

ADVANCING ARIZONA

Developing minds, ideas, solutions

2013



Technology and Research Initiative Fund
Fiscal Year 2013 Annual Report

September 1, 2013

As required by A.R.S. § 15-1648 (D)



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**ARIZONA BOARD OF REGENTS
TECHNOLOGY AND RESEARCH INITIATIVE FUND (TRIF) ANNUAL REPORT**

For the Fiscal Year Ended June 30, 2013

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discovery

TRIF Executive Summary

innovation

exploration

opportunity

creativity

integrity



Technology and Research Initiative Fund (TRIF)

BACKGROUND

- ▶ Education 2000 (Proposition 301), passed by Arizona voters in November 2000, approved a six-tenths-cent increase in the state sales tax to be dedicated to K-12, the community colleges, and the Arizona University System (Arizona State University, Northern Arizona University, and The University of Arizona). Collection of the tax began on June 1, 2001, and will continue through June 30, 2021, under current law.
- ▶ A.R.S. §15-1648 establishes the Technology and Research Initiative Fund (TRIF) in the State Treasurer's Office and gives the Arizona Board of Regents (ABOR) the responsibility to administer the fund.
- ▶ Pursuant to A.R.S. §42-5029, the State Treasurer's Office must first allocate from Proposition 301 sales tax revenues one-twelfth of the School Facilities Board annual debt service on K-12 school improvement revenue bonds for the current fiscal year. After this monthly allocation, ABOR receives 12 percent of remaining monies.
- ▶ TRIF monies are continuously appropriated to ABOR and do not lapse at the end of the fiscal year.

TRIF BUDGET

- ▶ The Arizona Board of Regents approves the TRIF budgets and business plans in 5-year cycles. The FY 2012-2016 business plan was approved by the Board in April 2011. The FY 2012-2016 revised budgets were approved by the Business & Finance Committee in August 2012, based on an updated sales tax forecast from the JLBC. The Board approves revisions to the annual budgets and performance measures annually. These business plans and brochures are available on the ABOR web site at: www.azregents.edu
- ▶ Projected revenue for FY 2012-2016 is approximately \$302.8 million. Total TRIF revenue received to date since the inception of the program in June 2001 is \$690 million.
- ▶ The TRIF statute includes a 20 percent limitation on use of TRIF funds for capital projects expenditures.

(continued)

- ▶ Pursuant to statute, each annual TRIF budget allocates funding for Certificates of Participation costs for lease-purchase of buildings and associated infrastructure at ASU Polytechnic and ASU West campuses.

TRIF INITIATIVES

- ▶ Pursuant to A.R.S. §15-1648(C), TRIF monies will be used to support initiatives and projects that meet one or more of the following criteria:
 - Promote university research, development, and technology transfer related to the knowledge-based global economy
 - Expand access to baccalaureate or post-baccalaureate education for time-bound and place-bound students
 - Implement final recommendations from the Governor's Task Force on Higher Education and/or the Arizona Partnership for the New Economy
 - Develop programs that will prepare students to contribute in high technology industries located in Arizona
- ▶ Priority will be given to proposals that involve collaboration between and among the universities and/or collaboration with private industry or public sector agencies.
- ▶ The above criteria are included in ABOR Policy 3-412, along with formats for submission of proposals and other guidelines.
- ▶ The universities' investments of TRIF funds in FY 2012-2016 will be limited to and focused in four research areas and one workforce development area:

Research investment areas:

Improving Health—ASU, NAU, UA

Water, Environmental, and Energy Solutions—ASU, NAU, UA

National Security Systems—ASU

Space Exploration and Optical Solutions—UA

Workforce development investment areas:

Higher Education Access for Workforce Development—NAU, UA

TRIF REPORTING

- ▶ A.R.S. §15-1648(D) requires the Board to submit to the Governor and the Legislature by September 1 of each year a report of prior year TRIF expenditures.
- ▶ The FY 2013 TRIF report, along with previous reports, is available on the ABOR web site.

July 30, 2013

opportunity
innovation discovery
exploration

ASU

integrity creativity



ARIZONA STATE UNIVERSITY



Technology and Research Initiative Funding (TRIF) investments made at Arizona State University (ASU) stimulates the development of promising new research innovations and allows for the expansion of successful research programs. This support has been and continues to be critical in establishing ASU as a world-class research university attested to by our success in securing competitive external funding, dissemination of ideas through impactful publications, the training of a highly-skilled workforce that is pivotal for the growth of Arizona’s economy, and the translation of ideas into marketable products, patents, and intellectual property disclosures.

For the TRIF cycle of FY12 through FY16, three focus areas are being strategically invested in at ASU:

- **Improving Health** focuses on use-inspired, collaborative research to improve human health and quality of life;
- **National Security Systems** addresses the rapidly changing research and technology needs throughout the security and defense sector; and
- **Water, Environment and Energy Solutions** integrates multifaceted and diverse research efforts for finding solutions to the challenges posed by urbanization and the increasing demands for energy, water and clean air.

ASU is committed to providing high-value returns on TRIF investments. While the focus areas have been described in detail in ASU’s FY12 – FY16 TRIF Business Plan, here we present updates of the TRIF activities in FY13. Overall, TRIF

investment has enabled the acceleration of discoveries made by ASU’s faculty and has resulted in significant increases in our overall research productivity and technology translation. They have

also enabled the establishment of new instructional degree programs that train Arizona’s students to become innovators and contributors to Arizona’s prosperity.

“It is a pleasure to provide this report highlighting ASU’s achievements and contributions made possible by the TRIF investment.

ASU’s faculty are constantly pushing the boundaries of innovation and discovery and our students achieve the highest scholastic goals.

ASU’s robust research portfolio and strong academic programs directly contribute to the strengthening of Arizona’s knowledge-based economy.

The TRIF investment ensures a bright future for our citizens as well as our state.”



Dr. Sethuraman “Panch” Panchanathan
Senior Vice President of Knowledge Enterprise Development



IMPROVING HEALTH

Arizona's TRIF investments are used to advance a broad ASU agenda for improving healthcare locally, regionally and nationally. ASU is innovating approaches that aim to solve several of today's critical challenges, by bringing together complementary expertise and activities into larger collaborative endeavors and finding new solutions to real-world problems. It seeks to leverage current and emerging connections between ASU researchers and community partners, and enhance ASU's positive impact on individuals and the community at large.

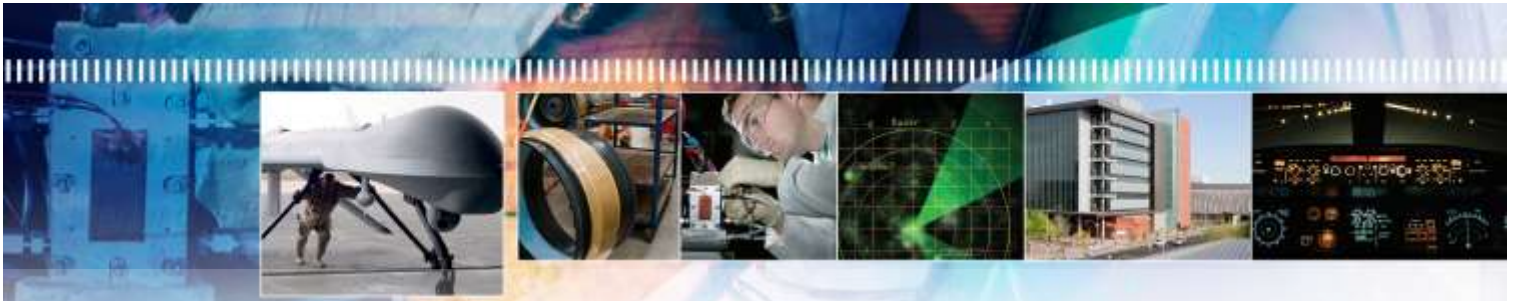
Goals

- **The Biodesign Institute** pursues cutting edge research to create personalized medical diagnostics, outpace infectious disease, clean the environment, develop alternative energy sources and secure a safer world.
- **Complex Adaptive Systems** addresses large-scale, multi-stakeholder, transdisciplinary research initiatives and takes a biosocial system dynamics approach to creating a holistic understanding of life, from molecular biomarkers to complex disease.
- **Advanced Computing Center** is a solutions processing portal for ASU researchers, industry partners, and community leaders to collect, manage, and analyze large data sets in order to elucidate healthcare strategies and outcomes.
- **Center for Games and Impact** partners with scientists and game developers to harness the power of gaming platforms, theory, and technology for application in health, economics, and sustainability.
- **Arizona Technology Enterprise (AzTE)** works with ASU inventors to bring tools and technology to market, where they can make a deep and lasting impact across the continuum of care.



ASU's Entrepreneurship and Innovation Group, formerly Venture Catalyst, hosted an intensive, six-month accelerator program designed to commercialize discoveries made in Arizona laboratories. Each company is created to license technology and intellectual property from Arizona's premier research institutions. The Arizona Commerce Authority provided seed money for high-potential startups participating in the program.

AzTE partnered with the ASU Research Park to create the ASU Catalyst Fund, which competitively awards small loans to further develop high-impact technology. The fund receives a portion of the initial revenues following commercialization to pay back the loans and help advance other technologies. Award recipients include Dr. Carl Wagner, who is leading a drug discovery program to treat Alzheimer's, and Dr. Sandeep Gupta, who is contributing to improving the data switching in information technology applications.



Summary of Accomplishments

The investment in **Improving Health** continues to expand the depth and breadth of its impact locally and nationally. This focus area continues to move several initiatives forward, purposely designing and driving collaborative research to improve health and quality of life. This has translated into national attention for Arizona. The Biodesign Institute, in conjunction with ASU leadership, successfully recruited Dr. Raymond DuBois as Executive Director to lead the Institute. He is an internationally renowned physician-scientist, who with the addition of his research program in colon cancer research advances the Biodesign Institute to a national leadership position.

Results - Impact

- HealthTell Inc., a spin out company of Biodesign's Center for Innovation in Medicine, was selected as the most innovative startup company in Arizona at the 2012 Governor's Celebration of Innovation.
- Biodesign Institute researchers, in partnership with Life Technologies Corporation, secured an additional \$9.33 million in funding from the Department of Health and Human Services, Biomedical Advanced Research and Development Authority (BARDA) to complete an additional five years on a project that aims to commercially develop technologies that rapidly assess radiation dose during emergencies.
- In FY13, Biodesign faculty members authored five articles in *Nature* and two articles in *Science*, premier peer reviewed international scientific journals.
- Cheryl Nickerson, of the Biodesign Institute, received an award to elucidate the effects of microgravity induced host-pathogen interactions. As part of ASU's Space Act agreement, she has established a new avenue of research that will provide experiments to the International Space Station in late 2013.
- Technology developed by Biodesign Institute researchers is being used by a new startup company, Breezing, that has produced a device of the same name. The handheld, mobile metabolism tracker is the first of its kind and uses indirect calorimetry to track the metabolism and calorie needs of the user and interfaces with mobile phones.

"TRIF funds give ASU a unique opportunity to invest time and effort into developing new ideas and innovative research in the areas of health, sustainability and security. Our goal at Biodesign is to move research forward rapidly, so that discoveries can be patented, expanded and benefit the public as quickly as possible. We know what we are doing here at Biodesign will ultimately result in a huge return on investment for Arizona and will improve the health, sustainability and security of people across Arizona and the Nation."



Dr. Raymond DuBois



NATIONAL SECURITY SYSTEMS

TRIF funds catalyze ASU's defense and security-related research, with the ultimate goal of protecting humans and ecosystems from harm. By synergizing the efforts of research on and off campus, with regional aerospace and defense industries, ASU has been able to identify and drive key technologies that improve outcomes across diverse projects; from creating powerful, complex mobile flexible displays that help the warfighter in battle, to cleaning toxic waste spills near drinking water sources.

Goals

- The ***Security and Defense Systems Initiative*** (SDSI) coalesces ASU's outstanding research efforts under a single, university-wide enterprise and leverages its expertise and resources to broaden existing efforts, improve connections and collaborations with government and industry, and engage university students in research projects and public service.
- The ***Center for Environmental Security*** (CES), a joint center between the Biodesign Institute and the Security and Defense Systems Initiative, focuses on environmental protection, remediation, mitigation, and biosecurity, from microorganisms to humans. The center seeks to incorporate engineering approaches that bridge the gap between human use and abuse of chemical and biological agents.
- The ***Flexible Electronics and Display Center*** (FEDC) is a public-private partnership that has established itself as an international leader in flexible electronics manufacturing, including materials R&D and supply chain development. The center has created a powerful innovation infrastructure to advance full color, video-rate, and flexible display technology and to fulfill its 10-year cooperative agreement with the U.S. Army and industry partners while also building capacity for continued research and production.



