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THE BEST IN SBIR

SMALL BUSINESS INNOVATION RESEARCH 2011

TIBBETTS | SBIR
AWARDS | HALL OF FAME

February 15, 2011 | Washington, DC



Table of Contents

Introduction	3	Dr. Abraham Abuchowski	34
TIBBETTS AWARD		Viocare, Inc.	35
Radiance Technologies, Inc.	4	ATC-NY	36
Kutta Technologies, Inc.	5	Balfour Technologies, LLC	37
Aerius Photonics, LLC	6	Kitware, Inc.	38
Opto-Knowledge Systems, Inc.	7	Touch Graphics, Inc.	39
SA Photonics, LLC	8	3-C ISD	40
Space Micro	9	Corvid Technologies	41
Weidlinger Associates, Inc.	10	Cornerstone Research Group	42
Wyatt Technology	11	Quality Electrodynamics, LLC	43
Colorado Engineering, Inc.	12	ViewPlus Technologies, Inc.	44
FIRST RF Corporation	13	Advanced Cooling Technologies, Inc.	45
Mikhail Plam	14	RE2, Inc.	46
Numerica Corporation	15	Analysis and Measurement Services Corporation	47
Precision Photonics Corporation	16	Dr. James Stover	48
Safety Dynamics, Inc.	17	Nanohmics, Inc.	49
ANP Technologies, Inc.	18	Operational Technologies Corporation	50
Dr. Douglas Maughan	19	Williams-Pyro, Inc.	51
United States Department of Energy	20	Total Quality Systems, Inc.	52
BryCoat, Inc.	21	Adaptive Technologies	53
MedShape Solutions, Inc.	22	John H. Ruehe	54
Trex Hawaii-Advanced Materials Group	23	Hummingbird Scientific	55
M4 Sciences	24	SBIR HALL OF FAME	
Harrisvaccines	25	Advanced Ceramics Research, Inc.	57
Network Foundation Technologies, LLC	26	Qualcomm, Inc.	58
Fiber Materials	27	Symantec Corporation	59
Ocean Farm Technologies	28	ViaSat, Inc.	60
NAVAIR Team	29	ATMI	61
Vecna Technologies, Inc.	30	A123 Systems	62
Variation Reduction Solutions, Inc.	31	iROBOT Corporation	63
Marti Elder	32	Martek Biosciences Corporation	64
Windmill International, Inc.	33		



Congratulations to the recipients of the 2011 Tibbetts and SBIR Hall of Fame Awards

Created in 1953, the Small Business Administration (SBA) helps Americans to start, build, and grow their own companies. Its mission often is described as the “three Cs”: facilitating access to *capital*, providing *counseling*, and ensuring that small businesses receive a quarter of all federal *contract* dollars.



One key way the SBA accomplishes these goals is through two programs: one devoted to small business innovation research (SBIR), the other to small business technology transfer (STTR). 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 thousands of small businesses over the years. Today, we recognize the crème 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 participated in the SBIR Phase I and II award programs, and awards for individuals who have supported the SBIR Program.

SBIR Hall of Fame

New for 2011 are the SBIR Hall of Fame, which recognizes companies with a long period of extraordinary success of research, innovation, and commercialization within the SBIR program. To be eligible for this 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 its 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.



Radiance Technologies, Inc.

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Radiance Technologies, Inc. provides systems engineering, technology development, systems integration, testing, and production for the Department of Defense (DoD), armed services, intelligence agencies, and other government organizations. With 11 consecutive years of growth, and three consecutive years among *Inc. Magazine's* 500 fastest growing privately held small businesses, Radiance has grown from a single office in Huntsville to offices in 18 states and three foreign countries, with more than 400 employees.

Radiance's work performed under SBIR awards involves developing defensive measures against vehicle- or vessel-borne IEDs. No widespread weapon application has yet emerged to take advantage of the commonly known fact that extremely powerful bursts of electromagnetic radiation in the radio frequency bands can disrupt and/or destroy sensitive electronics that are prevalent in almost all sophisticated systems. Radiance's SBIR projects focused on overcoming the inherent obstacles to developing such a weapon. The Radiance team has developed several systems, capable of small size and high power. Key technologies have been patented and others are under consideration.

Recent developments have produced favorable results. Current laboratory prototypes have functioned for hundreds of tests without failure at military test facilities.

These projects can have huge impacts on military and civil infrastructures alike. This technology provides a cost effective way to mitigate threats in that it can be built inexpensively so that local agencies can afford to purchase the technology; portably to be routinely employed by a police team; and deployed permanently when possible or within minutes in a portable version.

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In 2003, working under an SBIR grant, Kutta Technologies was the first company in the world to develop an Unmanned Aerial System (UAS) controller on a commercial, off-the-shelf, personal digital assistant. The grant called for the development of UAS controller software to run on very small form factor computer platforms. The initial contract progressed to Phase II, then a Phase II extension, and is now in Phase III. Kutta expects to deploy the technology to the Army in late 2011, integrating it into an Army Program of Record known as the OSRVT Block II with bidirectional capabilities. This technological innovation promises to change the way the Army uses unmanned systems.

To date, Kutta has received \$10 million in additional funding for this technology. The company anticipates even more investments as the technology is certified and integrated onto all Army UAS assets, and projects licensing revenue from the Department of Defense, allied nations, and commercially derived technologies. Another financial stream is possible as Kutta applies its UAS controller to the national airspace. Meanwhile, Kutta is working with Arizona State University's Aero/Mechanical Engineering schools on new UAS concepts.

Not only did this SBIR contract facilitate sustainable, high-paying engineering jobs over the past seven years, but because of its far-reaching impact for the military and the nation, it is also poised to create additional jobs far into the future.

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Aerius Photonics was founded seven years ago to develop and manufacture electro-optical devices and sensors. The company has been profitable since, generating revenue through contract technology development and product sales.

Aerius is actively involved in the SBIR Program, through which it seeks to develop innovative, lightweight solutions for sensing applications. Applications it is pursuing include:

- High power VCSELs
- High sensitivity infrared focal plane arrays
- Optical preamplification to improve SNR
- Lightweight laser rangefinders
- Novel focal plane array testing (scene projection) technologies

Aerius has succeeded in selling its products to both large suppliers of government agencies and companies that supply civilian markets. Its success is reflected in its fast revenue growth and results from its business philosophy of ensuring that SBIR-funded programs lead to commercialization.

Aerius works closely with several universities, such as the University of California-Santa Barbara, Stanford University, University of California-Santa Cruz, Arizona State University, Boise State University, and Georgia Tech. These partnerships provide a channel to commercialize technology developed at a university with federal funds, and enhance a student's education by exposing him to leading-edge, industrial R&D.

With its current backlog of orders, plus new technologies and products under development (many of which are funded by the SBIR Program), Aerius forecasts continuous growth in revenue and employment.

Opto-Knowledge Systems, Inc.

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Opto-Knowledge Systems, Inc. (OKSI) specializes in the development of turn-key electro-optical sensor systems. The company was founded in 1991 to take advantage of a new and emerging technology: imaging spectroscopy. This technology has potential application in a variety of fields, including agriculture, environmental science, geology, medicine, military, space, and beyond. The challenge of imaging spectroscopy is the multi-disciplinary effort required, including such fields as opto-mechanical engineering, electrical and software engineering, mechanical engineering, mathematics, chemistry, and physics.

Imaging spectroscopy devices are highly complex, and need a high level of customization to cater to each specific application. Despite this issue, rather than focus on a niche application, OKSI made the decision early on to focus on the technology. In the face of scarce funding, OKSI entered the field, putting together a strong group of multi-disciplinary engineers. In the last decade, OKSI has been awarded more than 50 SBIR Phase I grants, over 28 Phase II awards, and many Phase II enhancements and Phase IIIs.

OKSI excels in R&D projects where off-the-shelf solutions are unavailable. Some of OKSI's technologies have become mandatory parts of DoD acquisitions. With a proven record of commercialization of new technologies, OKSI is obtaining Department of State approvals for exporting its agricultural product lines.

OKSI has invested in, and is developing, an ongoing, growing patent portfolio that will help in licensing technologies initially developed under SBIR funding. Currently, OKSI holds five patents, and has seven patent applications in various stages. OKSI projects a staff growth of 20% in 2011.

SA Photonics, LLC

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Founded in 2002, SA Photonics is a pioneer in developing and deploying innovative photonics solutions. The company specializes in commercializing hardware made possible by the SBIR Program, including high-bandwidth optical communications, head-mounted displays, digital night vision, high-power microwave sensors, LADAR/LIDAR systems, mirror sense and control systems, compact fiber gyros, high-power-pulsed fiber lasers, and RF beamformers. Its competitive advantage derives from its team of seasoned employees, who blend extensive, large-company experience with the quick reaction times of a small engineering firm.

Such agility is one reason why SA has won 52 SBIR/STTR Phase I and 23 Phase II awards—and why the majority of the firm’s revenue now comes from Phase III contracts that leverage its Phase I and Phase II work. The firm knows how to transition its research into products for commercial and government application. Indeed, its Commercialization Achievement Index is 90, aided by strong partnerships with prime contractors such as Vision Systems International, BAE Systems, Rockwell Collins, Ball Aerospace, Lockheed Martin, and Boeing.

SA employees designed an optical switch that is at the heart of telecommunications networks throughout the United States and Europe, as well as the touch screen that is flying on every F/A-18 E/F fighter jet in the world. Together, these hardware sales have led to over \$1 billion in profit for the companies where SA employees previously worked.

Space Micro

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Space Micro, which specializes in payload and communications equipment for satellites, says it wouldn’t exist without the SBIR Program. The numbers back this up. In 2010, SBIR funding represented 30% of the firm’s revenue; the other 70% came from products that evolved from SBIR awards. So integral is SBIR to the firm’s success that its CEO teaches an internal seminar called “SBIR 101.”

Beginning with a Phase I SBIR award from the Air Force, Space Micro has grown from two employees in 2002 to 43 today. Its revenues now exceed \$7 million. In other words, in eight years, the firm has created 41 high-tech, high-paid jobs, which is why, for the past five consecutive years (2006-2010), it has been named to the list of San Diego’s “Fast 100” rapid growth companies.

The SBIR Program also has enabled Space Micro, now a pioneer in technologies that enable commercial, off-the-shelf electronic devices to be deployed in space, to develop many strategic relationships. Working with large-business primes such as Lockheed Martin, Aerojet, Raytheon, and Boeing has opened new doors for product sales. Meanwhile, alliances with university partners, such as USAFA, UCSD, UCLA, and Arizona State, have enabled Space Micro to take research to market. Finally, the SBIR Program has introduced Space Micro to other small businesses for subcontractor partnerships, such as PRT, Nu-Trek, U.S. Semiconductor, NxGen Electronics, and Vanguard Composites.

Weidlinger Associates, Inc.

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Weidlinger Associates Inc (WAI) is an engineering consulting company with an Applied Science Division established for the express purpose of developing hi-tech engineering solutions. Thanks to an SBIR grant from the NSF, WAI has developed and since commercialized PZFlex, the world's leading modeling software for piezoelectric and ultrasound design.

