



Seven-Year Impact Report Summary

In 2006, Arizona's political, education, business and philanthropic leadership established Science Foundation Arizona (SFAz) to invest in the technologies the new economy would most reward, and for which Arizona has special strengths. The non-profit, public-private partnership is founded on the principle that it takes rigorous cooperation between public and private sectors to create high paying jobs, launch new companies, educate its children, develop a quality workforce, invest in high impact technologies and attract industry and talent to Arizona. SFAz is the only organization of its kind involved with all facets of education – from K-12 through university-based grant making; and the only venue bringing together the leaders from business, education, government and philanthropy to work collaboratively to bolster Arizona's economic standing globally.

SFAz also leads the Arizona STEM Network (Science, Technology, Engineering and Mathematics), improving the State's K-12 public education and beyond. With generous support from industry and foundation partners, SFAz is building a robust pipeline that carries Arizona's youth into the state's vibrant and diverse 21st century economy.

**“SFAz works in partnership with local leaders to ensure each investment is sound and will gain measurable returns for Arizona.”
–Bill Harris, President and CEO, SFAz**

Diverse Funding Sources

- Income received from CEO Groups, Corporate Contributions, In Kind and Other Sources, Individual Contributions, Federal Grants, Philanthropic Contributions, State Contracts totals nearly \$150 million.
- 95% of funds received have been invested into programs.

Grants Awarded ~ By the end of 2014, SFAz awarded 216 individual grants.

- For every \$1 of State funds SFAz has awarded for university and non-profit research, an additional \$4.83 has been committed from industry matching and non-state research funding.
- 116 Research grants totaling \$70.6 million generated:
 - ✓ 1,865 additional direct jobs
 - ✓ 24 new companies
 - ✓ 207 patents filed and/or issued
 - ✓ 23 technology licenses filed
- 100 STEM Education grants totaling \$41.6 million engaged:
 - ✓ 385,000 students
 - ✓ 10,656 teachers
 - ✓ K-12 and community college levels
 - ✓ 297 Graduate Research Fellows
 - ✓ 14 Bisgrove Scholars

Return on Investment ~ SFAz's matchmaking among more than 100 industry and academic partners has reinvigorated Arizona.

- \$8.5 million in SFAz grants leveraged \$64.2 million in federal and \$23.5 million of industry matches.
 - ✓ 469 jobs created
 - ✓ 4 high-tech companies created
 - ✓ 9 patents issued and 44 more filed
 - ✓ 595 publications in peer-reviewed journals

Arizona STEM Network and STEM Pathways ~ SFAz is Arizona's STEM education leader

- 385,000 students and over 10,000 teachers impacted through direct participation
- SFAz supports a network of over 200 STEM clubs in 13 of Arizona's 15 counties.
- SFAz catalyzed the inclusion of robotics as interscholastic activity by the Arizona Interscholastic Association (AIA).
- The STEM Pathways program is guiding the use of \$2.8 million in federal grants by 8 rural AZ colleges.
- The Bisgrove Scholars Program is providing Arizona with its next generation of STEM leaders, expanding the pipeline of highly skilled, experienced scholars and building a stronger, knowledge-based economy for Arizona.

Advancing Arizona Together

- SFAz is dedicated to developing sustainable relationships that help improve Arizona's economy and education for all its citizens and advance its ability to compete in a global market. SFAz is a unique asset essential to connecting public and private interests to create greater value for industry, education, research and development.

**“When states and regions commit themselves to aligning the goals of universities and industries—everyone wins. Investment flourishes. Innovation thrives. And economies grow.”
–John Kelly, IBM Senior VP & Director of Research**

Seven-Year Impact Report

A Globally Competitive Arizona

2007 | 2014



INTRODUCTION & IMPACTS

In 2006, Arizona's political, education, business and philanthropic leadership made the decision to launch Science Foundation Arizona (SFAz). It was to be a unique investment vehicle – funded by both public and private contributions – to invest in the technologies the 21st century economy would most reward, and for which Arizona had special strengths.

The State's most promising intellectual property was to be identified and brought to commercial status by attracting private sector investors to match the public investment, to create and attract new companies and build a high quality workforce. After inception, SFAz was also asked to lead the Arizona STEM Network (Science, Technology, Engineering and Mathematics), which added improving the State's K-12 public education system to its responsibilities.

SFAz:

Diversifying the state's economy

by developing programs

and partnerships that

stimulate joint industry and

university research

and development, to benefit

state-based industries.