"TRIF funding has enabled our team in the Center for Environmental Security at the Biodesign Institute to develop and deploy technologies for the cleanup of contaminated groundwater resources in the Valley of the Sun."

- Rolf Halden, PhD
Director, CES

The Arizona Board of Regents, through the Regent's Innovation Fund, awarded an Arizona university consortium led by ASU to design and implement software and infrastructure aimed at creating rich data sets that can be used by multiple stakeholders via a user-friendly interface. This forward-thinking, digital research infrastructure lays the necessary groundwork to support large-scale, high-impact projects, and opens critical new avenues for additional research funding from several organizations. The Regent's Innovation Fund also supported the implementation of SciVal Experts, a searchable online database tool featuring researchers from all three Arizona universities that facilitates transdisciplinary collaboration across the three institutions.



Summary of Accomplishments

The **National Security Systems** focus area strategically advances the research and development strengths of ASU in collaboration with key local and national stakeholders. This success is exemplified in the continued achievements of ASU's Flexible Electronic Display Center (FEDC). FEDC's leadership and ASU's strategic high-level partnerships with PARC and others, creates powerful synergistic collaborations that result in tangible commercial advances. Since being founded, FEDC has generated 50 invention disclosures and eight US patents with many additional patents pending.

Results – Impact

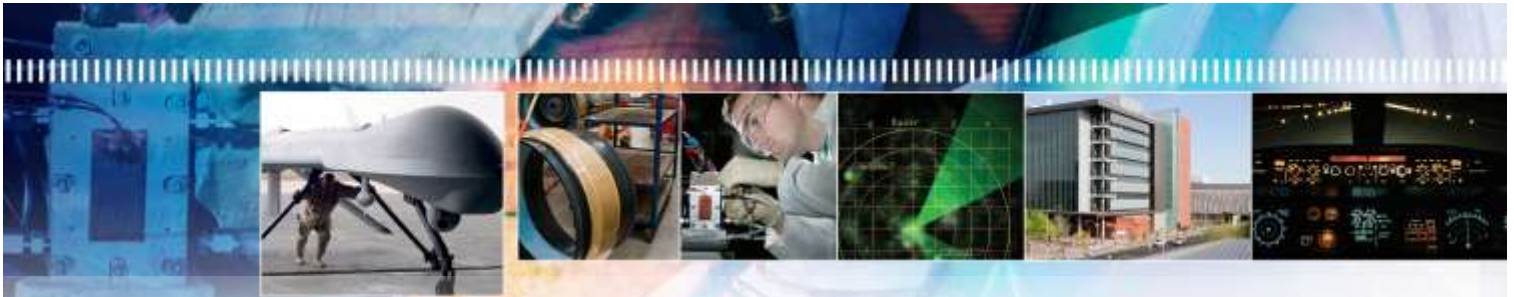
- FEDC received a \$4.2 million award from the U.S. Army as part of its original cooperative agreement for development of flexible display technology. Also, in FY13 FEDC made significant advances in new flexible technology production and applications, including successful fabrication of the world's largest flexible emissive OLED display on plastic.
- FEDC together with PARC, a Xerox company, successfully manufactured the world's largest flexible X-ray detector prototype using thin film transistors. The device measured 7.9 diagonal inches and will be used to advance the development of flexible X-ray detectors for use in thin, lightweight, conformable and highly rugged devices.
- In the first year of inception, CES has received over \$5 million in external funding and published over 12 journal articles. This remarkable achievement speaks to the high-quality of the research performed in the center.
- SDSI has partnered with the U.S. Army Electronic Proving Ground (USAEPG), headquartered at Fort Huachuca, AZ, in developing a new approach to the management of large and complex data sets generated during the Army network test events. As a result, the efficiency of network traffic analysis has been significantly improved, incorporating automation and data summarization. These new capabilities allow for better understanding of and planning for expected behavior of fielded systems.
- New SDSI research facilities, like the Autonomous System Technologies Research and Integration laboratory, provide access to valuable resources and technology used across a wide range of projects that support national security, including terrain mapping and delivery of critical care equipment to watercraft during inclement weather conditions.



In 2013, FEDC designed and manufactured the world's largest flexible X-ray detector and the world's largest flexible color organic light emitting display.

The Interdisciplinary Science and Technology Building IV, houses the Security and Defense Systems Initiative and the School of Earth and Space Exploration. This state-of-the-art, seven story building, prominently features interactive displays targeted to K-12 audiences throughout the first floor and collaborative laboratories and space command centers in upper floors.





WATER, ENVIRONMENT AND ENERGY SOLUTIONS

TRIF funding supports Water, Environment and Energy Solutions to tackle pressing issues in an increasingly urbanized world. ASU provided strong leadership to Arizona on current concerns in these areas and regularly provides expert opinions and research on topics that ranges from land use to economic drivers of energy policy. TRIF contributes directly to research in the area of creation of fuel from renewable resources such as cyanobacteria and algae; increased efficiency, distribution, and use of solar technology; and the impact of various types of land use, local and regional policy making bodies and utilities management on key economic and environmental indicators.

Water, Environment and Energy Solutions is where long-term strategy meets innovative exploration, where forecasting conquers tomorrow's emergency, and where the future of Arizona's residents is enhanced.

Goals

- The **LightWorks Initiative** assembles ASU's energy activities under a strategic framework that leverages ASU's broad strengths to tackle complex energy problems. Its capabilities range from basic research on biofuels and new materials discovery for photovoltaics to the applied developments of complex algorithms coupling weather forecasts with electrical grid distributions.
- The **Global Institute of Sustainability's Water and Environmental Sustainability** (GIOS) program carries out research on Arizona's ecosystems and promotes long-term, sustainable economic growth across the state.
- The **Decision Theater** (DT) is an innovative research facility that serves as a resource to help shape sophisticated and nuanced policy decisions concerning the needs of our modern world. It combines data-based system-sciences and technologies, with the operational perspectives of community, scientists and other thought leaders, allowing them to developing useful perspectives that address real-world challenges in water, environment and energy.



ASU student Phillip Carrier is the inaugural artist in residence at the Arizona Center for Algae Technology. He is spending two semesters fusing art and technology using tiny photosynthetic algae as inspiration for an art installation at the Herberger Institute School of Art.

"Great minds, from scientists and researchers to philosophers and poets, must work together to create a cultural shift toward a sustainable existence," says Gary Dirks, Director of GIOS and LightWorks. "Artists like Philip tell stories that instruct us or stimulate us into thinking about what that future is going to look like."

ASU welcomed the first cohort of students participating in the recently funded Integrative Graduate Education and Research Traineeship: Solar Utilization Network (IGERT SUN) program. Funded through the National Science Foundation, IGERT SUN is a unique interdisciplinary PhD training program covering multiple solar energy conversion areas and integrating policy and social understanding. ASU is ranked #2 in number of IGERT awards nationally and reflects ASU's commitment to academic achievement.





Summary of Accomplishments

The **Water, Environment and Energy Solutions** focus area made considerable gains towards its goal of finding solutions to the challenges posed by urbanization and the increasing demands for energy, water and clean air. Researchers in this area authored several key policy briefs, publications, and reports that continue to inform and guide critical decisions made by utilities and governments in regards to their sustainability practices, response to environmental regulation and delivery of renewable energy. ASU faculty and researchers in this area have designed unique, transdisciplinary programs that create future scholars, business leaders and policymakers who will proactively address emerging concerns in water, environment and energy. Funding supports cutting edge design and development of technologies like microgrids for solar power generation, and attracts new external and diverse partnerships, including the National Weather Service, while enabling small business startups, such as Heliae, a local algae technology company.

ASU's Utility of the Future convened "*Utility Summit on Demand Response and Energy Efficiency*," which attracted over 20 utility executives from across the nation (representing over 25% of the electricity generating capacity of the US). Attendees participated in scenario and strategy sessions surrounding federal regulations that later informed their internal policymaking and ongoing discussions with the Environmental Protection Agency.

Results - Impact

- LightWorks leveraged TRIF investments in a successful application to develop a national algae test bed public-private partnership (ATP³). Funded through a \$15 million award from the Department of Energy, ATP³ provides an open test bed and evaluation facility that supports the commercialization of algae-based biofuels and other biomass co-products. This is the only such facility supported by DOE. LightWorks researchers secured four patents related to algal energy production.
- Dr. Amy Landis, associate professor in the School of Sustainable Engineering and the Built Environment in the Ira A. Fulton Schools of Engineering, was awarded a contract from Cooper-Yulex as part of a project that examines the sustainability analysis of natural rubber tires.
- The Quantum Energy and Sustainable Solar Technologies (QESST) Engineering Research Center (ERC) continues to make great strides toward generating terawatts of electricity with minimal environmental impact, starting with ASU powering 50% of its buildings using solar electric power as of January 2013.
- Researchers at GIOS developed and successfully applied models to water and sediment regulation and valuation of ecosystem services. These results led to a meaningful dialogue between 20 organizations engaged in water and land management.
- DT was selected for an award by the National Oceanic and Atmospheric Administration for the study of social and behavioral influences on weather decisions.



Dr. Roy Curtiss, Director of the Center for Immunology and Vaccinology at the Biodesign Institute, and Dr. David Nielsen, Assistant Professor in the School for Engineering of Matter, Transport and Energy, are leveraging TRIF investments to design a system that will quickly and efficiently collect biofuel from photosynthetic organisms, minimizing use of harsh chemicals.

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innovation

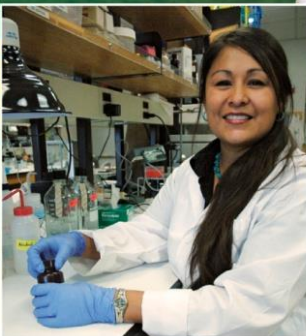
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**NORTHERN ARIZONA
UNIVERSITY**



INTRODUCTION

In spring of 2011, the Arizona Board of Regents approved the following initiatives under Northern Arizona University's FY12-FY16 TRIF Business Plan.

WATER, ENERGY, AND ENVIRONMENTAL SOLUTIONS (WEES)

Northern Arizona University's WEES initiative comprises two programs: Solutions for Arizona's Rural Landscapes encourages and supports rigorous scientific research and sound scientific and technical support to minimize catastrophic wildfire risks, rebuild a forest products economy, promote collaborative conservation planning and analysis using landscape-scale spatial data, and to convene rural and tribal community stakeholders to explore economic alternatives such as renewable energy development. Climate and Energy Solutions explores and evaluates energy development and environmental context in Arizona. Northern Arizona's University's strength in environmental science and policy, climate science and wind energy, and the collaboration between stakeholders, communities, and tribes serves as the foundation for increasingly visible and ambitious programs that contribute to building Arizona's economic future.

IMPROVING HEALTH

The overall goal of NAU's Improving Health initiative is to strengthen and grow Arizona's biosciences economy through significant investments in research infrastructure, technology transfer capacity, and applied research projects designed to result in tangible intellectual property that can be commercialized through licensing and the formation of university spin-offs. Investments in FY13 included individual research projects and investments in campus-wide research capacity in the form of new postdoctoral associates, shared research equipment and establishment of a rapid prototyping laboratory.



Mount Eldon Middle School students ask questions while building an "energy bike". The students worked on the bicycle generator project with guidance from NAU's Institute for Sustainable Energy Solutions. Courtesy of AZ Daily Sun.

ACCESS AND WORKFORCE DEVELOPMENT (AWD)

Northern Arizona University's AWD initiative addresses the need of Arizona employers, as well as their current and future employees, to support the state's economic growth. NAU addresses this need through the development and delivery of courses and degree programs to support workforce development in program areas such as health, teacher education, and business and nonprofit managers; and the use of technologies to increase student achievement, accelerate student progress through degree completion and enhance efficiency across university courses and programs.



WATER, ENERGY & ENVIRONMENTAL SOLUTIONS (WEES)

Arizona's TRIF investment in Northern Arizona University under the WEES initiative funds a number of projects designed to identify and catalyze economic opportunities for Arizonans that sustain environmental and social values. In FY13, NAU leveraged its historical strengths in environmental science and policy, climate science and wind energy while introducing new visible and ambitious projects that contributed to building Arizona's sustainable future.