In the early 1990s, as the growing medical ultrasound imaging community presented the demand for robust modeling and simulation systems, WAI rose to the challenge, creating the PZFlex software. By offering a commercial package, WAI was able to serve the medical imaging community, universities, and even extend applications for customers in other fields, including the US Navy.

Customers reported significant reductions in prototype design timeframe, development expense, and time-to-market. While heavily used in the United States, PZFlex is a global product, and is sold worldwide, particularly in Japan and Europe.

PZFlex has since expanded into new markets, including sensors and actuators, non-destructive testing, and recently the use of ultrasound for medical therapeutics—focusing ultrasound to destroy tissue non-invasively, attacking tumors from outside the body.

WAI has grown its operation in staff and revenue, bringing in more export revenue annually from PZFlex than its combined SBIR total.

Currently, all the major medical ultrasound research companies use PZFlex as their primary software development tool. Ultrasound is the largest imaging modality in medicine, and thanks to the SBIR Program and WAI's unyielding leadership in the field of ultrasound simulation, PZFlex promises to further advance this vital field.

Wyatt Technology

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Named in each of the previous three years as “one of the best places to work in America” by the *Scientist* magazine, Wyatt Technology Corporation (WTC) is the world's leading producer of laser based instrumentation used to measure the masses, sizes, and colligative properties of large macromolecules such as proteins and polymers (plastics).

Dr. Philip Wyatt, the company's CEO, founded WTC around his patents (over 60, both foreign and domestic), ideas and inventions in industrial, military, and medical domains.

WTC's extensive instrument line provides unique and powerful tools for many different areas of analytical chemistry, including quality control, process control, molecular weight and size determinations, and a host of other applications, which are all possible with these multi-angle light scattering instruments. The company's instruments are sold in over 50 countries and have become world standards for the pharmaceutical and biotechnology industries. These instruments have made an enormous impact within the industries and sciences they serve. Most significant is their use by biotechnology and pharmaceutical companies throughout the world and are essential elements for today's growing pharmaceutical industries.

WTC maintains wholly owned subsidiaries in the UK, China, France, Scandinavia, and Central Europe (serving Germany, Switzerland, Austria, and the Netherlands) which provide direct sales and service for its products. Exports account for more than 40% of the company's sales, helping the nation's current accounts on a small yet consistently growing basis.

WTC has grown steadily from an initial staff of 1 to today's 80 plus employees. It has been profitable for each of the preceding 61 quarters, while incurring no debt.

Colorado Engineering, Inc.

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Located across from the Air Force Academy in Colorado Springs, Colorado Engineering, Inc. (CEI) is a woman-owned small business that develops and produces hardware, software, and system solution technologies.

Under a Phase II SBIR contract, CEI's Radar Advanced Receiver Exciter (RARE) has received funding from the Defense Department's Missile Defense Agency. RARE combines high-performance computing, ease of programmability, low cost, and commercial-standard I/O flexibility to facilitate scalable, embedded processing solutions for a variety of environments and footprints within government, military, and commercial applications.

The RARE architecture has been so successful that the Air Force Research Lab at Wright Patterson Air Force Base has awarded CEI a prime contract to design and develop a complete radar system that leverages RARE as its core technology. This radar, dubbed USTAR for "Unmanned Sense, Track, and Avoid Radar," will add an autonomous sense-and-avoid capability to the Air Force Global Hawk Unmanned Aerial Vehicle, ultimately allowing such UAVs to operate in civil airspace without the need for expensive, manned escorts.

RARE has steadily gained popularity in the military, as evidenced by the program's receipt of a Defense Priorities and Allocations System rating of DX-C9. RARE also has admirers on Capitol Hill: Congressman Douglas Lawborn awarded the technology congressional plus-up funding to support the USTSR program under which RARE is being transitioned.

CEI has received seven contract awards, totaling almost \$10 million, which leverage RARE. These awards have facilitated outstanding partnerships with Ball Aerospace and the University of Colorado, made possible 300% growth in job creation, and allowed CEI to triple its staff from six to 19.

FIRST RF Corporation

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FIRST RF Corporation (FIRST RF) was founded in 2003 to develop and manufacture state-of-the-art antenna and RF technology. FIRST RF successfully won and executed a record number of SBIR programs: more than 50 Phase I awards and more than 30 Phase II awards to date.

In the 2003, the US Army had a critical requirement for a very broad bandwidth antenna that encompasses various communications, sensors, and electronic countermeasure systems. FIRST RF demonstrated the feasibility of a 125:1 bandwidth antenna from a single compact aperture with high power handling capability. This antenna allowed for a single installation on already overcrowded vehicles to cover multiple bands and functions.

The combination of the right technology at the right time led to an extremely successful product. FIRST RF recognized the vitality and grave importance of finding a rapid solution to the problem for fielding in the current conflict. Even before the end of Phase I, FIRST RF had sent prototypes to the field for evaluation. By the middle of 2005, FIRST RF had begun production on this product line. To date, more than 150,000 antennas have been sold. FIRST RF has recently received the Army Commercialization Award for 2010.

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Dr. Mikhail “Misha” Plam is widely known for his entrepreneurial success, longtime support for the SBIR Program, and distinguished advocacy of the Program’s philosophy in Russia and China. A serial entrepreneur, Dr. Plam was an early and enthusiastic adopter of the SBIR Program as a way to match his companies’ commercially oriented R&D with national R&D priorities. During his career, he has successfully started a string of science and technology-based small businesses that have fostered innovation and created jobs. One of his companies received its first SBIR grant in 1984; his latest grant was issued in 2008, with a long string of awards between those dates.

Several of Dr. Plam’s companies have achieved significant business success. A product pioneered by one of his companies and funded in part through SBIR was used by NASA in the life support system on the Russian Mir Space Station and on the International Space Station. Among his greatest contributions, however, has been his decades-long advocacy for the SBIR Program and its goals. He defended the SBIR Program in 1988 when its elimination was considered. He testified on behalf of small businesses to the National Science Foundation (NSF) at the invitation of Roland Tibbetts and helped convince the Director of the NSF to save the Program. In the last decade, Dr. Plam has significantly broadened the international scope of the SBIR

Program in Russia and China, including numerous lectures and workshops in both countries, both on his own and in collaboration with U.S. government representatives. He has also continued to foster new collaborations with the University of Colorado through its Technology Transfer Office, which has recently informed him that he has been awarded its first Serial University Start-Up Entrepreneur Award.

Numerica Corporation

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In 1995, an applied math professor at Colorado State University (CSU), Dr. Aubrey B. Poore, gained national attention when the Air Force chose his technology as the best-of-breed tracking system and upgrade to its Airborne Warning and Control System surveillance plane. The next year, Dr. Poore incorporated a company, Numerica, to commercialize this multiple frame assignment tracker, giving Numerica patent rights to its flagship product.

Over the next 15 years, this technology evolved into state-of-the-art, next-generation work in software development, engineering services, and computational research in tracking and sensor fusion as they relate to national security surveillance. Today, Numerica’s sought-after software is licensed to industry leaders such as Boeing, Northrop Grumman, MITRE, and General Dynamics, and the company holds four U.S. patents. Such consistently excellent solutions result directly from Numerica’s participation in the SBIR Program, from which it has won, on average since 2002, eight SBIR Phase I and II awards per year.

This commercial success has allowed Numerica to expand to 50 employees across three offices in Colorado, Ohio, and California. It recently hired three new people at its Colorado headquarters, and is actively looking for 13 more.

Precision Photonics Corporation

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Precision Photonics Corporation (PPC) develops, manufactures, and sells precision optical components, coatings, and assemblies. By taking advantage of diverse backgrounds in spectroscopy, precision metrology, and high-volume manufacturing, PPC has been able to provide high performance, price-competitive laser optics and coatings to the telecommunications, defense, aerospace, biomedical, and semiconductor industries.

A decade after its founding, PPC gave rise to a spin-off company, mBio. Handling multi-million dollar annual revenues, mBio specializes in the development of small array diagnostics to measure common infectious diseases including HIV/AIDS and its co-infections. The novel approach to solving diagnostic challenges was made possible by using the laser technologies developed at PPC, combined with substantial funding from the SBIR Program.

Currently, mBio focuses on diagnostics for global health applications, particularly related to infectious diseases, aiming to provide low-cost tools in countries that lack a strong medical infrastructure and in rapidly emerging countries. In the United States, mBio is targeting companion diagnostic tools for personalized medicine applications, as well technologies for decentralized testing sites such as pharmacy and retail-store based clinics.

PPC and mBio demonstrate the success of moving technical innovations from the small business research environment to the commercial realm while maintaining high revenue production and manufacturing in the United States.

PPC has successfully maneuvered through profitable product development as well as the sale of intellectual property. PPC's pragmatic approach to maintain its core business and IP, while maintaining profitable product structures has allowed the company to increase revenues and add employees even in a downturned economy. PPC prides itself on the efforts it takes to hire locally, particularly among women and minorities.

Safety Dynamics, Inc.

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With SBIR Phase III funding from the Office of Naval Research, Safety Dynamics is developing a perimeter security system called the Smart Fence. Smart Fence detects the approach of vehicles, footsteps, and gunshots, and records any disturbances on camera.

In 2006, the Navy issued a solicitation for intelligent sensors to protect perimeters against intrusion and terrorist attacks. Based on research by Dr. Theodore Berger, Director of the Center for Neural Engineering at the University of Southern California (USC), Safety Dynamics' Steven Berger oversaw the deployment of smart fence- and ground-based sensors to protect the perimeters of fixed assets. His insight was to use sensors that employ biologically inspired algorithms, thus creating virtual perimeters for areas where no fence can be supported.

2007 brought significant success for the Smart Fence. The low rate of false positives achieved by the algorithms developed at USC, combined with the wireless communications and gunshot-detection cameras supported by Safety Dynamics, have generated interest from both government and the private sector. Operational prototypes generated \$2.5 million in commercialization pilot funding from Naval Facilities Engineering Command, were tested by the Naval Surface Warfare Center, and obtained a customer in the Transportation Security Administration (TSA), which selected the system to protect the perimeter of the first post-9/11 airport built in the United States, in Panama City, Florida. Meanwhile, the Navy plans to make these intelligent sensors a component of future naval security systems.

ANP Technologies, Inc.

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Founded in 2002 by Ray Yin, ANP Technologies, Inc. is a nanobiotechnology company with cutting-edge technology platforms focused on biological drug R&D, biodefense and homeland security, home/point-of-care diagnostic systems, and nanotechnology-based drug delivery systems.

As a specialty contract research organization, ANP has rapidly gained a reputation as the “go-to” firm that large pharmaceutical and biotechnology companies seek when encountering obstacles in developing new biological drugs.

ANP’s patented technologies have enabled it to enhance the field of nanobiotechnology, with multiple projects and technologies involving assays delivered to numerous pharmaceutical industry clients.

Among examples of ANP’s effective usage of the STTR program was 2004 DoD Army Phase I and 2005 Phase II STTR project titled “Multiple Bio-Agent Detection with Low-Cost Nanomaterial-based Devices.” This STTR effort has also led to the award of a full rate DoD production contract followed by a private commercial open-ended contract on behalf of special forces by SAIC, Inc.

