NEW RETURNS ON INVESTMENT IN THE KNOWLEDGE ECONOMY

PROPOSITION 301 AT ARIZONA STATE UNIVERSITY

THREE-YEAR AGGREGATE REPORT, FY 2002-FY 2004

MORRISON INSTITUTE FOR PUBLIC POLICY

SCHOOL OF PUBLIC AFFAIRS / COLLEGE OF PUBLIC PROGRAMS

ARIZONA STATE UNIVERSITY

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This publication updates the January 2004 study, *New Returns on Investment in the Knowledge Economy: Proposition 301 at Arizona State University, FY 2003*. Both works were launched by the report, *Seeds of Prosperity: Public Investment in Science and Technology Research* (2003), by Morrison Institute for Public Policy.

Morrison Institute will periodically publish new material to keep you informed of the status of Proposition 301 investments at Arizona State University.

NEW RETURNS ON INVESTMENT IN THE KNOWLEDGE ECONOMY: PROPOSITION 301 AT ARIZONA STATE UNIVERSITY, FY 2002 - FY 2004

Morrison Institute for Public Policy has analyzed returns from Arizona's Proposition 301-supported public investments in science and technology research at Arizona State University since 2001.

NEW RETURNS FY 2002 - FY 2004:

- Aggregates results and illustrates trends over time for the first three fiscal years of Proposition 301 funding at ASU, FY 2002 through FY 2004.

  (Data do not cover Proposition 301 funds allocated to ASU East or West for capital infrastructure development and building and central plant expansion.)

- Analyzes data obtained from ASU's annual reports to the Arizona Board of Regents and information from interviews with key Proposition 301 managers and observers.
- Presents Arizona's return on investment for the knowledge economy from Proposition 301-supported research at ASU.
- Complements Morrison Institute's ongoing development of the CAT Measures, a new model of assessment for public investment in science and technology research that addresses the impacts of Connections, Attention, and Talent for the knowledge economy (see page 17 for more information).

EXECUTIVE SUMMARY

In the past three years, Arizona State University has dramatically expanded its portfolio of science and technology research as a result of new funding from Proposition 301, a ballot measure referred by the legislature and approved by Arizona voters in November 2000. This measure established a 20-year, statewide 0.6% sales tax increase primarily for the benefit of K-12 education, community colleges, and Arizona's three public universities. The goal of Proposition 301 funding for university research is to grow and stimulate Arizona's knowledge economy.

In an effort to track the state's return on investment from university research supported by Proposition 301 revenue, the Arizona Board of Regents has required annual reporting from each university on specific research performance measures. The Regents further stipulated a three-year evaluation report from each university presenting its aggregate performance data for the first three years of the program. Morrison Institute for Public Policy has analyzed ASU's Proposition 301 projects each year FY 2002 through FY 2004. The full report that follows presents ASU's three-year performance data and trends for that period. Below are selected results.

ASU received a total of $46.1 million in Proposition 301 revenue for the three fiscal years, FY 2002 through FY 2004. In return, ASU has produced numerous impacts and outcomes directly relevant to the drivers of the knowledge economy, including:

- $47.7 million in increases from external research funding, and $3.7 million in total revenue from new products and company startups
- 26 new courses developed in science and technology, 72 new online courses offered, and 262 undergraduates who gained research experience
- 46 new U.S.patents, 10 new startup companies, and 13 new products developed
- 43 ASU post-doctoral fellows and 100 graduate students trained in science and technology added to the workforce
- 515 high school students experienced in software design
- 64 new tenure track and research faculty successfully recruited, and 6 visiting scientists appointed
- An internationally recognized R&D and business leader hired to direct the Biodesign Institute at Arizona State University

Most performance measures for Proposition 301-related research activities showed substantial increases since the first year of the program. Comparing FY 2004 results to FY 2002:

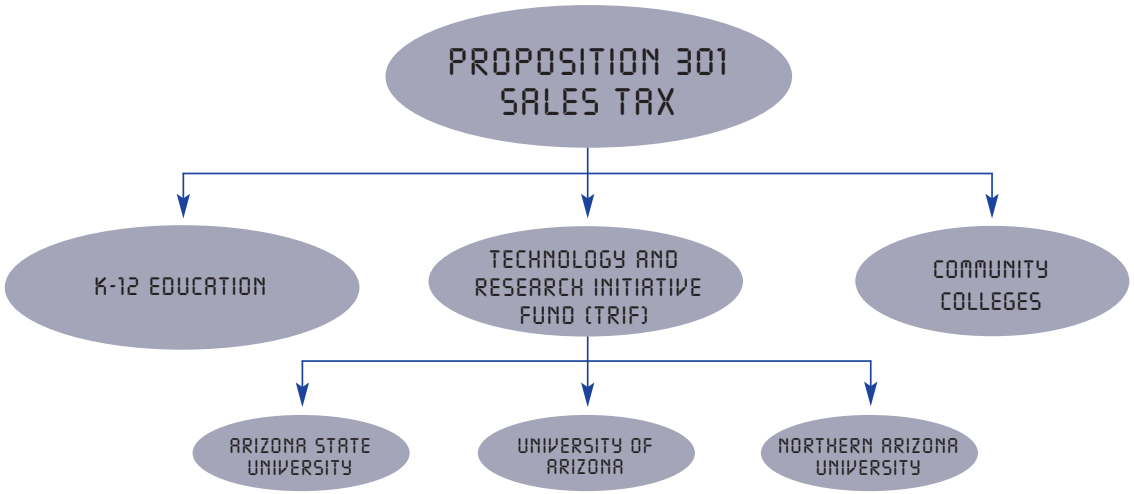
- Annual growth in external funding more than doubled from $12.0 million to $27.1 million.
- The value of new products more than tripled from $0.4 million to $1.4 million.
- Newly introduced courses in biosciences, information technology, and nanotechnology quadrupled from 4 to 16.
- New patents increased 64% from 11 to 18.
- New graduate students in the pipeline more than tripled from 29 to 106.
- Undergraduates with research experience more than tripled from 39 to 139.

