

Arizona's Bioscience Roadmap: Performance Assessment 2002-08

Presentation and Discussion

Walter H. Plosila, PhD

Senior Advisor, Technology Partnership Practice

January, 2009

A vision for Arizona in the Biosciences

Today's Look: Six Years of Implementation

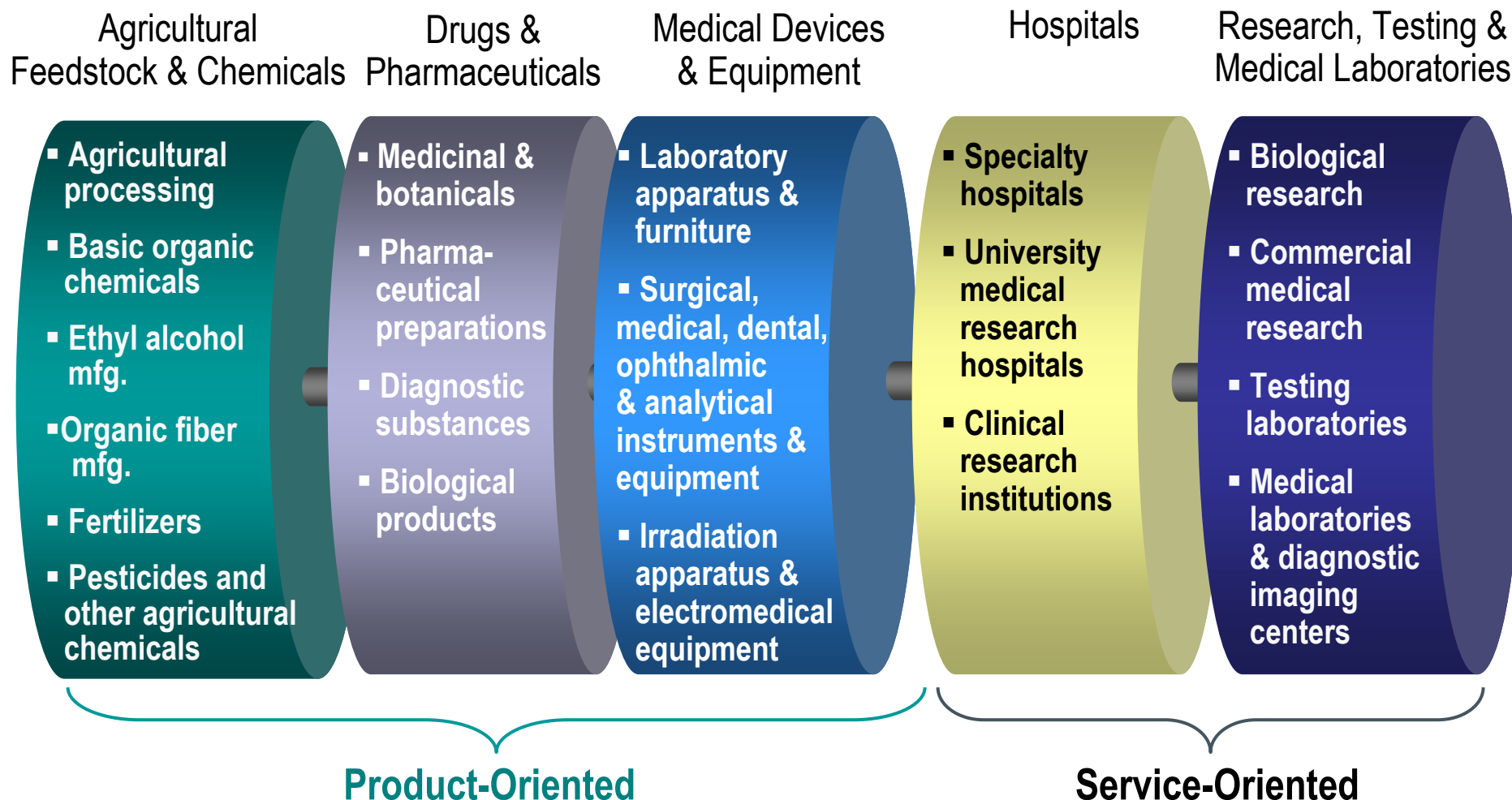


Arizona is one of the nation's foremost biomedical research and bioscience commercial centers, built around world-class research, clinical excellence, and a growing base of cutting edge enterprises and supporting firms and organizations.

