

CELEBRATING 25 YEARS



**OCAST**>>  
2013 IMPACT REPORT

25  
YEARS

PURPOSE.

PROGRAMS.

PARTNERSHIPS.

PERFORMANCE.

# LETTER FROM THE DIRECTOR >>

The Oklahoma Center for the Advancement of Science and Technology was created in 1987 by the state legislature. The agency's mission is to diversify and grow Oklahoma's economy through strategic investment in technology – its development, transfer and commercialization. The agency takes great pride in being recognized as a results-driven, high-performing organization that helps to increase research activity and public/private partnerships leading to high-paying jobs, overall economic growth and improving quality of life.

Technology changes everything, and the acceleration of technology will continue with rapid advancements in aerospace and defense, precision agriculture, energy solutions, sensors and electronics, weather science and radar systems, high-performance computing and data security and advanced manufacturing. Advances in biomedical research, biotechnology and imaging technology are enhancing our quality of life through better diagnostic capabilities and better treatment and prevention protocols. Throughout its 25 year history, OCAST has funded 2,388 projects with a total investment of more than \$234 million and a cumulative return on that investment of 20:1. OCAST is helping to build a culture of innovation and entrepreneurship through partnerships and alliances with Oklahoma research institutions and foundations, technical education and the private sector.

Governor Mary Fallin's Science and Technology Council recently released *One Oklahoma: A Strategic Plan for Science and Technology in Oklahoma*. The report states, "The State of Oklahoma benefits directly from a strong science and technology base. Economic development in the United States over the past 50 years or more has illustrated that a commitment to science and technology is the most important key to building a better economy and quality of life for our citizens." OCAST is uniquely positioned to play a vital role in realizing the bold objectives set out in the plan.

The benefits of research are multifaceted. When researchers make discoveries and move their ideas from concept to commercialization, they create new businesses and hire new or additional employees to market, manufacture and sell their products around the world which generates increased tax revenues for Oklahoma.

OCAST is proud to present this 25<sup>th</sup> anniversary edition of the agency's Impact Report – it is a continuing story of our successes in science and technology, innovation and entrepreneurship that benefits Oklahoma and helps advance our state in the global knowledge economy.

The OCAST journey continues!

*Michael Carolina*

C. Michael Carolina  
Executive Director  
OCAST

... a continuing story of our successes in science and technology, innovation and entrepreneurship that benefits Oklahoma and helps advance our state in the global knowledge economy.





POWER IS A CONCERN FOR MOST OF FRONTIER ELECTRONIC SYSTEMS' AEROSPACE AND DEFENSE CLIENTS. SO WHEN THE COMPANY BEGAN LOOKING AT EXPANDING THEIR TECHNOLOGY BASE AND LONG-TERM STRATEGIC GROWTH, THEY SAW A RESEARCH OPPORTUNITY.

## FRONTIER ELECTRONIC SYSTEMS / VADOVATIONS >>

### Since 1973, Frontier Electronic Systems has been manufacturing electronic components for the aerospace industry.

This Oklahoma-based business has received worldwide recognition from NASA for their work on the International Space Station. The company designed and manufactured a component of the system that controls the movement of the space station's solar panels, a vital source of energy for the space station that, if not positioned correctly, can jeopardize the function of the spacecraft. The company also manufactures the engine fuel display unit used in the U.S. Navy's Super Hornet fighter jets. This instrument provides pilots with mission-critical fuel and engine performance information such as monitoring fuel levels and notifying pilots of how much flying time they have remaining before they must return to their aircraft carrier.

