Mind's pedagogical approach is the knowledge that 21st century skills, such as motivation, positive self-belief, productive persistence, and sense of belonging are fundamental to success

in school, college, and career. Its mathematics and science programs incorporate breakthrough research in the application of these factors and their effect on how students learn. The visualizations developed through SBIR funds and the 250 additional visualizations developed after the project ended have been commercialized and are delivered in course programs (including Biology) licensed to schools and districts in 19 states. At present, these visualizations have been used by thousands of educators and more than 200,000 students. Fees from education entities licensing Agile Mind programs and services (including Biology visualizations) provide 100% of the company's operating capital.

1705 W. Northwest Highway
Suite 160
Grapevine, TX 76051
agilemind.com

Attagene, Inc.



ATTAGENE is a rare example of a small business that combines the technology development and commercialization with cutting-edge research directed toward understanding the molecular mechanisms underlying biological effects of drugs and toxicants.

ATTAGENE technology offers a radically different approach to the evaluation of biological activities of compounds via analyzing perturbations of multiple cellular gene regulatory pathways in exposed cells. This approach affords comprehensive assessment of biological properties of various compounds, from drugs to environmental chemicals to natural products.

The ATTAGENE mission is to provide innovative tools for drug discovery and development and toxicity testing, a mission which many may say it has already accomplished. These tools help to eliminate unsafe drug candidates at an earliest stage, thereby reducing drug development costs, and providing radically new solutions for toxicity testing, bringing about a cleaner and safer environment. Furthermore, ATTAGENE's technology is based on animal-free test systems that enable comprehensive assessments of the safety of environmental chemicals, consumer products, and drinking water. The company has provided research services to government regulatory agencies, including the U.S. EPA, National Institute of Environmental Health Sciences (NIEHS), and the U.S. Geological Survey. In 2010, ATTAGENE evaluated the safety of oil dispersants used for cleaning the Deepwater Horizon oil spill in the Gulf of Mexico. Based on these data, the U.S. EPA issued recommendations for the oil dispersant use.

7020 Kit Creek Rd.
Morrisville, NC 27560
attagene.com

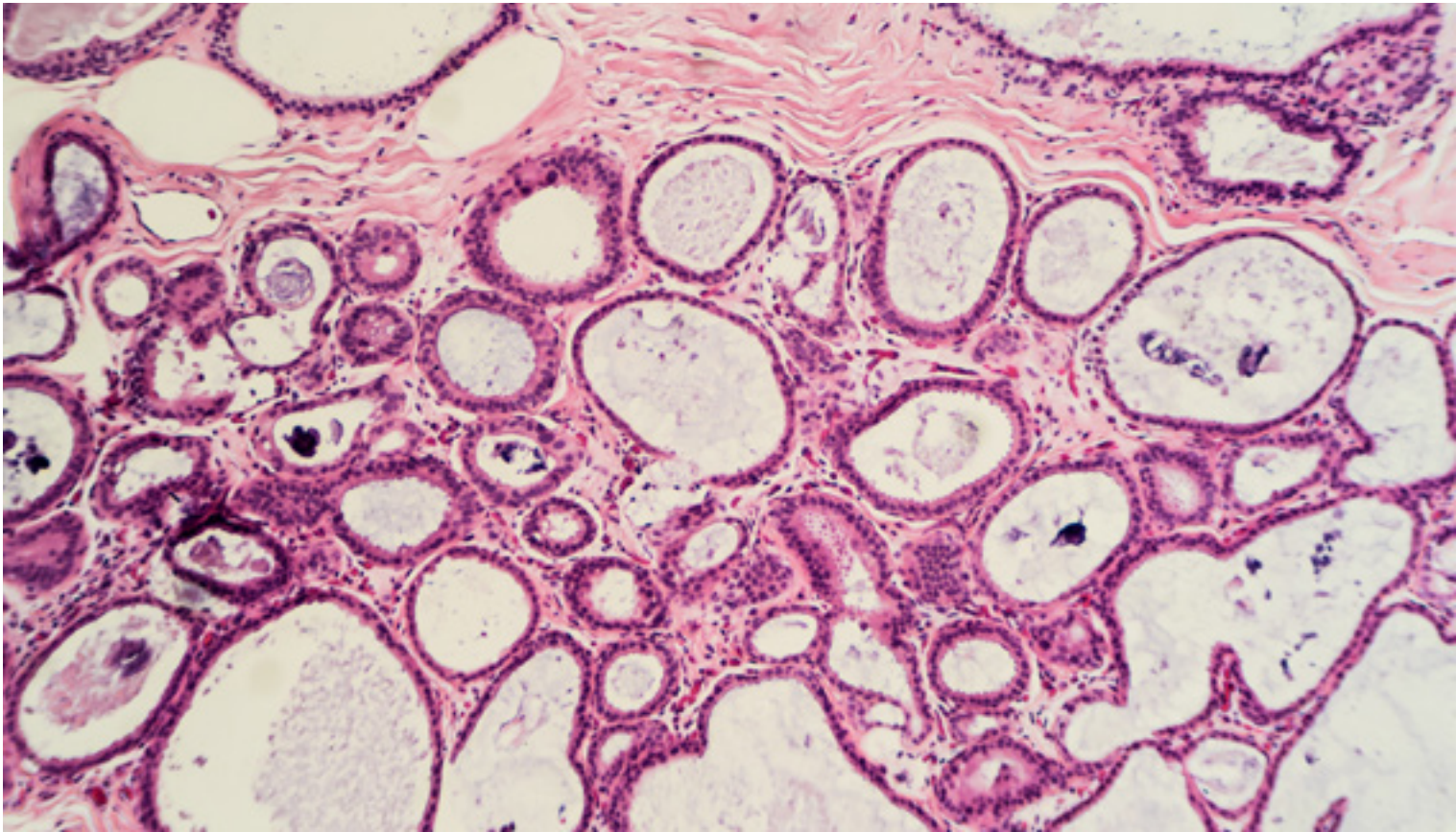
ATTAGENE has invented, constructed, validated, and commercialized a first-of-a-kind molecular biology platform (the FACTORIAL™) that enables high-content-assessment of the activity of multiple gene regulatory pathways in human and animal cells. ATTAGENE uses this platform as a powerful new tool for drug discovery and development and for assessing the safety of environmental chemicals, natural products, and drinking water.

The company's SBIR awards provided early funding for testing the feasibility of the innovative technology and prototype development, and fostered the follow-up funding for ATTAGENE R&D. In 2010, ATTAGENE became a commercially successful, self-sustained entity.

ATTAGENE was founded in 2001, but was dormant until 2004, when it received two SBIR grants from the National Cancer Institute of the NIH. These grants funded the proof-of-the-concept study, building the prototype, and patenting the technology for its platform. With the prototype in hand, the company was able to raise further non-diluting investments (contracts and grants) from government regulatory agencies, NIH, and the biopharmaceutical industry.

ATTAGENE technology has become an integral part of the U.S. Environmental Protection Agency (EPA) evaluation programs dedicated to the development of new approaches toward toxicity assessments of environmental pollutants.

Biopsy Sciences



After founding Biopsy Sciences in 2001, with angel seed money of \$500,000 and several National Institutes of Health (NIH) SBIR grants, Dr. John Fisher, CEO, and his partner, Fred Ahari, CTO, have steered the company into a successful, stand-alone, medical device company. This funding led to BioSEAL, a novel biopsy device system to prevent air leaks that can lead to a collapsed lung, pneumothorax, in patients having lung biopsies. In 2007, when the trials were only approximately 50 percent complete, the company was sold to Angiotech, a global specialty pharmaceutical and medical device company. The \$19 million sale occurred while completing the NIH SBIR Larta CAP program, and included its patented VMark breast biopsy site marker and Maxi-Cell biopsy needle. In March 2014, BioSEAL received a de novo 510k device classification from the Food and Drug Administration.

The company continued to innovate following the 2007 sell of BioSEAL. The company developed HydroMARK, a breast biopsy site marker that offers increased comfort to patients and reduces procedure times during breast biopsies. HydroMARK was sold in the U.S. and in over 30 countries through a network of worldwide distributors. HydroMARK generated approximately \$7 million in revenues in 2013. The product and all rights associated with HydroMARK were acquired by Devicor Medical Products, Inc. in early 2014. HydroMARK is the number one breast biopsy site marker and is used by many physicians. Biopsy Sciences continues to operate as a fully functioning company even though BioSEAL and HydroMARK have been acquired. Dr. Fisher explained that, "Biopsy Sciences has become a kind of an incubator – if we or someone else develops a promising innovative idea

that has commercial vitality, we will look at it. As a physician, I am interested in products that help doctors do our jobs better, alleviate suffering in patients, and make an overall positive impact. We don't view commercial success unless our company makes a positive impact on people's lives."

4900 Creekside Dr.
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Clearwater, FL 33760
biopsysciences.com

CSSI (Composite Support & Solutions, Inc.)



Composite Support & Solutions, Inc.'s (CSSI) technology helps fulfill the need for quicker, cheaper, and more efficient solutions across a variety of industries. The company's SBIR-funded technological innovation eliminates tens of thousands of fasteners in manufacturing assembly operations resulting in a fastener-less composite communication tower concept and hardware that serves as an enabler for the "data-driven economy." Data-driven activities – the production, distribution, and use of digital information of all kinds – have become the leading edge of economic innovation and growth in the United States. Additionally, the Air Force Research Lab has identified as

missions' goal achievements, not only huge costs savings, but also increased communication capabilities across Military Services, State and Local Governments, and the private sector.

CSSI was in business for four years before receiving its first SBIR/STTR award and has grown from three to twenty-eight employees. The SBIR funding allowed the company to channel the creative energy in its firm into developing a "new to the world" advanced technology asset for the U.S. Air Force. This in turn provided leverage and opportunities for the firm to grow and to engage in a series of commercial

ventures. Without the SBIR funding, these opportunities would not have happened. Furthermore, revenue has grown exponentially and resulted in the direct creation of 143 high-wage manufacturing jobs at two locations in Southern California.

Recently, CSSI has acquired all the assets and the intellectual property of Digiray, a silicon-valley based company specializing in Non-destructive Testing (NDT) and is now uniquely positioned to leverage this technology into the traditionally hard industry of manufacturing and more specifically into the emerging 3D-printing segment for which the quality of manufacturing needs to be recorded and communicated in real time.

The successful demonstration of its fastener-less advanced composite communications tower on an active Air Force Base installation at an assembly speed that is eight times faster than the previous best of category has saved the federal government and the taxpayer \$1M. The installation at Hanscom AFB has science-based projections of zero maintenance cost, because there are no metal fasteners or other metal tower materials that can corrode. According to the National Association of Corrosion Engineers, the cost of corrosion in the U.S. FY 2015 exceeded \$1 trillion (6% of GDP) and it is a national priority to employ R&D to drastically reduce this expense. The company's technical innovation falls completely in line with the stated National Priority to develop and enhance advanced manufacturing for the greatest possible return on investment.

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San Pedro, CA 90731
intellifirewall.com

Diagnostics for the Real World

Sometimes, the hardest and the longest part of a test is waiting for the results, and that can be particularly true for medical diagnostic tests, especially among vulnerable populations. The Health and Human Services (HHS) SBIR program has supported Diagnostics for the Real World (DRW) to develop innovative diagnostic technology, which has led to the commercialization of high quality rapid tests for point of care use in resource-limited settings to test for HIV, Chlamydia, and Hepatitis B. DRW's new point-of-care nucleic acid test technology called SAMBA has reduced a complicated diagnostic test requiring a machine the size of a small car to that of a coffee machine, with some 180 chemicals provided in ready-for-use cartridges.