ARIZONA'S ONGOING INVESTMENT: PROPOSITION 301 AND THE TECHNOLOGY AND RESEARCH INITIATIVE FUND

Arizonans set in motion a substantial new public investment in university science and technology research when the Arizona State Legislature referred Proposition 301 to the ballot and voters approved it in November 2000.

- Proposition 301 established a 20-year-long 0.6% increase in state sales taxes primarily to support K-12 education, public university science and technology research, and community college workforce development programs.
- The public university share of Proposition 301 revenue from FY 2002 through FY 2004 totaled $142 million, which was allocated among Arizona's three public universities. The funding is anticipated to cumulatively total $1 billion by FY 2021.
- Revenue from Proposition 301 for the state's three public universities flows through the state's Technology and Research Initiative Fund (TRIF), which is administered by the Arizona Board of Regents as part of a long-term economic development strategy for the state.
- The goal of the Proposition 301 investment in Arizona's public universities is to build the state's science and technology portfolio to provide both a foundation for and stimulus to a competitive knowledge economy in Arizona.

GENERAL DISTRIBUTION OF PROPOSITION 301 REVENUE



Source: Morrison Institute for Public Policy, 2005.

ANNUAL FUNDING: ASU'S PROPOSITION 301 ALLOCATIONS AND EXPENDITURES

ASU's revenue allocations from Proposition 301 for research-related initiatives totaled $46.1 million over the three fiscal years FY 2002 through FY 2004. These funds were assigned to ASU activities each year as follows:

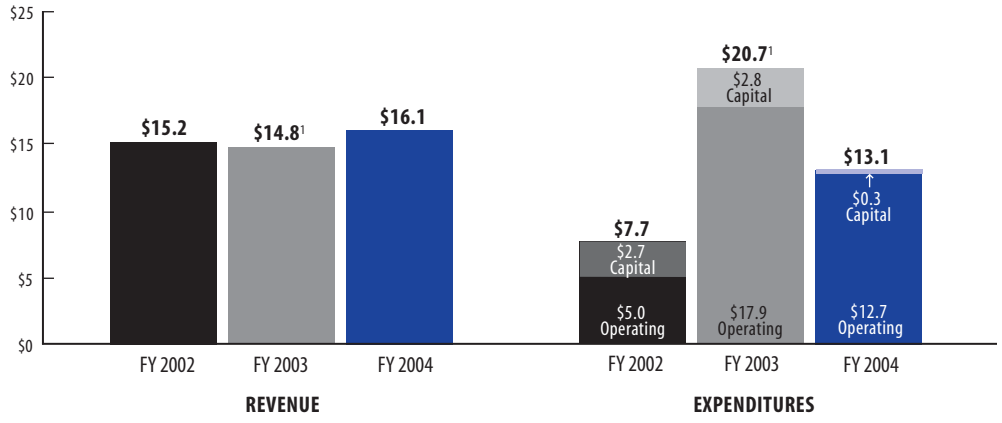
- **FY 2002** Six independent research and support initiatives in biosciences, information technology, advanced materials, manufacturing, technology transfer, and access/ workforce development
- **FY 2003 and FY 2004** Large interdisciplinary research projects under the Biodesign Institute at ASU and in ASU's Capacity Building Project Investments (see pages 13-15 for more information)

ASU's expenditures of Proposition 301 revenue for research and support initiatives totaled nearly $41.5 million for fiscal years FY 2002 through FY 2004.

- $35.6 million for operating expenses
- $5.8 million for capital expenses

ASU PROPOSITION 301 REVENUES AND EXPENDITURES ($ MILLIONS)

	FY 2002	FY 2003	FY 2004	TOTAL FY 2002-FY 2004
New Revenue	**$15.2**	**$14.8**[1]	**$16.1**	**$46.1**[2]
Expenditures	**$7.7**	**$20.7**[1]	**$13.1**	**$41.5**[2]
Operating	$5.0	$17.9	$12.7	$35.6
Capital	$2.7	$2.8	$0.3	$5.8



Source: Morrison Institute for Public Policy, 2005.