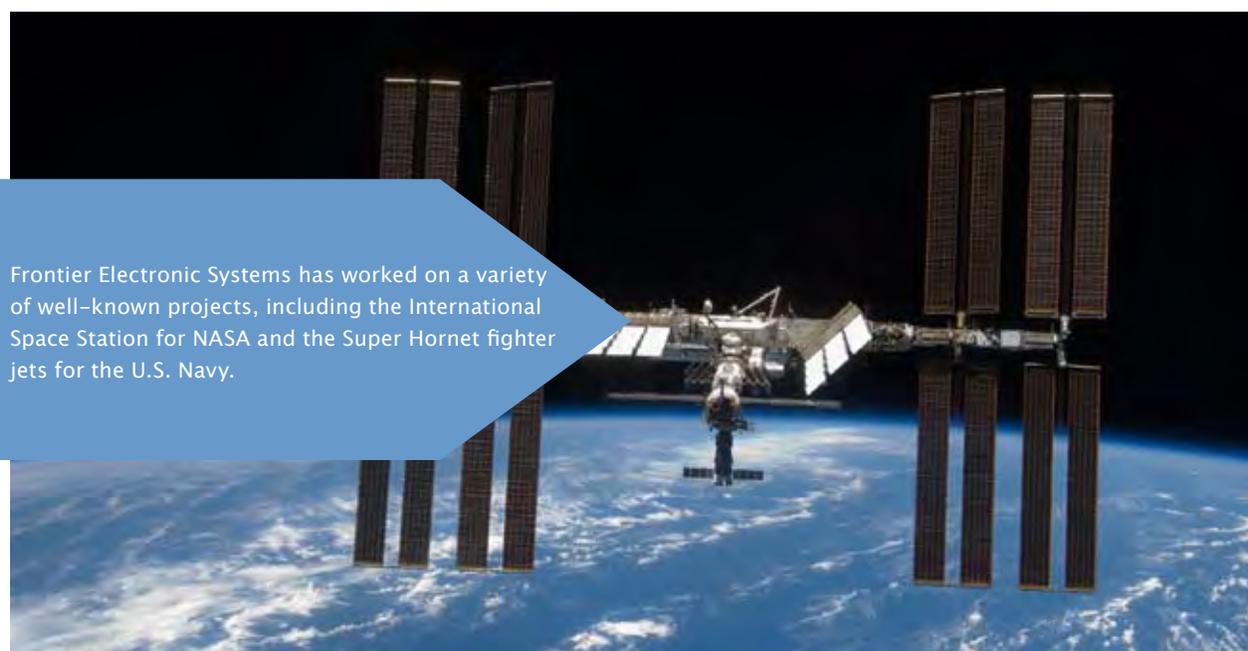
Power is a concern for most of Frontier Electronic Systems' aerospace and defense clients. So when the company began looking at expanding their technology base and long-term strategic growth, they saw a research opportunity.

Frontier Electronic Systems, in collaboration with the University of Tulsa, is using OCAST funds to support development of a new product – nano-structured lithium ion batteries. These small power sources will have uses in many different products – from national defense to healthcare. Once research is completed and the product is ready, the company anticipates being able to launch a second business which would also be based in Oklahoma and eventually could lead to the opening of a second manufacturing facility.

"One of our clients is interested in the nano-batteries for use in missiles," said Dr. Brenda Rolls, Frontier Electronic Systems president. "Current batteries are troublesome for missiles because of the high levels of heat they emit, their combustibility and the safety concerns that accompany these characteristics. The nano-battery is less likely to have these undesirable chemical reactions and would potentially be much safer."

OCAST also introduced Frontier Electronic Systems to another client, VADovations Inc., to produce a nano-battery for their miniature blood pump.

**"Throughout work with both companies, we knew Frontier Electronic Systems and the University of Tulsa were in the research phase developing a nano-battery, and we knew VADovations was in need of a small power source for their medical device, so we made the introduction" said Dan Luton, director of programs for OCAST.**



Frontier Electronic Systems has worked on a variety of well-known projects, including the International Space Station for NASA and the Super Hornet fighter jets for the U.S. Navy.



**THE MINIATURE BLOOD PUMP WILL BE MORE COMPATIBLE WITH THE HUMAN BODY, SIGNIFICANTLY DECREASING THE ADVERSE EFFECTS WHICH OCCUR WITH CURRENT BLOOD PUMPS, POTENTIALLY SAVING MILLIONS OF LIVES.**

"They each had something the other needed to develop a viable product," said Luton. "It's rewarding to connect two Oklahoma companies, and it will ultimately benefit our state's economy to have growth in these two small businesses."