SFAz, a nonprofit, public-private partnership, awarded its first grant in 2007. Its returns on the first seven years of research investment are measured in quantifiable terms of revenue, high-salary jobs, companies, technologies, and talent generated and attracted.

Diverse Funding Sources

Using funds received from state, federal, philanthropy and industry sources, Science Foundation Arizona began seven years ago to help diversify the state's economy by developing programs and partnerships that create and stimulate industry, linking industry needs with university research, and focusing Arizona's education system on producing a 21st century workforce.

INCOME RECEIVED

CEO Groups

*(Greater Phoenix Leadership,
Southern Arizona Leadership Council and Flagstaff Forty)*

11,084,373

Corporate Contributions

2,772,583

In Kind & Other Sources

5,524,185

Individual Contributions

46,660

Federal Grants

763,976

Philanthropic Contributions

38,221,939

State Contracts

91,432,004*

TOTAL INCOME

\$149,845,720

**Includes \$10M of Federal Stimulus contracted through the State & \$2.5M from the Department of Education for K-12 grants.*

95%

of funds received have been invested into programs.



Impact anchored by fiscal intelligence.

\$4.83 : \$1.00

For every \$1 of state funds SFAz has awarded for university and non-profit research, \$4.83* has been committed from industry matching and non-state research funding. Matching and leveraged funds generated \$598M in total economic impact through 2013.

* According to a 2013 Battelle Technology Partnership Practice independent report. Does not include additional 2014 returns.

SFAz investment means Arizona grows in education, workforce, the economy and competitiveness.



Economy

Investing in scientific and engineering areas of greatest economic importance to Arizona



Competitiveness

Facilitating strategic collaborations between Arizona research institutions and industry



Education

Supporting effective STEM education



Workforce

Attracting, developing and retaining world-class jobs and talent

“We invest in projects, people and places that are producing tangible, lasting results.”

Bill Harris, President & CEO, Science Foundation Arizona



Grants and Investments by Program

Sustaining technology innovation requires a relentless focus on:

- Promoting public/private partnerships
- Raising the level of skilled talent

“The capability to innovate is fast becoming the most important determinant of economic growth and a nation’s ability to compete and prosper in the 21st century global economy.”

National Research Council Report Rising to the Challenge

RESEARCH	
Bisgrove Scholars Program	2.7M
Competitive Advantage Awards	8.5M
Small Business Catalytic	5.5M
Stardust Director’s Fund & Strategic Initiative	0.8M
Strategic Research Group	53.1M
Research Sub-Total	\$70.6M
STEM EDUCATION	
Graduate Research Fellowship	19.2M
K-12	14.6M
STEM Education*	7.8M
Education Sub-Total	\$41.6M
TOTAL	\$112.2M

*STEM Clubs, STEM Pathways, Professional Development, Computer/Science Lab Grants, STEM Schools

“The total return on the first seven years of SFAz investment is in some ways incalculable. How do you measure the impact that breakthroughs in healthcare and personalized medicine will have for generations to come? Or the effect of revitalizing mining technologies and investments in cyber security, aerospace and defense, data and IT will ultimately have on the Arizona economy? Or creating entirely new industries? Or the cascade of benefits to Arizona resulting from attracting, retaining and developing some of the finest minds in the world? The generations of benefits from SFAz’s first seven years are yet to unfold.”

Gary Tooker, Former President & CEO, Motorola



Public/Private Partnerships

SFAz is advancing Arizona's home-grown research discoveries into new technology products and growing technology industries for the state, seeking out, thoroughly investigating and investing in successful programs.

By the end of 2014, SFAz awarded 216 individual grants.



216

individual grants



116

in research
totaling \$70.6M



100

in education
totaling \$41.6M

Research Grant Investments Generated:

- 1,865 additional direct jobs
- 207 patents filed and/or issued
- 24 new companies
- 23 technology licenses filed

All grants require rigorous peer review by experts outside the state to confirm that each grant meets the highest standards, plus additional review by the SFAz board to verify grants have strategic value to Arizona.

Skilled Talent

SFAz is cultivating Arizona's future workforce, in the fields of science, technology, engineering and math (STEM) through active engagement of students and teachers across the state.

STEM education activities and programs have engaged:

- 385,000 students
- 10,656 teachers
- K-12 and community college levels
- 297 Graduate Research Fellows
- 14 Bisgrove Scholars



Invigorating & Creating Industries

Competitive Advantage Awards (CAA)

SFAz's CAA program invests in exceptional researchers by providing bridge financing for research projects with the greatest potential to secure high levels of federal funding.