What is unique about Arizona

- **Collaboration is a key means for advancement**
- **Lead with technology and interdisciplinary research**
- **Leapfrog rather than follow in footsteps of traditional academic health leaders**

Defining the Biosciences



Summary: Bioscience Roadmap progress

- Commitment of public/private sector leadership has been sustained
- Strong private/public partnerships have mobilized to support the Roadmap
- Ongoing effort to inform the general public about biosciences
 - Northern Arizona Roadmap
 - Southern Arizona Roadmap



Measures for assessing Arizona's Bioscience Roadmap progress

Best Practice Metrics To Measure Building a Biosciences-driven Economy

- ***Federal bio-related R&D funding to universities***
- ***NIH R&D funding as the “gold standard”***
- ***Specialization of industry and its concentration rates***
- ***Private venture investments***
- ***University-related start-ups***
- ***Roadmap implementation progress***

Metrics of success: 2002 - 2007

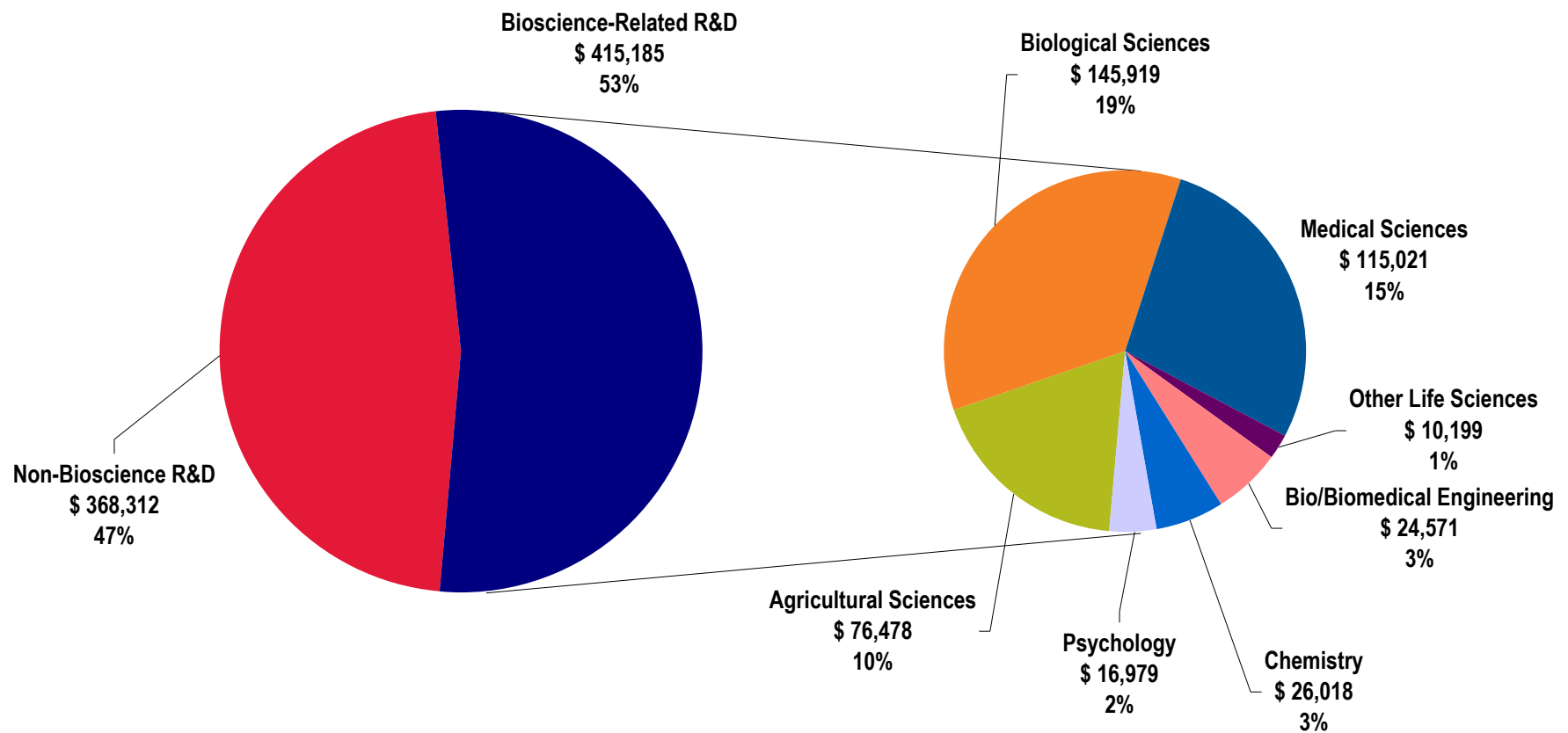
Metrics	Performance	Comments
NIH Funding	↑ 24% ('02-'07)	Arizona performance outpacing top 10 States (↑ 11%) and U.S. (↑ 11%)
Bio Jobs	↑ 23% ('02-'07)	Arizona's growth exceeding country
Bio Firms	↑ 22% ('02-'07)	Medical devices; Research, testing and medical labs are key segments
Bio Wages	↑ 34% ('02-'07)	Average salary: \$52.5K