Goals

- **New Initiatives in FY13: REAP and SPA Programs.** Catalyze the advancement of research and research training capacities through the acquisition of new talent and state-of-the-art research equipment. In FY13, NAU faculty recruited 13 post-doctoral scholars from top-tier research universities for two-year fellowships at NAU through the **Support for Post-doctoral Associates (SPA)** Program. These scholars bring to NAU new technical capacities and expertise that did not currently exist at NAU and are expected to stimulate new research ideas, collaborations, entrepreneurship and innovation with the potential to deliver increased extramural funding, intellectual property and student research training opportunities. In addition, through the **Research Equipment Acquisition Program (REAP)**, teams of NAU researchers collaborated to acquire state-of-the-art research equipment that extends NAU's current research and research training capacities in both laboratory and field investigations, and that will make NAU investigators more competitive for extramural funding.
- **Ecological Restoration Institute.** Provide leadership in the development of solutions to the costly environmental problem of degraded forest health, water quality and availability and alternative energy fuel in the form of biomass and biodiesel. Contribute to workforce development by providing quality undergraduate and graduate funding, fieldwork, and education in forest restoration.
- **Landscape Conservation Initiative.** Through the establishment of this new institute, engage students, decision makers, and the public in meaningful dialog, grounded in robust science, to help forge solutions to landscape conservation and sustainable community development.
- **Institute for Sustainable Energy Solutions.** Establish a new institute to build the research base at NAU through increased opportunities for proposal submissions and acceptance with external partners. The strategic participation in regional and national meetings will develop collaborations with researchers at other Arizona universities and prominent research universities nationwide.
- **Merriam-Powell Center for Environmental Research.** Expand and market the availability of field stations, experimental arrays, and facilities for geospatial analysis and biodiversity studies. Such expanded capability and visibility will be aimed both at increased leveraging of grant funding and at a transition toward self-sustaining status for the field stations and facilities.



Summary of Accomplishments

In FY13, NAU invested TRIF-WEES funds in projects and activities whose outcomes were intended to stimulate the state's economy through research innovation, partnerships in sustainable solutions research, research training and technical assistance.

Outcomes

- Recruited six post-doctoral scholars (from top-tier research institutions) with expertise in Paleoclimatology, ecohydrology, wind and solar energy, environmental sciences and acoustics.
- Start-up consultancy Conservation Science Partners, Inc. (CSP) (a spin-off of NAU's Landscape Conservation Initiative) increased staff from two to seven and expanded its presence into California and Colorado.
- Produced a full-length documentary, "A Thousand Invisible Cords: Connecting Genes to Ecosystems", showcasing the 20-year body of work of Regents' Professor Tom Whitham of NAU's Merriam Powell Center for Environmental Research (MPCER). This documentary has been screened by over 150 PBS stations, has been publically shown in France, Australia and Chile, and has won a number of film-making awards.



Karin Wadsack of the NAU Institute for Sustainable Energy Solutions (left), receives the Outstanding Young Advocate Award at the WPA All-States Summit in Atlanta. NREL/PIX 21971



The TRIF-funded Landscape Conservation Initiative is investigating the effects of grazing and large catastrophic wildfires on small mammal communities in high-elevation meadows.

- Established a number of international collaborations to expand the Southwest Experimental Garden Array (funded through a \$2.5 million NSF Major Research Instrumentation Award received in October, 2012) into a Global project.
- Merriam Powell's Colorado Plateau Museum of Arthropod Biodiversity and nine collaborating arthropod collections received a three-year, \$2.1 million grant from the NSF to create a virtual information network on ground-dwelling arthropods.
- Ecological Restoration Institute produced two key reports associated with the 2010 Schultz Fire: "Efficacy of Hazardous Fuel Treatments" and "Full Cost Accounting of the Schulz Fire" (the latter produced in conjunction with NAU's W.A. Franke College of Business and the Rural Policy Institute). Media generated by the release of these reports was significant, involving 426 news outlets.



IMPROVING HEALTH: Investing in Biotechnology and Bioengineering

The mission of the I-Health initiative is to strengthen the university as an innovator and facilitator, translating biotechnology and bioengineering into economic activity. In FY13, NAU built upon existing regional and state-wide economic development partnerships to strengthen its ability to commercialize university innovations through licensing and the formation of spin-offs, and continued to encourage and support applied research designed to solve real-world problems and generate intellectual property.

Goals

- **Build Capacity in Technology Transfer.** Up until FY12, Northern Arizona University's technology transfer activities were largely conducted by a combination of outside organizations and consultants (e.g., such as through the Northern Arizona Center for Entrepreneurship and Technology) supported by in-house staff. However, in order to maximize the potential economic benefit of the outcomes of NAU research through commercialization, NAU set out in FY12 to strengthen internal capacity so that technology transfer at NAU is managed by a professional in-house staff which utilizes outside entities such as NACET and NAU Ventures (a subsidiary of the NAU Foundation) for supporting activities. These efforts are expected to be ongoing throughout the FY12-FY16 Business Plan period.
- **Catalyze development of intellectual property (IP).** Provide project-based financial support to faculty whose research has the potential to generate outcomes suitable for commercialization through licensing to established companies and/or the formation of spin-offs; build and strengthen relationships with state-wide partners to facilitate the acquisition of funding and technical assistance necessary to grow successful spin-offs.
- **Build institutional capacity to expand bioscience research.** Establish and implement competitive internal grant programs, such as the REAP and SPA programs (*see WEES Goals*) designed to make targeted investments in bioscience-related research infrastructure that will result in the growth of the research enterprise and allow NAU researchers to compete more successfully for external funds.
- **Establish a state-of-the-art, rapid prototyping facility.** As NAU has placed a greater emphasis on generating tangible intellectual property, researchers across campus demonstrated the need for a facility that would provide design and manufacturing expertise and equipment and assist in the reduction to practice of innovations coming out of NAU.
- **Invest in the Center for Microbial Genetics and Genomics.** Investments aimed at enhancing synergies between Northern Arizona University and the Translational Genomics Research (TGen) Institute through the support of individuals jointly appointed.



Summary of Accomplishments

In FY13, NAU invested TRIF I-Health dollars to encourage interdisciplinary research and innovation in biosciences and biotechnology strategically designed to strengthen and expand NAU's contributions to Arizona's bioscience economy.

Outcomes

- Submitted one provisional and three non-provisional patent applications for intellectual property developed exclusively through research supported by the TRIF I-Health initiative
- Recruited six post-doctoral scholars (from top-tier research institutions) with expertise in bioinformatics, molecular/cellular biology, biomechanics and neuroengineering, and microbial genomics.
- Received TechConnect 2013 National Innovation Award for the iTester™, a hand-held multiple assay reader developed largely with TRIF funds by NAU researchers.
- Provided over 1,000 hours of services to NAU faculty through the NAU RAPIDLab (Realization of Advanced Products and Innovative Design) facility for the design and development of prototypes, research tools and components. Establishment of this lab has resulted in the initiation of discussions with PADT, Inc. regarding a partnership to provide services for their clients in Northern Arizona.
- Center for Microbial Genetics and Genomics (MGGen) Director Paul Keim received the 2012 Bioscience Researcher of the Year Award from the Arizona Bioindustry Association!
- Received a \$600,000 Partnerships for Innovation grant from the National Science Foundation for the project, "Emulating Biological Actuation", which has catalyzed the commercialization of intellectual property developed (in part) with TRIF funding.



The iTester™ device is designed to accept a cassette cartridge of up to seven individual lateral flow assays, and it quantifies the assay, displays the assay results, and archives/exports the data to a database server.



Paul Keim- Regents' Professor of Biology and Cowden Endowed Chair in Microbiology in his lab on NAU's Flagstaff Campus



ACCESS/WORKFORCE DEVELOPMENT

One of Northern Arizona University's (NAU) strengths is access and workforce development. For over 30 years, NAU has served rural and urban communities throughout Arizona, providing opportunities for place- or time-bound citizens to continue their educational progress. Three-quarters of NAU's Extended Campuses students work at least 32 hours per week.

This initiative focuses on shortages of teachers, health-care professionals, trained managers and information technology professionals. The goal is to make quality programs available in locations and through delivery methods that suit student need. Thirty-six rural and urban sites offer face-to-face contact, a wide variety of on-line and hybrid programs, and flexible scheduling, all of which support students to learn while balancing work and other commitments. Courses can be completed in as little as seven weeks and numerous programs allow students to transfer as many as 90 credit hours from an Arizona community college, leaving only 30 NAU units needed to complete a bachelor's degree. These transfer friendly programs are among the most affordable four year degree options in the state of Arizona. Students can also receive admission, enrollment, payment, and other services in-person and through the Extended Campuses Service Center, which is available by toll-free phone, email, and online chat.

Partnerships with Arizona community colleges continue to thrive. The 2NAU joint admission program continues to attract students as it is structured to provide access to a four-year degree through seamless transition from the community college to NAU. Students are jointly admitted to their community college and NAU so their coursework at each institution is tailored to ensure their goals are met in the most affordable and efficient way. The program's more than 3,400 participants in 2013 reflect the statewide demand for this innovative pathway (including participants from the Maricopa Community College District, Cochise Community College, Pima Community College, Central Arizona Community College, Eastern Arizona Community College, Mohave Community College, Yavapai College, Arizona Western College, and Coconino Community College).

Extended Campuses conducted a thorough review of the enrollment process during the 2012/13 academic year. With a focus on removing obstacles to enrollment and identifying opportunities to improve the service and information provided to students, this evaluation resulted in significant staff reorganization and improved business processes. As most of the students pursuing AWD programs are adults who work and have other commitments, streamlining the processes surrounding enrolling in classes is essential to their success. This effort will continue through the upcoming year and reflects NAU's ongoing commitment to offer programs that best serve the needs of the state.



E-LEARNING

Established in 2001, the e-Learning initiative has been improving student learning and supporting successful degree completion through engaging, effective and efficient use of technology. Over the past year the eLearning Center (ELC) completed the majority of course migrations from Blackboard (Bb) Vista to Bb Learn Learning Management System (LMS). As these two LMS's were initially significantly different, and as Bb Learn continues to change, a triage process was developed to repair and update courses as needed. In addition, a template has been developed and is being piloted by several departments for use in maintaining consistency in the look and feel of NAU web courses and simplifying and enhancing the student experience.

Continued efforts to support student success include providing training courses for faculty that focus on basic technology skills and on teaching with and through technology. The teaching course is technology agnostic with a focus on pedagogy and technique for engaging students in online and blended courses.

The eLearning Center provided on-going support for faculty through technology based activities that included implementing a new classroom response system (iclickers) and migrating to a new Web Conference server system. Both of these activities required rewriting support materials and providing training and support for faculty as well as migrating and updating course materials.

The ELC Faculty Helpline also provides dedicated support Monday – Friday, 7am – 6pm via telephone, and 24/7 via email. Assistance is provided by ELC staff and student employees, support staff from across NAU (ITS, CASA, Extended Campuses, Cline Library, etc.), and occasional vendor support (e.g., Blackboard, e-Instruction, etc.). The Helpline supports over 12,600 requests on an annual basis. ELC also provides faculty with training on Bb Learn and other web & technology tools. The majority of the training offered has been related to Bb Learn's Learning Management System (LMS). The table below details the number of attendees of Bb Learn trainings by college and workshop title.

Workshop Title	Attendees by College						Totals
	Engineering, Forestry, & Natural Sciences	Social & Behavior Sciences	Health & Human Services	WA Franke College of Business	Arts and Letters	Education	
Introduction to Bb Learn	52	41	27	37	66	20	243
Organizing Content	43	20	14	19	41	9	146
Communicating with Students	34	18	15	17	29	8	121
Grading Student Work	36	23	16	24	33	8	140
Developing Learning Activities	26	15	14	20	33	10	118
Your Migrated Course	17	15	8	10	22	8	80
Boot Camp	25	63	14	7	10	50	169
Totals	233	195	108	134	234	113	1,017

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innovation

exploration

discovery

UA

creativity

integrity

opportunity





At the University of Arizona, TRIF promotes the economic development of the state by catalyzing innovative research in target areas of high impact, facilitating the translation of research results into new products and services that benefit the health, security, and prosperity of Arizonans, and educating students—from elementary to graduate school—to be science and innovation leaders who will create Arizona’s bright high-technology future.