## VADOVATIONS

Congestive heart failure is one of the most serious medical challenges of our day. With 5.7 million Americans affected by this disabling disease, congestive heart failure is the leading cause of hospital admissions with an economic burden exceeding \$40 billion each year. Heart disease is the leading cause of death in Oklahoma, and the state has the second highest mortality rate in the nation. Once end-stage is reached, the only alternatives to death are heart transplant or implantable blood pumps.

Current implantable blood pumps, known as left ventricular assist devices, require open heart surgery to implant and a minimum three week hospitalization. The devices continue to be plagued by adverse effects including bleeding, blood clots, strokes or infection. They are also large and require patients to carry around 8 to 13 pounds of batteries.

VADovations, a spin out of INTEGRIS Baptist Medical Center, is creating a miniature blood pump the size of a AAA battery, enabling less invasive surgery to implant, shortening hospitalization time from three weeks to three or four days. Patients would not be burdened with toting heavy batteries, thanks to the company's partnership with Frontier Electronic Systems and the University of Tulsa, allowing the patient a better quality

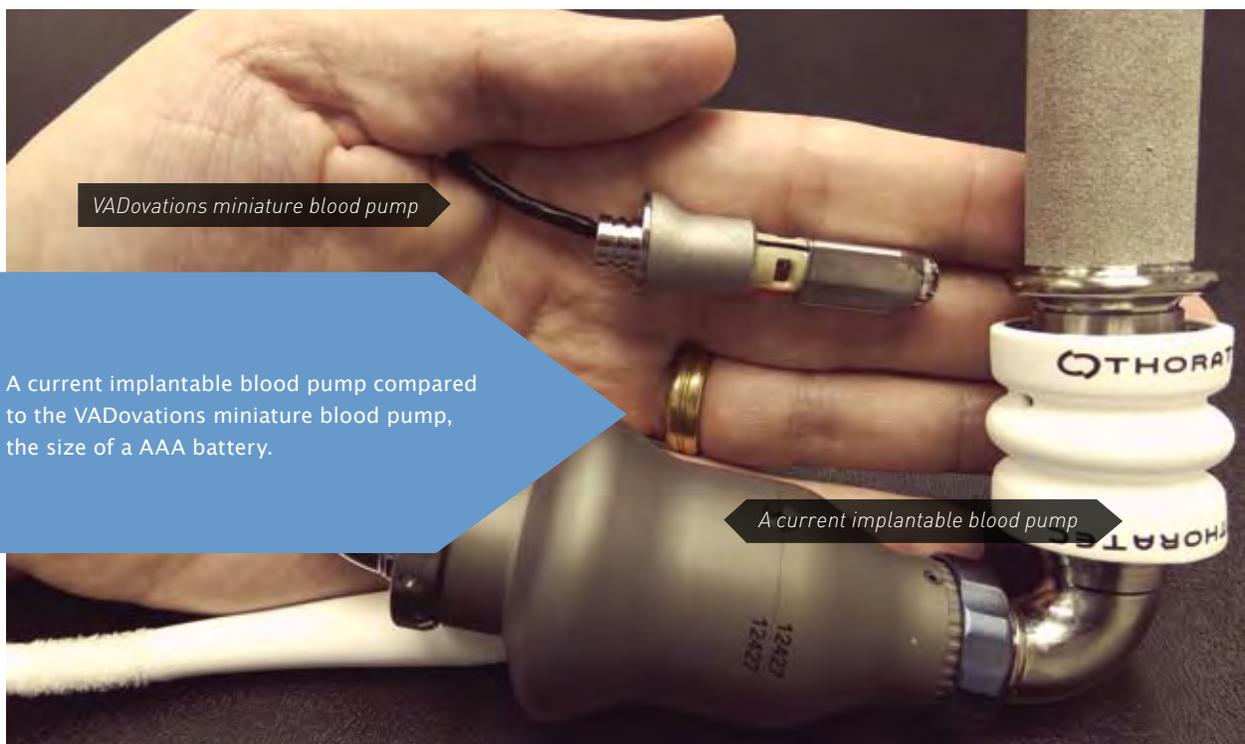
of life. Most importantly, the miniature blood pump will be more compatible with the human body, significantly decreasing the adverse effects which occur with current blood pumps, potentially saving millions of lives.