Metrics of success: 2002 – 2008

Metrics	Performance	Comments
Bio Risk Capital	↓ 41% ('02-'08)	Reached 86% of goal in 2007 but only 65% of goal in 2008
Bio University IP		
• Bio Startups	↑ 50% ('02-'08)	42 bio startups 2002-08
• Bio Licenses	↑ 15% ('02-'08)	176 licenses 2002-08
• Bio Income	↓ 18% ('02-'08)	total of \$14.4 m. 2002-08; significant decline in 2008 over 2006-07 levels

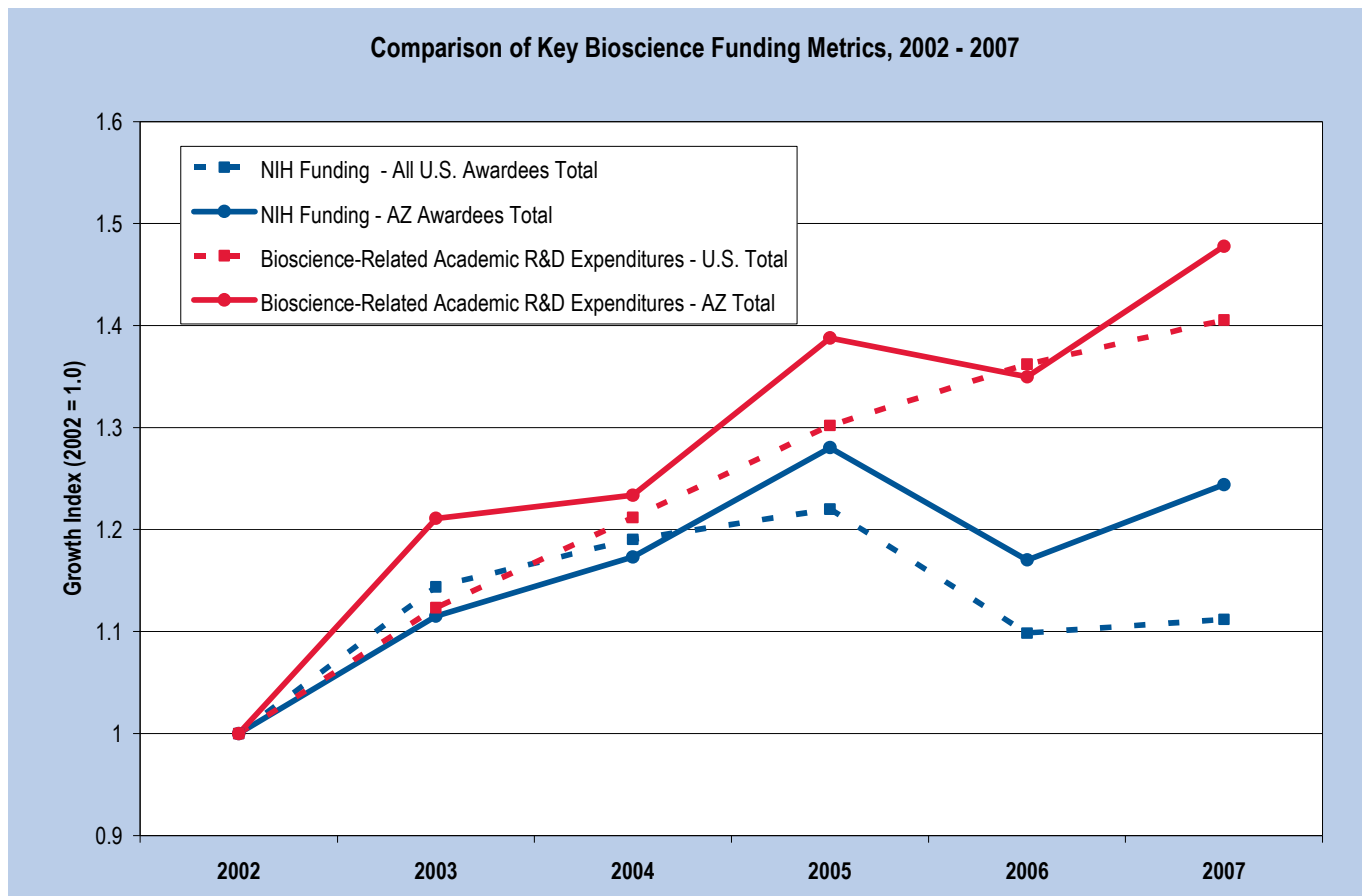
Biosciences Share of Arizona Academic R&D