SAMBA is a molecular test that can be used to monitor antiviral treatment in HIV infected individuals, identify HIV-infected babies born to HIV-positive mothers, and diagnose other infections. The development of DRW's high quality, rapid SAMBA technology for nucleic acid allows molecular testing to move from complex centralized laboratories to the point of patient care, where previously the tests could not be performed. Patients benefit by getting clinical examination and laboratory test results during the same visit, resulting in improved treatment and health outcomes. The elegance of SAMBA II design has led to it receiving the coveted iF design award.

The impact of this diagnostic technology may be felt for years to come, especially in sub-Saharan Africa where 70% of HIV-infected individuals live. The SAMBA test is not only simple to perform, it is also robust and heat stable. For early infant diagnosis, Samba II offers results within two hours and does not need centralized laboratories and specialist technicians to carry out the test. Samba II integrates the entire testing process within a single instrument using ready-made disposable



Award winning SAMBA II molecular point of care system (recipient of iF design award, European inventor award & Innovate 2016 Design for Innovation Award).

cartridges. The results are indicated visually by a blue line, similar to a pregnancy test. The SAMBA machines will help transform the lives of tens of thousands of HIV-exposed infants who have a 50% chance of early death if HIV is not diagnosed within the first six weeks of life and if they are not immediately initiated on treatment. The SAMBA instrument is also designed to monitor the viral load in HIV-infected individuals on antiretroviral therapy. The early detection of drug resistance will help improve treatment once the diagnosis is made and antiviral treatment initiated.

SBIR funding has allowed DRW to develop its technologies into commer-

cialized products, creating and keeping jobs in California for over a decade. The funding has also helped to forge DRW into a sustainable, successful company with innovative products that will have a lasting impact on global healthcare outcomes.

845 Embedded Way
San Jose, CA 95111
drw-ltd.com

EnChroma



EnChroma emerged from three National Institutes of Health (NIH) SBIR funded studies on the feasibility of correcting color vision deficiency (CVD). There are an estimated 300 million people in the world with CVD. One in 12 men, and about one in 200 women, have some form of CVD. Color blindness is typically inherited genetically and carried recessively on the X chromosome. Based on a rigorous scientific foundation, the company used the latest understandings of the genetic basis of CVD to create a sophisticated computer-based model of human color vision. A result of over 10 years of R&D was the creation of glasses for the color blind.

Approximately four-out-of-five color blind people (80%) can be helped by EnChroma eyewear. Many color blind people find their occupational, sports, or artistic pursuits limited by their condition. While color blindness is often

considered a mild disability, studies estimate that two-thirds of people with CVD feel it is a handicap. Through EnChroma's partnership with Clorox, 75 color blind schoolchildren in the US received EnChroma glasses. Its glasses have been used by over 60,000 people.

Most people have three types of color-sensing cones in their eyes: red, green, and blue. The wavelengths of light that these three cones absorb have overlapping regions. Color blindness is often a result of a malfunctioning cone that causes wavelengths to overlap even more, resulting in poor color discrimination. The EnChroma glasses use a filter to cut out these overlapping wavelengths, allowing for a clearer distinction between colors, especially red and green. EnChroma glasses enhance the vibrancy and saturation of certain colors and improve color discrimination, depth, and detail perception.

Today, the company has built out its production facility and begun manufacturing its lenses at its Berkeley headquarters. EnChroma upgraded its lens from acrylic to Trivex, a high end optical plastic developed by the military, which is strong enough to take a ballistic hit. A contact lens version has been developed and will be offered in the future. The company has grown from 4 to over 30 employees in two years and expects sales of over \$12 million this year. EnChroma is a vocal advocate for color vision deficiency testing for all U.S. schoolchildren. Its goal is to help every color blind person enjoy and participate in all of life's colorful experiences.

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Berkeley, CA 94710
enchroma.com

Exelus, Inc.

Exelus, Inc. has solved a problem that has stymied the oil industry for the past half-century. Major oil companies have investigated solid acid catalysts as a replacement for the toxic liquid acids (either hydrofluoric acid or concentrated sulfuric acid) catalysts used during the alkylation process—this process upgrades LPG (liquefied petroleum gases) into premium high-octane gasoline blend stock. The path towards a solution began in 2000, with the founding of Exelus, Inc., and was supported by a Department of Energy (DOE) Small Business Innovation Research (SBIR) grant received during its first six months of operation. Their solution, Exelus' Solid Acid Catalyst (ExSact), is an engineered solid-acid catalyst based alkylation process, which is now being licensed world-wide.

Exelus invents, develops, and sells chemical process technologies that address the long-standing needs of the oil-refining, petrochemicals and bio-fuels and chemicals industries. Its new catalytic processes are both clean and economical and provide measurable benefits to both the producer and the end user. During Exelus' sixteen-year history, the SBIR program has allowed the company to navigate the long development and deployment cycle for new industrial chemical processes, which typically takes 7 to 10 years. Today, with SBIR support, Exelus has developed a new generation of economically viable "green" technologies, which eliminate the use of toxic chemicals, reduce energy use and decrease Greenhouse Gas (GHG) emissions by an order of magnitude.

Its ExSact technology was developed at the lab scale and later at the small pilot scale through SBIR grants from the DOE and the National Science Foundation (NSF). To commercialize the technology, Exelus worked with a consortium of larger companies who fill the roles of catalyst manufacturer and engineering contractor to bring the technology to



the end user. Exelus' unique approach to catalytic science has allowed it to achieve significant scientific and technological breakthroughs that match or exceed those of much larger companies. This approach makes ExSact an attractive solution, as it allows oil refiners to address societal needs without additional cost burdens, allowing them to remain competitive against global rivals.

In May 2015 Exelus signed a strategic alliance with KBR (a global technology, engineering, procurement and construction company) to commercialize the technology world-wide. KBR/Exelus has sold licenses for the ExSact

technology, and the license fee and catalyst revenues from the first plant alone are in excess of several million dollars. These revenues have allowed Exelus to continue to grow and also continue research and development work on next generation clean fuel technologies using natural gas and biomass as feedstocks.

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Fairfield, NJ 07004
exelusinc.com

FirstString Research



FirstString Research was founded on a vision to deliver clinically relevant and effective solutions for inflammation-based medical conditions through a better understanding of the molecular and cellular contexts that define the underlying pathology. This dedication has led to measurable results - FirstString Research is advancing the development of its novel peptide-based therapeutic platform for several unmet medical needs. Its lead drug, aCT1, mitigates excessive inflammation by reinforcing cell-cell contacts in endothelial cells (blood vessel wall), and restoring cell-cell communication that restores and enables cellular coordination and leads to improved injury response.

With support of the SBIR program, FirstString has been able to advance its aCT1-based lead product, Granexin® gel, through four human clinical studies. Required pivotal trials are currently underway, green-lighted by the FDA, with expected NDA filing in 2019. The product has demonstrated superior clinical benefit to patients with diabetic foot ulcers and venous leg ulcers, making it a highly desirable therapeutic likely to become first in line treatment (i.e. standard of care). Furthermore, it provides significant pricing and profit margin advantages, relieving the economic burden of treating DFUs for our healthcare system. Not to mention, its ease of use and once weekly administration, making it an ideal fit with

practice of medicine (i.e. weekly physician visits or home healthcare providers).

The SBIR and STTR programs have helped the company immensely in advancing its product pipeline through preclinical and clinical testing with the goal of bringing therapies to market to treat unmet clinical needs. FirstString Research has been successful in utilizing the SBIR/STTR grant program to answer critical scientific questions and develop a robust product pipeline. The SBIR/STTR program is highly aligned with FirstString's mission of delivering breakthrough solutions for inflammation-based medical conditions. Its business objective is to translate novel therapeutic discoveries from the laboratory into early stage human clinical trials. A prime example of the SBIR/STTR program's influence on FirstString's growth is its chronic wound program, for which it has received a SBIR Phase I, Phase II, and Phase IIb for evaluation of its peptide-based technology in the treatment of diabetic foot ulcers. The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) SBIR program has helped support the development of this program from preclinical to clinical studies, and has allowed FirstString to create and sustain jobs, increase its revenue, generate large private investment (>\$12 million), increase shareholder value, and has allowed it to move forward in a number of indications having high unmet therapeutic needs such as chronic wounds, ophthalmology, burns, organ preservation, and oncology.

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Mount Pleasant, SC 29464
firststringresearch.com

Ginkgo Bioworks

Ginkgo Bioworks works with the most advanced manufacturing technology on the planet — biology. Ginkgo is inspired by the power of biology and driven to build tools that make it possible to access that power in new ways. The Boston-based biotech startup combines biology with technology, to efficiently and sustainably manufacture high-value and high-demand chemicals in the fragrance, flavor and food industries, among others. Ginkgo's organism engineers design synthetic gene pathways to alter the metabolism of yeast or bacteria, resulting in the production of the new desired chemical during the process of fermentation. Producing these cultured ingredients via fermentation can allow for a more accessible, stable, and sustainable supply of many important products.

Biology, an incredibly versatile engineering platform, enables Ginkgo Bioworks to engineer new organisms to solve challenges across a range of industries. Its biological engineers make use of an in-house pipeline of synthetic biology technologies to design, build, and test new genetic pathways. Making use of sophisticated automated tools and proprietary software, Ginkgo's organism foundries—Bioworks1 and Bioworks2—are creating economies of scale for the process of genetic engineering.

Ginkgo's foundries are rapidly accelerating the time it takes to develop a new organism compared to the work of building new genetic pathways by hand. For example, in one project to improve the function of a strain used in industrial fermentation, the Ginkgo team developed 1,700 different prototype strains, accounting for nearly 2.5 million base pairs of designed synthetic DNA in 10 months. As the foundries grow—today running 15,000 automated operations per month—those timelines and costs can go down further.



As costs go down, biology becomes accessible to industries that previously were not associated with innovative new biotechnologies. Clients today include food ingredient companies looking for help in the creation of flavorings or specialty nutritional ingredients, or fragrance companies creating scents. Ginkgo is also seeing growth in the cosmetics and personal care industry, and in the mainstream intermediate chemical industry, as well as new opportunities in the traditional biotech industries of pharmaceuticals and agriculture.

Early SBIR funding was essential to the company, allowing Ginkgo to purchase equipment and supplies, lease its first office and lab space, and hire interns,

and staff at an early stage. This enabled the team to bootstrap the company and focus on developing and refining its foundry technologies that have led to its current phase of growth, after nearly \$200 million in VC funding in the past two years. Since receiving its first SBIR award in 2009, a year after its founding, Ginkgo has grown from 5 full time employees to approximately 120 employees today.

27 Drydock Ave.
8th Floor
Boston, MA 02210
ginkgobioworks.com

GVD Corporation



Simple. Functional. Radical.

Many consumer products—including virtually all everyday products with plastic or rubber parts, like kitchen utensils, children's toys, shoe soles, combs, keyboards, DVDs, automotive tires, casings, and packaging—and industrial and medical devices are manufactured with parts made using molds. To free the parts from those molds, manufacturers use special coatings.

These coatings typically are made of organic solvents that release volatile organic compounds (VOCs) during the drying and curing process. VOCs from

mold-release coatings negatively affect air quality. They have been linked to health problems such as eye, nose and throat irritation; headaches and nausea; loss of coordination; and damage to the liver, kidney, and central nervous system.

With support from EPA's Small Business Innovation Research (SBIR) Program, GVD Corporation created a mold-release coating made of highpurity polytetrafluoroethylene (PTFE) that uses no organic solvents or PFOA. As a result, air quality is improved inside manufacturing facilities.

These facilities, in turn, release less toxic emissions into the environment. To apply the coating, GVD developed a novel vapor deposition process called initiated chemical vapor deposition (iCVD). In GVD's iCVD process, a Teflon®-like coating is created on mold cavities by heating the coating chemicals, which are in gas form, on a metal filament while the surface of the mold stays at room temperature. With 15 permanent employees, GVD Corporation has been profitable since 2003. GVD predicts that sales will grow to \$10 million within the next 3 to 5 years as the company expands its operations in the Southeast United States and establishes additional service centers in Europe and, ultimately, Asia.