ANP’s CEO, Ray Yin, began his working relationship with several federal agencies in 1997, and has since served in several technical leadership roles. Yin oversaw the largest nanobiotechnology-based research and development program within the Department of Defense.

Yin has grown the company to 40 employees in 8 years, without debt or venture capital financing. Since its inception, ANP has generated over \$55 million in R&D contracts and product sales.

ANP Technologies, Inc. and its CEO, Ray Yin, have led the way in their effective use of SBIR/STTR funding for fundamental scientific research and converting it into commercialized products and a very successful business.

Dr. Douglas Maughan

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Named 2010’s Government Information Security Executive of the Year by Tech Exec Networks, Dr. Douglas Maughan is the Division Director of the Cyber Security Division of the Homeland Security Advanced Research Projects Agency (HSARPA). In support of the Science and Technology Directorate (S&T) of the Department of Homeland Security (DHS), Dr. Maughan currently directs Cyber Security Research and Development activities at DHS S&T. Over the course of his career, Dr. Maughan has contributed to every single phase of the SBIR lifecycle. This includes topic generation, proposal review, technical management, project management, commercialization assistance, and interagency, congressional and community outreach. A senior member of DHS’s Science and Technology team, Dr. Maughan is now heavily focused on public outreach in support of the SBIR Program.

Dr. Maughan has been responsible for helping bring to market over 20 commercial and open-source information security products during his seven years at DHS. Averaging nearly three new products released each year, this is an R&D success rate that rivals the very best the private sector has to offer. A recognized thought leader in applied innovation, he has published extensively on the challenges associated with transitioning from the sanctity of the lab to the rough and tumble uncertainty of the marketplace. In partnership with SRI International Dr. Maughan has developed innovative programming to expose his SBIR participants to best practices in management, marketing, and innovation.

Dr. Maughan also organizes a “Systems Integrator Forum” for his SBIR awardees. This event brings federal clients, large companies, and venture capitalists together with SBIR awardees. A familiar face on the Hill, Dr. Maughan regularly briefs congressional members and staffers on the many benefits of the SBIR Program. He has also played a major role breaking down institutional barriers and encouraging civilian-DoD cooperation against the cyber threat. As part of this effort, for the last four years he has organized a joint SBIR conference with DoD.

United States Department of Energy

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The Department of Energy created the SBIR Phase III Xlerator Program as a new initiative in 2010. The Xlerator Program’s purpose is to help transition important, new DOE clean energy technologies to the marketplace, as well as to help create new jobs. Beginning with briefings to the Under Secretary of Energy in 2009, and Assistant Secretaries of DOE and Secretary Stephen Chu in early 2010, the initiative obtained funds and awarded SBIR Phase III Xlerator projects by September 30, 2010 to 33 companies for a total award amount of \$57 million, including nearly \$11 million of Recovery Act funding. Total time from releasing the Phase III Xlerator Funding Opportunity Announcement to completing full merit review on 181 Phase III applications and completing all 33 Phase III awards was less than 90 days.

“With these Phase III Xlerator awards, 33 small businesses in 16 states will lead projects that received SBIR or STTR funding, teaming up with universities, national labs and industry to bring their work to the commercial marketplace. By drawing upon the resources of universities, labs and industry, innovative small businesses will be able to develop the manufacturing processes needed to scale up production of their new and proven technologies.”

— Department of Energy Blog

(<http://blog.energy.gov/blog/2010/09/15/boost-small-business>)

The DOE SBIR Phase III Xlerator demonstrates what motivated and creative federal employees can do to assist in bringing important new technologies to the marketplace and in creating new jobs in the face of high unemployment using existing contracting mechanisms and funding programs.

BryCoat, Inc.

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BryCoat, Inc. is Nadcap certified and ISO-9001:2000 and AS9100B registered company that works with the major aerospace OEMs. Since its incorporation in 1990, BryCoat has grown from a small startup to a 40-person coating solutions operation.

BryCoat was requested by the Missile Defense Agency (MDA) to acquire the CVD TiC coating of 440 CVM stainless steel balls from its developer, CSEM, Switzerland, due to the critical nature of TiC coating technology to U.S. weapons and avionics designs. BryCoat purchased the license and equipment from CSEM and set up TiC ball coating operations in Oldsmar, Florida. The MDA SBIR support is focused on demonstrating successful transfer of the technology into U.S. hands and to make process improvements.

U.S. systems currently using TiC coated balls include:

- Trident Missile – DoD
- THAAD Missile – DoD
- Space Tracking and Surveillance System – DoD
- Standard Missile-3 – DoD
- PAC-3 Missile – DoD
- Avionic Navigation – Commercial and Government
- NASA, DoD and Commercial Satellite

BryCoat leads the qualification effort involving the ball manufacturers, Hoover Precision Products, Winsted Precision Ball Company, and The Bearing Consultants, a group of former Draper Laboratory engineers that originally developed the DoD applications for TiC coated precision balls.

BryCoat has directly created and supported existing jobs in Florida and Georgia. Establishing the supply chain of CVD TiC coated balls completely within the U.S. ensures a safe source of precision TiC coated balls that are used in high precision products manufactured throughout the U.S. As the only source for the CVD TiC coating process, worldwide, BryCoat fuels a high-tech export stream that include many U.S. vendors.

MedShape Solutions, Inc.

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MedShape Solutions is a medical device company that develops distinctive orthopedic medical devices from an innovative platform of “smart” functional materials, such as shape-memory polymers and alloys. MedShape became the first company to secure regulatory clearance and begin implantation of shape-memory medical devices with the launch of the Morphix™ suture anchor and ExoShape™ anterior cruciate ligament (ACL) reconstruction device, both supported by SBIR grants. These products and technologies have created a new class of smart biomedical devices, while offering the potential for dramatic improvements in the outcomes of common surgical procedures.

MedShape has launched two products in a heavily regulated, highly competitive marketplace based on the support of two SBIR Phase II awards. It is the only company to have secured regulatory clearance to manufacture and market shape-memory polymer medical devices, which was a direct result of SBIR support. MedShape has secured four FDA 510(k) clearances and commercialized two products in just over five years since founding for less than \$10 million of invested capital. Compared to industry peer averages of 80 months and \$31 million per FDA clearance under the 510(k) program, this is a particularly remarkable achievement in light of the fact that MedShape is using novel materials. SBIR support has been instrumental in driving this efficiency. MedShape currently employs a full-time team of 30 individuals, 20 of whom hold degrees in advanced technology and six of whom hold a Ph.D. in an engineering discipline.

Trex Hawaii-Advanced Materials Group

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Trex Hawaii-Advanced Materials Group (Trex Advanced Materials) was founded in 2000, on the Hawaiian Island of Kauai. Trex uses its proprietary Chemical Vapor Composites (CVC) process to chemically grow ultra high purity silicon carbide (SiC). Trex CVC SiC™ is highly stiff and thermally stable with very low intrinsic stress. As a result, it polishes to demanding optical specifications and is therefore the material of choice for sophisticated optical (DoD and commercial) applications where weight, thermal stability, and optical figure are all critical.

The CVC process is a rapid manufacturing process that reduces both cost and lead-time for sophisticated optics. Whereas traditional lightweight and thermally stable optical technology has been supported by beryllium (a hazardous material that can be fatal if not handled correctly) CVC SiC™ is a non-hazardous material that equals or exceeds the performance of beryllium in demanding optical applications.

In its SBIR/STTR research work, Trex Advanced Materials has partnered with several universities, including the Universities of Hawaii, Arizona, Alabama-Huntsville, and Kauai Community College, to complement its in-house capabilities. Trex has also utilized the services of student interns from University of Hawaii and Kauai Community College.

Trex Advanced Materials has had a positive impact on the economically disadvantaged rural island of Kauai. In an economy dominated by the low-wage industries of tourism and agriculture, Trex Advanced Materials has created high paying jobs and has been a leader in local efforts to diversify the economy.

M4 Sciences

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James Mann is responsible for business strategy and technology management at M4 Sciences—a designer and developer of precision machining technologies. Mann co-founded M4 Sciences in 2005 and led business and technology development to enable successful commercialization of Modulation-Assisted Machining (MAM), a front-line, patented manufacturing technology that dramatically increases efficiency and sustainability in industrial machining.

Mann led the technology development in drilling biomedical components with MAM through Phases I and II of an NSF STTR award, and helped M4 receive several awards and grants, as well as raise private investment, which helped acquire facilities for product development and fund commercial activities. A parallel NSF STTR Phase IIB award continues to fund M4 Sciences' MAM technology research.

In just five years, directly as a result of the STTR Program, M4 Sciences has grown to nine employees at its Purdue Research Park location. Today, M4 Sciences sells TriboMAM drilling systems worldwide to customers in the orthopedic, automotive, aerospace, and industrial markets.

Before M4 Sciences, Mann did research at Purdue, where he holds an appointment at the School of Industrial Engineering. He develops projects and mentors engineering graduate students at the Center for Materials Processing and Tribology. He also is the author of several technical papers, trade publications, award-winning presentations, and three U.S.-issued patents; additional patents are pending.

Harrisvaccines

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Harrisvaccines was founded in 2005 by Dr. D.L. "Hank" Harris, one of the world's foremost authorities on infectious diseases of swine. Dr. Harris has expertise in the areas of pathogenic microbiology, nomenclature and classification of bacteria and viruses, bacteriophage therapy, vaccinology, infectious agent elimination techniques, antibiotic alternatives, and xenotransplantation.

Among Harrisvaccines' further accomplishments are:

- Obtaining USDA approval of the company's SIV vaccine efficacy study, with licensure for the SIV expected in November, 2011
- Developing an RP-based vaccine that can efficiently and economically be introduced to marine shrimp to combat devastating diseases such as White Spot Syndrome Virus
- Obtaining exclusive licensing by the Iowa State University Research Foundation to manufacture and distribute vaccines using its technology
- Creating partnerships with international companies to advance development of urgently-needed vaccines
- Growing from two employees to 15 full-time and five part-time employees. Another 10 new technical jobs are anticipated within the next 18 months
- Contributing to the local economy by hiring recent graduates from local colleges and universities
- Generating revenue, more than 10 times the amount of funding received through the SBIR Program

Harrisvaccines has received two Phase I and one Phase II awards from the USDA. The companies goal is to become the leader in development, production, and marketing of alphavirus RP vaccines to improve the health of domesticated animals. The company focuses on rapid response to the biological threat by researching and developing universal and targeted vaccines for mutating viral agents. Current priorities for the company are SIV and PRRSV, two of the most costly diseases in the industry.

Network Foundation Technologies, LLC

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Network Foundation Technologies (NiFTy) brings television-style broadcasting to the Internet. The company's technology overcomes many of the bottlenecks that limit widespread viewing of live video online, and decreases bandwidth costs by an average of two-thirds to three-quarters. These breakthroughs make possible a new broadcast model that provides free-for-view (no charge to the viewer) broadcasts on a large, extended scale for sports, supported by advertising.

In 2007, NiFTy received initial SBIR funding from the National Science Foundation (NSF). As a result of NiFTy's progress in Phase I, the company was awarded additional funding through NSF's Phase IB, Phase II, Phase II-REU, and Phase IIB Programs. NiFTy also has completed a first round of investment funding by attracting private equity from regional and national investors.