Data: *Technology and Research Initiative Fund (TRIF) Annual Report,* Arizona Board of Regents for fiscal years 2002, 2003, and 2004.

Note: Figures may not sum due to rounding.

[1] Expenditures were allowed to exceed new revenues in FY 2003 because unspent FY 2002 funds were carried forward.

[2] Total revenues have exceeded total expenditures over the three years of the program due to startup status for Proposition 301-supported projects and the unpredictability of annual revenues from sales taxes.

The public sector is looking for methods of assessing how its use of public money can most effectively meet policy goals. It is in this context that new forms of measurement are being sought.

David Aeron-Thomas, author of *Social Return on Investment: Valuing What Matters*

Not everything that counts can be counted, and not everything that can be counted counts.

Albert Einstein, author of *Relativity: The Special and General Theory*

UNIVERSITY ACCOUNTABILITY: REPORTS AND ANALYSIS OF PROPOSITION 301 RESEARCH

Results of Proposition 301 funding for Arizona's public universities have been monitored in a variety of ways during the first three years of the program.

- The Arizona Board of Regents has required Arizona's three public universities to collect data on specific performance measures for Proposition 301-supported research each fiscal year.
  - Performance results for all three universities are compiled in the *Technology and Research Initiative Fund (TRIF) Annual Report*.* Each year's TRIF report is presented to the Arizona Board of Regents, the Governor of Arizona, and the Arizona Legislature.
- The Arizona Board of Regents has also stipulated that universities report more detailed information on the state's return on investment information from Proposition 301 funding after the first three years of operation.
  - This report, *New Returns on Investment in the Knowledge Economy: Proposition 301 at Arizona State University; Three-Year Aggregate Report, FY 2002 - FY 2004*,* provides that information on ASU for the Board of Regents.

* Links to these reports can be found on page 18.

- Morrison Institute for Public Policy has annually provided ongoing, value-added analysis of ASU's performance.
  - Morrison Institute's FY 2002 report, *Seeds of Prosperity: Public Investment in Science and Technology Research*:*
    - Described ASU's first-year Proposition 301-supported activities.
    - Presented ASU's Proposition 301 results in light of current thinking on the knowledge economy.
    - Explained the economic and industrial context for ASU's high tech research.
    - Introduced the CAT Measures — a new model for determining public return from state investment in university-based science and technology research by analyzing the value of Connections, Attention, and Talent (see page 17 for more information).
  - The Morrison Institute's FY 2003 report, *New Returns on Investment in the Knowledge Economy: Proposition 301 at Arizona State University, FY 2003*:*
    - Analyzed data from the August 2003 ASU report to the Arizona Board of Regents.
    - Presented ASU's performance relative to the knowledge economy in five categories: new money, new programs, new ventures, new skills, and new talent.

ASU RESEARCH IMPACTS AND RETURNS ON INVESTMENT FOR THE KNOWLEDGE ECONOMY: THREE-YEAR TOTALS AND TRENDS

ASU's Proposition 301-supported research and support activities from FY 2002 through FY 2004 produced numerous impacts and outcomes directly relevant to the drivers of the knowledge economy, including:

- $47.7 million increase in external funding for research, and $3.7 million in revenue from new products and new company startups
- 26 new courses developed in science and technology, 72 new online courses offered, and 262 undergraduates who gained research experience
- 46 new U.S. patents, 10 new startup companies, and 13 new products developed
- 43 ASU post-doctoral fellows and 100 graduate students trained in science and technology added to the workforce
- 515 high school students experienced in software design
- 64 new tenure track and research faculty successfully recruited, and 6 visiting scientists appointed
- An internationally recognized R&D and business leader hired to direct the Biodesign Institute at ASU

Most performance measures for Proposition 301-related research activities showed substantial increases since the first year of the program. Comparing FY 2004 results to FY 2002:

- Annual growth in external funding more than doubled from $12.0 million to $27.1 million.
- The value of new products more than tripled from $0.4 million to $1.4 million.
- Newly introduced courses in biosciences, information technology, and nanotechnology quadrupled from 4 to 16.
- New patents increased 64% from 11 to 18.
- New graduate students in the pipeline more than tripled from 29 to 106.
- Undergraduates with research experience more than tripled from 39 to 139.

These are just some of the results. The table on page 9 provides a comprehensive listing of aggregate impacts and outcomes for ASU's Proposition 301 funding. The tables and charts on pages 10-12 present the same data broken out by fiscal year to illustrate performance trends.

(Data do not cover Proposition 301 funds allocated to ASU East or West for capital infrastructure development and building and central plant expansion.)