In addition to the Frontier Electronic Systems collaboration, OCAST also helped VADovations through the Oklahoma SBIR Collaborative Resources program. The resulting \$3 million "Fast-Track" award provided a significant source of additional capital to accelerate VADovations research and development efforts. VADovations has grown from 3 to 12 employees in 2012 and expects to double in size in 2013. They've recently expanded into a larger facility to expand production and testing of their blood pump in Oklahoma. The company plans to begin clinical trials in 2014.

## Both companies say they found each other and developed their products more quickly because of OCAST.

"We would have never met Frontier Electronic Systems or been introduced to the nano-battery without OCAST," said Trevor Snyder, vice president, research and development at VADovations. "Our miniature heart pump required a small battery, so without the nano-battery, our product wouldn't have been as viable. It will be a significant competitive advantage for our product."

"We would have never known about VADovations without OCAST making that connection for us," said Rolls. "Having an end product like the heart pump in mind when we are designing the battery allows our research to go so much faster and opens the door to other applications for our technology."



VADovations miniature blood pump

A current implantable blood pump compared to the VADovations miniature blood pump, the size of a AAA battery.

A current implantable blood pump

## IMMUNO-MYCOLOGICS INC.>>

### One thing is universal, people throughout the world get sick.

Just as important as the medications that treat diseases are the tests to help pinpoint the correct diagnosis to connect the sick patient with the proper drugs. That's where Oklahoma-based Immuno-Mycologics Inc. (IMMY) excels. IMMY manufactures diagnostic tests and sells them to hospitals and clinics throughout the world. Their goal is simple—save lives.

Every year, there are more than one million cases of cryptococcosis which causes fungal meningitis. To contract the deadly disease, an individual's immune system must be compromised. Primarily, it causes disease in AIDS patients, many of whom are in sub-Saharan Africa and southeast Asia. Pfizer donates the drug to treat this disease. The only thing missing was a test to diagnose the disease in these patients. Existing diagnostic tests are easy to administer, but because they require water and refrigeration, there was no effective way to perform the tests in developing countries where access to electricity and clean water is a challenge. So IMMY developed a test that met the World Health Organization's A.S.S.U.R.E.D. criteria – affordable, sensitive, specific, user-friendly, reliable, equipment-free and could be delivered to the people who need it most. Everything is contained within the test. It's based on the same technology as a home pregnancy test where two lines mean positive, one means negative.

The U.S. Centers for Disease Control estimates the test developed by IMMY can save between 50,000 and 100,000 lives annually. By keeping mothers alive who would have died from this disease, the IMMY diagnostic test can prevent somewhere between 300,000 and 600,000 orphans. In September, the South African government began to roll out national screening using this test.

With the support of OCAST, IMMY is developing a similar test that will treat histoplasmosis, a disease that has a similar impact in Latin America and South America. Both of these tests are the only ones of their kind in the world and will ultimately save millions of lives. IMMY has developed and manufactures more than 60 diagnostic tests in Oklahoma.

Also with the support of OCAST, IMMY has hired highly skilled interns. Brian Doherty, a former biotechnology student at Oklahoma City Community College, was one of the OCAST supported interns. Now, Doherty is the project manager for the cryptococcosis test.

**“The OCAST internship was a vital piece of my education and what led to my employment at this Oklahoma-based company,” said Doherty. “Without them, I wouldn't be working here today.”**

During Doherty's internship, he participated in the very early “dream” phase of the cryptococcosis test he has now seen come to fruition. Other research discoveries he made while interning were recently requested by the Mayo Clinic.