Fields of strategic importance to Arizona are Information and Communications Technology, Sustainable Systems and Biosciences.

7:1
ROI

\$8.5M in SFAz grants leveraged \$64.2M in federal and \$23.5M of industry matches

469
jobs created

279
post-secondary MS and PhD students and post-doctoral researchers employed

4
high-tech companies created

9
patents issued and 44 more filed

5
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595
publications in peer-reviewed journals



C-Path – Critical Path Institute

SFAz awarded \$13.1 million in two multi-year strategic research grants to take C-Path from an early-stage start up to a fully operating entity. C-Path tripled SFAz’s initial investment.

\$13.1M

multi-year strategic research grants

\$40M

industry/philanthropic funding

Since 2010, C-Path has attracted more than \$40M in industry and philanthropic funding – more than tripling the original SFAz grant investment.

46

jobs

C-Path has grown from 5 to 46 jobs, with average salaries of \$91,789.

1300

scientists

C-Path manages eight global consortia of over 1300 scientists from across the globe willing to share data, knowledge and expertise.

C-Path develops innovative tools and methods to help speed the process of drug development and regulatory review.

“SFAz funding enabled us to get past the ‘valley of death’ and establish C-Path to become a major national and international force.”

Martha Brumfield, President & CEO, C-Path

AzCATI & Heliae

SFAz’s approximately \$7.7 million strategic investments in algae research seeded the growth of the nationally recognized Arizona Center for Algae Technology and Innovation (AzCATI) at ASU’s Polytechnic campus. SFAz met with the MARS company leadership and helped to catalyze the creation of a spin off company, Heliae Development LLC, based in Gilbert, and identified its initial interim CEO. The company is engaged in research and development to unlock the immense opportunity that algae presents.

Results:

- SFAz’s investment spurred an additional \$35 million in funding from both federal and industrial sources, including a \$15 million Department of Energy (DOE) grant.
- Heliae has created more than 125 jobs, employing young scientists and engineers, with an average salary of more than \$90,000.
- Heliae grows algae and harvests and processes byproducts for use in nutritional supplements, biofuels and health and beauty products.

“A key factor in the success of SFAz’s investments is their external peer review system using nationally recognized experts to assess and recommend programs through a competitive bid process, instilling confidence that investments are made in organizations and projects that are – or become – globally competitive.”

Gary Dirks, Director of ASU Global Institute of Sustainability



Lowell Institute for Mineral Resources – University of Arizona

A \$7.8 million SFAz grant – matched by 15 industry partners, federal support and an endowment from David and Edith Lowell – rescued and revitalized the declining 124-year-old mining program at the UofA.

Results:

- | | | | |
|--|---|--|--|
| <p>→ 5 spin off companies have been created through Lowell Institute. Institute faculty members have started 5 companies and technology is being disclosed for at least 4 more. These are real companies with real payrolls.</p> | <p>→ Supports 100% job placement for students</p> <p>→ Undergrad mining engineering students earn starting salaries of \$70,000 – \$100,000; PhDs start from \$85,000 to \$140,000</p> <p>→ Grew from 3 to more than 40 industry partners</p> | <p>→ Reaches more than 8,000 Arizona K-12 and beyond students and teachers in their classrooms every year</p> <p>→ Has provided 1,200 industry professionals from 80 companies in 27 countries with continuing education courses</p> | <p>→ Helps develop technology with Arizona companies through federal SBIR programs</p> <p>→ Growing international relationships within China, Mexico, Australia and Canada</p> |
|--|---|--|--|

Timeline

2004	UofA mining program: 19 undergrad students
2005	UofA mining program: 3 faculty
2009-12	SFAz \$7.8M grant led to \$8.73M industry match, and leveraged additional \$9.3M federal grant funds
2009	Lowell Institute for Mineral Resources established
2009-12	27 mining industry departments in 10 colleges
2014	9 faculty in mining engineering, 1 San Xavier Mine director, 1 education outreach coordinator, and approximately 100 undergraduates
2014	Approximately 170 faculty, staff and students at UofA
2014	Mining Institute is among the top interdisciplinary mineral resources research centers in the world

“Colleagues across the nation understood the change at the UofA and were impressed with the commitment and diversity of our industry partners. . . .The Lowell Institute started with three industry partners and now has more than 40. SFAz was the game changer – the importance of this investment to Arizona cannot be overstated.”