RETURN ON INVESTMENT FROM ASU PROPOSITION 301-FUNDED RESEARCH, FY 2002 - FY 2004

NEW MONEY	NEW PROGRAMS	NEW VENTURES	NEW SKILLS	NEW TALENT
$39.5 million increase year-over-year in new federal awards	26 new courses in Bio, IT, and Nano	41 new research collaborations with industry and national labs	97 new post-doctoral students in pipeline	64 new tenure-track and research faculty
$8.2 million increase year-over-year in industrial contracts and donations	8 classrooms upgraded with new technology in engineering and biology	16 new software packages developed for clients	254 new graduate students in pipeline	6 visiting scientists
$2.2 million to ASU in royalties and other fees from new products	72 new online courses	13 new products in marketplace	43 post-doctoral students entering workforce	2 process engineers for Center for Solid State Electronics Research
$1.5 million in fees, royalties, and R&D revenue to ASU from company startups	5-year Integrative Graduate Education and Research Traineeship grant from National Science Foundation	10 new companies started	100 graduate students earning degrees and entering workforce	6 IT support staff
	"Introduction to IT" curriculum for all students	53 licenses/options signed	262 undergraduate students with research experience	Director of training for Microelectronics Teaching Factory
	Seed grant program for research collaborations between ASU and Phoenix-area clinical scientists	46 U.S. patents approved	26 more graduates in Computer Science and Engineering than previous years	Internationally renowned research scientist to lead the Biodesign Institute
	Technology transfer portal for industry inquiries	342 patent applications filed	515 high school students completing software design curriculum	
	ASU Innovation Fund formed to provide proof of concept grants for faculty inventors	286 inventions disclosed	256 student interns in industry or Software Factory	
	ASU Software Factory	17 business plans written for new and potential startup companies	16 more teachers with math/science certification than previous years	
	Software engineering curriculum for high school students	8 companies citing ASU as factor in relocating or expanding in Arizona		
	Server and portable module for classroom technology support	29 tech transfer portal inquiries		
	Manufacturing research road map developed in collaboration with industry	17 proof of concept grants to faculty researchers		
	Test bed equipment for research in advanced manufacturing	1 new nationwide industry-university research consortium		
	Business development services for ASU entrepreneurs			
	Technology Venture Clinic for graduate students			
	Microelectronics teaching factory			
	Lab facilities upgrade for Health Assessment Core Facility to improve research grant competitiveness			
	Upgrade of advanced materials/ microsystems joint use facilities with two high density plasma deep etch systems			
	E-learning programs in security engineering technology, semiconductor manufacture, and others			

Source: Morrison Institute for Public Policy, 2005.

Data: *Technology and Research Initiative Fund (TRIF) Annual Report*, September 1, 2002, 2003, and 2004.

PERFORMANCE TRENDS: RETURN ON INVESTMENT BY FISCAL YEAR

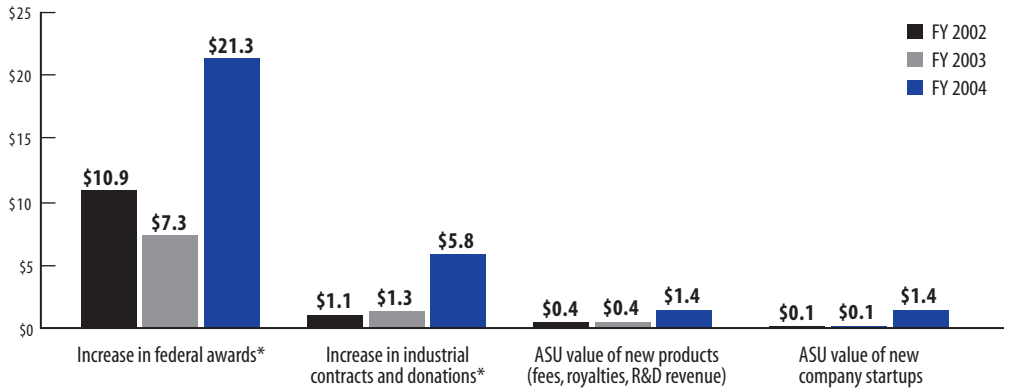
NEW MONEY: OVERALL FINANCIAL GAINS SHOWN, BUT NOT IN FY 2003 ($ MILLIONS)

PERFORMANCE MEASURE	FY 2002	FY 2003	FY 2004
Increase in federal awards*	$10.9	$7.3	$21.3
Increase in industrial contracts and donations*	$1.1	$1.3	$5.8
ASU value of new products (fees, royalties, R&D revenue)	$0.4	$0.4	$1.4
ASU value of new company startups	$0.1	$0.1	$1.4

Source: Morrison Institute for Public Policy, 2005.

Data: *Technology and Research Initiative Fund (TRIF) Annual Report*, September 1, 2002, 2003, and 2004.

* Increase is for each year over the previous year.

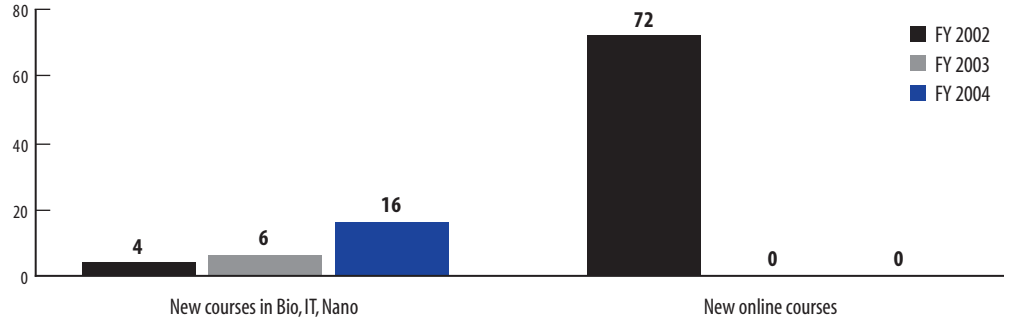


NEW PROGRAMS: HIGH TECH COURSES SEE MAJOR INCREASE IN FY 2004

PERFORMANCE MEASURE	FY 2002	FY 2003	FY 2004
New courses in Bio, IT, Nano	4	6	16
New online courses	72	0	0

Source: Morrison Institute for Public Policy, 2005.