“Internships are so vital for students going into a scientific field,” said Doherty. “My internship exposed me to things I would have never seen in school. You have hands-on access to the equipment and tools you will be using in the real world. It also helped solidify my area of focus and allowed me to network with professionals in my field.”



Dr. Sean Bauman, president of Oklahoma-based IMMY, develops diagnostic tests that are used all around the globe.



THE U.S. CENTERS FOR DISEASE CONTROL ESTIMATES THE DIAGNOSTIC TEST DEVELOPED BY IMMY CAN **SAVE BETWEEN 50,000 AND 100,000 LIVES ANNUALLY.**



## OCAST PROGRAMS >>

The following OCAST programs and strategic partners are available to help Oklahoma businesses and researchers prove their ideas, attract additional funding and take their products to market. For specific program requirements, funding levels, application deadlines, notification sign-up or more information, contact OCAST.

### OKLAHOMA APPLIED RESEARCH SUPPORT (OARS)

Cutting edge research leads to commercially successful products, processes and services. OARS funds quality research in all fields from medicine and agriculture to energy and manufacturing.

### OKLAHOMA NANOTECHNOLOGY APPLICATIONS PROJECT (ONAP)

Oklahoma scientists have big ideas for small, enabling technologies. Nanotechnology is impacting all aspects of life by making products stronger, smaller, faster and more durable. ONAP assists Oklahoma companies with the process of applying nanotechnology through research and development to improve or create new products or processes.

### OKLAHOMA PLANT SCIENCE RESEARCH (OPSR)

Plant science research is playing a growing role in developing advancements in health, energy, agriculture and defense. OPSR funds basic and applied plant science research.

### OKLAHOMA HEALTH RESEARCH (OHR)

Oklahomans are developing treatments and conducting research to help people live longer, healthier lives. OHR funds basic research projects to improve human health.

### INTERN PARTNERSHIPS (INTERN)

Internships are vital to keeping talented undergraduate students in Oklahoma. The Intern program supports R&D projects that involve Oklahoma industry and Oklahoma institutions of higher education by providing matching funds to support internship positions.

### OKLAHOMA MANUFACTURING ALLIANCE

Small and medium-sized manufacturers must implement new technology and modernize in order to compete successfully in a global economy. The Alliance connects manufacturers to cost-effective resources, more efficient manufacturing processes and technology to increase productivity and reduce costs.

### OKLAHOMA SBIR COLLABORATIVE RESOURCES (OSCR)

Small business owners and entrepreneurs need help to apply for the highly competitive federal Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs. The OCAST program supports development of federal proposal preparation costs, provides critical "bridge" funding between Phase I and Phase II and provides technical assistance throughout the lifecycle of the project and into commercialization.

### INVENTORS ASSISTANCE SERVICE (IAS)/NEW PRODUCT DEVELOPMENT CENTER (NPDC)

It's a long, winding path from invention to marketplace. IAS navigates the process through education, information and referrals. The NPDC follows with design, development, engineering and business support.

## OCAST PROJECTS OPERATED UNDER CONTRACT WITH i2E»

i2E was created to respond to an OCAST initiative and is a private not-for-profit Oklahoma corporation focused on wealth creation by growing the technology-based entrepreneurial economy within our state. i2E operates under contract with OCAST to administer several programs.

### OKLAHOMA TECHNOLOGY COMMERCIALIZATION CENTER

An OCAST center under contract with i2E, The Tech Center works with companies, inventors, entrepreneurs and researchers to turn technological innovations into business opportunities for Oklahoma.

### TECHNOLOGY BUSINESS FINANCE PROGRAM (TBFP)

Financing a new business can be challenging. An OCAST program operated under contract with i2E, TBFP provides technology start-ups with pre-seed financing and early-stage risk capital to encourage investments from private sources.

### TECHNOLOGY BUSINESS INCUBATOR

OCAST, in partnership with the Oklahoma Health Center Research Park, helps to provide services to meet the needs of Oklahoma technology-intensive start-up companies including biotechnology and biomedical firms.