The results of NiFTy's most loyal customer, the sports league, arenafootball2 (af2), speak volumes about NiFTy's product. In the first year with NiFTy, af2's viewership exploded, as 35 times more online viewers watched af2 games than before af2 introduced the NiFTy free-for-view model. In its second season with NiFTy, af2 again saw an overall increase, this time to 50 times the number of viewers that it had when using the old approach. NiFTy's success is also reflected in the seven patents it holds. An eighth has received a "Notice of Allowance," and six more are pending.

These accomplishments have allowed NiFTy to thrive. What began in 2001 as a company of two is now a workforce of 30, with plans to hire more as part of the Enterprise Campus Research Park development now underway at Louisiana Tech University.

Fiber Materials

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Fiber Materials, Inc. (FMI®) is a recognized leader in research, development, and manufacture of advanced high temperature composite materials for defense, aerospace, and commercial industries. Participating in SBIR Programs since 1983, FMI has been awarded 50 Phase I and 25 Phase II SBIR contracts from multiple government agencies. SBIR Programs have been an essential part of FMI's ability to develop materials for high performance composite application.

Among other recent material innovations by FMI, developed under SBIR funding, Phenolic Impregnated Carbon Ablator (PICA) has successfully been transitioned from R&D to flight. FMI has leveraged PICA, a material capable of carrying heat away from a space vehicle during atmospheric re-entry, in various implementations. In support of the development of PICA Thermal Protection System materials for NASA, FMI was contracted for the Phase II SBIR "Lightweight Ceramic Ablators." Subsequently, FMI was contracted by Lockheed Martin Space Systems Company (LMSSC) to produce a PICA heatshield for the Stardust Sample Return Capsule. Stardust was launched in February 1999 and returned to Earth in January 2006 after collecting cosmic matter from the tail of comet Wild-II. During the return to Earth, the FMI heatshield protected the capsule and its contents, representing the fastest atmospheric re-entry of a man-made object. In 2008, the capsule and heatshield were installed in the Smithsonian Institution's National Air and Space Museum in Washington, DC as recognition of the significant accomplishment.

FMI's 170 employees have significant impact in Biddeford, York County, Maine, supporting schools and funding community activities. FMI is a proven asset to its community, by hiring locally, and subcontracting to local business.

Ocean Farm Technologies

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With initial funding from the Maine Technology Institute and subsequent SBIR funding from the National Oceanic and Atmospheric Administration, Ocean Farm Technologies (OFT) develops and markets technology for aquaculture in exposed, open-ocean conditions. The company’s claim to fame, for which it holds an exclusive license, is the Aquapod containment system, a patented, proprietary platform that supports offshore fish farming. If U.S. regulatory issues can be resolved, the Aquapod may change how Americans get their seafood.

A novel net pen, the Aquapod is suited for rough ocean conditions, a diversity of finfish, and other marine species, such as shrimp. Its structure, a geodesic sphere, offers unparalleled strength and a volume-to-surface area ratio unseen elsewhere on the market. Its modular net panels can be covered in the same wire mesh used on lobster traps, which makes the pens predator-proof, and can be assembled with different panels designated for different functions, including access, feeding, fish transfer, grading, harvesting, mooring, and mortality recovery. Additionally, the Aquapod is neutrally buoyant, easily submerged, and does not lose its shape or volume while submerged. And its mooring system, which increases operational efficiency, is as innovative as the wave energy converter, which powers the Aquapod.

When OFT was founded in 2005, it consisted of a scientist, a financial advisor, and an unused factory in rural Maine. Today, that factory keeps eight people gainfully employed and generates \$3.5 million in annual revenue. OFT plans to continue hiring more like-minded innovators and collaborators in 2011, with the goals of improving the way people farm and fish, reducing the human impact on the environment, and offering an affordable, sustainable future for offshore, submersible fish farming.

NAVAIR Team

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The team of Jim D’Andrade, Jim Wilt, Jim Janousek (known to many as “The Jims”) and Valerie Bjorn stepped up to the challenge of a late 1990s DoD Acquisition Under Secretary to “significantly improve the hearing protection and communications effectiveness of maintainers and pilots” who would be working in the vicinity of the planned F-35 (JSF) aircraft at that time. Working closely with their Air Force counterpart, Mr. Rich McKinley, Jim D’Andrade initiated the N01-162 SBIR Program for Advanced Passive and Active Hearing Protection soon after the Under Secretary’s challenge. This first step launched a decade of work that continues even today, toward improved protection of maintainers in the United States Navy. The SBIR Program was their essential, and sometimes only, means of implementing their annual goals and milestones toward a new acquisition program that would unite some legacy requirements and establish new requirements for maintainer head and hearing protection.

The service of the nominated team of NAVAIR individuals spans the decade from 2000 to 2010, beginning with helping to organize an international military noise conference, followed by the initial SBIR Programs in 2001 and 2002. They created a broad scope of SBIR Programs and made innovative use of technology transition programs to fund the path to the SDD program for the head and hearing protection equipment. After successful conclusions to Phase II awards, the team worked closely with the SBIR Program office to create three different Indefinite Delivery, Indefinite Quantity (IDIQ) contracts that provided post Phase II funding for three of the small businesses that were down selected for SBIR awards.

As advocates for the Program, the team introduces their SBIR small businesses to Lockheed Martin Aeronautics. These introductions eventually led to a Mentor Protégé agreement between Lockheed Martin and Aegisound, one of the small businesses that is now producing head and hearing protection products for the FDC acquisition program.

Vecna Technologies, Inc.

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Founded in 1999 by MIT alumni, Vecna Technologies delivers products and expertise in systems interoperability, process optimization, and task automation. Headquartered in Cambridge, Massachusetts, it also has offices in Maryland, Virginia, and Silicon Valley.

Vecna’s various SBIR grants have seen great commercial success. For example, its QC Pathfinder, an automated infection control and surveillance solution, has generated \$20 million in revenue. Its use continues to grow in the military, private hospitals and clinics, and the Department of Veterans Affairs (VA), which has selected the Pathfinder for national deployment.

Vecna also successfully commercialized its vKiosk, a self-service kiosk that automates patient check-in, registration, screening, and payment processing. The kiosk is deployed in more than 60 community-based hospitals, such as Johns Hopkins, and in facilities within the VA and Department of Defense health systems. Moreover, Vecna is the only vendor of self-service, patient kiosks and patient-provider portal solutions endorsed by the American Hospital Association.

In 2001, Vecna employed 15 people. Since then, it has won almost 20 SBIR awards—nine of them in 2010. This rapidly increasing success has helped the company to become a workforce of almost 100.

Variation Reduction Solutions, Inc.

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Founded in 1998, Variation Reduction Solutions (VRSI) originally developed structured light dimensional gauging and robot guidance applications for the automotive industry as well as its Tier I suppliers. Since then, it has expanded to add technology development and aerospace to its core activities, attracting SBIR funding and a more diverse clientele.

The success of VRSI’s Inlet Duct Robotic Drilling (IDRD) has led to both a series of successful SBIR Phase Is, IIs and IIIs and viable commercial devices and systems. Recognizing the importance of the IDRD technology, Northrop Grumman used internal funds from 2005-2007 to support the concept’s development and integration activities. In 2009, using its F-35 program funds, Northrop ordered three production level IDRD systems based on the prototype equipment developed through the first Critical Air Force ManTech SBIR Program. IDRD resulted in over \$24 million worth of SBIRs, Phase IIIs, and commercial sales, including:

- Robotic Applied Drilling System – A \$7M Phase III add-on to IDRD.
- Fastener Insertion Live Link System – A \$1.75M Phase III add-on to IDRD.
- Affordable Accurate Robotic Guidance – A \$4.8M critical SBIR, targeted for use in new systems as well as an add-on to existing systems
- Outer Mold Line Control – A \$100K Phase I award

Thanks to the SBIR Program, VRSI has grown despite the devastating economic downturn in Michigan, expanding from six employees in 1998 to 38 employees today.

Marti Elder

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Marti Elder brings 16 years of experience with the SBIR/STTR Program, with an intense focus on the commercialization of new and innovative technologies, to provide unsurpassed resources to small businesses in a large, underserved geographic region. She has leveraged this experience to assist more than 100 small companies in more than a dozen states in winning well over \$75 million in SBIR/STTR funding. Through her seminars and individual business counseling, Ms. Elder has assisted companies throughout the region to improve their business capabilities and commercialization strategies.

For the past nine years, Ms. Elder has provided critically needed support to several state and regional economic development programs, covering more than a dozen states in a region where venture capital or angel investments are only rarely found. This support greatly increased the overall success rate in applying for SBIR/STTR. In 2007, for example, SBA data show that 25 out of 80 Phase I SBIR proposals from Montana companies were awarded—an outstanding 31% success rate for the entire state. Statistics from specific programs she supported for TechLink demonstrated a roughly 35% award rate for Phase I proposals a roughly 80% rate for Phase II, both of which are double the national averages.

- Examples of clients she has assisted include:
- Visual Learning Systems (Missoula, MT) developed Feature Analyst™ and LidarAnalyst™ feature extraction software under multiple SBIRs
 - EnerG2 Inc. (Seattle, WA) won an Army Phase II SBIR for development of supercapacitor energy storage materials
 - Triverus LLC (Palmer, AK) won Phase III contracts to supply an innovative system for aircraft carrier deck cleaning, developed under Navy SBIR

Windmill International, Inc.

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Windmill International, Inc. began in the field of program management and acquisition support, and has since expanded to provide for its customers information technology, engineering, training, logistics, and testing and evaluation services. Its clients include NATO Airborne Early Warning & Control (AEW&C) Program Management Agency (NAPMA)—its first client which it is still serving, more than twenty years after its founding—the Transportation Security Administration (TSA), and U.S. Air Force Electronic Systems Center (ESC) at Hanscom AFB, Mass—which awarded Windmill the Small Business Contractor of the Year in 2002.

Expanding its efforts even further, Windmill's Tactical SATCOM Systems Team designed, developed, and field tested the KA-10, a unique, lightweight, and rugged, Suitcase Portable Receive Suite (SPRS) for warfighters needing a reliable, portable connection to the Global Broadcast System (GBS). Windmill was able to decrease the total system weight of the GBS by a factor of about 80%. This compact Ka-band satellite terminal has been designed for single-person transport and easy setup. The battle-ready KA-10 conveniently brings crucial command center information and data to the in-field warfighter, substantially improving mission success probabilities and saving lives. The KA-10 is currently in production and is being deployed operationally.

Windmill's Product Development capability has grown from a part time single individual to a team of 12 in house engineers, technicians, and managers. Windmill has secured three US patents and one Australian patent. Windmill proudly maintains an excellent reputation as a highly efficient and skilled solutions provider. Windmill was one of eight companies recognized with the Smaller Business Association of New England's annual Innovation Award in 2010.

Dr. Abraham Abuchowski

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Dr. Abuchowski is a leader in the field of protein therapeutics and protein delivery systems. Among other things, he developed a procedure to modify proteins that opened up the field of protein therapeutics and now is the industry gold standard. For his achievements, Dr. Abuchowski was named New Jersey's "Entrepreneur of the Year" for high technology, awarded by Ernst & Young, Inc. and Merrill Lynch. Presently, Dr. Abuchowski is the CEO and founder of Prolong Pharmaceuticals.