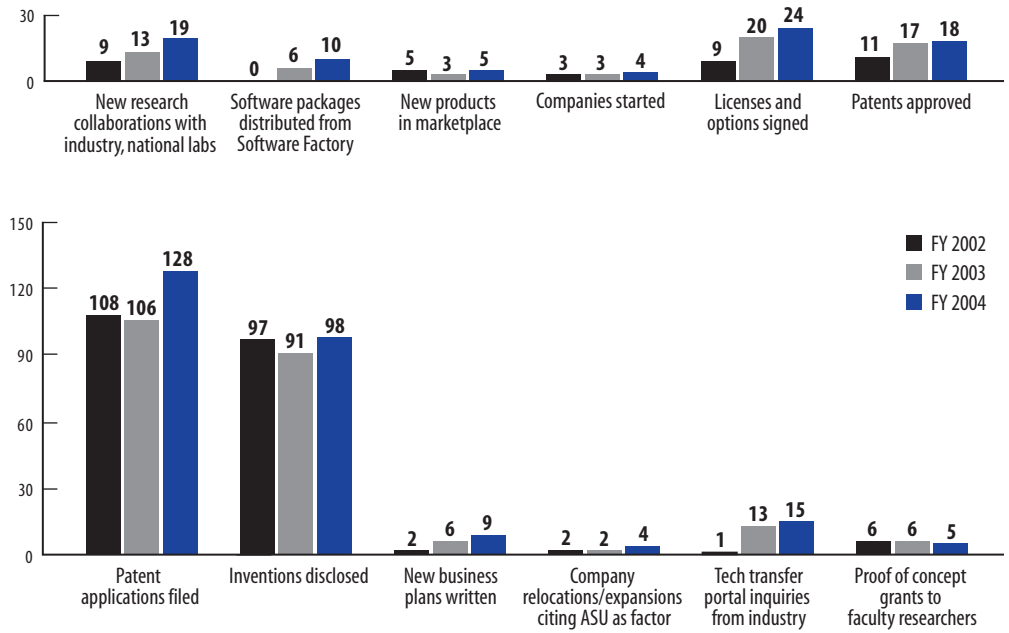
Data: *Technology and Research Initiative Fund (TRIF) Annual Report*, September 1, 2002, 2003, and 2004.



PERFORMANCE TRENDS: RETURN ON INVESTMENT BY FISCAL YEAR (CONT.)

NEW VENTURES: MOST MEASURES SHOW STEADY GAINS FROM FY 2002 TO FY 2004

PERFORMANCE MEASURE	FY 2002	FY 2003	FY 2004
New research collaborations with industry and national labs	9	13	19
Software packages developed by Software Factory for clients	0	6	10
New products in marketplace	5	3	5
Companies started	3	3	4
Licenses and options signed	9	20	24
Patents approved	11	17	18
Patent applications filed	108	106	128
Inventions disclosed	97	91	98
Business plans written for new and potential start up companies	2	6	9
Company relocations/expansions citing ASU as factor	2	2	4
Tech transfer portal inquiries from industry	1	13	15
Proof of concept grants to faculty researchers	6	6	5



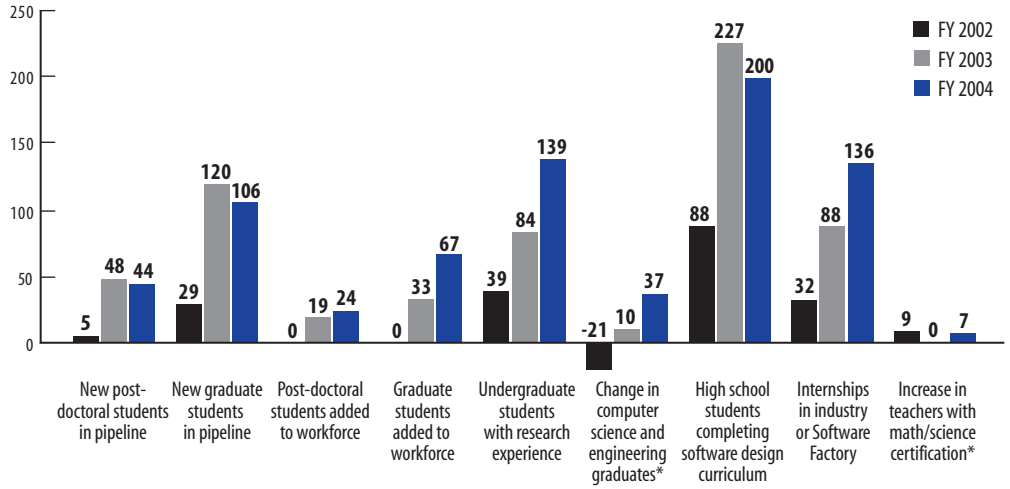
Source: Morrison Institute for Public Policy, 2005.