EPA's SBIR funding has helped GVD Corporation partner with a major automotive parts manufacturer who uses GVD's vapor-deposited PTFE mold-release coatings to streamline tire manufacturing. Millions of tires produced using GVD coatings are now on the road. GVD also has partnered with a major semiconductor parts manufacturer, providing dry-film lubricity services for applications such as gaskets, O-rings, seals, plungers, and stoppers. Additional applications of GVD's coating technology are in the consumer, electronic, medical, and semiconductor industries. GVD coatings can be used for mold release, dry lubrication, electronics protection, and custom coating solutions. GVD's coatings are especially beneficial for electronics protection (e.g., printed circuit boards, radio frequency electronics, sensors, LED boards).

45 Spinelli Pl.
Cambridge, MA
gvdcorp.com

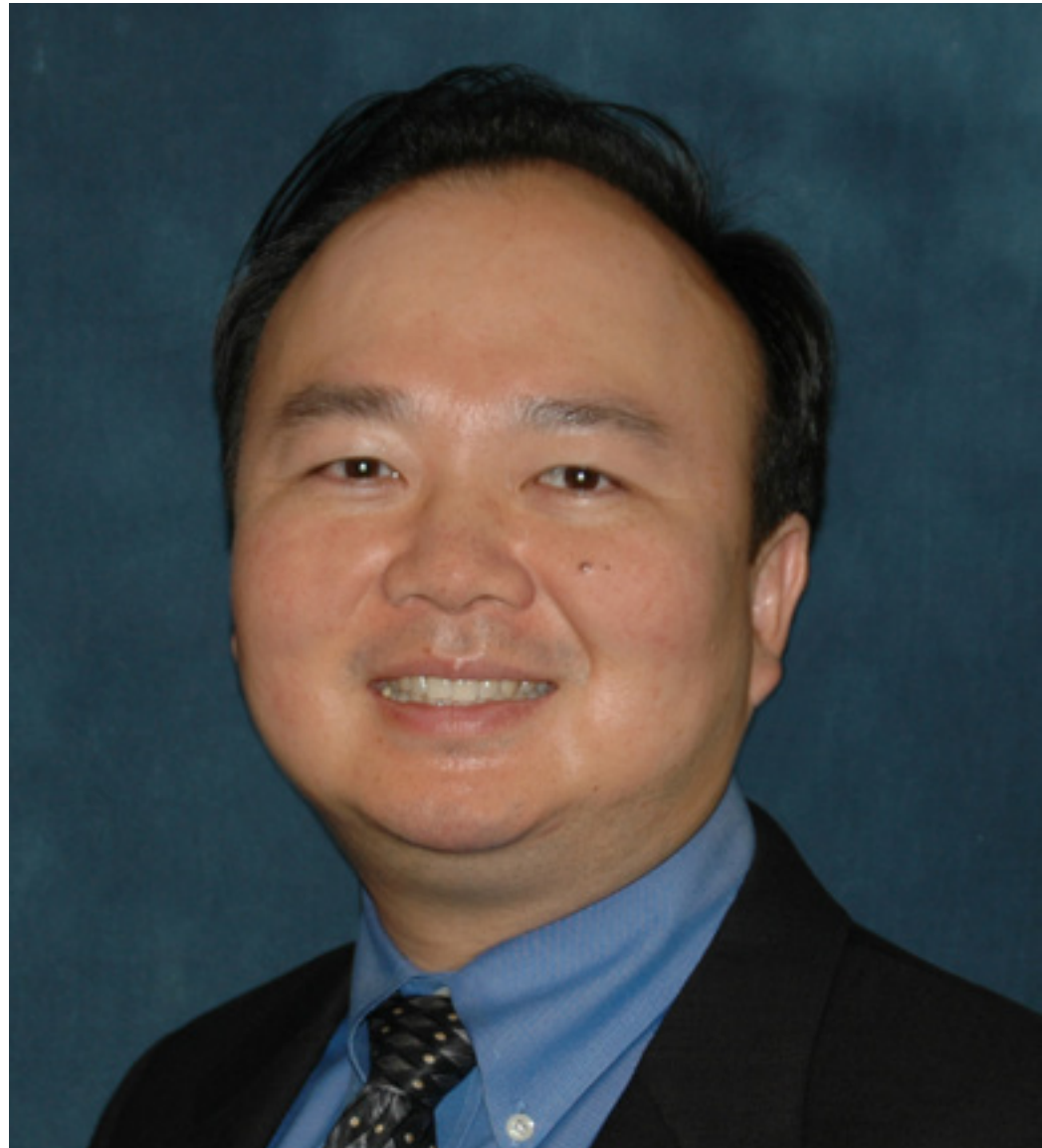
KeraMed, Inc.

KeraMed's revolutionary KeraKlear is the first artificial cornea which is a practical alternative to corneal transplantation. Unlike transplant tissue, the KeraKlear cannot undergo rejection and provides immediate improvement in vision. Only 5-10% of the corneal tissue is removed during the surgery and the procedure can be performed in the office instead of an operating room. The KeraKlear has European Approval and has over 6 years of follow-up in patients. KeraMed has recently received permission from the FDA to run a U.S. clinical trial which will be conducted at Harvard Medical School and other prominent academic eye surgery departments around the country.

The SBIR program has helped KeraMed conduct its KeraKlear research and development through the grants it has received from the National Institutes of Health and the National Eye Institute. Once approved by the FDA, KeraMed plans to market the KeraKlear artificial cornea to U.S. corneal surgeons as a better alternative to high risk corneal transplantation and other commercially available artificial corneas. Because of the KeraKlear's many advantages over the current commercially available devices, including the ease of implantation and quick recovery time, KeraMed anticipates that the commercial adoption of the KeraKlear will be rapid.

KeraMed has filed over 30 patent applications worldwide to protect the KeraKlear artificial cornea designs, methods of implantation, and other technology related to refractive corneal surgery. In the near future, KeraMed expects to file a number of other patent applications that will further protect its core technology.

KeraMed currently has strategic partnerships with two leading organizations in the field of corneal surgery: Ziemer Ophthalmic Systems, the second largest seller of ophthalmic



femtosecond surgical lasers in the world, and Sightlife, the only non-profit global health organization solely focused on eliminating corneal blindness in the U.S. and around the world. Sightlife is also the single largest provider of corneal transplant tissue in the world.

KeraMed has begun to fortify its infrastructure, including hiring a general counsel, and expects to create further job opportunities upon full FDA approval. By leveraging the SBIR program, KeraMed has been able to develop a new and nov-

el artificial cornea that is the first device that can be used to treat the majority of the 10 million bilaterally cornea blind people in the world. Currently only 1% of these patients can be treated annually because of lack of graft tissue.

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keramed.com

Lucid



Energy efficiency is commonly stated as a goal for institutions of all sizes and structures, but how does one determine if their buildings are truly energy efficient? Developed in part with funding from the EPA, Lucid's BuildingOS product is deployed across the nation, in over 14,000 buildings owned and managed by customers including Google, Autodesk, college universities, and city governments. One hundred of the Fortune 500 companies use BuildingOS to modernize and improve their building operations.

BuildingOS, the leading cloud-based building management platform, integrates and aggregates portfolio-wide building and metering systems data for simple, collaborative analysis. By connecting people to their buildings, the company is redefining the commercial building space and the future of people-centric building technology. Lucid's intuitive solutions empower organizations to make smarter decisions that reduce costs, improve occupant comfort, and accelerate team productivity.

When Lucid wanted to branch out into other applications of the technology, the company turned to the EPA Small Business Innovation Research (SBIR) program. The SBIR grants seeded the development of software tools that allow off-the-shelf, multi-colored, internet-connect LEDs to be transformed into "Building Orbs." These orbs work to reduce electricity use in commercial buildings by providing ambient color-based feedback to building occupants, thus enabling behavior-based peak demand management through the use of visual messaging. Built on the same BuildingOS platform, the resulting software allows building managers to turn LED light bulbs into Building Orbs in a matter of minutes. BuildingOS has helped cities, colleges, and businesses save millions of dollars on energy costs.

Lucid received the Business Intelligence Group's BIG Award for Business and was named 2016 Green Company of the Year. It has received over \$14 million in private equity funding, including a large

investment by GE Ventures. Today, over two hundred educational institutions use BuildingOS.

A recent grant from the Department of Energy (DOE) is fostering a collaboration between Lucid and Lawrence Berkeley National Laboratory, centered around Big Data cloud analytics and a measurement & verification application for using data science to track efficiency investment dollars ROI. With hundreds of corporate, government, and academic customers, Lucid is sure to stay at the forefront of people-centric building technology.

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Oakland, CA 94607
lucidconnects.com

Lynntech, Inc.

What are some of the greatest scientific challenges to overcome? It appears that this question is what drives Texas-based Lynntech, which began operations in 1987, providing early-stage scientific research and technology development for government-sponsored initiatives. Building on early successes, Lynntech expanded into prototype and product development and explorative research for wide-ranging applications, including technologies to better sustain the warfighter, improve space missions, and fight cancer. The company's first SBIR award was made in 1990 to the then 3 employee company – today Lynntech has 110 employees with 25-30% of its workforce composed of Ph.D.s in a variety of scientific disciplines.

Current Phase III contracts with the U.S. Navy and DHS related to the company's three most recent SBIR-funded technologies are worth \$20 million. Lynntech has continually leveraged Federal funding to address specific, and critical challenges ranging from its Electrochemical Breathing Device for Hypoxia Training for the Navy to a sensor fusion system for the Department of Homeland Security (DHS) to improve the performance of infrared cameras and to identify low thermal signatures in a maritime environment. Lynntech has partnered with dozens of universities, industry experts, technology experts, and private companies to facilitate innovation. The company's research has resulted in patents and licenses that support the formation of independent businesses rooted in its technological innovations.

The company notes that the unique character of the SBIR program is the ability to test new concepts for solving important real world problems in health, defense, and energy to name but a few. Its recent transition successes go all the way back to those initial two contracts as Lynntech has had the ability to fully develop the materials,



methods and engineering design criteria to produce complete power systems for the Navy's UUV fleet.

Lynntech has specialized in electrochemical power for over two decades, with a strong focus on fuel cell technology – today this expertise is being utilized by the Navy and NASA. To further demonstrate the company's technical reach, with support from NCI, Lynntech is working to counter the emergence of primary and secondary resistance to therapies that are used for treating patients with HER2+ breast cancer by developing a novel class of HER3 antagonists that potentiate anti-

tumor effects of current HER2-directed therapies via blocking ligand-dependent and ligand-independent HER3 heterodimerization.

Lynntech's business model centers around providing high-demand solutions, spinning off successful businesses, and continuing to innovate.

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lynntech.com

Made In Space, Inc.



Made In Space. It is not often that a company is able to literally capture its unique capabilities in three short words but, its company name does just that. Founded in 2010 with the goal of enabling humanity's future in space, Made In Space, Inc. (MIS) has developed additive manufacturing technology for use in zero-gravity. By constructing hardware that can build what is needed in space, as opposed to launching it from Earth, the company plans to accelerate and broaden space development while also providing unprecedented access for people on Earth to use in-space capabilities. Astronauts and NASA personnel at the International Space Station (ISS) are printing tools and other necessities in zero gravity which will open up an entirely new era of off-world additive manufacturing using the company's technology.

The NASA SBIR program has helped Made In Space accomplish a world's first technological feat—it was the first

company to successfully manufacture in zero gravity. Its Zero-G Printer was launched to the International Space Station on September 21st, 2014, and is not solely benefiting astronauts, but is simultaneously opening up an opportunity for people on Earth to use in-space capabilities. MIS has leveraged its innovation to build deep development relationships with commercial companies, including Lowe's and other government agencies (OGA).