Mary Poulton, Professor & Dept. Head, Dept. of Mining & Geological Engineering, UofA



REhnu – Concentrated Solar Energy at UofA

SFAz funded a total of \$2.7 million to the UofA astronomy program and its unique Mirror Lab to find ways to use focused sunlight to reduce the cost of solar generation to fossil fuel levels. Professor Roger Angel led the development of a solar energy system using large mirrors to focus sunlight, with super-efficient PV cells that double the electrical output.

Results:

- Based on this success, Angel secured a \$2.5 million Department of Energy grant for the University and to found a new Tucson-based company, REhnu.
- The company has raised an additional \$2.5 million in private investment.
- Today, REhnu is building commercial generators for early-adopter customers in California, Mexico and Arizona.

“Without the SFAz start, we might never have been able to develop this groundbreaking technology.”

*Roger Angel, Founder & CTO of REhnu;
Regents' Professor of Astronomy & Optical Sciences, ASU*

Strategic Matchmaking

SFAz's core strength is connecting the appropriate public and private partners. SFAz-guided grants have engaged more than 100 companies, strengthening the ties among industry, academia and government.

“During my tenure as a National Governors Association (NGA) division director, we focused on identifying and sharing best practices for economic development with the nation's governors and their top policy advisors. We learned that states are moving to independent intermediary organizations to drive strong ties among universities, companies and entrepreneurs to support business growth...and providing strategic advantages for state-based companies competing in the global economy. The NGA now recommends intermediaries as a best practice... Arizona has one of the best possible intermediary models in the nation – Science Foundation Arizona. What an opportunity for Arizona as it chooses policy direction and investments to foster business growth.”

Mary Jo Waits, Former National Governors Association Division Director

**SFAz has forged successful collaborations with
notable industry, philanthropic, government and academic partners.**

Air Force Research Laboratory	GenoSensor Corp	Renco
Algae Biosciences Corp	GM Translucent Inc.	Resolution Copper Mining
Algasol Renewables	Google	Rosemont Copper
Anglo America	Hanlon Engineering & Architecture	Sandia National Laboratories
Animus Resources	Heliae	Sanofi Aventis
Arizona Community Foundation	Helios Education Foundation	SCI, LLC
Arizona Public Service (APS)	IBM	SEMATECH
Arizona Mechanical Insulation	Innovatek	SenesTech, Inc.
Arizona Research Laboratories	Intel	SEZ
Asarco	International Royalty	Sierra Solar Power
Barrick Gold Corporation	JP Morgan Chase	Soitec Phoenix Labs
Battelle	Los Alamos National Laboratory	Solon
BAE Systems	Massively Parallel	Southwest Power Group
BeachFleischman	Medtronic	Southwest Solar Technologies, Inc.
BHP Billiton	Microchip Technology Incorporated	Spectrolab
BioVigilant	Mineral Zone	Salt River Project
Boeing	Mining Foundation of SW Inc	ST Microelectronics
Breault Research	MJS Designs	Sundt Construction
Bright Source Energy	National Solar Observatory	Tucson Electric Power (TEP)
Bronco Creek Exploration	Nevada Copper Inc.	Texas Instruments
C-PATH	Newmont Mining	TGen
CreateSoft	Northrop Grumman	Triple Creek Ranch
Darkpulse Technologies	NanoVoltaics, Inc.	Tucson Airport Authority
DermSpectra	Orbital Sciences	UBS Financial Services Inc.
Dionex	Osborn Maledon	United Way of Northern Arizona
Diversified Technologies	Paragon Space Development Corp	Vante
ESI Service Corp/ITT Tech	Peabody	Ventana Roche
Eurasian Minerals Inc.	PetroAlgae	Verrado Assembly
Far West Mining	Piper Plastics	ViaSol
Fluid Imaging Corp	Prism Solar Technologies	Virginia Piper Charitable Trust
Fort Huachuca Army Intelligence Center	Quadra	White Electronic Designs
Freeport-McMoRan	Raven Industrial	White Tank LLC
General Plasma	Raytheon	W.L. Gore & Associates
	REhnu	World Water Works



SFAz is Arizona's STEM Network Leader

Expanding the Talent Pipeline – A vibrant and diverse 21st century economy can only be realized with a workforce possessing 21st century skills.