Arizona Academic R&D in Bioscience Related Fields, FY 2007 (\$ in Thousands)



Trends in federal research grants

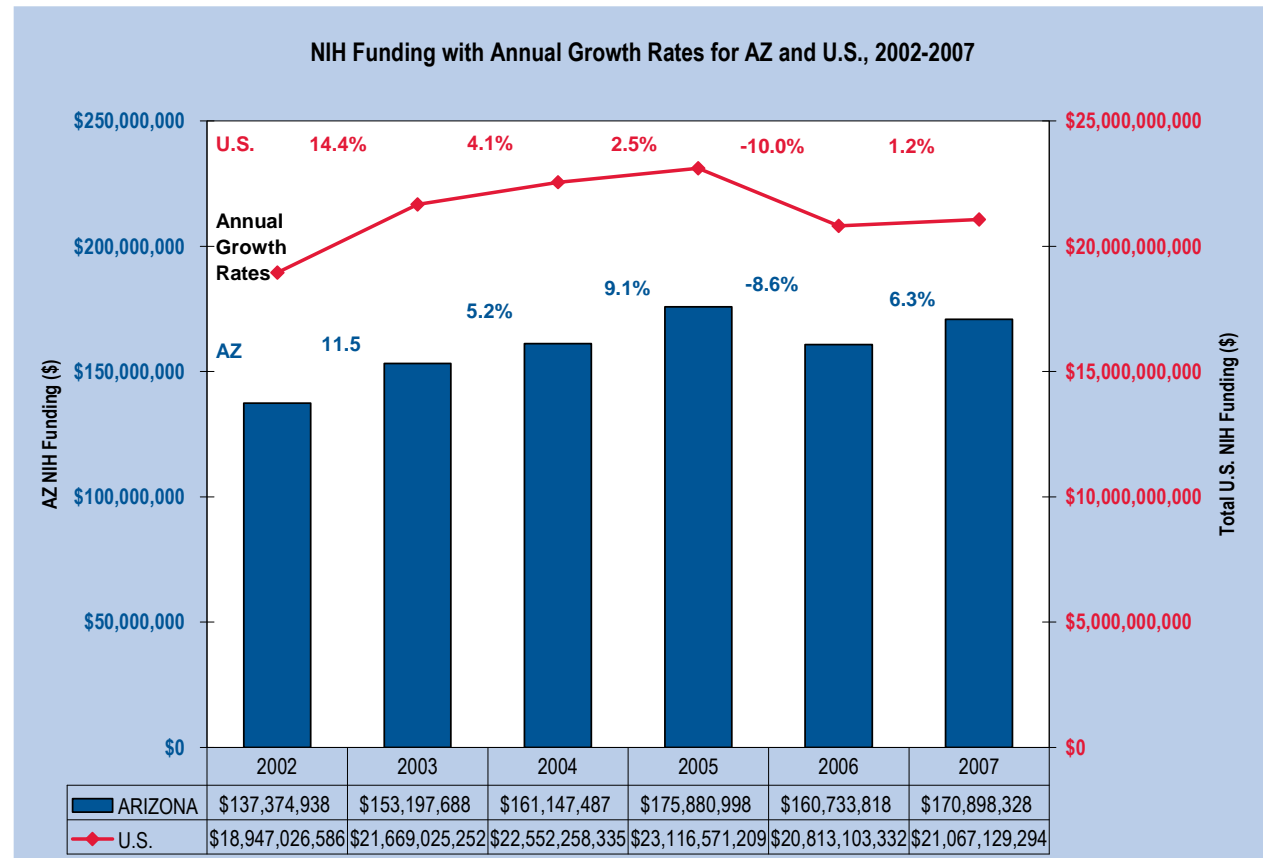
- With a higher than U.S. growth rate from FY '06-'07, Arizona bioscience-related academic R&D is at a new high and NIH funding is nearing the FY '05 peak.