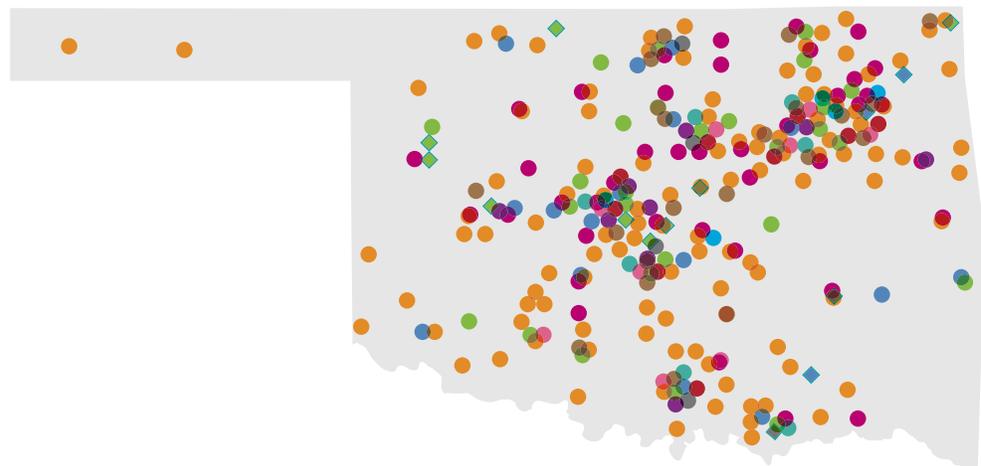
### OCAST SEED CAPITAL PROGRAM

OCAST invests in the private-sector Oklahoma Seed Capital Fund (OSCF). The OSCF was created to invest in Oklahoma high-tech companies that need the nearly nonexistent capitalization to grow their business. The state dollars used to invest in this fund are matched with private sector co-investment at an amount greater than the state's investment. Oklahoma is repaid more than its original investment when the companies are successful and those repayments help sustain future investments in the OSCF.

## OCAST FUNDED PROJECTS

- OARS
- PLANT
- ONAP
- SBIR
- PIPELINE
- HEALTH
- INTERNS
- MANUFACTURING ALLIANCE
- SEED CAPITAL
- TBFP
- SBRA

◆ A diamond shape denotes all collaborating Organizations.



# OCAST FINANCIAL OUTCOMES >>

## RESEARCH PROGRAMS

### Leveraged Investments

OCAST Programs	Private & Federal Investment Attracted as a Result of OCAST Awards	OCAST Awards FY12	Leverage Return
Applied Research	\$16,131,901	\$2,878,333	5.60
Nanotechnology	\$149,984	\$1,311,955	0.11
Plant Science	\$8,588,707	\$793,191	10.83
Health Research	\$22,328,728	\$4,413,695	5.06
Intern Partnerships	\$0	\$448,829	0.00
SBIR			
Collaborative Resources	\$3,477,000	\$186,000	18.69
<b>TOTAL OCAST</b>	<b>\$50,676,320</b>	<b>\$10,032,003</b>	<b>5.05</b>

### Business Impact

OCAST Programs	Private & Federal Investment Attracted as a Result of OCAST Awards + Business Financials / Payroll	OCAST Awards FY12	Leverage Return
Applied Research	\$53,969,036	\$2,878,333	18.75
Nanotechnology	\$4,227,025	\$1,311,955	3.22
Plant Science	\$10,611,191	\$793,191	13.38
Health Research	\$23,389,517	\$4,413,695	5.30
Intern Partnerships	\$13,705,000	\$448,829	30.54
SBIR			
Collaborative Resources	\$3,477,000	\$186,000	18.69
<b>TOTAL OCAST</b>	<b>\$109,378,769</b>	<b>\$10,032,003</b>	<b>10.90</b>