For almost 30 years Dr. Abuchowski has facilitated the development of biotechnology in New Jersey and across the United States. In 1994, he established the Biotechnology Council of New Jersey, which is now called BioNJ, and was elected its first Chairman. BioNJ was instrumental in developing the Technology Business Tax Certificate Transfer Program, which gives SBIR-funded biotech companies cash to further develop their technologies to the point of commercialization. BioNJ also worked with members of Congress to include the Therapeutic Discovery Project Credit in the Health Care Reform bill that provides \$1 billion to SBIR-funded biotech companies in cases of economic crisis. This is critical to the viability of small companies, which are primarily supported by the SBIR Program.

In the late 1990s Dr. Abuchowski served as an investment advisor and consultant at his company New Paradigm Consulting where he helped in the development of a number of new biotechnology companies, many of which are funded by SBIR awards. The knowledge gained from his diverse experiences was used to aid other entrepreneurs to develop their own business as well as aid growing companies requiring expertise in general management issues, strategic planning, and product development. Dr. Abuchowski has continued his role in advising and helping biotechnology companies in his role as scientific advisor to Foundation Ventures.

Viocare, Inc.

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Viocare, a healthcare software company, develops nutrition-based systems for corporate wellness programs, community programs, clinical research, and patient assessments. Its technologies provide a platform for personal assessment, planning, monitoring, and behavioral modification.

Viocare's family of SBIR products has seen great commercial success. Healthcare providers use VioScreen to assess, motivate, and refer patients to resources within the community. Corporate wellness vendors use VioWell to support employee dietary habits. Viocare's community-based health Web portal, Princeton Living Well (PLW), increases awareness within communities across the country on ways to improve the lifestyles of the residents, and enables local businesses to participate by integrating VioWell into their systems. DSM, a major international corporation headquartered in the Netherlands, has licensed two Viocare technologies for its corporate wellness system. And a major comprehensive care clinic has licensed a custom system that combines PLW and VioWell.

Over the past 17 years, Viocare has won 14 SBIR awards. Its growth in the past five has been particularly successful, as it has expanded to 10 employees and increased its revenue from \$250,000 to \$2 million. It expects continued growth.

ATC-NY

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ATC-NY was founded in 1982 as Odyssey Research Associates (ORA). After an acquisition in 1999, ORA began doing business as ATC-NY, providing advanced research and development, as well as products, in the fields of computer information security, digital forensics, information management, and reliable computing. Today, the company employs about 30 people, most of whom have advanced degrees in mathematics, computer science, or engineering.

True to the goals of the SBIR Program, ATC-NY has consistently used the technologies funded by Phase I and II awards to supply critically needed products. This formula and focus has allowed the firm to earn five patents for SBIR-developed technologies since 2004.

One example of ATC's commercialization success: its Pedigree Management and Assessment Framework™ (PMAF), a general-purpose, extensible system to maintain network and cybersecurity. In 2007, ATC undertook a joint venture with richARO Enterprises, an IBM solutions partner, to market PMAF; development funding came from the Air Force Research Laboratory. As a result, PMAF now is a product sold jointly with IBM, and richARO is spearheading efforts to install PMAF throughout the U.S. intelligence services.

By aggressively finding opportunities such as these, ATC-NY has tripled in size since 2001, providing exciting jobs in Ithaca, Syracuse, and Rome, NY. Indeed, ATC is recognized in central New York as an employer of choice for computer scientists and software engineers with an interest in product R&D.

Balfour Technologies, LLC

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Founded in 1999 by twin brothers, Robert and Richard Balfour, Balfour Technologies is a small software/systems development company. Over the past decade Balfour has developed an award-winning, four-dimensional, virtual reality browser/server technology called fourDscape®. Through the support of the DHS/HSARPA SBIR Program over the past four years, fourDscape technology has been applied to produce homeland security applications and products specifically for security surveillance, emergency management, and first responder organizations. As a direct result of the DHS/HSARPA SBIR Program and the results it produced, Balfour has grown in size, and is now a Resident Research Partner of the "Applied Science Center of Innovation and Excellence in Homeland Security" (known as the Applied Science Foundation for Homeland Security, or ASFHS), located in the recently established Morrelly Homeland Security Center in Bethpage, NY.

As a direct result of Balfour's successful Phase II effort, Phase III commercialization contracts and products have been produced and executed, including:

- Deployment of a Command & Control Security System at the Anaheim Convention Center
- Development and deployment of the tailgatER mobile C2 situation awareness product
- C2 Regional Common Operating Picture (RCOP) being deployed at the ASFHS

In addition, SBIR funding has supported Balfour's development of an Emergency Responder Tracking System visualization (ERTS) which has been integrated and tested with DHS S&T developed emergency responder tracking devices, and is ready for integration with other devices resulting from DHS S&T's ongoing GLANSER project and other commercial development. They are currently executing a newly awarded DHS S&T SBIR project, demonstrating their capability to rapidly transition (through innovative integration, test and evaluation) effective technologies from the DHS S&T Universities R&D Program into deployable products for first responders, which is a critical need in the R&D community. In May 2010, Balfour presented its recognized SBIR Phase I/II/III "success story" at the DHS/HSARPA FY10 SBIR Awards kickoff meeting.

Kitware, Inc.

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A leader in the creation and support of open-source software and state-of-the-art technology, Kitware, Inc. serves multiple industries, solving complex technical problems. Among Kitware’s offerings are collaborative R&D, software support, consulting, custom application development, and training and productivity tools that leverage its open-source systems. Kitware has been on the Inc. 5000 list for the past three years.

Under Phase I and II STTRs, Kitware developed the Image-Guided Surgery Toolkit (IGSTK), an open-source foundation for conducting research and developing applications for minimally invasive, image-guided medical procedures. IGSTK has been integrated into various research projects and clinical studies with resounding success, suggesting its future potential as an integral tool in the operating room. IGSTK is shaping the future of the exciting and growing field of image-guided surgery.

With its downloads numbering in the thousands, studies conducted using the IGSTK framework are taking place in several high profile universities worldwide. These studies may to lead to new methods and procedures for saving patients’ lives. Moreover, they foster a collaborative attitude between the U.S. and international researchers, reflecting well on the federal government’s commitment to advancing research and development in key scientific fields.

The company has consistently experienced 25-30% growth, with a business model based on three key elements: software support, consulting, and product development. Kitware’s growth has contributed to the success of the “Tech Valley” region of upstate New York. Kitware promotes this dynamic area through involvement with Rensselaer Polytechnic Institute, consistent growth and hiring, bringing talented engineers to region, and participating in community events.

Touch Graphics, Inc.

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Touch Graphics creates and markets educational products for people with visual impairments and other disabilities that interfere with reading or using a standard computer mouse and video display. Founded in 1997, the company currently employs six people in two locations, New York City and Barcelona.

Owing to a small market size and the limited purchasing power of its target audience, companies servicing the disabilities market are typically ineligible for venture capital financing. In fact, without SBIR support Touch Graphics’ products might not be viable. Yet with SBIR support, the company has successfully commercialized a range of products that now are in wide use in the United States and elsewhere—a testament to the company’s adherence to the principles and purpose of the SBIR Program.

Touch Graphics’ flagship product, the Talking Tactile Tablet, or TTT, acts as a “viewer” for raised-line and textured (tactile) graphic pictures and illustrations. With the TTT, users place one of a large number of tactile overlay sheets under the unit’s weighted frame. They explore the image lightly with their fingers and hands, and then press down on any part to hear appropriate audio responses from an attached computer. By means of this simple concept, it is possible to make a large variety of subjects accessible to the disabled, many of whom would otherwise face difficulty in school or in their jobs.

3-C ISD

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The 3-C Institute for Social Development (3-C ISD) was founded in 2001 with the aim to bridge the research-practice gap that exists in schools and mental health organizations, where evidence-based interventions (EBIs) are rarely used outside of research studies. The company’s mission is to create and deliver evidence-based products that promote positive social, emotional, and mental health. 3-C ISD is committed to developing tools that are not only supported by rigorous research, but also broadly disseminated so that children and families can directly benefit.

3-C ISD received its first SBIR Phase I grant in 2002 and its first Phase II grant in 2003. Since its inception, the company has successfully completed Phase I and Phase II grants and contracts funded through NIMH, NICHD, NCRR, NCMMHD, and DoEd. Several SBIR awards have also resulted in North Carolina One matching grant awards to 3-C ISD to support marketing research and commercialization efforts.

To strengthen commercialization of their intervention and assessment products, 3-C ISD entered into a strategic partnership in 2007 with SELmedia, to market, sell, and distribute these products on an international scale. 3-C ISD has also recently moved two of its web-based technologies, *4Researchers* and *Interlink Your Training*, to commercialization. 3-C ISD is driven to ensure that its products are used to help children and families. In order to achieve broad scale dissemination and commercialization, 3-C ISD has actively pursued a variety of commercialization strategies over the years, modifying and refining them to improve their commercial success.

In its nine-plus years, 3-C ISD has grown to over 35 full-time employees, and generates considerable economic development for its home city of Cary, North Carolina.

Corvid Technologies

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Founded with the vision of providing high fidelity, computational physics analysis to the defense and automotive industries, Corvid Technologies has grown from five employees in 2004 to 37 today. Indeed, with an internationally recognized staff, cutting-edge hardware, and annual revenues of \$10 million, Corvid now puts its engineering and scientific brainpower to work for clients such as the Defense Advanced Research Projects Agency (DARPA), the Missile Defense Agency (MDA), and the Air Force Research Laboratory Munitions Directorate (AFRL) at Eglin Air Force Base. These qualifications have allowed the company to win 15 Phase I SBIR awards, to transition eight of 11 eligible Phase I awards to Phase II, and to win two Phase III contracts.

Beyond computational physics, Corvid has begun producing prototype hardware for incorporation into existing and emerging weapon systems. With AFRL, Corvid has developed and built high-explosive detonation wave attenuation barrier for incorporation into variable yield bomb technologies. With DARPA and MDA, Corvid has two, robust, prototype armor programs. Beyond these customers, Corvid continues collaborative research programs with Sandia and Lawrence Livermore National Laboratories, Concurrent Technologies Corporation, Raytheon, Lockheed Martin, and Northrop Grumman.

Corvid has also used its approach to predict the reaction of rocket motor propellants to thermal insult. The work and application of this analysis resulted in the construction and flawless operation of a large-scale rocket motor slow cook-off oven for PAC-3/MSE Insensitive Munition compliance testing. This result emphasized the Corvid methodology of the insertion of computational physics early into a design cycle, the fast-paced execution of prototype builds, and the capabilities of a dedicated and motivated small business.

Cornerstone Research Group

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The Cornerstone Research Group (CRG) is an Ohio-based research and development firm whose government contracts represent nearly 50% of its total current sales. Through Phase I and II SBIR awards for Reusable Shape Memory Polymer (SMP) Mandrels, CRG developed Smart Tooling to meet the Air Force's need for an innovative tooling solution that would significantly reduce the cost of manufacturing and extracting mandrels from cured composites. For CRG's customers, the Smart Tooling product line averages more than 75% cost savings over conventional tooling systems. Smart Tooling's evolution from technology to product was recognized in a May 2010 Air Force SBIR/STTR Transition Story, and the new products have been featured at Composites 2010 and SAMPE 2010.