TRIF activities fall under four initiatives:

- **Improving Health** supports UA researchers who are tackling complex and pressing health problems of critical importance to Arizona and the nation, as well as major challenges in the agricultural sciences. With a focus on harnessing large data sets and addressing unmet needs in medicine, we are building the brain trust, infrastructure, and collaborations with stakeholders to transfer bioscience research breakthroughs into applications that directly benefit society.
- **Optics and Space Sciences** supports development and commercialization of the extraordinary applied research of UA’s top-ranked optics and space sciences programs. Through interdisciplinary research and educational efforts, this initiative facilitates breakthrough technology for applications as diverse as unmanned aerial vehicles, semiconductor manufacturing, and laser surgery.



*Jennifer Barton, Ph.D., Interim
Vice President for Research*

“TRIF funding provides critically needed support in areas of high strategic value to the state of Arizona. The funds generate and prove innovative scientific concepts, develop new technologies, and translate significant research findings into commercial use.”

- **Water, Environmental, and Energy Solutions** seeks sustainable solutions to Arizona’s water, environmental, and energy resource challenges, with far-reaching societal benefits. WEES projects aim to secure adequate supplies of clean water for Arizona’s economic vitality and the health and well-being of its residents, optimize sustainable use of its lands, and create a vibrant renewable energy industry.
- **Tech Launch Arizona**, a new technology commercialization center, aims to accelerate the process that moves UA discoveries from the lab to the marketplace, providing a more direct avenue for UA inventions to be licensed to companies. Tech Launch Arizona will streamline the translation of research results to practical applications and help the state foster a knowledge-based economy for the twenty-first century.



IMPROVING HEALTH INITIATIVE

TRIF investments in the UA have resulted in outstanding infrastructure and tangible results. World-class basic biology labs are discovering clues to the genetic basis of disease and drought-resistant crops, a drug discovery and development center is testing new treatments, and the BIO5 Institute is bringing together scientists, engineers, and physicians who have fresh approaches to complex problems. The Improving Health Initiative nurtures physician-scientists who want to apply their discoveries to practice. With its rare combination of assets—a teaching hospital, outstanding clinical expertise, and Tech Launch Arizona—the UA is uniquely positioned to facilitate translation of research into health solutions and applications that also benefit the Arizona economy.

Goals

- *Establish shared resources* in computational approaches, cyberinfrastructure, imaging, high-throughput screening, genomics, proteomics, and cell sorting across all biological disciplines. This collaborative approach is increasingly required by funding agencies to apply for large-scale grants needed to boost research.
- *Extend the iPlant big data paradigm* to other bioscience-related disciplines, building on the success of the BIO5 Institute-based iPlant Collaborative, to which NSF has awarded another \$50 million over the next five years.
- *Continue the experiential engagement of the next generation of scientists* by expanding the KEYS (Keep Engaging Youth in Science) high school research program, facilitating industry internships with companies like Ventana Medical Systems and Sanofi, and providing leadership in science outreach and literacy through events such as our Science City at the Tucson Festival of Books.



Thomas W. Keating Bioresearch Building, home of the BIO5 Institute

TRIF funding that helped launch BIO5 continues to be a catalyst in establishing major initiatives that provide a return on investment to the people of Arizona.



"You see the potential we have yet to realize in ourselves, and I truly believe KEYS is the perfect first step in helping students such as myself make an impact on the world."

Morgan "Mackenzie" Brown, KEYS 2013 intern



New advanced MRI system for basic and translational research.



Summary of Accomplishments

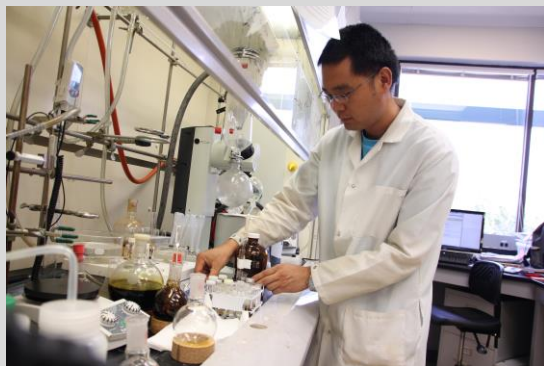
Through the support of TRIF funds, BIO5 continues to enable clinical and translational science research breakthroughs at the University of Arizona. With the evolution of novel treatments for lymphoma and thyroid cancer, new methods to study genetic variations that may increase the risk of sudden cardiac death, and promising new ways to prevent necrotizing enterocolitis in premature infants, we have made significant progress in the fight to improve health and save lives.

Additionally, with the recruitment of experts in the field of computer and information technologies who collaborate with our climate, genetics, and imaging researchers, we have laid the foundation for our major initiative in computational approaches to the life sciences. Many of these researchers will be housed in our new biosciences research laboratory building and will make us more competitive for big data/bioinformatics research grants.



Carol Barnes, Ph.D., Regents' Professor, McKnight Brain Institute Director and BIO5 Institute Associate Director

"The UA is uniquely poised to catalyze neuroscience-related efforts around President Obama's BRAIN Initiative. We already have scientists working collaboratively in physics, engineering and optics, nanotechnology, information technology and neuroscience that will revolutionize how we study the brain."



As part of BIO5's drug discovery and development program, a major translational project in the development of new treatments for thyroid cancer headed by Dr. Hong-yu Li was recently approved by the National Center for Advancing Translational Sciences, allowing for the transformation of discoveries into specific clinical application.

Results – Impact

- Leveraged funding from NSF, NIH, and other sources for a total of \$45 million.
- 390+ publications by TRIF-supported researchers.
- Expanded the KEYS high school internship program to 48 students working in 45 different UA laboratories.
- Hosted successful global conferences in plant breeding and aging, and led a major outreach effort on science literacy.
- Dr. Fernando Martinez, Director of BIO5, was one of only 200 scientists nationwide invited to attend the White House unveiling of President Obama's BRAIN Initiative.

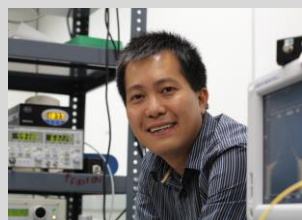


OPTICAL SCIENCES and TECHNOLOGY

The TRIF Optical Sciences and Technology Program seeks to incubate novel research directions, expand the breadth and depth of education for students in optics-related fields, and positively impact regional economic development by leveraging the University's world-renowned optics resources to attract significant federal research funds, create new companies and products, and be the world's go-to intellectual and technological resource for space science and optics.

Goals

- *Leverage TRIF funds* to obtain at least a ten-fold return-on-investment through increased external research funding, to develop new technologies and provide student and staff support.
- *Identify and support key optics faculty hires* in strategic areas of need and opportunity across the University of Arizona campus.
- *Create new shared imaging and photonics infrastructure and facilities* that broadly benefit the research and education missions of the University and are a world-wide resource.
- *Support workforce development* through increased student fellowships by enhancing outreach to companies and under-represented Arizona populations to help increase the number of trained minority students.
- *Encourage technology transfer*, helping create new start-ups and expand innovation activities.



*Khanh Kieu, Ph.D.,
Asst. Professor,
Optical Sciences*

"Thanks to the TRIF funding, I have been able to set up a state-of-the-art laboratory to do research in ultrafast and nonlinear optics. I have leveraged my TRIF support to recently secure \$1.25M from Air Force Office of Scientific Research under a MURI (Multidisciplinary University Research Initiative) to develop nonlinear devices for photonic communication and optical signal processing, and \$600K from Canon Inc. to develop new compact fiber lasers that can replace the bulky, expensive lasers used today in surgery and medical imaging applications."

Summary of Accomplishments

This year investments in the TRIF Optical Sciences and Technology program again spawned exciting new faculty research directions, new research infrastructure, and enhanced outreach programs.

Dr. Russell Witte in the College of Medicine's Department of Medical Imaging used TRIF funding to establish a medical imaging research lab. He and his colleagues secured a \$1.5 million contract from the Defense Advanced Research Projects Agency that aims to demonstrate the extension of a remarkable new method—first developed for breast cancer imaging—to detect improvised explosive devices (IEDs) on the battlefield.

The TRIF Imaging team has also procured a new state-of-the-art Atomic Force Microscope, located in the W.M. Keck Center for Surface and Interface Imaging. The Keck Center supports the innovations of more than 50 research investigators and 200 undergraduate and graduate students and postdoctoral scholars working in a broad range of optical, semiconductor, and bio-technologies.



Summary of Accomplishments (cont'd)

In Photonics, the College of Optical Sciences used TRIF support to hire Dr. Khanh Kieu and set up his state-of-the-art laboratory for ultrafast and nonlinear optics. This hire has already yielded major research grants ranging from nonlinear optical signal processing for the Air Force to ultra-compact commercial sources for laser surgery. Dr. Stanley Pau was able to secure substantial Department of Defense awards to develop new optical filter and sensor device technologies, using preliminary results from studies made possible by TRIF funding for graduate students and laboratory equipment. TRIF funding was also essential in obtaining the \$18.7 million in NSF funds received to date for the Center for Integrated Access Networks (CIAN) Engineering Research Center led by Dr. Nasser Peyghambarian.

The College of Optical Sciences invested in a new nanometer-precise optical surface generator that will enable breakthroughs in areas such as biomedical imaging, wearable displays, and ultra-light camera systems for unmanned aerial vehicles. Prior TRIF investments to develop computer-controlled polishing machines in our Optics Shop helped to secure \$4.4 million for an international consortium for one of the world's largest telescopes.

The TRIF Optical Sciences and Technology program also excels at workforce development through support for graduate and post-doctoral students. TRIF seed funding was also key to securing NSF awards totaling \$344,000 for student participation in national workshops and for outreach enabling regional teachers and community college faculty from Native American-serving institutions to bring high-tech optics programs to their classrooms.

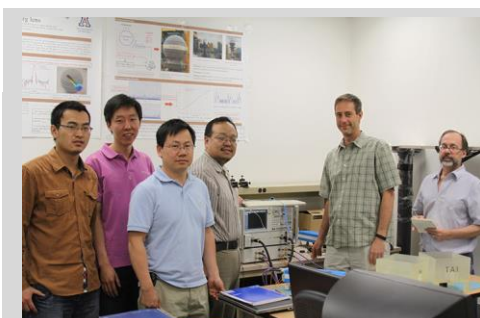
Results – Impact

- \$55M of new TRIF-seeded research funding.
- Provided support for 60 graduate students and postdoctoral researchers.
- 3 new strategic faculty hires supported.
- 37 invention disclosures, 9 patents issued, 6 license/option agreements, and 1 start-up company.
- 110 scientific conference presentations and 80 journal publications.



*Stanley Pau, Ph.D.,
Associate Professor, Optical
Science*

“By leveraging TRIF funding to support graduate students and unique lab equipment, preliminary results allowed us to win research contracts from the Department of Defense for \$600,000 to develop new technology for optical filters and novel prototype sensor devices.”



Russell Witte, Ph.D., Associate Professor, Medical Imaging, Optical Sciences and Biomedical Engineering (second from right), with collaborator Prof. Hao Xin and their research team.

“TRIF funding has been critical to outfitting my biomedical imaging lab where we are demonstrating remarkable new techniques with applications ranging from cancer detection to sensing explosives on the battlefield. The TRIF funding was key to getting our recent \$1.5M DARPA grant for remote IED detection. “



WATER, ENVIRONMENTAL, and ENERGY SOLUTIONS

The Water, Environmental, and Energy Solutions (WEES) initiative is developing innovative, practical solutions necessary for water, environmental, and energy sustainability in Arizona and other semi-arid regions facing increasing demands on natural resources and the uncertainties of climate variability. WEES projects help to secure adequate supplies of clean water for Arizona's economic vitality and the health of its residents, provide a foundation of knowledge to optimize sustainable use of Arizona's lands, create an Arizona that is resilient in the face of climate variability, and lead the creation of a vibrant renewable energy industry in the state.



Dr. Linda Samuels, director of the UA Sustainable Cities Project, partnered with the City of Tucson and local businesses to identify opportunities to improve economic development in Tucson's Warehouse Arts and Rail District. The project was one of eight invited to the Sustainable Cities Design Academy, where participants collaborated with urban planners from across the country.

Goals

- *Build on the UA's world-renowned expertise in water and climate variability and its emerging excellence in the renewable energy sector to enhance multi-disciplinary collaboration for science, technology, and policy studies.*
- *Focus on use-inspired research performed by multi-disciplinary teams that will result in innovative, practical solutions.*
- *Leverage investment in strategic areas to increase public and private sector funding and increase the rate of technology transfer and commercial development.*
- *Train a new generation of scientists, engineers, and other professionals.*



Regents' Professor of Astronomy and Optical Sciences Roger Angel is working to make solar power more cost-effective. He secured a \$1 million grant from the U.S. Department of Energy to improve manufacturing techniques for concentrated solar power mirrors (left). Industry partner Rioglass Solar is one of the world's largest manufacturers of parabolic trough mirrors and has a large plant in Surprise, Arizona.