MIS has sustained 40+% year-over-year growth since its first SBIR grant, and grown from four founders to 35 employees with all revenues tying back to SBIR enabled technology. The company has generated an ROI of 33x on the government's Phase I and II investment, and although SBIR is the foundation of its success, the majority of MIS revenues come from commercial contracts.

Made In Space's team consists of successful entrepreneurs, experienced

space experts, and key 3D printing developers. With over 30,000+ hours of 3D printing technology testing, and 400+ parabolas of microgravity test flights, Made In Space's experience and expertise has led to the first 3D printers designed and built for use on the International Space Station. The company is proud to inspire future generations of scientists, engineers, and entrepreneurs. Manufacturing in space has inspired students across the country and spurred design challenges at the K-8, high school, and college levels due to the science fiction to science fact nature of 3D printing in space.

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Moffett Field, CA 94035
madeinspace.us

Makai Ocean Engineering, Inc.



Makai Ocean Engineering was founded in 1973 as a diversified ocean engineering company focused on providing design engineering and development services to a broad range of clientele both international and domestic. The company takes pride in its extensive record of success in achieving innovative solutions to difficult problems for its partners and clients and continues to serve leading industrial and commercial firms as well as federal, state, and local governments worldwide. Its work through the Navy's SBIR program led to the company's most successful project to date, MakaiLay.

MakaiLay, the company's patented technology, is the number one subsea cable installation software in the world and is used by over 75% of subsea cable ships worldwide. The foundation of the program started in 2000, in response to a Navy SBIR topic seeking an improvement in the way underwater cables were laid on the ocean floor. Makai's response was a faster, more accurate, and cost saving

method that evolved into a sought-after international commercial product, and a SBIR Phase III contract with the Navy. The company has generated over \$35 million in Phase III revenue stemming from this original Navy SBIR-funded technology with approximately 50% of revenue coming from the commercial sector.

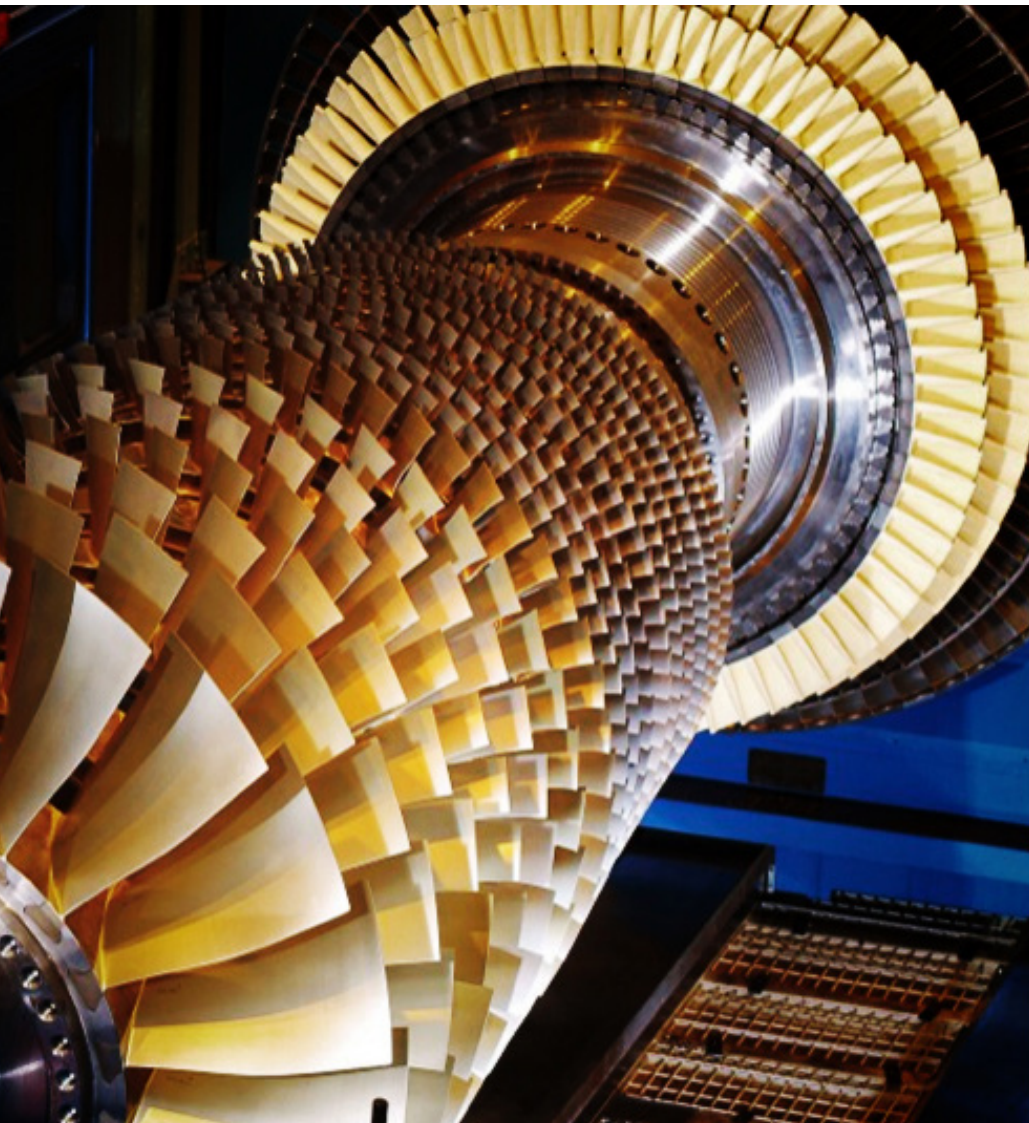
Makai has maintained the highest caliber of quality engineering services because of an uncompromising selection of talented engineers in various disciplines. The vast majority of Makai employees hold advanced degrees in engineering, and the physical and computer sciences. This has allowed Makai to delve into new technical areas to meet new challenges, including renewable energy.

Its Ocean Thermal Energy Conversion technology (OTEC), sponsored primarily by the Navy, takes the ocean's warm and cold waters and generates electricity from the thermal gradients. The goal is to provide a stable flow of renewable

electricity that does not need a separate energy storage system. Ocean Thermal Energy is available 365 days of the year, 24-7, and has the potential to power 4-times current electricity needs. Their efforts to realize this potential has been supported through a Phase III Navy contract, and the company continues to work with both the Office of Naval Research and the Hawaii Natural Energy Institute. In August 2015, the largest operational OTEC plant in the world, built by Makai, was connected to the electrical grid.

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Kailua, HI 96734
makai.com

Mikro Systems, Inc.



The uniqueness of Mikro Systems, Inc. begins with its ability to innovate and create technology solutions that are “out of the box,” but at the same time practical and scalable for commercial markets. This innovative ability has been demonstrated in multiple markets (healthcare, energy, aerospace) where longstanding technology problems have been addressed and solved. Since its inception, Mikro has used SBIR funding as a strategic resource to develop its Advanced Manufacturing Technology (TOMO) and apply it to product breakthroughs in global industries.

Mikro has applied TOMO, with over 130 patent applications filed to date, to meet critical mission and program needs for NASA, NIH, DOE, and DoD and commercialized products and technology in three major markets: Medical, Energy, and Aerospace, leading to commercial product sales and licensing revenues over \$45 Million. Its medical products provide better diagnostic imaging at lower cost and lower radiation dosage; its energy products facilitate cleaner, lower cost power generation with increased fuel efficiency and lower emissions; and its aerospace work provides significant

cost reductions for advanced products, higher performance engines, fuel savings, longer engine life, and major performance advantages for military, and civilian aerospace, platforms.

Mikro was incorporated in October 2000 and received its first SBIR award a few months later, in February 2001 with three founders as its only employees – today the company has grown to 82 employees. Mikro submitted its first SBIR proposal to NASA as it was forming the business, and SBIR funding has been a strategic part of the business plan at every stage of development from startup to the present.

Mikro has always focused its technology and business solutions from a market pull perspective. In other words, Mikro brought solutions to difficult and challenging technical areas, rather than having a great solution looking for the problem. This approach has allowed the company to capture and leverage business value at very early development stages. Lastly, and very relevant to SBIR projects, is the company’s ability to integrate its technology development and innovations with large global companies in a strategic way, so that high risk, high return programs, once proven, can transition to a commercial program. Through its success, Mikro has brought real manufacturing jobs to the US economy and has had a significant impact on the local tax base and quality of life in its Virginia community.

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mikrosystems.com

MMA Design LLC



Cleaning-up our planet is a familiar concept, but how do you clean-up outer space? MMA Design has developed several technologies through the SBIR program that do just that. The company's De-Orbit system based on membrane technology helps to eliminate space debris meeting National Space Support policy requirements, while also further advancing the field of membrane technologies.

SBIR funding helped the company to create a high powered, low volume, low cost, solar array for CubeSats, and other types of solar arrays that have been purchased for use in government, and commercial space, missions. These technologies have been crucial in finding a solution for minimizing space debris and providing more power to Small Satellites so that missions can be more productive. The company has been highly successful in working with the SBIR

program to produce technologies such as antennas, solar arrays and de-orbit systems that save the Military from having to purchase high cost items and saving taxpayer money while helping to secure communications from space.

To date, MMA has received four Phase II SBIRs, which have allowed the company to quickly turn its innovative ideas and cutting-edge research into real product development and commercialization success for the Air Force and the Space Community. Drawing from its diligent efforts, expertise, and the SBIR program, MMA has received and delivered on over 70 contracts for space and space related products, some of which have flown and been qualified in space, with others currently being staged for launch into orbit. SBIR funding has accounted for only a portion of the company's budget, and has provided the opportunity to develop high-risk, cutting-edge,

technologies for the Air Force and Space Community that would not have been undertaken without the support of the SBIR program.

Founded in 2007 in Boulder, Colorado, MMA Design LLC started with 3 full-time employees and has since grown to a team of 15 full-time inventive thinkers with Ph.D.'s, Master's Degrees, and years of aerospace experience. Revenues have increased almost six-fold since their first year, and this has enabled the creation of high-tech, high growth jobs in its community and the support and training of interns.

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mmadesignllc.com

Niowave, Inc.



first Phase I award, Niowave employed 5 full time and 4 part-time staff. Today the company has 62 full-time and 6 part-time employees on staff, with another 5 planning to come onboard early in 2017. To date, Niowave has received SBIR/STTR awards from three separate agencies: Department of Homeland Security, Department of Energy and the Department of Defense.

While focusing on the commercial markets, Niowave has also supported federal research needs, with superconducting structures based on SBIR projects operating at numerous DOE, DoD, and European laboratories. Niowave is currently building superconducting deflectors for an upgrade to the Large Hadron Collider at CERN. In 2015, Niowave became the first domestic company, since 1989, to produce the medical radioisotope molybdenum-99 (Mo-99) from uranium fission under a Nuclear Regulatory Commission license. This medical isotope is used in over 30 million procedures each year around the world. Niowave's Mo-99 production is based on superconducting electron accelerator technology partially developed by investment from the SBIR/STTR program.

The company is located in Lansing, Michigan, and its presence has had an estimated impact on mid-Michigan of over \$250 million over the past decade. To meet the growing need for commercial superconducting accelerators, Niowave, and its highly skilled workforce, has expanded twice, and now operates three facilities at two Lansing locations.

1012 N. Walnut St.
Lansing, MI 48906
niowaveinc.com

Niowave is the only company in the world licensed to operate superconducting accelerators in its own facility, and is the first company to transfer this technology into commercial markets. At Niowave, Inc. superconducting electron linear accelerators (linacs) are being built to tackle America's high tech challenges in fields as diverse as health care to national security. Over the past several decades, the Department of Energy (DOE) has developed superconducting accelerator technology for the largest and most powerful atom smashers ever built. Much like SpaceX has successfully commercialized NASA technology, Niowave has commercialized superconducting accelerator technology developed at the DOE national laboratories.