In a Phase I Air Force SBIR, CRG developed shape memory polymer (SMP) mandrels that are moldable to a custom shape and easily removable. In Phase II, CRG optimized mandrel materials and processes for rapid fabrication. This SBIR project allowed CRG to generate subsequent funding for both additional product development and production from commercial customers and the U.S. Air Force and Navy, resulting in the Smart Tooling line of Smart Mandrels™ and SMP Bladders.

One of CRG's unique strengths is the way the company moves emerging technologies into the marketplace. SBIR projects allowed CRG to recently launch a new spin-off company, Spintech Ventures, LLC. Spintech Ventures opened its doors on October 1, 2010 with eight employees, and they expect to have 16 employees at the end of the first year. Within three years, the company intends to create 50 new jobs. CRG also launched another spin-off company, CRG Industries, in 2004. On January 13, 2011 CRG Industries received ISO 9001/AS9100 certification for its quality management system, a significant milestone in the development of quality manufacturing processes.

Quality Electrodynamics, LLC

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Quality Electrodynamics, LLC (QED) was created in 2006 to revolutionize medical imaging through advanced technical innovation in clinical diagnosis equipment. QED was the first industrial group to design, prototype, test, and manufacture in large quantities new "miniature" preamplifiers in Restriction of Hazardous Substances (RoHS) compliance for use as components in the MRI medical systems industry. It is this achievement that has been supported by the SBIR award. Parallel imaging techniques have rapidly developed over the last few years, and are the basis behind the next generation of clinical MR scanners that are being produced and sold today.

Building on its SBIR preamplifier work, QED has become a recognized world leader in the development and manufacturing of high-quality RF coils for MR imaging. QED is an ISO-13485 certified company, as of July 2007, and received its first 510(k) clearance from the FDA on a wrist array coil product for Toshiba Medical Systems Corporation in November 2007. The company has progressed to obtain 10 510(k) clearances as of date and five additional pending clearances. QED registered with the Japanese Ministry of Health, Labour and Welfare (MHLW) in December 2007 as a foreign medical device manufacturer permitted to sell its products in Japan.

Since its creation, QED has grown 1,506% from 2006 to 2009. This impressive growth reflected major technical achievements and the creation of significant partnerships with international corporation giants such as Toshiba Medical Systems and Siemens Healthcare. QED was listed at 193 on 2010 Inc. 500, *Inc. Magazine's* annual ranking of the fastest-growing private companies in America. In 2008, when the NIH Phase II SBIR was submitted, QED had 19 employees. In the following two years, the company has almost quadrupled its employees, to 65.

ViewPlus Technologies, Inc.

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ViewPlus’ story begins with its founder, Professor John A. Gardner, and his sudden loss of sight in 1988. He was in midcareer as a respected Oregon State University Physics Professor. His greatest blindness-related problem was understanding graphically displayed data accumulated by his own research students.

So, in 1991 he started a new research program under NSF sponsorship to develop technologies for improved math and graphics access. ViewPlus was formed in 1996 to commercialize the TIGER Tactile Graphics technology invented by his student, Peter Langer. The company began shipping its first product, the Tiger Advantage tactile graphics and Braille embosser, in 2000. By 2010 it was employing more than 40 people with annual sales approaching \$5 million, making it one of the largest companies in the blindness industry.

ViewPlus has received nine Phase I SBIR awards, five Phase II awards, and a Phase IIB award. ViewPlus’ commercial products developed under these awards include the Tiger Advantage embosser; Emprint Color Embosser, Pro Ink embosser Attachment, and the IVEO accessible graphics viewer; IVEO Creator and Creator Pro accessible Scalable Vector Graphics (SVG) authoring software; Math Tutor accessible arithmetic software; and Premier and Elite embossers. Several other SBIR supported products are expected to reach market soon.

Advanced Cooling Technologies, Inc.

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Since its founding in 2003, Advanced Cooling Technologies (ACT), a thermal management solutions company, has actively participated in the SBIR and STTR Programs. In recent years, ACT has commercialized the technologies developed under these contracts. Its heat pipe technology, which is used for the thermal control of electronics onboard a spacecraft, exemplifies this work.

In January 2005, ACT received an SBIR contract from NASA’s Johnson Space Center to develop a fault-tolerant heat pipe heat exchanger for manned spacecraft. This heat exchanger used aluminum constant conduction heat pipes (CCHPs) to provide double isolation layers to prevent inter-path leakage. While working on this project, ACT conducted an extensive study of the market for CCHPs for use in spacecraft thermal control—and identified an unfilled niche for spacecraft radiators. So, using the technology base developed under its NASA SBIR grant, ACT decided to develop, qualify, and produce flight-grade CCHPs for satellite customers.

By Thanksgiving 2006, the heat pipe development was complete, with operating samples that customers could see, feel, and touch, and the quality assurance (QA) system was up and running. Within a week, ACT’s manufacturing process was certified, and weeks later, the company received its first order for radiator heat pipes. To date, ACT has generated more than \$3 million in sales from the satellite CCHP market—a revenue base larger than the size of the company when the development program was started.

ACT now is a recognized supplier of these critical spacecraft components. The program has been a success from the initial market survey to full commercialization. As a result, the company has grown from a single person to a full-time staff of 71, together with a number of part-time employees and consultants.

RE2, Inc.

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When Robotics Engineering Excellence (RE2) was founded in 2001, its primary business was contract engineering for Carnegie Mellon University. Although this provided steady work for a company of RE2's small size, it limited the company's growth and the development of its technologies. Thanks to the SBIR Program, this all changed in 2005.

2005 was the year RE2 won its first SBIR award. The contract requested the ability to make mobile robotic manipulators, and the tools that they use, more modular and efficient. While performing this work, RE2 identified a marketplace need to make the manipulators better and easier to use. This epiphany helped to set the company's strategy and current direction: advanced, reliable, and, most important, high-quality mobile manipulator technologies are what RE2 is known for today.

Since winning this award, RE2 has doubled in size and revenue every year. What started in 2001 as a firm of four working exclusively for one customer has exploded to a thriving business of 40 engineers, managers, administrators, business developers, and student interns working on multiple and varied projects. Based on its current pipeline and estimated opportunities, RE2 anticipates again doubling in size in 2011.

Analysis and Measurement Services Corporation

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AMS grew out of a research project at the University of Tennessee and Oak Ridge National Laboratory. Since its beginning in 1976, AMS has grown consistently and continually due in large part to the commercialization of SBIR and other funded research projects. AMS provides a unique set of equipment, services, and training to the worldwide nuclear industry. These products help nuclear power plants verify that the sensors, which are used for control of plant operations and safety functions, are working properly. AMS products allow nuclear plants to perform their tests remotely, while the plant is operating. Without these services the plants need to conduct these tests at the site of the sensors while the plant is shut down, which significantly increases the costs of maintenance. An AMS customer recently published a paper indicating that AMS technology saves the plant \$10 million per year.

AMS was awarded a Phase I effort in 2006. Since that original award, the Department of Energy's Office of Nuclear Energy has awarded AMS with a Phase II, a Phase II extension, and in August 2010, the Phase III XLerator commercialization funding.

Dr. James Stover

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Dr. Stover has made a career of helping small businesses find capital for founding and growth. Dr. Stover serves as the Vice President for Operations for the Tennessee Technology Development Corporation (TTDC), a legislatively created, private, non-profit organization whose mission is to increase the formation and expansion of science and technology businesses in Tennessee.

During Dr. Stover's tenure at TTDC, he was involved in the redrafting and consultation of capital formation legislation (SB1203/HB2085), which will provide no less than \$150 million of venture capital funds to be invested primarily in seed and early stage businesses in Tennessee. In addition, Dr. Stover aligned multiple private sector alternative energy companies with key research institutions as part of the NSF EPSCoR proposal, which resulted in a \$20 million award to the state of Tennessee to enhance research capacity and greater competitiveness within all Tennessee's diverse academic institutions.

With TTDC, Dr. Stover has overseen the creation of the TTDC Phase 0 and Phase 00 programs, which provide direct support to small businesses to hire the services of experienced and high-level grant proposal writers in the creation of competitive SBIR/STTR proposals. Dr. Stover also created the Tennessee Innovation Conference and Venture Showcase, a conference providing the business, research, academic and legislative communities with a glimpse into new technologies that will shape the future of the Volunteer State's economy.

Dr. Stover also created two funds to provide financial capital to high-growth entrepreneurs. These funds enable the scientific research that is needed to lead to the development of new products, services and business opportunities in Tennessee. In addition to direct financial assistance from these various programs, Dr. Stover designed an entrepreneurial support system through TTDC called the Tennessee Enterprise Network (TEN).

Dr. Stover has overseen the creation and growth of a Tennessee statewide training program to help small businesses and faculty researchers in their SBIR/STTR proposal processes. Through the assistance of SBIR/STTR proposal experts, Dr. Stover has helped drive awareness and production of SBIR/STTR proposals statewide, including major cities and academic institutions, as well as Historically Black Colleges and Universities, women-owned businesses, and other underrepresented groups.

Nanohmics, Inc.

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Founded in 2002 by science and technology researchers with experience in start-ups and an interest in forming an entrepreneurial R&D firm, Nanohmics received its first SBIR award in 2003 from the National Aeronautics and Space Administration. From that point on, the now-25-person firm, whose revenues now approach \$5 million, has focused on bringing to market SBIR-sponsored technologies and commercializing the results. It achieves the latter through several ways: by forming a focused independent company via spinout of the technology and its stakeholders, by licensing the technology to others, or by developing the technology within an internal operating division and ultimately expanding with subsequent external investment or with direct product sales.

Several successful commercial ventures have resulted from Nanohmics' investment in the SBIR Program. The first, SAXET Surface Science, came in 2004, followed by Faradox, a Texas Emerging Technology Fund recipient that is currently engaged in M&A talks with several buyers. GlideLine Systems has also seen commercial success, fielding 50 parachute navigation systems for Special Operations HAHO/HALO use, while the Argus Compact Laser Threat Detector has attracted interest from the Army, Navy, Air Force, and National Reconnaissance Office. Each venture follows the Nanohmics philosophy of low-volume production of high-value products.

Operational Technologies Corporation

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Operational Technologies Corporation (OpTech) focuses on logistics and supply chain management, government contract services, as well as information technology and biotechnology. The biotechnology division has been largely funded by SBIR and STTR funds since its inception in early 2003.

OpTech's first SBIR funding from NSF in 2003 resulted in a new patent-pending method to couple aptamers to the human immune system to kill antibiotic-resistant bacteria, parasites, and cancer cells. OpTech's SBIR and internal funding of the aptamer technologies culminated in the spin out of Pronucleotein Biotechnologies, which subsequently secured a \$1M investment from the Texas ETF. Once tests are fully validated, Pronucleotein will launch into the food safety testing market with a novel product line of assays and a handheld reader that will enable broader and faster food testing, thereby allowing greater confidence in food consumption from "farm-to-fork."