Data: *Technology and Research Initiative Fund (TRIF) Annual Report*, September 1, 2002, 2003, and 2004.

PERFORMANCE TRENDS: RETURN ON INVESTMENT BY FISCAL YEAR (CONT.)

NEW SKILLS: NEARLY ALL MEASURES SHOW MAJOR GAINS FY 2002 - FY 2004

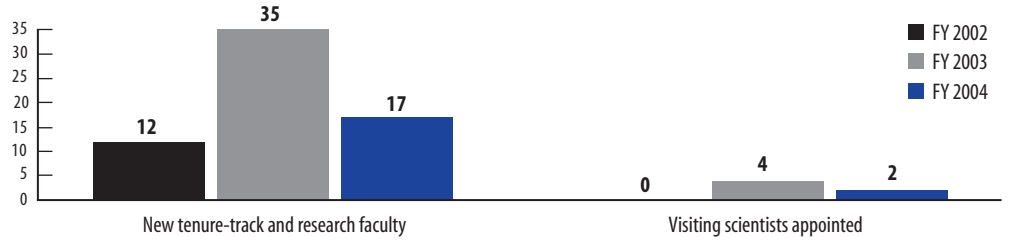
PERFORMANCE MEASURE	FY 2002	FY 2003	FY 2004
New post-doctoral students in pipeline	5	48	44
New graduate students in pipeline	29	120	106
Post-doctoral students added to workforce	0	19	24
Graduate students added to workforce	0	33	67
Undergraduate students with research experience	39	84	139
Change in computer science and engineering graduates*	-21	10	37
High school students completing software design curriculum	88	227	200
Internships in industry or Software Factory	32	88	136
Increase in teachers with math/science certification*	9	0	7



Source: Morrison Institute for Public Policy, 2005.
Data: *Technology and Research Initiative Fund (TRIF) Annual Report*, September 1, 2002, 2003, and 2004.
* Change or increase is for each year over the previous year.

NEW TALENT: PEAK YEAR FOR HIRING IN FY 2003

PERFORMANCE MEASURE	FY 2002	FY 2003	FY 2004
New tenure-track and research faculty	12	35	17
Visiting scientists appointed	0	4	2



Source: Morrison Institute for Public Policy, 2005.
Data: *Technology and Research Initiative Fund (TRIF) Annual Report*, September 1, 2002, 2003, and 2004.

NEW DIRECTIONS: CONSOLIDATION OF RESEARCH UNDER THE BIODESIGN INSTITUTE AT ARIZONA STATE UNIVERSITY

First-year (FY 2002) Proposition 301 projects at ASU were concentrated in 6 separate areas:

- 4 emerging research fields — biosciences, information technology, advanced materials, and manufacturing
- 2 support areas — access/workforce development and technology transfer

Second-year and third-year research efforts were refocused on larger, more encompassing interdisciplinary projects, with most research consolidated under the newly conceived (in FY 2003) and renamed (in FY 2004) Biodesign Institute at ASU (formerly Arizona Biodesign Institute).

THE BIODESIGN INSTITUTE IN FY 2003 AND FY 2004:

- Oversaw 8 research centers comprised of interdisciplinary teams representing bioscience, nanotechnology, and information technology
- Linked ASU with the Phoenix-based biomedical research center, Translational Genomics Research Institute (TGen), and other institutions (e.g., Barrow Neurological Institute, Mayo Clinic) through affiliated faculty, joint faculty appointments, and supercomputing facilities

Additional research centers are anticipated each year for the next several years.

GOALS OF THE BIODESIGN INSTITUTE'S 8 RESEARCH CENTERS, FY 2004

NAME OF RESEARCH CENTER	RESEARCH GOAL
Applied NanoBioscience (ANB)	Apply advances in nanoscience, molecular biology, and genomics to understand disease at the molecular level
BioOptical Nanotechnologies (BON)	Integrate biomolecular sciences with materials engineering and solid-state electronics to develop the next generation of biosensors, implants, pharmaceuticals, biomaterials, and nanoscale power sources
Evolutionary Functional Genomics (EFG)	Understand how genes, gene families, and genomes change over time, and clarify the gene interaction networks responsible for development of a single fertilized egg cell
Infectious Diseases and Vaccines (IDV)	Find selective pathogens, identify vaccine antigens, and use transgenic plants as low-cost, efficient systems for producing oral vaccines
Neural Interface Design (NID) *Formerly Neural Interface Engineering*	Develop neural interface and brain control technologies to rehabilitate motor function disorders caused by central nervous system disease or injury
Protein and Peptide Therapeutics (PPT)	Identify, characterize, and optimize biologically active protein derivatives for use as pharmaceuticals
Rehabilitation Neuroscience & Rehabilitation Engineering (RNRE)	Design and develop technologies to counteract the effects of neurological disorders, including devices for improved health, fitness, and assistance with daily activities
Single Molecule Biophysics (SMB)	Examine the physical processes of life at the molecular level to develop new health care tools

Source: Morrison Institute for Public Policy, 2005.