Niowave has leveraged SBIR and STTR projects to advance superconducting accelerators to the point where they now operate a compact, rugged and flexible platform that can be adapted to compete in several commercial markets. The primary commercial markets being pursued are the production of medical radioisotopes, active interrogation of cargo containers, and sterilization of medical equipment. To accomplish these innovative advances, Niowave has collaborated with a wide range of universities, national laboratories, and industrial collaborators.

Founded in 2005, Niowave received two Phase I SBIRs in 2007, followed by its first Phase II SBIR in 2008. At the time of its

OMAX Corporation



MicroMAX (Gen II)
2016 Finalist R&D 100 Awards

OMAX Corporation, through the support of an NSF SBIR Phase II/IIB grant, developed and commercialized micro abrasive waterjet technology that culminated in the MicroMAX® JetMachining® Center. OMAX micro abrasive waterjet technology has opened many doors for industrial and military applications that presented challenges to existing machine tools, particularly for complex part geometries in delicate and difficult materials. Five relevant U.S. patents with two patent applications pending were derived from the SBIR and company funded R&D. The company was in business for twelve years before receiving its first SBIR award in 2005 as a company of approximately 100 employees. Today the company has grown to 304 employees, and has achieved 250+% revenue growth since its first award.

The OMAX MicroMAX was named as a finalist in the 2016 R&D Awards under

the Mechanical/Materials category, highlighting its innovative capabilities in today's manufacturing world. An example of this technology at work would be nanomaterials with large gradients of material properties from metal to non-metal and anything in between. They are difficult or impossible to cut by material-selective tools such as lasers or electrical discharge machining (EDM), but abrasive waterjet technology can cut them quickly and without difficulty. The market demand for the U.S.-made MicroMAX has steadily increased in multiple fields including R&D, prototyping, maintenance and repair, and full-scale production. One of the most exciting applications, recently collaborated with NASA JPL, was the fabrication of prototype microspine flexures for asteroid gripping tools through the Asteroid Redirect Mission (ARM). Additional promising applications are underway with MIT, Pacific Northwest National Laboratory (PNNL), and NASA JPL.

The OMAX mission is to provide precise, easy to use, cost effective, standardized, reliable, and high quality abrasive waterjet machining systems to the manufacturing industry. The SBIR program is helping it achieve these goals. Additionally, OMAX actively collaborates with companies such as Boeing and research and academic institutions including MIT, Ryerson University, and organizations such as PNNL, and the National Institutes of Standard and Technology (NIST), to advance waterjet technology.

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Operative Experience, Inc.



Operative Experience was founded by a trauma surgeon and professor who realized that medical residents were not getting sufficient experience in hands-in-the-body surgery, so Dr. Robert Buckman Jr., holder of more than 20 medical patents, went to the barn and began carving organs and experimenting with various materials. An initial SBIR Phase I, SBIR, launched the company, which has moved from the barn to a state of the art production facility. Operative Experience now has domestic and international customers including the U.S. Department of State, USMC, and the Mayo Clinic.

Today, Operative Experience, Inc. (OEI), a veteran-owned small business, has created the world's first physical simulators upon which major surgical hands-in-the-body operations can be performed on tissues that can be incised, sutured, retracted, and operated on using standard surgical instruments. OEI provides high fidelity medical simulators for non-live tissue training in surgical and non-surgical interventions, ranging from point-of-injury casualty care to surgical hospital procedures. Its technology

enables cost effective, repetitive training to measured psychomotor and cognitive proficiency in operative skills and full procedures. It enables standardization in surgical training, fills gaps in random, event-based apprenticeship training, and supports worldwide expansion of non-physician operative training. OEI's solutions reduce patient mortality through improved provider performance.

The company's innovations are timely and necessary, as there is a widening gap between surgical knowledge and clinical requirements. The number of medical devices and procedures are growing, while training hours have been cut. Animal training has been virtually eliminated, and cadaver training is expensive and of poor tissue quality. Studies show residents receive inadequate training as 25% of required operations are rarely experienced during a five-year surgical residency program. Globally, 11% of the world's health burden is unmet surgical demand. Further, the increase in worldwide terrorism creates a market for civilian training in managing combat-type wounds. Since its first SBIR grant, the company

has created more than a dozen first-in-the-world surgical simulators including fasciotomy, craniectomy, diagnosable tension pneumothorax, emergency thoracotomy--including the repair of a beating heart, and damage control laparotomy for the surgery of abdominal trauma. Its initial simulator for lower leg fasciotomy is credited in part for reducing surgical errors in Afghanistan and Iraq from 19% to less than 3%. Furthermore, all products created under SBIR grants have been commercialized and the company has grown from 2 employees to more than 20, with annual revenue greater than \$2.5M.

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operativeexperience.com

OptiPro Systems, LLC

OptiPro's technical innovations, through its programs for Aerodynamic Infrared Missile Domes, and other programs requiring advanced optics, have made next generation missile defense technology possible. The company has more than 30 years of experience developing and manufacturing precision optical fabrication machines and metrology systems and is a global leader in designing and building computer controlled grinding, polishing, and measuring equipment for the precision optics and advanced ceramics industries.

OptiPro's solutions are designed to yield parts that can be manufactured from a variety of commercially available materials including optical glasses, ceramics, crystals, and alloys. Part diameters range from a millimeter up to one meter for flats, spheres, aspheres, and freeform shapes. OptiPro works together with customers' engineers on cost, process efficiency, design improvements, testing, and evaluations to produce the highest quality fabrication and metrology systems that will add significant value to their overall capabilities.

Through the SBIR program, OptiPro has developed new machines and processes which are commercialized in sales to Prime contractors, small to medium sized optics manufacturers, and exported around the world. OptiPro's OptiSonic machines, which were developed under the SBIR program, are the only American made automatic tool changing Ultrasonic machining centers. All profits earned since the company's start in the SBIR program have been re-invested in the company to increase technological improvement and commercialization of its technologies. OptiPro has increased its employment by more than 65 people since its start in the SBIR program and has more than \$10 million in revenue stemming from its product suite of SBIR-derived technologies. Additionally, the reduced internal cost of R&D for Op-



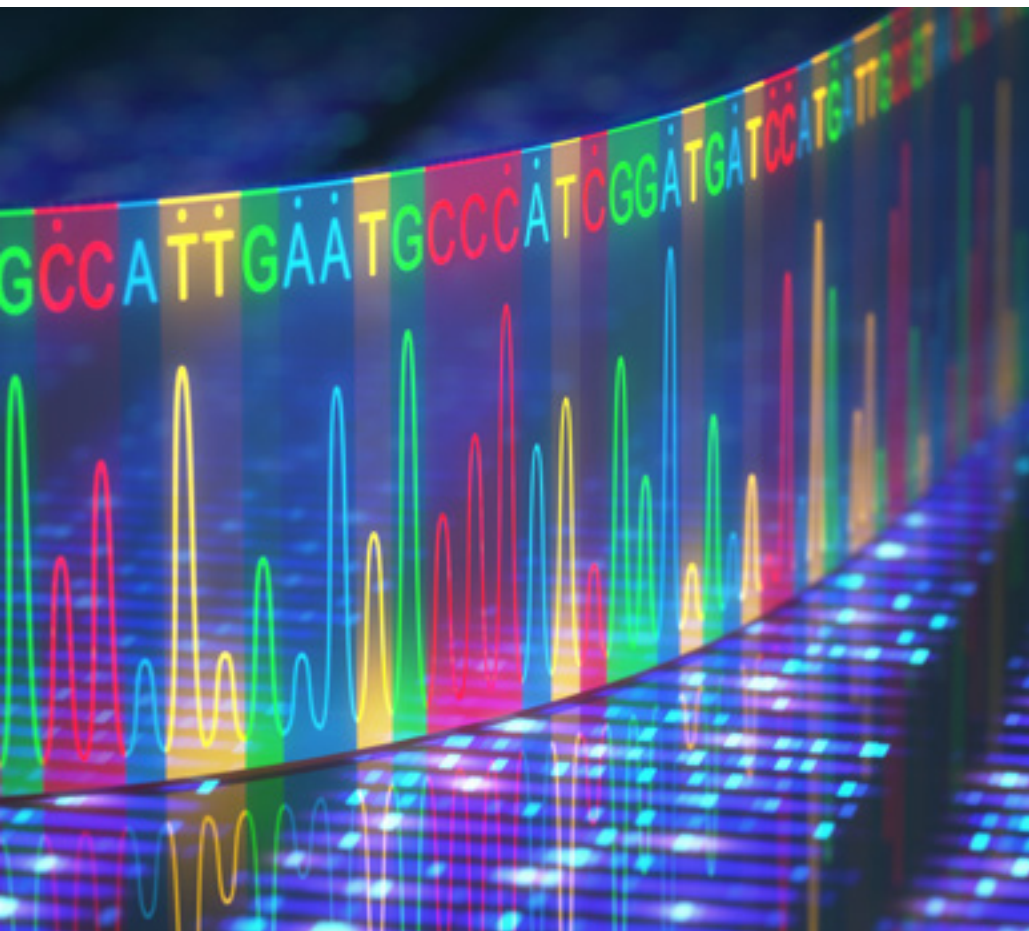
tiPro, as well as the advancements made in machinery and processes, has helped OptiPro make its customers in the U.S. more competitive. This has kept domestic optics manufacturing more viable and prevented these jobs from being taken overseas.

The technical innovations created through the SBIR program have helped OptiPro become the market leader for precision optics manufacturing equipment in the USA. The SBIR investments in OptiPro have greatly improved the technologies available to domestic precision optics manufacturers, and these technologies are used for the defense, aerospace, medical, surveillance, and many other industries. The company

has also added more than 20,000 square feet to its building, and made substantial investments in equipment in the last 5 years to continue its growth. Furthermore, revenues have increased by more than 10x and employment has increased by more than 5x since its start in the SBIR program.

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optipro.com

Parabon[®] NanoLabs, Inc.



Parabon NanoLabs (Parabon) is one of the only companies in the world that both analyzes DNA for its biological content and also uses it for nanomanufacturing. The company's Bioinformatics division investigates human DNA for forensics and medical applications, while its Nanotechnology division uses synthetic DNA to construct custom macromolecules for therapeutics and diagnostics. Together, Parabon's multidisciplinary team of world-class scientists and technologists is pushing the boundaries of what can be accomplished with DNA, and their innovations are redefining established industries.

Recently, the company's Snapshot[™] DNA Phenotyping System has revolutionized the field of DNA forensics. Initially developed under the SBIR pro-

gram, Snapshot is the first comprehensive phenotyping system able to accurately predict appearance and ancestry from forensic DNA samples. Rather than improving on existing capabilities, Parabon innovated in the fields of genetics and computer science to build an entirely new method of analyzing forensic DNA. Today, Snapshot is being used to assist investigators in solving some of the most challenging criminal cases and has already helped law enforcement bring rapists and murderers to justice. In the two years since it was first commercialized, Snapshot has been used by over 80 agencies within the law enforcement and counterterrorism communities, with analyses performed in 10 countries.

Based on Snapshot's accuracy for outwardly visible traits, Parabon's bioinfor-

matics team has begun adapting the core algorithms underlying Snapshot for use in medical applications. Under an NIH SBIR award, Parabon is developing models to predict from DNA an individual's lifetime risk of Alzheimer's Disease.

Separately, DoD SBIR and STTR projects supported the development of the company's computer-aided design (CAD) software for nanoengineering DNA constructs, the inSēquio[™] Design Studio. Now, under DoD and NIH funding, Parabon is using inSēquio to design and develop synthetic vaccines, i.e., vaccines created purely through chemical synthesis to avoid the risks associated with current attenuated ("live") vaccines. The ability to rationally design and produce multifunctional compounds from DNA, where the relative location of each subcomponent is precisely determined, gives Parabon and its customers a compelling drug and diagnostic development advantage.