U.S. and world patents issued and patent applications resulting from SBIR funding include:

1. Bruno J.G. and Chanpong J.C. Methods of Producing Intrachain Fluorophore-Quencher FRET-Aptamers and Assays. Patent Application No. 11/443,009. *Notice of Allowance Issued November 2, 2010.*
2. Bruno J.G. Methods and compositions of nucleic acid ligands for detection of foodborne and waterborne pathogens. U.S. Provisional filed August 2010.
3. Bruno J.G. Methods and compositions of nucleic acid ligands for detection of clinical analytes related human health. U.S. Provisional filed August 2010.

4. Bruno J.G. Methods and compositions of DNA ligands for arthropod-borne pathogen detection and prophylaxis or therapy. U.S. Provisional filed August 2010.
5. Bruno J.G. Provisional Patent Application Filed Feb. 21, 2008, Methods of producing homogeneous adherent aptamer-magnetic bead-fluorophore sandwich assays. WO2009/104075.
6. Bruno J.G. and Chanpong J. Application No. 20060257915 and 20090186342 Methods of producing competitive aptamer FRET reagents and assays (Published Nov. 16, 2006).
7. Bruno J.G. and Miner J.C. Application Nos. 20080161236 and 20050191680 Therapeutic nucleic acid-3' -conjugates (Published Sept. 1, 2005).

Williams-Pyro, Inc.

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Founded in 1963, Williams-Pyro is a woman-owned small business located in the fast-growing Dallas-Fort Worth technology corridor. With 100 employees and more than 200 profitable products—all of which it designs and manufactures in-house—the company specializes in customized connectors, cable assemblies, and test equipment for the military.

Specifically, Williams-Pyro has been performing research in the areas of power-grid management and controls in order to develop a tactically deployable micro-power grid for the Department of Defense (DoD). During this research, Williams-Pyro observed that no interconnected system to distribute electricity over a tactical operations area (i.e., a tactical power grid) exists in today's armed forces. To address this need, Williams-Pyro is developing IECS, a distributed control, fully automated power electronics-based system, which will feature the simplified planning, setup, and use of tactical quiet generators (TQGs) to a degree that can make tactical power distribution as easy to set up and use as plugging in a light.

IECS is a requirements-driven, clean-slate design, specifically developed for ad hoc tactical power distribution in tactical operations. IECS automates portable grid setup and management; is highly modular, scalable, and rugged; and provides an expandable architecture for the next generation of tactical-power distribution equipment. Williams-Pyro has completed integration testing for IECS, culminating in a successful demonstration of the system capable of handling sources and loads of up to 30kW.

Full production of IECS will provide Williams-Pyro with the potential to exponentially increase hiring and retention in the engineering and manufacturing sectors. It projects revenue of up to \$50 million. This growth also extends to the universities, with which Williams-Pyro partners for research, and the prime DoD contractors with which it partners for development.

Total Quality Systems, Inc.

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Founded in 1994, Total Quality Systems (TQS) concentrates on two business lines: reliability and sustaining engineering services, and data management services. In 1998, the company received its first SBIR Phase I grant, “Statistical Control Process Application to Test Failure Information,” which was followed by a Phase II grant. In all, TQS has won 10 Phase I-III contracts.

Established in 1997, the Weapon System Flexible Sustainment (WSFS) program initially supported the F-16 sustainment community. As the WSFS prime contractor, TQS has brought together a team of industry leading companies to support Air Force reliability and sustaining engineering tasks. As WSFS grew, the need to organize, store, and accumulate depot-level maintenance histories resulted in the development of the Defense Repair Information Logistics System (DRILS).

As technicians test and repair assets, they enter detailed repair data directly into DRILS, including component-level repairs. This repair history then is available to technicians, engineers, and managers to support their weapon system. DRILS provides WSFS the historical maintenance data to support root-cause failure analysis, product recalls, and other sustainment studies and engineering tasks. WSFS was recently nominated as a best practice in the Air Force’s Global Logistics Support Center, and, to date, has saved more than \$250 million.

TQS continues to be an industry leader in partnering with the Department of Defense (DoD) to develop commercially viable products that satisfy the DoD’s emerging requirements.

Adaptive Technologies

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Adaptive Technologies, Inc. (ATI) is a research and development firm, helping military and industrial personnel work safely and efficiently in noise. ATI is dedicated to advancing the science of hearing protection and improving combat and civilian communications.

Technologies are brought to market through strategic partnerships and through ATI’s affiliate company, Aegisound. ATI created Aegisound to manufacture and market products based on its technologies, allowing ATI to focus on engineering research, development, design, and testing.

The SBIR Program has been critical in the long-term success of both ATI and Aegisound, accounting for the creation of over 35 full-time positions. ATI’s SBIR-related work has led directly to 11 patent awards.

ATI has successfully transitioned innovative designs into a suite of world-class hearing protection and communication products designed to protect our military personnel and industrial workers alike. These technologies include custom molded earplugs (CTE30 Series), combination hearing protectors (MAX40 DHP), single hearing protector earmuffs (DC2), combination hearing protectors with radio communications (DANR T3E/MAX25), cranials (HGU-95/P Series Flight Deck Cranial), high performance headsets with noise-rejecting microphones (Argonaut™ DHP), and adaptive noise-reducing combination headsets with radio communications (DANR).

The pairing of innovative products and SBIR funding has allowed ATI to grow at an average rate of over 30%, and Aegisound at a rate of over 100%, effectively yielding a return of roughly 25% of Phase I and II SBIR funding. ATI’s growth rate was identified as the 13th fastest in Virginia by Goodman and Company in 2006 and 21st fastest in 2007.

John H. Ruehe

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Since 1998, John Ruehe has provided the U.S. Army planning, managing, coordinating, and execution support on several related programs: the Army SBIR Program, the Joint Chemical Biological Defense (CBD) SBIR Program, the Army Small Business Technology Transfer (STTR), and the Director, Defense Research & Engineering DDR&E managed Department of Defense (DOD) SBIR Programs. He has been a tireless advocate for the program, and has continually reached out to new audiences to assist in the success of SBIR awardees.

- John has demonstrated exemplary service to the SBIR Program in the following ways:
- Helped create the U.S. Army SBIR Phase II Achievement Award Program, to recognize Phase II projects that exemplify the SBIR goal of bringing innovative technologies and products to the marketplace. Award winners are feted at a ceremony hosted by a senior Department of the Army Official. The Army is the only Federal Agency that does this.
 - Built and implemented an Army SBIR Communications Campaign Plan that has resulted in greater participation and enthusiasm for the Program
 - Implemented a web-based system to support the entire Army CBD SBIR and Army STTR source selection processes, from requirements and topic generation through to award and tracking of contracts
 - Facilitated more than \$250 million of research, development, testing and evaluation each year
 - Managed error-free data reporting during the 12 years when the program tripled in size

Hummingbird Scientific

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Hummingbird Scientific was founded in 2004 to develop advanced products for Transmission Electron Microscopes, Scanning Electron Microscopes, and Focused Ion Beam systems (TEM/SEM/FIB). Using several Phase I and II SBIR and STTR grants from DOE, NIH, NSF and DoD, Hummingbird Scientific has grown from a three-person start-up to a profitable company with 12 full-time employees.

Hummingbird's strength lies in helping customers translate their innovative ideas into user-friendly tools, thereby advancing their science. Working both alone and in collaboration with its customer base, it has created a dozen new electron microscopy experimental platform designs, each of which has been developed into commercial products. In 2008, Hummingbird became a test center for Makino (Japan) as their designated U.S. expert site for precision micro-machining. This collaboration included a loan of \$1 million in equipment to Hummingbird. The company has a track record of success with SBIR/STTR awards that exceeds 50% and have totaled nearly \$8 million in funding through the SBIR/STTR Program. The company has received considerable attention worldwide. In the past two years the company has been made four buyout offers and received significant attention of the much larger electron microscope companies (Zeiss, JEOL, FEI, Leica and Hitachi) some of which now purchase products directly to sell to their customers and others who are directly contracting Hummingbird Scientific to build their products.

Advanced Ceramics Research, Inc.

Anthony C. Mulligan

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Founded in 1989, Advanced Ceramic Research, Inc. (ACR) develops state-of-the-art high temperature, high strength ceramic materials and innovative processes. ACR's first revenues came from the US Government's SBIR Program and \$1,000 in start-up capital. Within six months, ACR had secured a Phase II SBIR contract for \$500,000 from the US Naval Surface Warfare Center. Funding from the Navy had been critical in helping ACR become what it is today. As Anthony Mulligan, president of ACR, said, "The Navy's support has been invaluable to ACR. We could not have attained the technical superiority we enjoy today without Navy funding."

Since 1989, ACR has received nearly \$6 million in SBIR/STTR funding that has led to over \$30 million in follow-on non-SBIR/STTR funding and an additional \$35 million in signed license and technology transfer contracts. Much of the early follow-on funding was federal research dollars from the Office of Naval Research, the Defense Advanced Research Projects Agency, and the Department of Energy. Now a majority of it comes from defense prime contractors and Fortune 500 companies. ACR has grown in size from three employees in 1990 to over 40 in 1999. Revenues have grown by 2,000%, and ACR was listed by Inc. magazine as one of the fastest growing businesses for 1993 to 1997.

ACR has concentrated on two main business areas: Fibrous Monoliths (FM) and Rapid Prototyping/Rapid Manufacturing (RP/RM). FM composite ceramics are a novel class of high strength, high temperature composite materials that are manufactured using a patented process. This technology originated from ACR's first SBIR award during which it drew upon the research expertise at the University of Michigan, the University of Arizona, and the growing technology base of Tucson to address the increasing need for more economical high temperature, wear resistant components for aerospace and defense applications.

Some of ACR's most successful commercial transitions have come from its FM materials. ACR recently signed a 10-year, multi-million dollar license agreement with Smith International, Inc. for the use of this technology to improve the efficiency of oil and rock drilling. ACR and Smith believe that the FM technology will increase tool life many-fold and allow Smith and ACR to garner millions of dollars in additional revenue and increased market share. Over 12 years, ACR has established close business relationships with corporations such as Honeywell, Smith International, Raytheon, Lockheed, Kyocera, Phelps Dodge, Inco Mines, IBM, Seagate, Thiokol, Alliant Tech, Aerojet, Varian, General Electric, and BF Goodrich.

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Qualcomm (San Diego, CA)

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Qualcomm Incorporated (Qualcomm) is a world leader in 3G and next-generation mobile technologies. Qualcomm's inventions have turned the ordinary mobile phone used primarily for voice communication into an extraordinarily powerful mobile computer, the largest information platform in the history of mankind—one based on Qualcomm's innovative CDMA technology. For 25 years, Qualcomm ideas and inventions have driven the evolution of wireless communications, connecting people more closely to information, entertainment and each other. Today, Qualcomm technologies are powering the convergence of mobile communications and consumer electronics, making wireless devices and services more personal, affordable and accessible to people everywhere.