Ph.D. candidate Brian Wheelwright (right), who works in Angel's lab and received a TRIF scholarship, hosted a solar energy workshop as part of the Arizona Center for STEM Teachers' summer institute at Biosphere 2.





Summary of Accomplishments

WEES investments supported the completion of and first experiments at the UA's Biosphere 2 Landscape Evolution Observatory. This giant, state-of-the-art laboratory is being used to study how our landscapes respond to environmental changes such as floods, drought, and temperature extremes.

Dr. Shirley Papuga in the School of Natural Resources and the Environment leveraged WEES support into a \$500,000 National Science Foundation Career Award for outstanding research integrated with excellent education. She studies arid ecosystems, particularly how they respond to ongoing drought and heat.

The newly published *Assessment of Climate Change in the Southwest United States* is a key reference for resource managers to understand the choices and opportunities available for society to reduce the causes and effects of climate change on our ecosystems, water resources, agricultural production, energy supply and delivery, transportation, and human health.

WEES funds were key to securing a 5-year renewal of the \$3.5 million CLIMAS program. The grant will allow scientists to examine how residents in the rapidly growing Southwest can plan for and adapt to drought and other climate-related changes such as vector-borne diseases, air quality, and heat waves.

Results - Impact

- Investments in faculty and research resulted in \$34M in new grants and gifts to the UA.
- Supported 314 graduate students, 85 undergraduates, and 49 postdoctoral researchers through salary, assistantships, travel grants, scholarships, research experience, and internships.
- WEES-supported faculty initiated 21 new invention disclosures, 2 patents, and 1 startup company; in addition, 1 license and option was executed.
- Sponsored 70 lectures, workshops, and other events.
- Provided salary and startup support to 13 new faculty.
- Established the Environment, Exposure Science and Risk Assessment Center to unite university researchers, industry, and communities in addressing chemical, biological, and physical hazards.



Dr. Raina Maier, environmental microbiologist and director of the UA's Superfund Research Program, leads an effort to collaborate with several major mining companies to address important environmental issues including dust control, remediation of mining wastes, and recovery of critical minerals from mining waste streams using bacterial surfactants. Maier was recently recognized as a UA Leading Edge Researcher for her work on the discovery and environmental applications of bacterial surfactants now on the path to commercialization. In 2013 Maier brought more than \$2.6 million in new grants. Her work is an example of the range of WEES investments into cutting-edge research on water quality, pollution cleanup, and water reuse.



TECH LAUNCH ARIZONA

The Tech Launch Arizona (TLA) Initiative seeks to be a key leader in the University of Arizona's mission to contribute to the economic development of southern Arizona and the nation by fostering innovation, expediting the technology commercialization process, and generating new companies. Established in September 2012, TLA is a newly created cabinet-level unit at the University of Arizona that represents a reprioritization, restructuring, and resource enhancement of fostering the UA's technology commercialization efforts, industry-sponsored research efforts, and the university's connection with its technology parks. TLA will move knowledge and inventions developed by UA researchers into the market, with the primary goal of unifying UA research and business communities. This will significantly enhance the impact of university research, intellectual property (IP), technological innovation, and assets of the UA Tech Parks. TLA will direct the Offices of Technology Transfer (OTT), Corporate and Business Relations (OCBR), and University Research Parks (OURP). Together, these units will carry out the TLA objectives.

Goals

- *Expedite movement of UA research-derived intellectual property* into the commercial sphere to foster the further development of these assets along the appropriate commercial trajectory.
- *Effectively leverage local domain experts* and business development professionals to assist with technology commercialization.
- *Engage faculty researchers* in a way that encourages participation in the commercialization process and guarantees a culture of service excellence in the TLA family of organizations.
- *Promote engagement with private businesses* by ensuring the UA's research, knowledge, IP, and research park assets are fully leveraged for mutually beneficial outcomes
- *Grow the University's return on its efforts* through enhanced reputation, larger economic development impact in Arizona, increased industry-sponsored research partnerships, and increased licensing revenues.
- *Expand the Proof of Concept Program* to grow over \$750,000 of TRIF funding in FY2014.



"We will adopt innovative practices based on transparency and rewarding productivity, effectiveness, and entrepreneurship."

-- President Ann Weaver Hart, Inauguration Speech, November 30, 2012



Summary of Accomplishments

Dr. David Allen was hired in August 2012 to serve as the Vice President and Executive Director of TLA. He comes to us from the University of Colorado system, where for the last ten years he led a similar transformation in research outcomes and economic development. He reports directly to the UA President and serves on her leadership cabinet, giving TLA unprecedented integration with the upper administration and the direction of the research enterprise.

TLA has focused on building a capable leadership team to move the UA toward its goals through key hires that included: Sherry Hoskinson, Director of Commercialization Networks; Lewis Humphreys, Marketing and Communications Manager; and Doug Hockstad, Director of the Office of Technology Transfer. In April 2013, TLA unveiled its strategic plan—the *TLA Roadmap*—to the University and business community. This strategic plan will guide UA translation of research-based knowledge to social and economic benefit at a level not previously witnessed by the UA.

Late in 2012, TLA introduced the Proof of Concept Program at the UA, awarding \$715,000 of TLA TRIF funds, including a contribution from the WEES TRIF Initiative, to help investigators test critical technical or commercial dimensions of their technologies and move them closer to market. Recipients represented a broad spectrum of research, spanning 33 UA departments. This program represents an important aspect of UA's new institutional support for technology development and commercialization. TLA Director Allen stated, "This money is generally very difficult to access, but often means the difference between a promising technology with important social benefits, moving closer to commercialization—or being shelved. It is an important investment by Tech Launch Arizona."

Results – Impact

For fiscal year 2013, some key technology transfer achievements were as follows:

- 144 invention disclosures;
- 45 licenses & options, of which 8 are licenses and options to Arizona companies;
- 135 patent applications; 21 U.S. patents Issued;
- 3 startup companies, all of which are in Tucson, Arizona;
- \$926,023 patent royalty income.



David N. Allen, Ph.D., Vice President and Executive Director of Tech Launch Arizona

With Dr. Allen's leadership, TLA will strengthen business and research partnerships, and expand our capacity for technology commercialization.

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innovation

exploration

discovery

ABOR System Office

CREATIVITY

integrity

opportunity



The Regents Innovation Fund has been instrumental in supporting the research activities of the universities, and contributing toward collaborative efforts among the universities and with community partners.

In FY 2013, the Regents' Innovation Fund continued to support one on-going project: National Student Clearinghouse. In the late fall 2011, four additional projects received funding from one-time cash balances in the Regents' Innovation Fund: 1) Sci Val, 2) Regents' Graduate Grants, 3) Center for the Future of Arizona, and 4) ABOR Research Information Technology.

In February 2013, after a competitive process, three new, tri-university collaborative projects were approved for funding: 1) Using Wastewater for Mass Culture of Algae for Food, Feed and Fuel; 2) Planning, Development and Implementation of a Statewide Research Initiative in Environmental Informatics: Arizona Environmental Grid Infrastructure Service (AEGIS); and 3) Establishing a Digital Research Infrastructure for Arizona's 21st Century Universities Research Enterprise. These three projects combine the talent and resources of our three public universities. The first project (Wastewater and Algae) addresses an area of economic growth to the state. The next two projects are focused on building infrastructure to grow the research enterprise at the universities with the intent of attracting more federal projects and grant dollars. These three new projects were only recently funded; as such, there is no progress report at this time. Instead, a summary of each project proposal and goals are shared in this report.

NATIONAL STUDENT CLEARINGHOUSE

The Clearinghouse provides a nationwide, central repository of information on the enrollment status and educational achievements of postsecondary students. Participating educational institutions submit to the Clearinghouse information on the enrollment statuses of all of their students and listings of the alumni to whom they have awarded degrees or certificates.

As part of a multi-year agreement, ABOR is able to access the Clearinghouse data provided back to the Arizona Department of Education. This information is used in analyzing and reporting the postsecondary activity of our high school graduates as relevant to the Enterprise Model goals and economic development objectives of the state of Arizona.



CENTER FOR THE FUTURE OF ARIZONA (CFA)

This investment supported the Center’s three statewide initiatives—Beat the Odds, Move On When Ready and The Arizona We Want—continue to grow in visibility, momentum and measurable outcomes.

Beat the Odds was created to increase “achievement per student” in K-12, low-income, Latino-intensive schools by working with principles to raise expectations among teachers, students and parents. Increased growth was possible with TRIF funding to support the sophisticated communications infrastructure to connect principals to one another and to the Center for interactive programming and sharing. The program reached 70% of low-income students and 66% of minority/Latino Students.

The *Move On When Ready* initiative is led by the Center. The goal is prepare all high school students to be college-career ready by implementing a performance-based education model that increases academic achievement to national and international levels. The model eliminates “seat time” requirements for high school graduation and enables students to advance based on demonstrated mastery of academic content. 30 high school and 10 middle schools in both urban and rural Arizona communities are now participating.

The Arizona We Want research shows, improving Arizona’s education outcomes is a critical goal to citizens. Arizonans want their children to be “college-career ready” when they graduate from high school; they want graduation requirements to align with national and international standards; they want students to be able to customize their education pathway to meet their personal goals.

One key finding from the Center’s research is that education drives both the Arizona economy and its civic health. There is a direct and measurable correlation between levels of education attainment and unemployment rates, voter turnout and the full range of civic engagement and community involvement indicators measured annually by the Arizona Civic Health Index.

Unfortunately, high expectations are not enough. Despite the high consensus and all the progress made on education policy over the past few years, achieving these goals will continue to be an uphill struggle unless Arizonans are willing to mobilize and fully engage in the civic life of their community and state.

UNEMPLOYMENT RATES BY EDUCATION IN ARIZONA



Source: U.S. Census, 2010 American Community Survey

VOTE IN LOCAL ELECTIONS

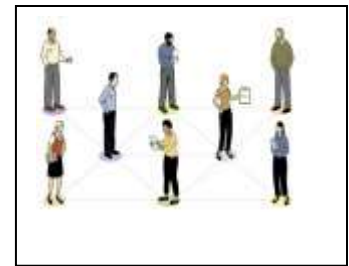


Source: 2012 Arizona Civic Health Index



SCIVAL

SciVal Experts is an online, public facing IT system for cataloging the expertise of faculty and other researchers across the Arizona University System. Profiled faculty and other researchers' publications in more than 19,000 peer reviewed journals as well as other works such as proposals, awards, courses taught, etc., are analyzed using sophisticated text mining techniques to create a searchable catalog of expertise across the system's three universities. SciVal Experts will allow users to quickly identify university system capabilities in various fields and will support collaboration within the system's universities as well as with external partners. The SciVal system will enable students to identify faculty working in their areas of interest for mentorships and research opportunities.



Representatives from ASU and UofA negotiated pricing and terms with the vendor. The system subscription exceeded the ABOR/TRIF funding commitment. In December 2012, additional financial support was obtained from the Arizona Commerce Authority.

The system data is being populated based upon criteria negotiated and identified by the 3 universities for experts to be profiled, and tiers of experts.

ABOR RESEARCH INFORMATION TECHNOLOGY

The purpose of the funding is to provide additional support in the area of information technology for the university system. This additional support will be in the form of ensuring data and system integrity in the IT systems which support the research mission.



GRADUATE RESEARCH GRANTS

The purpose of this program is to encourage Arizona graduate students to advance their research projects and support them as young researchers in our state. The proposal expects to achieve this goal through utilizing a portion of TRIF funds to facilitate a competitive grant program for graduate students at the three state universities. Students would be required to write a grant focused on how they would use the \$5,000 to improve their dissertation. The grant award would help to improve students' grant writing capabilities and provide additional funds to improve their research projects. It was left to the discretion of each university to determine their process for advertising and evaluating the grant proposals, and awarding and monitoring the grants.

ASU: With additional institutional funds, made 19 awards.

Fields of study included: Biological Design, Philosophy, Microbiology, Geological Sciences, Justice Studies, Environmental Social Science, Educational Psychology, Electrical Engineering, Counseling Psychology, Media and Engineering-Media Arts, Healthcare Innovation, Nutrition and Wellness, Community Resources and Development, Social Work, Sustainability, and business Administration Agribusiness

NAU: With additional institutional funds, made 10 awards.