In the years since its first SBIR Phase I award, Parabon has grown its staff roster from 2 to 18 personnel. During that time, SBIR and STTR awards provided a large portion of the company's overall R&D budget. In fact, SBIR projects have led to product innovations that now drive the bulk of Parabon's revenue. Snapshot[™] alone has generated nearly \$3M in revenue from casework and Phase III contracts. As a technology-driven organization, dependent on its ability to innovate, Parabon attributes much of the company's success to SBIR and STTR funding of its R&D program

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parabon-nanolabs.com

Pathfinder Systems, Inc.



How many systems are needed to keep our warfighters safe and at the forefront of technical innovation? Pathfinder Systems (PSI), a woman-owned, veteran-owned small business based in Lakewood, Colorado, is an expert in answering this and other critical questions. Pathfinder Systems is a leading provider of Aircrew Trainers, including External Load and Gunnery Trainers, Simulated Weapon Systems, and Weapon Mounts for the U.S. Army, Navy, Coast Guard, Marines, and the Netherlands. The company provides unique 3-D projection screens and visual systems that create a seamless display surrounding the aircrew. It provides its own, convertible crew cabins for helicopter and rotary wing training, software and systems engineering services for government and industry, and research and development, technology development, analysis, engineering, manufacturing and support services.

A rich history with the Small Business Innovation Research (SBIR) program has allowed the company to evolve from designing simulation software for the Army in the 1980s to building

and delivering fully integrated systems to a broad range of government and commercial customers. Today the company supports a staff of 13 key individuals as well as a larger team of up to 30 depending upon manufacturing and technical development needs.

The SBIR program was instrumental in helping the company to develop a number of key technologies, many of which were developed well in advance of the technology trends at the time of award. An example includes its Augmented Reality (AR) work in the 1990s, when technology trends were focused on virtual reality. Today, augmented reality is all the rage, and PSI's forward thinking established many of the tenants for AR which are used today. It has been able to use its Artificial Neural Net (ANN) technologies to support a variety of behavioral modeling requirements from target assessment to the representation of various threat forces for command and control simulation.

Today, the company is extending this basic research to incorporate deep learning and GPU processing to develop

sophisticated object recognition and collision avoidance capabilities. Finally, the company's work in the development of high-fidelity, reconfigurable aircrew trainers has paid significant dividends to the Department of Defense by providing air crew training across multiple platforms increasing crew proficiency in an environment when fewer and fewer actual aircraft hours are available to air crews.

All of PSI's systems today contain facets of its original SBIR-funded technologies. To date, PSI has seen over \$34 million in total revenue stemming from SBIR-funded technologies. PSI has identified additional commercial applications for its simulated weapons systems and is in talks with several NATO countries about delivering trainers. Through the SBIR program the company has been able to either patent or copyright over six key technologies, which it has used to obtain SBIR Phase III awards.

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pathfindersystems.com

Physical Sciences, Inc. (PSI)



PHYSICAL SCIENCES INC.

Physical Sciences, Inc. (PSI) was founded in 1973, 10 years before the SBIR program began, and received its first award in 1984 with 50 employees, today the company has grown to approximately 200. The company's long-standing relationship with the program has led to numerous Phase III successes, game-changing technologies, and refined transition plans that truly set PSI apart. Throughout its tenure, the SBIR program allowed PSI to rapidly advance its technologies to application by providing commercialization- focused development funding and assisting with customer and market identification.

While PSI has successfully employed a number of business models to successfully transition SBIR funded technology, its algorithm called Poisson Clutter Split (PCS) is recognized in this Tibbetts award

for greatly benefiting national security by permitting sensitive detection and identification of radiological threats in a compact form factor. Funded by the Department of Homeland Security (DHS) Domestic Nuclear Detection Office (DNDO) SBIR program, PCS is part of DNDO's "Cost Effective Materials Portfolio" and maximizes the return on investment to the U.S. Taxpayer by adding value to resources far beyond those provided to implement PCS.

As a somewhat larger company with researchers in multiple technology areas, PSI has followed multiple paths to market insertion – selecting the path best suited to each specific technology. For new products into an established market, the company prefers to partner with an established market leader with market presence, brand recognition and the nec-

essary sales, service and manufacturing staff to ensure rapid product introduction and wide market penetration. For emerging technology areas, PSI prefers to work with investment partners in creating a new company to rapidly commercialize the technology. PSI brings the SBIR developed technology and key staff to the new entity with its partners providing guidance, market insight and working capital. For selected technologies where the market needs are less well defined but the technology offers a compelling value proposition, PSI will continue demonstration and product maturation with a combination of mission-specific sponsor support and internal retained earnings – manufacturing and selling the product directly into the marketplace themselves.

For PSI, the SBIR program provides the early stage risk-tolerant funding support necessary to take technology from a concept through feasibility to demonstration. The above business model allows PSI to efficiently move technology from concept to the marketplace, while retaining the immense knowledge and expertise resident in its staff. Staff experience guides responses that effectively address the next series of technology challenges facing our nation. Those proposed solutions reflect their accumulated understanding of agency missions and urgent national needs. Their experience allows PSI to focus programs on developing the capability that will address that mission need from the program outset. PSI gets the technology to the market place by transitioning the SBIR technology via the best path/ partnering approach.

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psicorp.com

PittMoss, LLC



Having purchased his first greenhouse at the age of twelve, Mont Handley seemed destined for a career in commercial horticulture. After serving in the U.S Army and earning a degree from Purdue University, Mont began managing the live-goods department of a retail nursery chain. It was during this period that he recognized growing environmental concerns surrounding the primary ingredient of growing media for plants, and believed that he could develop a viable substitute from recycled paper. After three years of kitchen table experimentation and window sill growth trials, he felt he had succeeded in developing the next generation of sustainable, soil-less growing media. His next task was to prove that his potentially disruptive technology could win over very conservative and skeptical growers.

Led to the SBIR program by a business and industrial development program at Purdue University, Mont was taught how to write grants and provided complimentary workspace on the days

he was not managing the nursery. On his third attempt at an Environmental Protection Agency SBIR grant, Mont's one employee start-up company received a Phase I award. The funding was used to investigate various traits, and growth test the product, now known as PittMoss, in independent side by side growth trials with standard industry growing mix. The researchers, from Purdue's Schools of Agronomy and Horticulture, concluded the new media to be a viable product and suggested it could be better in future iterations.

PittMoss not only wets consistently while retaining moisture and draining efficiently, but it does not require the application of a costly wetting agent. Since it retains water so well, PittMoss requires less watering than alternatives, and eliminates fertilizer and water runoff. It also tends to adopt the pH of the material with which it is blended. In 2015, PittMoss completed a proof of concept phase in garages and small greenhouses. With its perfected formula

and its record of replacing traditional growing substrates by 100% in many trials, PittMoss started to garner not only local, but national attention.

The early, independent, proof of concept for PittMoss eventually led to raising a \$1.2 million in seed round funding, including funds from Mark Cuban, after Mont successfully pitched his product on the sixth season of ABC's Shark Tank. PittMoss, LLC currently has seven full-time employees, three part-time employees, two part-time interns, and multiple independent contractors, producing the best performing growing media in the industry. PittMoss is now made in the economically challenged borough of Ambridge, Pennsylvania with local up-cycled materials that are being diverted from area landfills.

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Ambridge, PA 15003
pittmoss.com

Privo Technologies



Oral cancer is a very devastating disease which is commonly overlooked. According to the Oral Cancer Foundation, over 48,000 Americans will be diagnosed with oral and pharyngeal cancer in 2016, causing over 8,000 deaths annually. The 5-year survival rate of oral cancer (OC) remains only 57%, and OC is one of the few cancers increasing in incidence both in the US and worldwide. By 2020, the annual worldwide OC incidence will increase 30%, and annual mortality will increase approximately 37%. Due to these reasons, Privo is passionate about developing its oral cancer treatment.

Privo's topical delivery platform is composed of proprietary combination of active drug particles, polymers and other excipients in a unique formulation to deliver and retain high doses of the active drug directly in the tumor without generating dose limiting side effects. One of Privo's main objectives is to eliminate the toxic side effects caused by intravenous (IV) chemotherapy. Privo's topical cancer patch has the potential to revolutionize

the way many epithelium-based cancers are treated. Epithelium cancers such as oral, skin, and anal cancers can significantly benefit from high concentrations of topical and local treatment with negligible toxicity.

Founded in 2010, Privo Technologies Inc. spun out of MIT's world-renowned Langer Laboratory. Privo has been fortunate to receive the prestigious SBIR awards from the National Institute of Dental and Craniofacial Research, the National Cancer Institute, and the National Science Foundation. In addition, Privo has received Innovation grant funding for two consecutive years from Massachusetts Institute of Technology (MIT), and several other private organizations and foundations. It has received over \$5 million in funding through the SBIR program to develop its unique, patent pending application for treating oral cancer. Privo has received FDA's orphan designation and has shown complete elimination of oral cancer tumors with no known recurrence in several sets of animal studies.

Privo has been working with OC patients via the Oral Cancer Foundation. Direct contact with OC patients has assisted Privo in better understanding the patient's journey in beating cancer through different treatments while gaining useful insights about the OC patient population. Privo plans to continue its work with patient advocacy groups and foundations to develop effective, patient friendly treatments.

Privo's topical treatment is simple to administer and customizable for several other cancers such as skin, colorectal and anal. Currently, there are no known safe and effective treatments for these type of cancers.

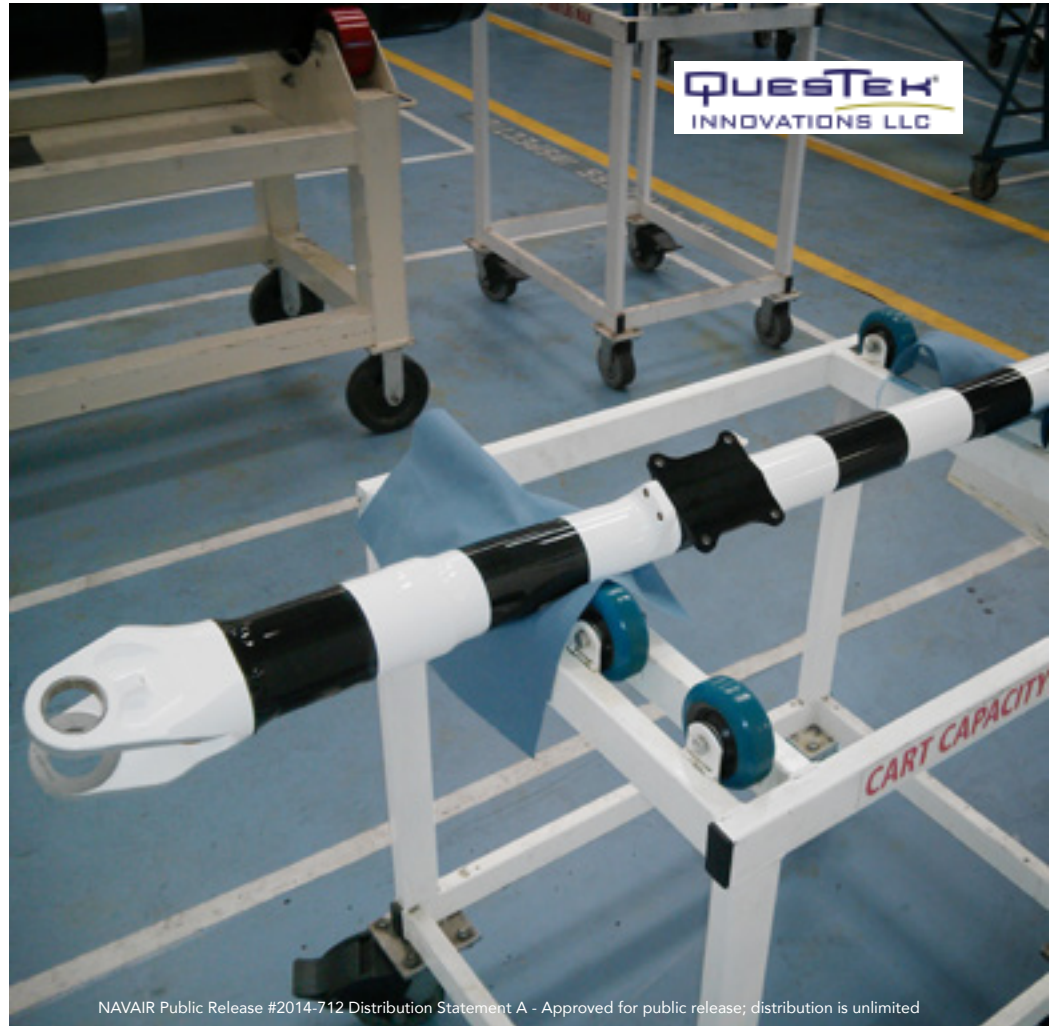
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QuesTek Innovations LLC

Making products that are lighter, stronger and more corrosion resistant is the crux of many of today's technical challenges - QuesTek Innovations LLC continually helps to meet that challenge. Since 1997, QuesTek has applied its Materials by Design® methodology and Integrated Computational Materials Engineering (ICME) technologies to quickly design and deploy advanced high performance materials. The technology addresses the national priorities in materials R&D outlined by President Obama in the Materials Genome Initiative (MGI) announced in 2011 to "support U.S. institutions in the effort to discover, manufacture, and deploy advanced materials twice as fast, at a fraction of the cost."