Qualcomm was a significant SBIR participant when the firm had less than 35 employees. Throughout its time in the SBIR program, it received roughly \$1.5M in awards. Dr. Irwin Mark Jacobs, co-founder and former Chairman and CEO of Qualcomm, acknowledges the value and importance of SBIR funding at a critical point in the earliest days of the firm. Qualcomm started out providing contract research and development services, with limited product manufacturing, for the wireless telecommunications market. Their real goal, however, was a full-fledged integrated research-to-manufacturing business, and they began to cast about for an application of digital satellite communications with commercial potential. They determined that the transportation industry offered the best opportunity. Between 1985 and 1988 the company developed a wireless, two-way messaging and positioning system that would enable trucking firms to closely track their drivers' progress while

enabling drivers and dispatchers to send messages to each other. This effort resulted in OmniTRACS. Since its introduction in 1988, OmniTRACS has grown into the largest satellite-based commercial mobile system for the transportation industry today.

This early success led the company to take a daring departure from conventional wireless wisdom. In 1989, the Telecommunications Industry Association (TIA) endorsed a digital technology called Time Division Multiple Access (TDMA). Just three months later, Qualcomm introduced Code Division Multiple Access (CDMA), a superior technology for wireless and data products that changed the global face of wireless communications forever.

Over the last 25 years, Qualcomm's innovations in wireless communications technology have become the backbone of communications infrastructure worldwide. Its current market capitalization is over \$90B and Qualcomm has more than 17,500 employees worldwide. Qualcomm's intellectual property portfolio includes thousands of United States patents for wireless technologies, with more than 185 telecommunications equipment manufacturers licensing them worldwide.

Symantec Corporation

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Symantec Corporation is the leading software company providing utility programs for personal computers. Symantec was founded in 1982 with an NSF SBIR grant for research on the first natural language understanding program for microcomputers. Symantec's founder and first president, Dr. Gary Hendrix, said that "the NSF project had the intellectual and commercial pizzazz that served as a magic catalyst for thinking big about the company's potential."

Following the grant the company obtained \$3.5 million in venture capital and shipped its first major product, Q&A for the IBM-compatible PC, in 1985. Although innovative, Q&A managed to bring in only \$8 million in sales in its first two years combined. Eubanks realized that the market had changed in such a way that Symantec could no longer be a one-product company relying solely on Q&A like other, established software companies. Thus, Symantec took the strategic move of broadening its product base, particularly in specialty niche software categories, through acquisition of other software companies.

Symantec began its acquisition campaign in 1987 and as a result Symantec's sales doubled between 1987 and 1988, to reach \$19.6 million. Even during the recession of the early 1990s, which was especially severe in California, Symantec continued to grow. Revenues increased from \$75 million in fiscal 1990 to over \$116 million in fiscal 1991, and the number of its employees increased by 28 percent between June of 1990 and June of 1991.

The company also expanded internationally. By 1994 Symantec had a network of over 150 partner companies worldwide and had produced over 120 translated versions of various software products into different foreign languages. Today Symantec has sales of \$267 million and employs 1,100 people.

ViaSat, Inc.

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ViaSat produces innovative satellite and other digital communication products that enable fast, secure, and efficient communications to any location. Founded in 1986, ViaSat's early work on networking was funded through the SBIR Program. ViaSat participated in the SBIR Program for 14 years before it exceeded 500 employees and was no longer considered a small business. ViaSat is now publicly traded company that employs nearly 1,000 people.

ViaSat has been extremely successful at transitioning SBIR funded work into products and services that are needed by the military and private sector. ViaSat's first SBIR Phase I contract was from the Navy for the Communication Environment Simulator (CES), a technology that has evolved into a state-of-the-art simulator for testing the F-22 Fighter Aircraft avionic systems and has also resulted in several spin-off programs. The Navy and Air Force have used this system to ensure system performance in support during Desert Storm and Kosovo. The Department of Defense, Lockheed Martin, and GTE have awarded ViaSat more than \$60 million for the CES technology with a majority of the funding from the Central Test and Evaluation Investment Program Office. ViaSat has emerged as the dominant supplier of UHF Satcom Demand Assigned Multiple Access modems to our military forces.

ATMI

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ATMI is a global leader in enabling process materials and process technology for semiconductor, display, and life science industries. The company started out with five gifted scientists in 1986. 13 years later, ATMI grew out of the SBIR Program, having received 155 Phase I Awards and 27 Phase II awards. The company now employs 800 people. It is traded on NASDAQ and is a global leader in the Semiconductor and Life Science industries. ATMI received the Tibbetts Award in 1996.

According to Gene Banucci, "Without the SBIR Program, ATMI would barely have existed, and would not have been able to become a public company it is today with nearly 800 employees around the world and over \$350 million in annual revenues. The money we received under the SBIR Program has been paid back over 10 times in taxes alone. Thank you SBIR!"

ATMI developed SDS, the safest gas delivery system of its kind. SDS was recognized by the Department of Transportation as a breakthrough technology that creates a safe system for manufacturers and transportation. SDS reduces the hazards and environmental risks associated with transporting, storing, and delivering highly toxic gases. Since its introduction in 1993, SDS has become the standard for toxic gas delivery. Over one billion wafers have been manufactured with SDS without significant incident.

ATMI also leads the way in the manufacturing and delivery of film-based products for very demanding industries. With cleanroom-based manufacturing facilities in Belgium and Minnesota, ATMI LifeSciences creates leading single-use bioprocess vessels, mixers and bioreactors for the biopharmaceutical industry.

ATMI's founder and current chairman, Gene Banucci, has played a significant role in the SBIR community in Connecticut. He is a charter member of the Advisory Board of the Connecticut SBIR Office, supporting and guiding the state's advancement of the small technology company base, including women-owned, veteran-owned, and minority-owned technology companies. Banucci has promoted the federal SBIR Program through work with the National Academy of Sciences.

A123 Systems

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www.a123systems.com

A123 Systems makes advanced lithium-ion battery technology for the transportation, power grid, and commercial/industrial products industries. The company was founded in 2001 based on novel nanoscale technology initially developed at the Massachusetts Institute of Technology, but the road to commercial success was paved in 2002 when A123 was awarded a \$100,000 SBIR grant.

At that time, lithium-ion batteries could not meet the Department of Energy's targets for electric or hybrid-electric vehicles. Specifically, the existing technology could not meet the energy and power density requirements while remaining low cost, safe under abusive conditions, and environmentally benign. A123's breakthrough Nanophosphate™ lithium-ion battery chemistry showed tremendous promise as a game-changing solution that could meet all of these criteria, and the company turned to U.S. Small Business Administration to fund the research and development necessary to bring its Nanophosphate technology to market.

A123 successfully leveraged its SBIR grant to take Nanophosphate from the lab to the market. The company has grown rapidly in the years since, and today, customers in all industries are taking advantage of the benefits offered by A123's Nanophosphate design. Specifically, A123's lithium-ion batteries are more powerful, much safer, and last longer, making them ideal for vehicle electrification and other markets.

A123 employs more than 2,200 people globally at its facilities in North America, China, Korea, and Europe. The company's initial public offering in September 2009 raised more than \$391 million in net proceeds, making it one of the

most successful IPOs in 2009. In September 2010, A123 opened the largest lithium-ion battery manufacturing plant in North America in Livonia, MI.

A123's technology is enabling the electric vehicle revolution, and its customers include passenger carmakers Fisker Automotive, BMW, and SAIC Motor Co. Ltd, the largest automaker in China, as well as companies focused on the truck/bus market including Eaton, Navistar, and BAE Systems. In New York, San Francisco, Toronto, and other cities, transit buses powered by A123's technology have collectively traveled more than 50 million miles.

A123 is also enjoying commercial success in the power grid industry, where its technology is helping to make existing services more efficient and cost-effective while also enabling the widespread adoption of wind, solar, and other renewable energy. Customers include AES, Southern California Edison, and DTE Energy. To date, A123 has shipped more than 35MW of its Smart Grid Stabilization Systems to its customers, making A123 the largest producer of lithium ion batteries for the power grid. A123's technology made its debut in the commercial products industry with Black & Decker's professional DeWALT 36V power tool line, which was truly a game-changer for that industry.

iROBOT Corporation

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iRobot was founded in 1990 when Massachusetts Institute of Technology (MIT) scientists Colin Angle and Helen Greiner teamed up with their professor, Dr. Rodney Brooks, with the vision of making practical robots a reality. Their goal was to develop robotics and artificial intelligence technologies in order to produce and market robots. Today, iRobot has grown to a \$299 million public company that employs more than 500 of the robot industry's top professionals, including mechanical, electrical and software engineers, and related support staff.

iRobot emerged from the federally funded work on robotics that was being done at MIT. From 2001 to 2007 iRobot received 13 Phase I awards and five Phase II awards. Funding agencies included NASA and the Defense Advanced Research Projects Agency (DARPA), part of the Department of Defense.

For more than 20 years, the company has developed proprietary technology incorporating advanced concepts in navigation, mobility, manipulation, and artificial intelligence to build military, industrial, and consumer-focused robots. For the military and public safety organizations worldwide, iRobot has created several products. One major product for military use is the iRobot 510 PackBot. This robot provides soldiers with a tool to identify and dispose of roadside bombs and other unexploded ordnance while keeping them at safe distances. PackBot robots have performed tens of thousands of missions in Iraq and Afghanistan and are credited with saving soldiers' lives.

The most well known robot the company makes is the iRobot Roomba, the floor vacuuming robot. In all, more than five million iRobot home robots have been sold worldwide.

Martek Biosciences Corporation

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Martek Biosciences, founded in 1985, began when defense and aerospace contractor Martin Marietta tasked a few scientists with studying the beneficial use of algae in long-term space flight. In the course of this project, these scientists came to believe that algae represented a virtually untapped resource that could be screened for a variety of applications to greatly benefit human health. What started with a few visionary and passionate scientists is now a company with more than 525 employees and revenue of more than \$300 million.

Martek was awarded its first SBIR/STTR Phase I award in 1985 and received a total of 29 Phase I awards and 10 Phase II awards from 1985 to 2001. According to Martek officials, SBIR was the company's major support for R&D up until 1993.

Soon after its founding in 1985, Martek identified a strain of algae that is a naturally high producer of docosahexaenoic acid (DHA), an omega-3 fatty acid that plays a key role in infant development and adult health. Martek then developed and patented a method of deriving DHA-rich oil from the algae. Continuing its exploration of infant nutrition, Martek also developed a patented process for developing arachidonic acid, ARA, another fatty acid important to infant health. These innovations led to Martek's first license agreement in 1992 for the use of Martek's proprietary blend of DHA and ARA in infant formula.

In 1993, Martek went public after entering into similar license agreements with two additional infant formula companies. Martek continues to grow with headquarters in Columbia, Maryland, a research and development site in Boulder, Colorado, and state-of-the-art manufacturing plants in Kingstree, South Carolina, and Winchester, Kentucky.

At present, Martek's flagship product, *life'sDHA*™, along with *life'sARA*™, is found in 99% percent of U.S. infant formulas. Both fatty acids are also added to infant formulas sold in over 75 countries and, subsequently, have been consumed by more than 43 million babies worldwide. In addition, a range of supplements and functional foods containing *life'sDHA*™ for older children and adults continues to hit the market both in the U.S. and abroad.