Fields of study included: Biological Sciences, Applied Linguistics, Educational Psychology, and Forestry

UA: With additional institutional funds, made 20 awards.

Fields of study included: Ecology and Management of Rangelands, Nursing, Humanities, Chemical and Environmental Engineering, Entomology and Insect Science, Nutritional Sciences, Physiology, Molecular and Cellular Biology, Educational Policy Studies, Anthropology, Pharmaceutical Sciences, Optical Sciences, Disability and Psychoeducational Studies, Environmental Health Sciences, Linguistics, English Literature, Economics, Pharmacology, Geosciences,



USING WASTEWATER FOR MASS CULTURE OF ALGAE FOR FOOD, FEED AND FUEL

Throughout the state of Arizona, there are many sources of waste and recycled water from municipalities, power companies, and industries such as the semiconductor industry, feedlots and the dairy industry. Integrating algae cultivation with these industrial waste streams would have the dual benefit of reducing environmental impact and producing valuable products. The overall goal of this work is to build upon the leading expertise and research of the three Arizona universities to expand the algae industry within the state. We are looking for ways to improve profitability of algae farming through optimization of production and improved processing of higher value products.

This project will extend current algae research: 1) SABC at ASU; 2) NAABB at UA; and 3) Water Reclamation at NAU.

The University of Arizona is the lead on this project.

PLANNING, DEVELOPMENT AND IMPLEMENTATION OF A STATEWIDE RESEARCH INITIATIVE IN ENVIRONMENTAL INFOMATICS: ARIZONA ENVIRONMENTAL GRID INFRASTRUCTURE SERVICE (AEGIS)

The Arizona Environmental Grid Infrastructure Service (AEGIS) is an initiative that supports the transition to infomatics-intensive research for Arizona's nationally-ranked environmental research programs. More importantly, this project will move the Arizona higher education research enterprise into a national leadership position in the critical emerging area of environmental infomatics—the research and system development focusing on the environmental sciences relating to the creation, collection, storage, processing, modeling, interpretation, display and dissemination of data and information. The AEGIS will invigorate existing and catalyze new research across all three universities, establish a strong informatics-based foundation for the entire range of complimentary elements in our teaching and public service missions and create a framework that positions Arizona's state universities to capitalize on emerging national environmental network opportunities through the NSF, CDC, EPA, and others.

This project will create a statewide infrastructure for environmental infomatics (a fully functional operational network—including hardware and software) for capability to store, share and analyze large data sets across the three universities. This will help to facilitate and grow environmental infomatics projects.

Arizona State University is the lead on this project.



ESTABLISHING A DIGITAL RESEARCH INFRASTRUCTURE FOR ARIZONA'S 21ST CENTURY UNIVERSITIES RESEARCH ENTERPRISE

Establish a suite of 3 digital research infrastructure capabilities that together will enhance the research functions of the three universities acting both individually and collaboratively. Ultimately, this initiative will not only serve essential research functions of the university, but also assist with the integration of their innovations into the Arizona economy. The 3 components are designed to (1) establish a comprehensive and searchable catalog and network of technical expertise, (2) access a comprehensive and flexible worldwide database of funding opportunities that can be matched to specific technical expertise, and (3) develop a state-wide digital research data management infrastructure service that sets protocols for efficiently archiving, managing, and accessing all research data and results obtained by university researchers that are acquired under publically funding projects.

This project is for a suite of 3 products: Sci Val, Pivot and LiveData. These resources would place Arizona researchers in a better position to respond in an increasingly competitive funding environment and to connect to potential users of university innovations.

Sci Val (not funded under this grant; but under a prior Regents' Innovation Fund grant) would increase researcher's ability to form creative and dynamic collaborative teams across disciplines and locations.

Pivot would improve researchers' access to funding opportunities.

LiveData (an internal name for this development project) would provide access to a robust and persistent data management infrastructure.

Arizona State University is the lead on this project.

discovery

System Summary: TRIF Metrics and Financials

innovation

exploration

opportunity

creativity

integrity

**ARIZONA UNIVERSITY SYSTEM
TECHNOLOGY AND RESEARCH INITIATIVE FUND (TRIF)
FY 2012-2016**

	<i>FY 2012 ACTUAL</i>	<i>FY 2013 ACTUAL</i>	<i>FY 2013 BUDGET</i>	<i>FY 2014 BUDGET</i>	<i>FY 2015 BUDGET</i>	<i>FY 2016 BUDGET</i>
REVENUE						
Carryforward	\$ 3,142,709	\$ 7,164,840	\$ 7,555,530	\$ 7,659,736	\$ -	\$ -
TRIF Revenue	57,256,220	58,464,496	57,699,080	61,650,400	62,385,000	63,500,000
TOTAL REVENUE	\$ 60,398,929	\$ 65,629,336	\$ 65,254,610	\$ 69,310,136	\$ 62,385,000	\$ 63,500,000
EXPENDITURES						
OPERATING						
Personal Services	\$ 19,115,118	\$ 20,862,694	\$ 23,032,445	\$ 24,679,525	\$ 22,269,649	\$ 22,709,319
ERE	6,422,325	7,126,897	8,490,403	9,141,679	8,080,996	8,240,904
All Other Operating	14,636,828	18,990,675	16,085,422	18,224,065	16,690,615	17,069,177
Grants/Projects	659,993	1,923,049	2,315,554	2,226,527	1,750,000	1,750,000
TOTAL OPERATING	40,834,263	48,903,315	49,923,824	54,271,796	48,791,260	49,769,400
CAPITAL						
Building Renovation	400,000	140,000	4,134,400	1,090,000	1,050,000	1,080,000
Debt Service	6,430,990	6,206,985	5,565,040	7,239,300	7,545,056	7,633,956
ASU Polytechnic/West COPS	3,716,100	3,719,300	3,719,300	3,709,400	3,704,000	3,707,500
AZUN	500,000	500,000	500,000	500,000	500,000	500,000
Equipment Acquisition	962,046	-	1,412,046	999,640	794,684	809,144
TOTAL CAPITAL	12,009,136	10,566,285	15,330,786	13,538,340	13,593,740	13,730,600
EXPENDITURES TOTAL	\$ 52,843,399	\$ 59,469,600	\$ 65,254,610	\$ 67,810,136	\$ 62,385,000	\$ 63,500,000
SUMMARY BY PROGRAM AREA						
Access/Workforce Development	6,602,968	6,397,615	6,763,241	6,986,959	6,669,720	6,803,100
Improving Health	24,670,151	27,193,460	30,968,338	33,593,635	29,512,338	30,053,629
National Security Systems Initiative	1,628,600	2,126,300	2,097,000	2,521,600	2,500,000	3,000,000
Space Exploration and Optical Solutions	4,059,096	4,381,674	4,322,091	4,274,898	4,576,049	4,725,554
Water, Environment and Energy Solutions	8,983,949	10,352,013	11,653,648	10,873,215	9,986,739	9,703,978
UARC: Tech Launch Arizona	1,334,442	1,999,593	2,065,438	2,269,684	2,336,154	2,406,239
Regents Innovation Fund	778,359	2,098,342	2,565,554	2,476,527	2,000,000	2,000,000
ASU Polytechnic COPS	2,082,600	2,082,100	2,082,100	2,077,300	2,076,400	2,077,700
ASU West COPS	1,633,500	1,637,100	1,637,200	1,632,100	1,627,600	1,629,800
AZUN	1,069,734	1,201,403	1,100,000	1,104,218	1,100,000	1,100,000
PROGRAM AREA TOTAL	52,843,399	59,469,600	65,254,610	67,810,136	62,385,000	63,500,000
EXPENDITURES TOTAL	\$ 52,843,399	\$ 59,469,600	\$ 65,254,610	\$ 67,810,136	\$ 62,385,000	\$ 63,500,000

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opportunity
innovation discovery
exploration

ASU

integrity creativity



ARIZONA STATE UNIVERSITY

**ARIZONA STATE UNIVERSITY
TECHNOLOGY AND RESEARCH INITIATIVE FUND (TRIF)
FY 2012 - 2016**

	FY 2012	FY 2013	FY 2013	FY 2014	FY 2015	FY 2016
	ACTUAL	ACTUAL	BUDGET	BUDGET	BUDGET	BUDGET
REVENUE						
Carryforward	\$ 790,200	\$ 1,788,900	\$ 1,788,900	\$ 2,349,600	\$ -	\$ -
TRIF Revenue	23,848,700	25,091,200	25,091,200	25,505,800	25,936,400	26,384,500
TOTAL REVENUE	\$ 24,638,900	\$ 26,880,100	\$ 26,880,100	\$ 27,855,400	\$ 25,936,400	\$ 26,384,500
EXPENDITURES						
OPERATING						
Personal Services	\$ 7,684,500	\$ 7,722,700	\$ 7,855,100	\$ 8,527,500	\$ 7,665,256	\$ 7,818,553
ERE	2,883,800	2,782,000	2,947,900	3,200,300	2,876,654	2,934,185
All Other Operating	6,479,000	7,362,900	7,423,400	8,058,900	7,243,990	7,388,862
TOTAL OPERATING	17,047,300	17,867,600	18,226,400	19,786,700	17,785,900	18,141,600
CAPITAL						
Building Renovation	-	-	3,934,400	1,000,000	1,000,000	1,000,000
Debt Service	2,086,600	2,943,600	1,000,000	3,359,300	3,446,500	3,535,400
ASU Poly/ASU West COPS	3,716,100	3,719,300	3,719,300	3,709,400	3,704,000	3,707,500
TOTAL CAPITAL	5,802,700	6,662,900	8,653,700	8,068,700	8,150,500	8,242,900
TOTAL EXPENDITURES	\$ 22,850,000	\$ 24,530,500	\$ 26,880,100	\$ 27,855,400	\$ 25,936,400	\$ 26,384,500
SUMMARY BY INITIATIVE						
National Security Systems Initiative	\$ 1,628,600	\$ 2,126,300	\$ 2,097,000	\$ 2,521,600	\$ 2,500,000	\$ 3,000,000
Improving Health	13,974,400	14,877,300	17,282,900	17,906,200	16,487,400	16,937,000
Water, Environ and Energy Solutions	3,530,900	3,807,700	3,780,900	3,718,200	3,245,000	2,740,000
ASU Polytechnic COPS	2,082,600	2,082,100	2,082,100	2,077,300	2,076,400	2,077,700
ASU West COPS	1,633,500	1,637,100	1,637,200	1,632,100	1,627,600	1,629,800
TOTAL EXPENDITURES	\$ 22,850,000	\$ 24,530,500	\$ 26,880,100	\$ 27,855,400	\$ 25,936,400	\$ 26,384,500

ARIZONA STATE UNIVERSITY

IMPROVING HEALTH FOCUS AREA

PERFORMANCE ANALYSIS	Actual FY 12	Actual FY 13	Projected FY 13	Projected FY 14	Projected FY 15	Projected FY 16
TRIF EXPENDITURES						
Total	\$ 13,974,400	\$ 14,877,300	\$ 17,282,900	\$17,327,500	\$16,164,800	\$16,614,400
FINANCIAL IMPACT OF TRIF INVESTMENT						
Sponsored Awards	\$ 54,537,411	\$ 61,184,668	\$ 67,000,000	\$ 75,000,000	\$ 85,000,000	\$ 98,000,000
Gifts & Other Sources	40,505	390,000	40,000	40,000	40,000	40,000
Royalty Income	821,889	156,201	800,000	800,000	800,000	800,000
TOTAL	55,399,805	61,730,869	67,840,000	75,840,000	85,840,000	98,840,000
TECHNOLOGY TRANSFER ACTIVITY						
Invention Disclosures Transacted	45	70	75	80	85	95
US Patents Issued	0	5	4	5	6	6
Licenses and Options Executed	13	29	13	15	17	18
Startup Companies	2	1	1	1	1	1
WORKFORCE CONTRIBUTION						
Academic and Postdoctoral Appointees	38	155	60	95	135	175
Graduate Students	111	87	110	110	110	110
Undergraduate Students	73	90	70	70	70	70