Data: *Technology and Research Initiative Fund (TRIF) Annual Report*, September 1, 2002, 2003, and 2004.

BUILDING CAPACITY FOR THE FUTURE: RESEARCH IN IT, NANO, MANUFACTURING, AND WIRELESS TECHNOLOGIES

First-year Proposition 301-related research projects that were not realigned under the Biodesign Institute at ASU in FY 2003 were reorganized as "Capacity Building Project Investments." The goal of this reorganization was to provide better research focus, more interdisciplinary connectivity, and greater economic impact. For FY 2003, capacity building research concentrated on applications in information technology, development of materials science, and supply networks for advanced manufacturing. In FY 2004 the focus was shifted to include wireless technologies rather than manufacturing.

CAPACITY BUILDING PROJECT INVESTMENTS IN FY 2004:

- Aligned the information science initiative projects under the Institute for Computer Information Science and Engineering (InCISE), which serves as an umbrella for five core research groups and three affiliated research groups.
  - InCISE Core groups:
    - Center for Cognitive Ubiquitous Computing (CUbiC)
    - Enabling Technologies for Intelligent Information Integration (ET-I^3)
    - Information Assurance (IA)
    - Partnership for Research in Spatial Modeling (PRISM)
    - Software Factory (SF)
  - InCISE Affiliated groups:
    - Center for Research in Arts, Media, and Engineering (AME)
    - Center for Advanced Business through Information Technology (CABIT)
    - Consortium for Embedded and Internetworking Technologies (CEINT)
- Continued research under the advanced materials initiative to build on ASU's strengths in nanoelectronics, molecular electronics, organic light-emitting devices, and wide bandgap semiconductors to produce new nanoengineered devices for medical, security, and IT applications.
- Created a new wireless technology initiative to concentrate on development of nanoscale wireless devices for communication, monitoring, and medical applications. This initiative combines the resources of one new and one existing ASU program:
  - WINTech (Wireless Info-Nano Technologies) — a new program to build ASU's capacity in developing fully autonomous wireless systems envisioned by researchers working in other Proposition 301-supported areas, including the Biodesign Institute at ASU and the Consortium for Embedded and Internetworking Technologies
  - ConnectionOne — a National Science Foundation/University Cooperative Research Center at ASU with 12 member companies and 2 academic partners working on near-term industry R&D needs in wireless technology

RESEARCH FOCUS IN SELECTED CAPACITY BUILDING PROJECT INVESTMENTS, FY 2004

CAPACITY BUILDING PROJECTS	CENTER OR RESEARCH AREA	FOCUS
Information Science	Institute for Computer Information Science and Engineering (InCISE)	Provide leadership for information technology core research centers and affiliated groups; facilitate research on IT applications related to data management, security, and modeling; enhance interdisciplinary research and entrepreneurship
	Center for Cognitive Ubiquitous Computing (CUbiC)	Design computers that are aware of their surroundings and can communicate intuitively with humans
	Partnership for Research in Spatial Modeling (PRISM)	Research methods of visualizing 3D and higher dimensional data for use in biology, anthropology, fine arts, engineering, and other areas
	ASU Software Factory	Provide a hands-on learning experience in software engineering for student interns; offer software development services to projects across campus, including the Biodesign Institute at ASU
	Center for Research in Arts, Media, and Engineering (AME)	Integrate engineering technologies with fine arts to enable new methods of artistic expression
	Center for Advancing Business through Information Technology (CABIT)	Partner with industry to research business management in the emerging E-economy
	Consortium for Embedded and Internetworking Technologies (CEINT)	Collaborate with high tech industry to expand capacity in embedded systems through an integrated program of targeted research, visiting professorships, continuous curriculum development, for-credit internships, and support for talented students through scholarships and assistantships
Advanced Materials	Integrated Micro/Nanosystems	Create new micro and nanoscale applications and devices for sensing, memory storage, optics, and communications technologies
Wireless Technology	WINTech (Wireless Info-Nano Technologies)	Work with ConnectionONE to develop nanoscale wireless devices for the next generation of products in communications, monitoring, security, biotelemetry, and bioimplants

Source: Morrison Institute for Public Policy, 2005.

Data: *Technology and Research Initiative Fund (TRIF) Annual Report,* September 1, 2002, 2003, and 2004.

REDESIGN OF TECHNOLOGY TRANSFER: A MARKET-ORIENTED APPROACH

Proposition 301 monies allowed the university's tech transfer office to begin a series of creative initiatives that culminated in FY 2003 with the establishment of Arizona Technology Enterprises (AzTE), a new limited liability 501(c)(3) corporation closely affiliated with ASU. AzTE replaces ASU's former technology transfer unit. As a limited liability corporation, AzTE can practice a "technology venturing" approach to commercialization of university inventions that is more business friendly than the passive and protective handling of university intellectual property practiced by traditional university tech transfer offices.