# COMMERCIALIZATION SERVICES

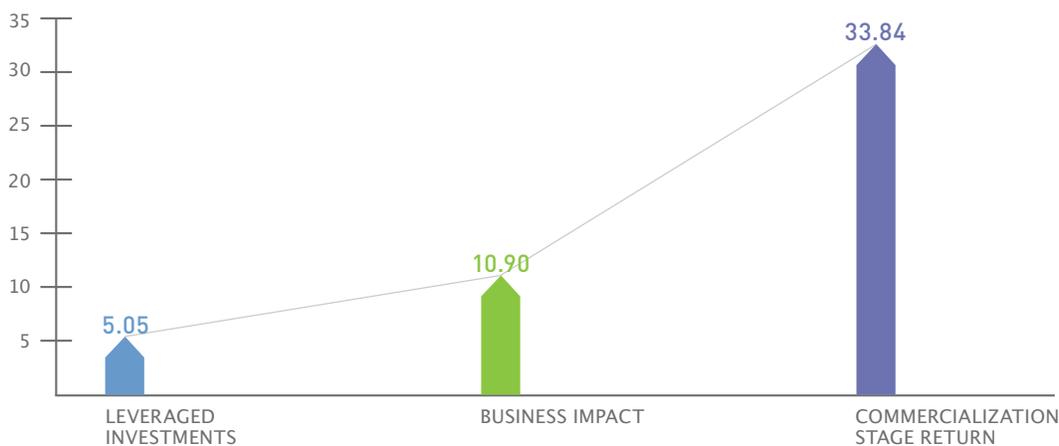
## Commercialization Stage Return

OCAST Programs	Private & Federal Investment Attracted as a Result of OCAST Awards + Business Financials / Payroll	OCAST Awards FY12	Leverage Return
Inventors Assistance Service	\$648,000	\$181,709	3.57
Manufacturing Alliance*	\$235,681,642	\$1,409,469	167.21
i2E - Technology Business Finance	\$14,897,820	\$1,459,697	10.21
i2E - Seed Capital	\$30,191,041	\$3,996,355	7.55
i2E - Technology Commercialization Center	\$24,512,620	\$1,992,962	12.30
<b>TOTAL PARTNERS</b>	<b>\$305,931,123</b>	<b>\$9,040,192</b>	<b>33.84</b>
<b>TOTAL OCAST + PARTNERS</b>	<b>\$415,309,892</b>	<b>\$19,072,195</b>	<b>21.78</b>

\*OCAST funds 44% of the Oklahoma Manufacturing Alliance budget.  $\$535,640,096 \times 44\% = \$235,681,642$

## PROGRESSION OF RETURN ON INVESTMENT

When investing in research & development, return on investment is a building process. The initial OCAST investment allows companies to see an immediate impact in business growth by leveraging that funding to attract additional private and federal investments and grants. Next, the OCAST funding has a positive impact on business financials by enabling the business to hire new employees and increase productivity. Finally, as the research grows closer to commercialization, OCAST funding helps leverage a higher return on investment through increased sales and licensing.



**IN 2012:**

**76**

PROJECTS WERE FUNDED BY OCAST

**170**

NEW JOBS WERE CREATED DIRECTLY BY OCAST FUNDING WITH A TOTAL PAYROLL OF \$5.9 MILLION

**93.5**

NEW JOBS WERE CREATED USING PRIVATE AND FEDERAL INVESTMENT ATTRACTED AS A RESULT OF THE OCAST FUNDING

**172**

STUDENT INTERNS WERE SUPPORTED BY OCAST GRANTS

**94%**

OF RESEARCHERS AGREED OCAST ASSISTANCE AND PROGRAMS ARE IMPORTANT TO THEIR RESEARCH OR BUSINESS

**\$5.1**

MILLION DIRECT IMPACT ON GROSS SALES AT PARTICIPATING COMPANIES



**OKLAHOMA CENTER FOR THE ADVANCEMENT OF SCIENCE AND TECHNOLOGY**

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To learn more about OCAST,  
watch our video here.