ARIZONA STATE UNIVERSITY
NATIONAL SECURITY SYSTEMS FOCUS AREA

PERFORMANCE ANALYSIS	Actual FY 12	Actual FY 13	Projected FY 13	Projected FY 14	Projected FY 15	Projected FY 16
TRIF EXPENDITURES						
Total	\$ 1,628,600	\$ 2,126,300	\$ 2,097,000	\$ 2,973,500	\$ 2,822,600	\$ 3,322,600
FINANCIAL IMPACT OF TRIF INVESTMENT						
Sponsored Awards	\$ 12,618,000	\$ 23,010,570	\$ 15,000,000	\$ 33,000,000	\$ 45,000,000	\$ 70,000,000
Gifts & Other Sources	-	-	10,000	10,000	10,000	10,000
Royalty Income	128,250	82,500	250,000	350,000	555,000	725,000
TOTAL	12,746,250	23,093,070	15,260,000	33,360,000	45,565,000	70,735,000
TECHNOLOGY TRANSFER ACTIVITY						
Invention Disclosures Transacted	9	7	15	20	25	30
US Patents Issued	0	3	1	1	1	2
Licenses and Options Executed	2	3	3	3	3	4
Startup Companies	0	0	0	0	0	0
WORKFORCE CONTRIBUTION						
Academic and Postdoctoral Appointees	0	6	12	15	23	25
Graduate Students	17	40	20	20	20	20
Undergraduate Students	0	8	5	5	5	5

ARIZONA STATE UNIVERSITY

WATER, ENVIRONMENT AND ENERGY SOLUTIONS FOCUS AREA

PERFORMANCE ANALYSIS	Actual FY 12	Actual FY 13	Projected FY 13	Projected FY 14	Projected FY 15	Projected FY 16
TRIF EXPENDITURES						
Total	\$ 3,530,900	\$ 3,807,700	\$ 3,780,900	\$ 3,845,000	\$ 3,245,000	\$ 2,740,000
FINANCIAL IMPACT OF TRIF INVESTMENT						
Sponsored Awards	\$ 12,122,712	\$ 12,392,507	\$ 14,000,000	\$ 14,000,000	\$ 17,000,000	\$ 17,000,000
Gifts & Other Sources	-	-	25,000	25,000	25,000	25,000
Royalty Income	252,018	184,720	290,000	375,000	475,000	610,000
TOTAL	12,374,730	12,577,227	14,315,000	14,400,000	17,500,000	17,635,000
TECHNOLOGY TRANSFER ACTIVITY						
Invention Disclosures Transacted	0	1	9	10	11	12
US Patents Issued	1	4	2	3	4	4
Licenses and Options Executed	3	1	6	9	12	12
Startup Companies	0	0	1	0	0	1
WORKFORCE CONTRIBUTION						
Academic and Postdoctoral Appointees	7	17	15	15	20	20
Graduate Students	36	77	35	35	35	35
Undergraduate Students	13	78	15	15	15	15



innovation

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 NORTHERN ARIZONA UNIVERSITY

**NORTHERN ARIZONA UNIVERSITY
TECHNOLOGY AND RESEARCH INITIATIVE FUND (TRIF)
FY 2012 - 2016**

	<i>FY 2012 ACTUAL</i>	<i>FY 2013 ACTUAL</i>	<i>FY 2013 BUDGET</i>	<i>FY 2014 BUDGET</i>	<i>FY 2015 BUDGET</i>	<i>FY 2016 BUDGET</i>
REVENUE						
Carryforward	\$ 1,630,638	\$ 1,821,191	\$ 2,211,881	\$ 1,525,243	\$ -	\$ -
TRIF Revenue	11,157,019	11,492,061	11,435,960	12,348,200	12,216,200	12,438,500
TOTAL REVENUE	\$ 12,787,657	\$ 13,313,252	\$ 13,647,841	\$ 13,873,443	\$ 12,216,200	\$ 12,438,500
EXPENDITURES						
OPERATING						
Personal Services	\$ 4,630,588	\$ 5,337,771	\$ 4,737,362	\$ 6,259,701	\$ 5,161,244	\$ 5,313,732
ERE	1,497,041	1,684,731	1,613,690	2,046,654	1,806,990	1,862,342
All Other Operating	1,641,711	4,002,122	3,619,703	3,097,449	2,804,726	2,774,726
TOTAL OPERATING	7,769,340	11,024,624	9,970,755	11,403,804	9,772,960	9,950,800
CAPITAL						
Building Renovation	-	-	200,000	90,000	50,000	80,000
Debt Service	1,344,390	263,385	1,565,040	880,000	1,098,556	1,098,556
Equipment Acquisition	962,046	-	1,412,046	999,640	794,684	809,144
AZUN	500,000	500,000	500,000	500,000	500,000	500,000
TOTAL CAPITAL	2,806,436	763,385	3,677,086	2,469,640	2,443,240	2,487,700
TOTAL EXPENDITURES	\$ 10,575,776	\$ 11,788,009	\$ 13,647,841	\$ 13,873,444	\$ 12,216,200	\$ 12,438,500
SUMMARY BY INITIATIVE						
Access/Workforce Development	\$ 6,602,968	\$ 6,397,615	\$ 6,763,241	\$ 6,986,959	\$ 6,669,720	\$ 6,803,100
AZUN	1,069,734	1,201,403	1,100,000	1,104,218	1,100,000	1,100,000
Improving Health	1,253,436	2,122,147	2,487,378	2,974,791	2,223,240	2,267,700
Water, Energy, Environmental Solutions	1,649,638	2,066,844	3,297,222	2,807,476	2,223,240	2,267,700
TOTAL EXPENDITURES	\$ 10,575,776	\$ 11,788,009	\$ 13,647,841	\$ 13,873,444	\$ 12,216,200	\$ 12,438,500

NORTHERN ARIZONA UNIVERSITY
 TECHNOLOGY AND RESEARCH INITIATIVE FUND (TRIF)

FINANCIAL SUMMARY	Actual FY 12	Budget FY 13	Actual FY 13	Budget FY 14	Budget FY 15	Budget FY 16
REVENUE						
Carryforward	1,630,638	2,211,881	1,821,191	1,525,243	0	0
TRIF Revenue	10,057,019	10,335,960	10,392,061	11,248,200	11,116,200	11,338,500
AZUN	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000
TOTAL	12,787,657	13,647,841	13,313,252	13,873,443	12,216,200	12,438,500
EXPENDITURES						
OPERATING BUDGET						
Personal services	4,630,588	4,737,362	5,337,771	6,259,701	5,161,244	5,313,732
Employee Related Expenses (ERE)	1,497,041	1,613,690	1,684,731	2,046,654	1,806,990	1,862,342
All Other Operating	1,641,711	3,619,703	4,002,122	3,097,448	2,804,727	2,774,727
OPERATING BUDGET	7,769,340	9,970,755	11,024,624	11,403,803	9,772,960	9,950,800
CAPITAL BUDGET						
Building Renovation	0	200,000	0	90,000	50,000	80,000
Debt Service	1,344,390	1,565,040	263,384	880,000	1,098,556	1,098,556
Equipment Acquisition	962,046	1,412,046	0	999,640	794,684	809,144
AZUN	500,000	500,000	500,000	500,000	500,000	500,000
CAPITAL BUDGET	2,806,436	3,677,086	763,384	2,469,640	2,443,240	2,487,700
TOTAL	10,575,776	13,647,841	11,788,008	13,873,443	12,216,200	12,438,500
SUMMARY BY INITIATIVE						
Access/Workforce Development	6,602,968	6,763,241	6,397,615	6,986,959	6,669,720	6,803,100
Improving Health	1,253,436	2,487,378	2,122,147	2,974,791	2,223,240	2,267,700
Water, Energy, Environmental Solutions	1,649,638	3,297,222	2,066,844	2,807,476	2,223,240	2,267,700
AZUN	1,069,734	1,100,000	1,201,403	1,104,218	1,100,000	1,100,000
TOTAL	10,575,776	13,647,841	11,788,008	13,873,444	12,216,200	12,438,500

NORTHERN ARIZONA UNIVERSITY
 WEES and IMPROVING HEALTH

PERFORMANCE ANALYSIS	Actual FY 12	Projected FY 13	Actual FY 13	Projected FY 14	Projected FY 15	Projected FY 16
TRIF EXPENDITURES						
Total	10,575,776	13,647,841	11,788,008	13,873,443	12,216,200	12,438,500
FINANCIAL IMPACT OF TRIF INVESTMENT						
Sponsored Awards	14,105,945	14,670,183	11,848,074	15,256,990	15,867,270	16,501,960
Gifts & Other Sources	1,500,000	25,000	0	40,000	50,000	50,000
Intellectual Property Income	22,276	20,500	29,299	21,100	22,000	23,100
TOTAL	15,628,221	14,715,683	11,877,373	15,318,090	15,939,270	16,575,060
TECHNOLOGY TRANSFER ACTIVITY						
Invention Disclosures Transacted	17	18	18	21	24	25
US Patents Issued	1	1	2	2	3	3
Licenses and Options Executed	1	3	0	4	4	5
Startup Companies	1	1	0	2	2	1
WORKFORCE CONTRIBUTION						
Postdoctoral Appointees	11	12	17	15	15	18
Graduate Students	92	100	44	120	125	130
Undergraduate Students	200	220	251	240	250	250

NORTHERN ARIZONA UNIVERSITY
ACCESS/WORKFORCE DEVELOPMENT/E-LEARNING

PERFORMANCE MEASURE	Actual FY 12	Projected FY 13	Actual FY 13	Projected FY 14	Projected FY 15	Projected FY 16
RETURN ON INVESTMENT (ROI)						
Annual impact of Graduates on Economy ¹	\$10.4M	\$11.3 M	\$11.3 M	\$12.4 M	\$13.5 M	\$14.7 M
TECHNOLOGY TRANSFER/CURRICULUM INNOVATIONS						
Web/Hybrid/Enhanced Courses Developed ²	141	125	406	155	180	200
Faculty Developing Courses ³	265	225	420	250	300	350
Increase in Student Technology Literacy ⁴	4,122	3,300	2,676	3,800	4,000	4,200
Degree/Certificate Programs Offered ⁵	49	43	48	46	49	52
INDUSTRY OUTREACH						
Business/Nonprofit Collaborations ^{6,A}	203	110	263	125	140	155
WORKFORCE CONTRIBUTIONS						
Number of Student Served by A/W/D ⁷	3,772	3,377	3,616	3,681	4,013	4,374
PARTNERSHIPS/COLLABORATIONS						
Community College/NAU Students ⁸	3,077	3,999	3,444	4,359	4,751	5,179
Community College to NAU Programs ^{9,B}	71	93	79	95	97	99

¹ Estimated based on U.S. Census Bureau Data for annual increase in earnings by a baccalaureate-trained worker compared to high school degree starting in FY12 in millions \$.

² Includes Web, hybrid, IT-enhanced, redesigns and quality review process compliance.

³ The number of faculty participating in course development, design and redesign.

⁴ Number of students completing a course with significant or advanced technical fluency skills.

⁵ Number of degrees supported by TRIF A/WD funding.

⁶ Organizations (business, industry, nonprofits, school districts) with formal or informal relationships with Northern Arizona University related to TRIF A/WD activities.

⁷ Reporting based on number of students eligible to enroll in programs supported by A/WD funding.

⁸ Number of new students participating in the Northern Arizona University joint admissions or who transfer from a community college to NAU.

⁹ Program paths for a student to seamlessly transition from a given community college to NAU.

^A Variance between projected and actual number of collaborations reflects an increased focus on outreach and recruitment efforts.

^B Variance between projected and actual programs due to the recategorization of Bachelor of Arts in Liberal Studies (BAILS) degrees to Bachelors of Interdisciplinary Studies (BIS) degrees.