QuesTek was established to commercialize Northwestern University Professor Greg Olson's pioneering work in computational materials design and is now an internationally-recognized leader in ICME technologies. SBIR/STTR funding has allowed QuesTek to create and sustain jobs, and grow its business to provide innovative solutions to a broader range of markets and companies. The company was awarded its first Phase I SBIR award in 2000, at that time QuesTek had 6 employees and has grown to 25 full time employees. Additionally, 13 full time employees were "acqui-hired" in 2012 by a major Silicon Valley consumer electronics firm that transitioned its ICME technology and team into that company. QuesTek has also leveraged the knowledge-base from SBIR/STTR funding to secure a multi-year strategic partnership with a major U.S. company to design and deploy game-changing materials.

Under SBIR funding, QuesTek designed and developed ultra high strength Ferrium® M54® steel, which is being used aboard the US Navy in the T-45 platform. The U.S. Navy estimates \$3 million saved by implementing M54 steel in the production and use of safety-critical hook shanks



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on the T-45. The advanced M54 steel is also approved to replace the incumbent steel on selected F/A-18 for landing gear components. Given the need for a next generation high performance gear steel, Ferrium C64® steel was also designed and developed under Navy-funded SBIR programs, and is being evaluated and qualified by Bell Helicopter and Sikorsky/ Lockheed Martin for next generation helicopter transmission gears under the Army Future Advanced Rotorcraft Drive Systems (FARDS) program. Due to its improved properties over existing gear steels, C64 has penetrated markets other than aerospace, including high performance racing, oil and gas, and is in consideration for wind turbine gearboxes.

If you need more proof of the company's success, QuesTek reports a commercialization value from its SBIR projects of \$52 million, which ranks them in the 95th percentile of the Commercial Achievement Index for all SBIR awardees.

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Referentia Systems, Inc.



Making the world a safer and better place is a lofty goal, but Referentia Systems has been developing innovative advanced technology solutions to do just that since its inception in 1996. By facilitating collaboration among government, academia, and private industries, Referentia leads the development of critical infrastructure solutions that benefit society, including cyber security, e-business operations, the utility smart grid, healthcare information exchange, and aircraft maintenance.

By leveraging SBIR grants, Referentia has successfully commercialized its technologies with more than 650 enterprise customers including the DoD, and brand names like Home Depot,

Walmart, Target, and BP, helping make their software-defined networks more reliable and secure by providing advanced visualization and control. In addition to leveraging SBIRs, Referentia leveraged its strategic location in the Pacific and proximity to Hawaii's strong military presence to build intimate relationships with the warfighter and understand firsthand their critical pain points and capability gaps, resulting in the development of truly customer-driven innovations. In addition, the leadership spent extra hours and time understanding the commercial market relevance of the military gaps, ensuring that resultant technologies could find commercial success after meeting military needs.

Referentia's LiveAction spin-off company is addressing critical needs in the DoD, thus meeting national priorities and benefitting taxpayers and the government. Currently, together with its SBIR seeded commercial spinout, LiveAction, Inc., Referentia has a total of over 100 employees. LiveAction's SBIR-seeded intellectual property (IP) attracted Series A and B investments of over \$41M from top tier venture capital firms including Cisco Ventures. LiveAction started in 2008 when Referentia won a Phase I SBIR award as well as a Phase II in 2009, and Rapid Innovation Funding (RIF) in 2012 – this eventually created the spin-off entity focused specifically on product sales and commercialization of the technology.

Along the way, Referentia has received many awards for innovations in eLearning, software defined networks, smart grid analytics, cybersecurity and more, creating a strong record of past performance and success with SBIR projects. In keeping with the goals of the SBIR program, Referentia has leveraged new technologies developed through SBIR/STTR to facilitate the formation of spin-off companies focused on commercial markets worldwide. Many of the things everyday Americans take for granted, including the reliability, stability, and security of our government and commercial computer networks, or the protection of critical infrastructure from cyberthreats, are all enhanced and supported by the innovative solutions from Referentia Systems.

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SFP Works, LLC (dba Flash Bainite)

To reduce America's dependence on oil imports, many agencies and industry players are pursuing vehicle lightweighting strategies and estimate that a 10% reduction in vehicle weight can increase fuel economy by 6 to 8%. To date, most efforts have focused on technologies to replace steel with metals like aluminum and magnesium, or carbon fiber composites. However, these materials are more expensive than high strength steel, and the use of these new materials requires billions of dollars of investment to retool factories. An alternative strategy for lightweighting vehicles is to fabricate components from advanced high strength steels (AHSS), which enables structural loads to be borne by less material. This strategy leverages the familiarity with using lesser costing steel and does not require expensive retooling of factories.

Enter, Flash® Bainite, a patented process for heat-treating steel that yields the Strongest, Most Ductile, Lean Alloyed, Readily Weldable, Least Costly Maximum Strength METAL known to man, developed by SFP Works, LLC. SFP was organized and operating for seven years prior to the award of its first SBIR, and its "hobby" of steel heat treating started 4 years before that. The Department of Energy's Advanced Manufacturing Office and SBIR program helped the company to add focus and funding to its work, enabling SFP to migrate its fledgling technology, known to make small scale but record setting armor as tested by the Department of Defense (DoD), into the leading candidate globally to reduce the mass of automobiles at a mass and cost savings coupled with improved overall crash and fuel economy performance. Furthermore, the company has grown from two to five full-time employees in 29 months since its first SBIR award.

Advanced Steel Research and Development is a field almost entirely comprised of well-respected academic



institutions, non-profit research powerhouse consortiums, and steel industry giants, all of which have been in existence for decades, if not centuries. These organizations' funding totals billions of dollars annually and are staffed by highly educated researchers, most with Ph.D. credentials, whose numbers exceed 10,000 scientists globally. Contradistinctively, the SFP Works team is comprised of a self-taught metallurgist and machine shop technicians. Not knowing "the rules" led the SFP Works team to combine breaking a half dozen metallurgical "rules" simultaneously, in other words, 6 wrongs made a steel product that was very, very right. Such

a haphazard endeavor as that taken by SFP Works' team would never have been allowed in other research groups, but since this was a "hobby" the company undertook for fun, it has led to an innovative disruption of an industry typically reserved for Academia and major Steel Mill Research Labs.

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Sokikom



Educators are often seen as innovators, an idea personified by Snehal Patel, educator, and founder of Sokikom. Sokikom is the only collaborative math program where elementary students help each other learn through a team-based game. Unlike any other math program Sokikom was started, through 6 SBIR grants from the U.S. Department of Education, to positively impact the teaching and learning of mathematics in our nation. As a former math educator, Mr. Patel started Sokikom with the vision of not only creating a commercially-viable, successful business, but also to make the world a better place by having a positive impact on the teaching and

learning of mathematics in our country.

The Department of Education SBIR program was instrumental in the development of Sokikom - through a 2009 SBIR Fast-Track grant received during the company's first year, Mr. Patel led his team to develop the Sokikom product. The company has used the SBIR grants to better local communities by investing in students. Since receiving its first SBIR award, Sokikom has employed over 50 people and its customer base and revenue is rapidly expanding with quarterly sales for the last 2 quarters growing over 100% compared to the prior year. Mr. Patel has also been

successful at raising over \$2 million in private capital, beyond SBIR, from world-class investors including Dr. Craig Barrett, the former Chairman & CEO of Intel (NASDAQ: INTC), Dave Pottruck, the former Chairman & CEO of Charles Schwab, and others. Today, Sokikom is a commercially viable company.

Since 2009, over 50,000 classrooms from all 50 states have used Sokikom, an adaptive, game-based math program providing elementary students with personalized and team-based opportunities to learn mathematics. More than 1,000,000 student accounts have been created by teachers. In total, students have completed over 250,000,000 math questions in Sokikom and continue to complete questions at a rate of 1 math question every 500 milliseconds, or roughly 200,000 questions per day. The company estimates that this has resulted in 126,534 years of grade-level mathematical growth for students.

The SBIR funding has helped to support high Title 1 elementary schools – Sokikom works with schools and districts that serve diverse populations who often don't have access to technology at home. Sokikom gives students the technical skills they will need to be successful and the confidence that they can succeed. Sokikom encourages children to utilize technology to become better students and allows them to practice the fine motor skills needed for technological advancement. By investing in children at an early age Sokikom is developing a nation of curious learners, students who will use that curiosity to advance the nation's STEM initiatives.

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Stratatech Corporation



The field of regenerative medicine may have seemed like something out of a science fiction novel a few years ago, but for Stratatech Corporation, this has been its mainstay since 2000. Founded in 2000 by Dr. Lynn Allen-Hoffmann, Stratatech was the first spin out company founded by a woman faculty member at the University of Wisconsin - Madison. Stratatech received its first SBIR in March of 2001. At the time of the first award, Stratatech had fewer than 5 employees and currently exceeds 50 employees. Stratatech is now a Mallinckrodt company, resulting from its acquisition by Mallinckrodt Pharmaceuticals in September 2016.

SBIR/STTR support was critically important to Stratatech, a leader in regenerative medicine, development of StrataGraft® skin tissue, its flagship product. The investment supported the technology from early stage research through Phase II clinical development. Dr. Allen-Hoffmann notes that the funding received was especially important for a

woman-owned company: other sources of capital were, in her view, even more inaccessible for a woman-owned small high-tech firm than they were for small high-tech firms in general. Funding from the SBIR/STTR program also provided for the development of ExpressGraft™ skin tissue, the first genetically-enhanced human cell-based therapy product to receive approval for clinical assessment in humans. These successes enabled the company to secure additional funding, including support from the Department of Defense and a series of contracts with the Biomedical Advanced Research and Development Authority.

Through its work, Stratatech has cultivated research relationships with various universities and research institutions including the University of Wisconsin - Madison, Wake Forest University, the Arizona Burn Center, the U.S. Army Institute of Surgical Research, Harvard Medical School, and industry. The SBIR/STTR program served to advance a federally-funded basic research discovery to the

point of demonstrating medical viability and utility, leading directly to acquisition in 2016 by Mallinckrodt Pharmaceuticals, a global specialty biopharmaceutical company.

As a small business, Stratatech generated the most SBIR/STTR funding of any biotech company in the state of Wisconsin. The company, supported by Wisconsin's angel investor community, the Wisconsin Advanced Research Foundation, and peer-review grant mechanisms such as the SBIR/STTR program, has served as a model for other small high-tech businesses located in the Midwest.