Tech venturing allows AzTE to be:

- More flexible in structuring licensing and partnership deals with companies
- More responsive to the time-sensitive development demands of the technology industry
- Faster at licensing and commercializing new inventions

ARIZONA TECHNOLOGY ENTERPRISES IN FY 2004:

- Actively assessed and marketed ASU inventions through entrepreneurial partnerships, relationships with investors, and business development services for new startup companies
- Established the Technology Venturing Clinic, offering selected graduate students an opportunity to work with AzTE on tech venturing projects including patent investigation, business modeling, deal structuring, and market assessment and research
- Received no Proposition 301 monies for operations in FY 2004,* but remained a resource for Proposition 301-supported research at ASU and NAU**

NEW VERSUS OLD APPROACH TO COMMERCIALIZING UNIVERSITY INVENTIONS

PROPOSITION 301 TECH VENTURING	TRADITIONAL TECH TRANSFER
Actively assesses new technologies for commercial value and marketability	Provides passive protection of new technologies
Bundles related inventions together as a portfolio to simplify and speed licensing	Licenses new inventions individually
Offers business development services and risk-sharing through partnerships with entrepreneurs	Does not assist companies after inventions are licensed
Provides entrepreneurial assistance for promising faculty startups	Follows a "hands off" policy regarding faculty involved with startups
Run by individuals with business experience including venture capital and product and business development	Staffed with university personnel

Source: Morrison Institute for Public Policy, 2005.

Data: Arizona Technology Enterprises and ASU Office of the Vice President for Research and Economic Affairs.

* Proof of concept grants for faculty inventors continued to be funded by Proposition 301.

** AzTE performs technology management services for NAU.

SCIENCE AND TECHNOLOGY POLICY: NEW CAT MEASURES ASSESS EN ROUTE RETURN ON INVESTMENT

As a complement to ASU's annual reporting to the Arizona Board of Regents, Morrison Institute for Public Policy is developing the CAT Measures, a new assessment tool to help policymakers and research managers identify the public's return from state investments in university-based science and technology research. The CAT Measures concept has already received considerable national interest — most recently at the October 2004 annual conference of SSTI (State Science and Technology Institute), a leading tech-based economic development organization with national and international prominence.

The CAT Measures focus on research outcomes related to three pillars of the knowledge economy:

- **CONNECTIONS** The networks developed among researchers, entrepreneurs, and venture capitalists that help transfer knowledge and generate economic opportunities
- **ATTENTION** The notice generated by research and research networks that attracts businesses, private investment, and highly skilled workers to a region
- **TALENT** The top scientists and workers in a region that help make it fertile ground for research, innovation, entrepreneurship, and economic growth

Benefits of the CAT Measures include:

- Early feedback on the progress of research investments for policymakers and research managers
- Annual collection of important knowledge economy outcomes not otherwise counted
- Clear and understandable results that are graphically presented and easily compared year over year

The CAT Measures were field tested in 2004 using the Biodesign Institute at ASU as a test bed. Next steps for the CAT Measures potentially include assessment of research conducted by:

- Other research units at ASU
- All three Arizona public universities
- Private nonprofit research labs
- Universities across the country

ADDITIONAL INFORMATION: RELATED LINKS ON PROPOSITION 301, TRIF, AND CAT

PROPOSITION 301 AND TRIF

- Proposition 301 funding and projects at ASU:
  http://researchnet.asu.edu/prop301/
- TRIF purpose:
  http://www.azleg.state.az.us/ars/15/01648.htm
- TRIF distribution of monies:
  http://www.azleg.state.az.us/ars/42/05029.htm

REPORTS

- FY 2002 TRIF report to the Arizona Board of Regents:
  http://www.abor.asu.edu/1_the_regents/TRIF/TRIF_FY2002.pdf
- FY 2003 TRIF report to the Arizona Board of Regents:
  www.abor.asu.edu/1_the_regents/TRIF/1TRIF%20FY2003.pdf
- FY 2004 TRIF report to the Arizona Board of Regents:
  www.abor.asu.edu/1_the_regents/TRIF/TRIF%202004%20PDF.pdf
- *Seeds of Prosperity: Public Investment in Science and Technology Research; A Study of the Economic Potential of Proposition 301 at Arizona State University and a New Model for Assessing its Long-Term Value*:
  www.asu.edu/copp/morrison/Prop301.pdf
- *New Returns on Investment in the Knowledge Economy: Proposition 301 at Arizona State University, FY 2003*:
  www.asu.edu/copp/morrison/NewReturns-REV.pdf

PROPOSITION 301-SUPPORTED RESEARCH AT ASU

- Arizona Technology Enterprises (AzTE):
  www.azte.com
- Biodesign Institute at Arizona State University:
  http://www.biodesign.org/
- Computer Science and Engineering:
  http://www.eas.asu.edu/cse/research/index.php
- Proposition 301 at ASU:
  http://researchnet.asu.edu/prop301

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