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exploration

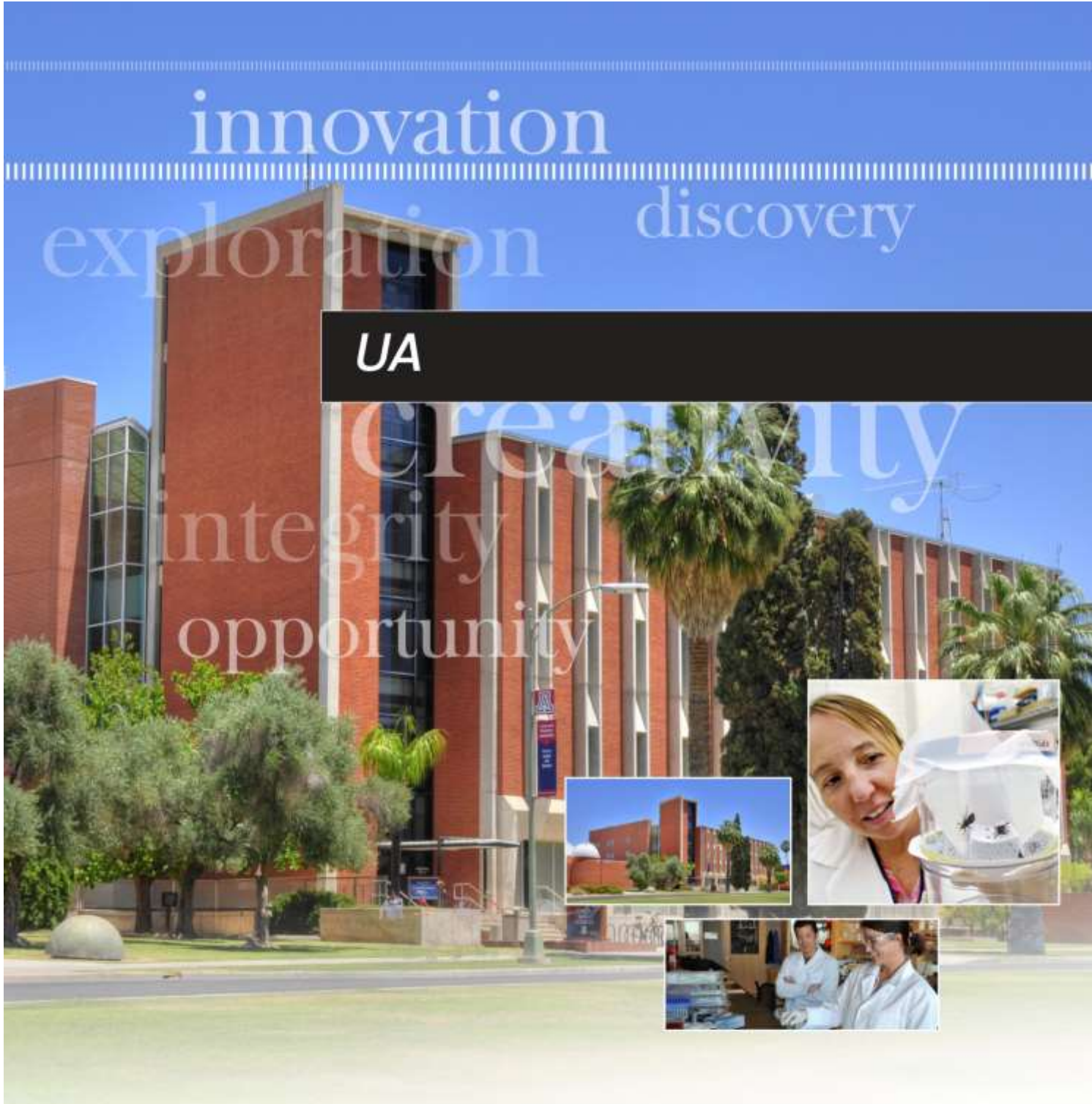
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THE UNIVERSITY OF ARIZONA
TECHNOLOGY AND RESEARCH INITIATIVE FUND (TRIF)
FY 2012 - 2016

	Actual FY 12	Actual FY 13	Budget FY 13	Budget FY 14	Budget FY 15	Budget FY 16
REVENUE						
Carryforward	\$ -	\$ 1,489,195	\$ 1,489,195	\$ 1,808,366	\$ -	\$ -
TRIF Revenue	20,128,459	21,371,920	20,671,920	21,796,400	22,232,400	22,677,000
TOTAL REVENUE	\$ 20,128,459	\$ 22,861,115	\$ 22,161,115	\$ 23,604,766	\$ 22,232,400	\$ 22,677,000
EXPENDITURES						
OPERATING						
Personal Services	\$ 6,711,059	\$ 7,670,923	\$ 10,308,683	\$ 9,761,024	\$ 9,311,849	\$ 9,445,734
ERE	2,013,928	2,622,851	3,889,413	3,855,325	3,357,952	3,404,977
All Other Operating	6,514,277	7,618,975	4,963,019	6,988,416	6,562,599	6,826,289
TOTAL OPERATING	15,239,264	17,912,749	19,161,115	20,604,765	19,232,400	19,677,000
CAPITAL						
Building Renovation	400,000	140,000				
Debt Service	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000
TOTAL CAPITAL	3,400,000	3,140,000	3,000,000	3,000,000	3,000,000	3,000,000
TOTAL EXPENDITURES	\$ 18,639,264	\$ 21,052,749	\$ 22,161,115	\$ 23,604,765	\$ 22,232,400	\$ 22,677,000
SUMMARY BY INITIATIVE						
Improving Health	\$ 9,442,315	\$ 10,194,012	\$ 11,198,060	\$ 12,712,644	\$ 10,801,698	\$ 10,848,929
Space Exploration and Optical Solutions	4,059,096	4,381,674	4,322,091	4,274,898	4,576,049	4,725,554
Water, Environmental and Energy Solutions	3,803,411	4,477,469	4,575,526	4,347,539	4,518,499	4,696,278
Tech Launch Arizona (UARC)	1,334,442	1,999,593	2,065,438	2,269,684	2,336,154	2,406,239
TOTAL EXPENDITURES	\$ 18,639,264	\$ 21,052,748	\$ 22,161,115	\$ 23,604,765	\$ 22,232,400	\$ 22,677,000

UNIVERSITY OF ARIZONA

TECHNOLOGY AND RESEARCH INITIATIVE FUND (TRIF) IMPROVING HEALTH

PERFORMANCE ANALYSIS	Actual FY 12	Actual FY 13	Projected FY 13	Projected FY 14	Projected FY 15	Projected FY 16
TRIF EXPENDITURES						
Total	\$ 9,442,315	\$ 10,194,012	\$ 11,198,061	\$ 12,712,644	\$ 10,801,698	\$ 10,848,929
FINANCIAL IMPACT OF TRIF INVESTMENT						
Sponsored Awards (\$M)	\$57.70	\$39.40	\$54.00	\$54.00	\$54.00	\$54.00
Gifts & Other Sources (\$M)	\$0.60	\$0.60	\$0.50	\$0.50	\$0.50	\$0.50
Royalty Income (\$M)	\$0.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
TOTAL	\$58.40	\$40.00	\$54.50	\$54.50	\$54.50	\$54.50
TECHNOLOGY TRANSFER ACTIVITY						
Invention Disclosures Transacted	15	10	29	32	32	32
US Patents Issued	2	3	0	1	0	1
Licenses and Options Executed	4	0	8	8	9	10
Startup Companies	0	0	1	0	1	0
WORKFORCE CONTRIBUTION						
Postdoctoral Appointees	80	86	135	135	135	135
Graduate Students	179	189	320	320	320	320
Undergraduate Students	209	324	320	320	320	320

UNIVERSITY OF ARIZONA

TECHNOLOGY AND RESEARCH INITIATIVE FUND (TRIF) SPACE & OPTICAL SCIENCE

PERFORMANCE ANALYSIS	Actual FY 12	Actual FY 13	Projected FY 13	Projected FY 14	Projected FY 15	Projected FY 16
TRIF EXPENDITURES						
Total	\$ 4,059,096	\$ 4,381,674	\$ 4,322,091	\$ 4,274,898	\$ 4,576,049	\$ 4,725,554
FINANCIAL IMPACT OF TRIF INVESTMENT						
Sponsored Awards (\$M)	\$49.40	\$54.97	\$45.00	\$52.00	\$57.00	\$65.00
Gifts & Other Sources (\$M)	\$0.20	\$0.04	\$0.45	\$0.48	\$0.49	\$0.51
Royalty Income (\$M)	\$0.19	\$0.15	\$0.19	\$0.19	\$0.20	\$0.20
TOTAL	\$49.79	\$55.16	\$45.64	\$52.67	\$57.69	\$65.71
TECHNOLOGY TRANSFER ACTIVITY						
Invention Disclosures Transacted	48	37	50	52	55	60
US Patents Issued	14	9	15	17	18	20
Licenses and Options Executed	14	6	15	18	19	21
Startup Companies	2	1	1	2	3	3
WORKFORCE CONTRIBUTION						
Postdoctoral Appointees	10	10	11	11	12	12
Graduate Students	34	50	35	35	36	37
Undergraduate Students	7	18	8	8	9	9

UNIVERSITY OF ARIZONA

TECHNOLOGY AND RESEARCH INITIATIVE FUND (TRIF) WATER, ENVIRONMENTAL AND ENERGY SOLUTIONS

PERFORMANCE ANALYSIS	Actual FY 12	Actual FY 13	Projected FY 13	Projected FY 14	Projected FY 15	Projected FY 16
TRIF EXPENDITURES						
Total	\$ 3,803,411	\$ 4,477,469	\$ 4,575,526	\$ 4,347,539	\$ 4,518,499	\$ 4,696,278
FINANCIAL IMPACT OF TRIF INVESTMENT						
Sponsored Awards (\$M)	\$26.40	\$30.00	\$21.80	\$21.80	\$22.50	\$23.10
Gifts & Other Sources (\$M)	\$3.43	\$3.70	\$3.40	\$3.50	\$3.60	\$3.80
Royalty Income ¹ (\$M)	\$0.00	\$0.00	\$0.00	\$0.00	\$0.30	\$0.50
TOTAL	\$29.83	\$33.70	\$25.20	\$25.30	\$26.40	\$27.40
TECHNOLOGY TRANSFER ACTIVITY						
Invention Disclosures Transacted	19	21	10	10	10	10
US Patents Issued	2	2	2	2	2	3
Licenses and Options Executed	1	1	4	4	7	7
Startup Companies	1	1	1	0	1	1
WORKFORCE CONTRIBUTION						
Postdoctoral Appointees	87	49	75	75	80	85
Graduate Students	321	314	250	250	260	270
Undergraduate Students	122	85	100	100	110	120

Notes:

¹Royalty Income was less than \$100,000 in FY 13

innovation

exploration

discovery

ABOR System Office

CREATIVITY

integrity

opportunity

**ABOR SYSTEM OFFICE
TECHNOLOGY AND RESEARCH INITIATIVE FUND (TRIF)
FY 2012 - 2016**

	FY 2012 ACTUAL	FY 2013 ACTUAL	FY 2013 BUDGET	FY 2014 BUDGET	FY 2015 BUDGET	FY 2016 BUDGET
REVENUE						
Carryforward	\$ 721,871	\$ 2,065,554	\$ 2,065,554	\$ 1,976,527	\$ -	\$ -
TRIF Revenue	2,122,042	509,315	500,000	2,000,000	2,000,000	2,000,000
TOTAL REVENUE	\$ 2,843,913	\$ 2,574,869	\$ 2,565,554	\$ 3,976,527	\$ 2,000,000	\$ 2,000,000
EXPENDITURES						
OPERATING						
Personal Services	\$ 88,971	\$ 131,300	\$ 131,300	\$ 131,300	\$ 131,300	\$ 131,300
ERE	27,555	37,315	39,400	39,400	39,400	39,400
All Other Operating	1,840	6,678	79,300	79,300	79,300	79,300
TOTAL OPERATING	118,366	175,293	250,000	250,000	250,000	250,000
GRANTS/PROJECTS						
Regents Innovation Fund	659,993	1,923,049	2,315,554	1,726,527	1,250,000	1,250,000
Other				500,000	500,000	500,000
TOTAL GRANTS/PROJECTS	659,993	1,923,049	2,315,554	2,226,527	1,750,000	1,750,000
TOTAL EXPENDITURES	\$ 778,359	\$ 2,098,342	\$ 2,565,554	\$ 2,476,527	\$ 2,000,000	\$ 2,000,000
SUMMARY BY INITIATIVE						
Regents Innovation Fund:						
Center for the Future of Arizona	225,000	325,000	325,000			
HRAA/CTSA	325,000	-	-			
National Student Clearinghouse	49,302	49,869	50,000	50,000	50,000	50,000
Collaboration	-	-	200,000	310,707	200,000	200,000
SciVal		202,000	202,000			
Graduate Research Grants		230,000	230,000			
IT Research (ABOR)		16,180	100,000	83,820		
Wastewater Mass Culture		200,000				
Digital Research		450,000				
AEGIS		450,000				
Regent Innovation Fund Grants				1,232,000	1,000,000	1,000,000
Other	60,691		1,208,554	550,000	500,000	500,000
TOTAL EXPENDITURES	\$ 659,993	\$ 1,923,049	\$ 2,315,554	\$ 2,226,527	\$ 1,750,000	\$ 1,750,000

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