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Tangible Haptics (Tanvas)



Despite advances in graphics, sound and vibration, today's touchscreen is still just a lifeless window to the digital world. Tanvas uses surface haptics to add a new dimension of interaction that goes beyond the buzz of vibration and brings unlimited textures and feelings to flat, physical surfaces. What is unique about Tanvas' innovation is that it introduces an entire sense to today's touchscreen interactions - a new dimension that previously did not exist and one consumers have never felt in the digital world.

Tanvas launched in May 2011 and the company received an NSF SBIR Phase I grant in July 2012. In 2012, there was one full time Tanvas employee plus the two inventors and full time professors. Today, that total has grown to fifteen. The company remains one of Chicago's hottest tech startups. The NSF Phase I grant in 2012 was instrumental in providing the company runway until Tanvas received seed investment, closing a \$4.6M Series A investment from R7 Part-

ners, Peakó, Northwestern University, and Silicon Valley venture investors. This funding has propelled the company's vision to make this new dimension of touch a reality for everyone, and is helping it continue to innovate further as Tanvas looks to bring it to wider commercialization.

TanvasTouch can be built into any touch-enabled product across a wide range of applications including automotive, retail, consumer electronics, visually impaired and custom displays. It is unique not only in its range, but also in its ability to connect the physical and digital worlds, transforming the way we communicate, share, interact and connect with technology. Its growth has been facilitated by Tanvas' personnel growth. The company has added mechanical engineers, haptics experts, the company's first multisensory designer, and more than doubled the software team. It also added experienced product leadership to guide development and launch efforts.

By increasing awareness among the broad ecosystem of creators, builders and makers, Tanvas is inspiring others to evangelize surface haptics and help move this new technology to the mainstream in creative and innovative ways. This ability to add a realistic sense of touch and unlimited effects on any touch-enabled screen will one day be ubiquitous. Tanvas aims to be the company to make touch a reality for everyone. The company is actively involved in the Chicago startup community through events and speaking opportunities as well as hands-on hackathons where people can experience the technology directly.

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tanvas.co

Third Wave Systems



Third Wave Systems (TWS) develops and sells premier materials-based modeling software and services for machining solutions. Innovative manufacturing companies implement these solutions to dramatically reduce costs of machined components, accelerate design cycles, and improve part quality. Its software products are used by the top aerospace, automotive, medical, and cutting tool companies to improve their machining process and gain a competitive edge in the marketplace, i.e., machining in a virtual environment to get their products to market faster.

The foundation that Third Wave Systems was built on was technical innovation and the SBIR program and its funding has played a big role in moving Third Wave's innovations forward. Enhancing new technologies for government projects has also allowed TWS to collaborate with other American industrial partners who

benefit from early stage research and provide feedback on new capabilities. This feedback ensures the newly implemented techniques meet the needs of the marketplace. The SBIR program also allowed TWS to employ new engineers to help aid in the additional work new technology brings. At the time of its first SBIR, in 2001, the company had 11 employees and has grown to 31 employees today.

The SBIR program has allowed TWS to develop products that have a positive impact on the warfighter. Its products have delivered 20% improvements in machining time, and 35% for milling, while increasing tool life. Currently, more than 50 aerospace suppliers for the F-35 and F135 are using TWS software. The firm is also contributing to domestic manufacturing through its Production Module product. The product keeps per-part costs down, which helps US manufacturers be more efficient and internationally competitive.

At TWS, having both R&D and commercial applications under one roof allows TWS to gain a better understanding of what is missing in the marketplace and in-turn, develop the technologies that enhance manufacturing.

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thirdwavesys.com

Texas Research Institute Austin, Inc. (TRI)



Being at the forefront of materials development and testing for 30 years is an impressive achievement, and Texas Research Institute Austin, Inc. (TRI/Austin) has done just that. Specializing in advanced polymeric material development, nondestructive testing/structural health monitoring, accelerated life testing, and composites engineering, TRI/Austin has been successfully developing fleet and field-proven products and technologies for the US DoD and the commercial sector for more than three decades. Once products/technologies are developed, the company evaluates and executes the appropriate business models to best ensure success in bringing its products and technologies to the marketplace and the warfighter.

A major component of the company's success is its thirty year relationship with the SBIR program. The company received its first SBIR award after 8 years as a company with 19 employees. In 1989, TRI partitioned into three wholly owned subsidiaries: TRI/Austin (research and product development); TRI/Environmental (materials testing for industry); and a parent holding company TRI/International. An additional subsidiary, TRI Applied Technologies, was formed to launch new SBIR supported products.

Today, TRI has grown to 109 employees overall, with 30 scientists, engineers, and support personnel involved in research and product development in TRI/Austin. Its work with the SBIR program has led to job creation and retention, revenue,

and a track record of successful technology transitions. Phase III successes resulting from its SBIR funded technologies are in excess of \$80 million. A few examples include its Bond-Coat™ and ecoMASS® technologies.

Its Bond-Coat™ product, a non-conductive ceramic coating technology, was sponsored by the Navy SBIR program and is currently specified as a requirement for all Navy submarine underwater electrical connectors. The technology dramatically extends the life of submarine and oil exploration underwater connectors, and is distributed directly by TRI Applied Technologies. It is currently utilized by the Navy and the private sector. TRI/Austin's EcoMass® Compounds were developed for the Army as a non-toxic lead substitute. TRI contributed the Ecomass® technology (ecomass.com) to a startup company called Ideas to Market, LP in exchange for significant ownership in the new company. Ideas to Market, LP raised external capital to fund its efforts to identify and enter markets where Ecomass® compounds could be used to replace traditional materials, such as lead, steel, and copper. The product prevents risks of exposure to metallic lead and has a variety of applications, including radiation shielding, vibration dampening, frangible projectiles, and weighting and balancing.

SBIR funding facilitated TRI/Austin's first products, and continues to contribute to the development of new emerging products.

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Triton Systems, Inc.



Today, Triton Systems describes itself as a global business venture company that successfully launches innovative products and solutions into emerging markets worldwide. The company invests in new technologies through in-house incubation and external partnerships – creating thriving businesses from novel ideas. How has this company excelled at building new products and launching new ventures? Perhaps it's through lessons learned during its highly successful tenure working with the SBIR program. SBIR funding is vital in seeding the company's early research and development as well as the transition to prototypes—all of which is attractive to the technology and investment communities.

Over the years, Triton Systems' success with SBIR has resulted in more than \$400 million in non-SBIR/STTR investments, and has generated greater than \$500 million in taxpayer savings for Department of Defense applications, and

created hundreds of new jobs. The company has commercialized technologies for the benefit of government and society across a variety of fields, including: FRX Polymers—environmentally friendly flame retardants; Emefcy (ASX:EMC)—waste management and re-use technology; S12 Technologies—conformal printed electronics; Senseral (ASX:SE1)—biomedical and defense microsensors; and Aduro Biotech (NASDAQ:ADRO): Cancer and infectious disease treatment.

Aduro Biotech, stimulates the body's own immune system to fight invasive tumors and infections. This cancer and infectious disease treatment technology is a prime example of Triton's ability to identify the dual use potential of SBIR technologies. The project was originally funded through the Army SBIR program to join plastic with temperature controlled particles. Triton recognized that it could employ this same technology in the fight against cancer and spun out the technology. In

2015, Aduro Biotech became one of the most successful biotech IPOs ever.

The team that Triton has carefully assembled includes an unusually broad skill set of professionals that include basic research scientists, applied applications engineers, quality system experts, manufacturing professionals, and serial entrepreneurs with a track record of multiple start-ups and exits. This team and their unique experiences help the company to continually keep one step ahead of the country's technical needs. Triton Systems' effectiveness in combining technology, people, and financing to create successful product companies from SBIR ideas is very unique -- and proves to be a winning strategy.

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tritonsys.com

Vindico NanoBioTechnology, Inc.



Vindico has developed a first-in-class cancer therapeutic to treat highly vascular cancers, including breast cancers, as well as renal cell and hepatocellular carcinomas. Collectively, these cancers affect 350,000 people per year in the US. The company is also working on the delivery of gene editing tools for gene therapy applications and on CAR T-cell immunotherapies for the treatment of orphan genetic diseases and of various hematologic and solid tumor malignancies, respectively. The promise of combining Vindico's platform technologies with gene editing tools offers the possibility of developing novel treatments that may affect the lives of millions of patients.

Vindico was founded in 2008 and it received its first SBIR award in 2010. The company had one full time employee and two part-time employees at the time it received its first award; in 2016, Vindico had three full time employees and two part-time employees before completing a merger with Poseida Therapeutics, Inc. After the merger, the company has 31 highly-skilled employees and expects to double its size in the next calendar year.

SBIR funding helped support the preclinical development of three separate products based on Vindico's platform technologies. For example, through a Phase I SBIR award from the National Cancer Institute, the company developed a first-in-class therapeutic construct that has shown tremendous anti-tumor activity

with no associated off-target toxicities in mouse models of cancer. From this SBIR-funded development, Vindico was able to raise a further round of private investment and to expand its activities in other therapeutic areas, including in the generation of novel delivery technologies that may lead to the development of ground-breaking treatments for several genetically inherited disorders.

Vindico is a biotechnology company focused on discovery research, development, and commercialization of highly innovative products based on its proprietary delivery technologies. Currently, Vindico is focused on the in vivo and ex vivo delivery of proprietary gene editing technologies, generating CAR T-cell immunotherapies for multiple myeloma and other cancer types, as well as non-viral genetic therapies for congenital diseases. The incorporation of Vindico's platform technologies into gene therapy products will result in significant advancements in efficacy and safety and will also result in considerable reductions in clinical development costs and time. Owing to the enormous versatility of its proprietary delivery platforms, Vindico's technologies have broad utility for other applications, including as delivery vehicles for vaccines as well as for diagnostic agents capable of both in vitro and in vivo molecular imaging of infectious, immunologic, and oncologic processes.

Vindico has worked closely with both local and regional universities to develop early-stage technologies, to train future scientific thought leaders, and to actively promote interest in STEM.

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SBIR and STTR Programs

The SBIR Program

The Small Business Innovation Research (SBIR) program is a highly competitive program that encourages domestic small businesses to engage in Federal Research/Research and Development (R/R&D) that has the potential for commercialization. Through a competitive awards-based program, SBIR enables small businesses to explore their technological potential and provides the incentive to profit from its commercialization. By including qualified small businesses in the nation's R&D arena, high-tech innovation is stimulated and the United States gains entrepreneurial spirit as it meets its specific research and development needs.

The STTR Program

Small Business Technology Transfer (STTR) is another program that expands funding opportunities in the federal innovation research and development (R&D) arena. Central to the program is expansion of the public/private sector partnership to include the joint venture opportunities for small businesses and nonprofit research institutions. The unique feature of the STTR program is the requirement for the small business to formally collaborate with a research institution in Phase I and Phase II. STTR's most important role is to bridge the gap between performance of basic science and commercialization of resulting innovations. Federal agencies with extramural research and development (R&D) budgets that exceed \$1 billion are required to reserve 0.45% of the extramural budget for STTR awards to small businesses.

SBIR Participating Agencies

Each year, Federal agencies with extramural research and development (R&D) budgets that exceed \$100 million are required to allocate a percentage, 3.2 percent, of their R&D budget to these programs. Currently, eleven Federal agencies participate in the program:



Department of Agriculture



Department of Commerce



Department of Defense



Department of Education



Department of Energy



Department of Health and Human Services



Department of Homeland Security



Department of Transportation



Environmental Protection Agency



National Aeronautics and Space Administration



National Science Foundation

Each agency administers its own individual program within guidelines established by Congress. These agencies designate R&D topics in their solicitations and accept proposals from small businesses. Awards are made on a competitive basis after proposal evaluation.



U.S. Small Business Administration
www.sba.gov