STEM Network

Rigorous STEM programs prepare Arizona's students to become Arizona's future workforce. SFAz has led the Arizona STEM Network with support primarily from Freeport-McMoRan Copper and Gold Foundation and Helios Education Foundation. The STEM Network Online Community serves and assists teachers and business leaders and has also developed nationally recognized STEM Guides: STEM Immersion Guide, STEM Implementation Guide, STEM Club Guide, STEM Resource Guide and STEM Pathways Guide (Workforce Development).

The Helios STEM School Pilot: SFAz and the Arizona STEM Network are working with seven districts, totaling 19 schools, selected as pilot sites for the Helios STEM School Pilot Program, a strategic partnership and investment by Helios and SFAz, using the STEM Immersion Guide to provide the infrastructure, resources and metrics needed to improve educational outcomes and achieve collective impact for Arizona students. The Helios STEM School Pilot includes schools and districts in Maricopa, Coconino, Yavapai, Pima and Yuma counties.

Results:

- STEM programs have impacted nearly 385,000 students and 10,650 teachers at K-12 and community college levels through direct participation.
- SFAz supported a network of nearly 200 STEM Clubs in 13 of Arizona's 15 counties, led a significant focus on robotics team support, and catalyzed the inclusion of robotics as interscholastic activity by the Arizona Interscholastic Association (AIA).
- Arizona will be the second state to have a statewide robotics championship beginning May 2015.
- Helios STEM school pilot and field staff; rural and remote computer labs; the Arizona Community Foundation-supported Tiered Mentoring Pilot in Flagstaff, Phoenix and Tucson; and the STEM Business Advocates and Partners led the Change the Equation/STEM Works for Arizona.

All of these initiatives help Arizona students develop greater technical knowledge, analytical agility, critical thinking and the hunger to discover and innovate.



STEM Pathways – Community College and Technical Opportunities for Students Through Partnerships With Local Business Centers



Community College

Stem Pathways

SFAz’s STEM Pathways programs lead to more Arizona students pursuing STEM degrees, more internships, and more local employers hiring students for STEM-related jobs.

The STEM Pathways programs connect K-12 students in primarily rural areas to community college-led programs with a technology driven curriculum that allows students to gain credentials in demand by local employers. Students may earn high school credits and courses that transfer toward college degrees and certifications at Arizona universities and community colleges.

“If we are ever to build a STEM pipeline from K-12 to college, and then to careers that accelerate economic growth statewide...it will be because of the engagement among business, industry, education and community provided by Science Foundation Arizona.”

*Jerry Proctor, Deputy to the Commanding General,
US Army Intelligence Center and Ft. Huachuca*

SFAz and STEM Pathways help educators and business community partners develop certifications and degree programs at area high schools and community colleges that align with local jobs.

Results:

- SFAz’s STEM Pathways program at Cochise College has proven so successful, SFAz is guiding the use of \$2.8 million in federal grants to assist eight additional rural Arizona community colleges and Hispanic Service Community Colleges nationwide develop their own STEM Pathways programs.
- The first STEM Pathways program nearly tripled the number of community college students participating in mechatronics classes, and increased fivefold the number of students earning mechatronics/Siemens certification.
- The initial Pathways program more than doubled the number of internships offered by local businesses.
- The number of internships paid by participating businesses now exceeds those paid through SFAz grant funds.

A full list of SFAz-led STEM initiatives can be found at www.sfaz.org/education.



A Catalyst for Building Exceptional Scientific & Engineering Talent in Arizona



Universities

Graduate Research Fellows

SFAz has drawn 297 top scholars to Arizona through the Graduate Research Fellow program, which contributes to the vitality of Arizona's scientist and engineer base.

“Science Foundation Arizona provides a vital link between industry and universities to extract greater economic benefit for our state.”

Sandra Watson, Arizona Commerce Authority, President & CEO

Bisgrove Post-Doctoral and Early Career Scholars Program

The Bisgrove Scholars Program, made possible by a portion of a \$25 million gift by humanitarian Jerry Bisgrove, introduced the first Rhodes Scholar-like program in the U.S. in Arizona. Bisgrove Scholars are early career engineers or scientists selected from applications of exceptional talent from around the nation and world to study complex problems at Arizona research institutions.

Results:

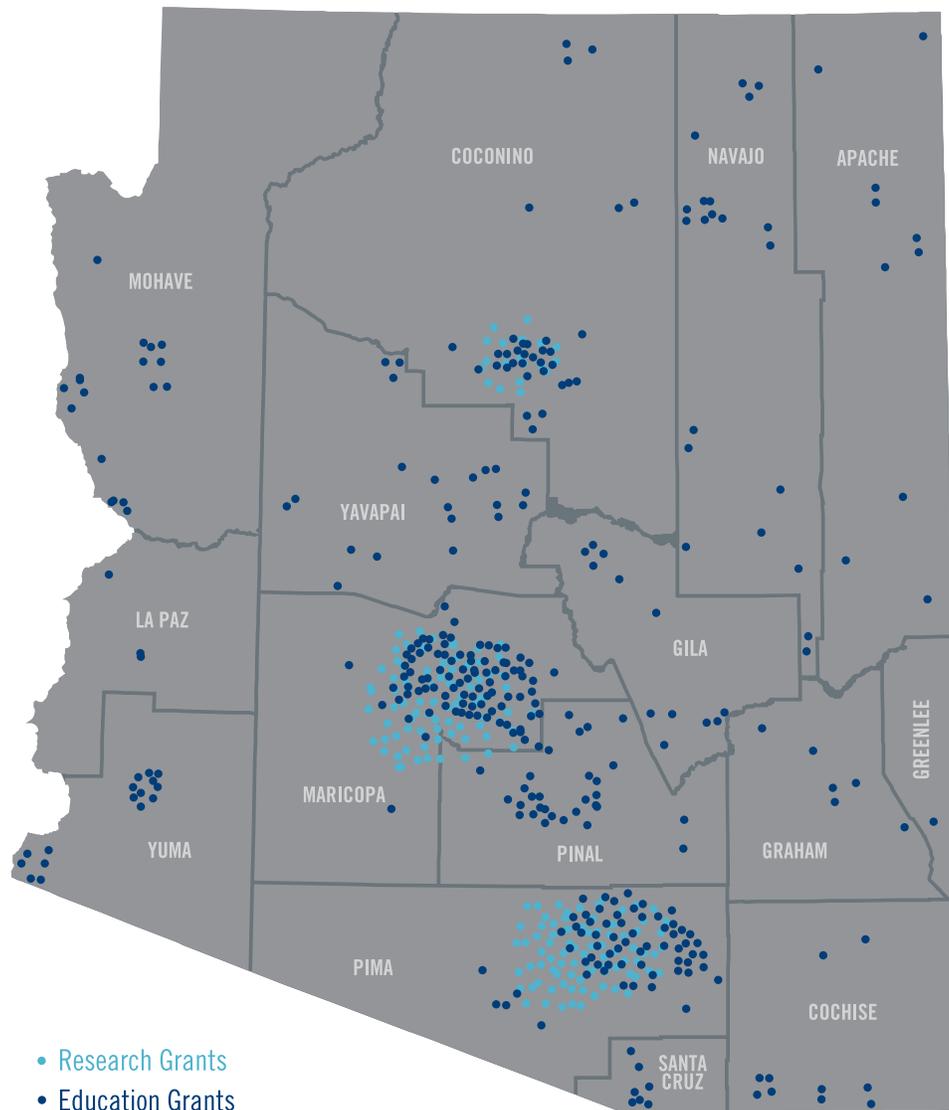
- Fellows have authored or coauthored 781 scientific research papers in peer-reviewed journals, patent submissions and juried abstracts accepted for conferences.
- More than half of the 52 fellows who have graduated with a PhD are employed in Arizona.
- MS program in engineering that fast-tracks graduates into Arizona technology jobs.
- One GRF fellow has started a company developing pathology devices to improve surgical treatments of cancer.
- GRF fellows engage in K-12 education in high-needs, inner city and rural Arizona schools.

Results:

- The Scholars program expands the pipeline of highly skilled, experienced scholars building a stronger knowledge-based economy in Arizona.
- 14 Bisgrove Scholars have been named; up to 7 more will be identified in 2015.
- Scholars work at Arizona's state universities and institutions such as TGen, Barrow Neurological Institute and Phoenix Children's Hospital.

“The Science Foundation Arizona GRF program enhanced our ability to recruit and support talented students from national and international applicant pools. SFAz has been a catalyst for many of the important advances that Northern Arizona University has made as a graduate and research institution over recent years.”

Laura Huenneke, Provost, NAU



Following the Great Recession and the sporadic recovery that has ensued, the work of Science Foundation Arizona is more important than ever. Because the SFAz operation model calls for half of all research investments to be made by the private sector, this organization has the unique advantage of using both private and public resources – united in common purpose – to make bold and wise investments that will benefit all the people of Arizona for decades to come.

Don Budinger, Chairman & Founding Director, Science Foundation Arizona



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