Source: NIH, NSF Research Expenditures, and Battelle calculations

NIH research grant funding trends

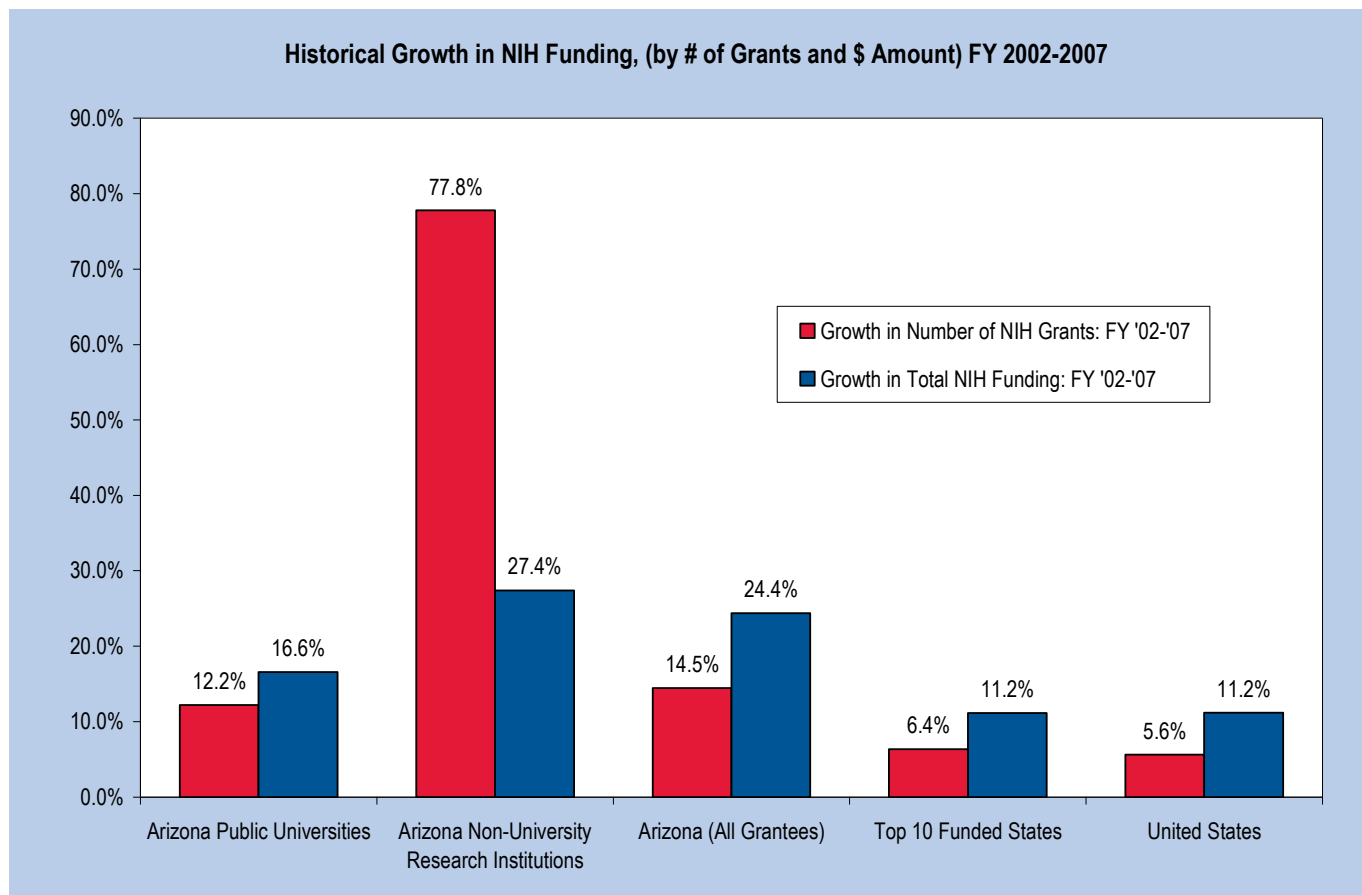
- Arizona has recorded strong growth in NIH funding—the gold standard of biomedical research funding
- FY '06 NIH cuts and rescissions impacted Arizona slightly less than the U.S. average.
- With FY '07 funding, AZ has almost rebounded to FY '05 levels.
- While Arizona is still playing catch up in NIH research funding—it has increased its share from 0.73% in FY '02 to 0.81% in FY '07.



Arizona NIH funding grew from ~ \$137 m in FY '02 to ~ \$171 m in FY '07 – a gain of 24.4% compared to 11.2% for the nation.

Trends in federal research grants

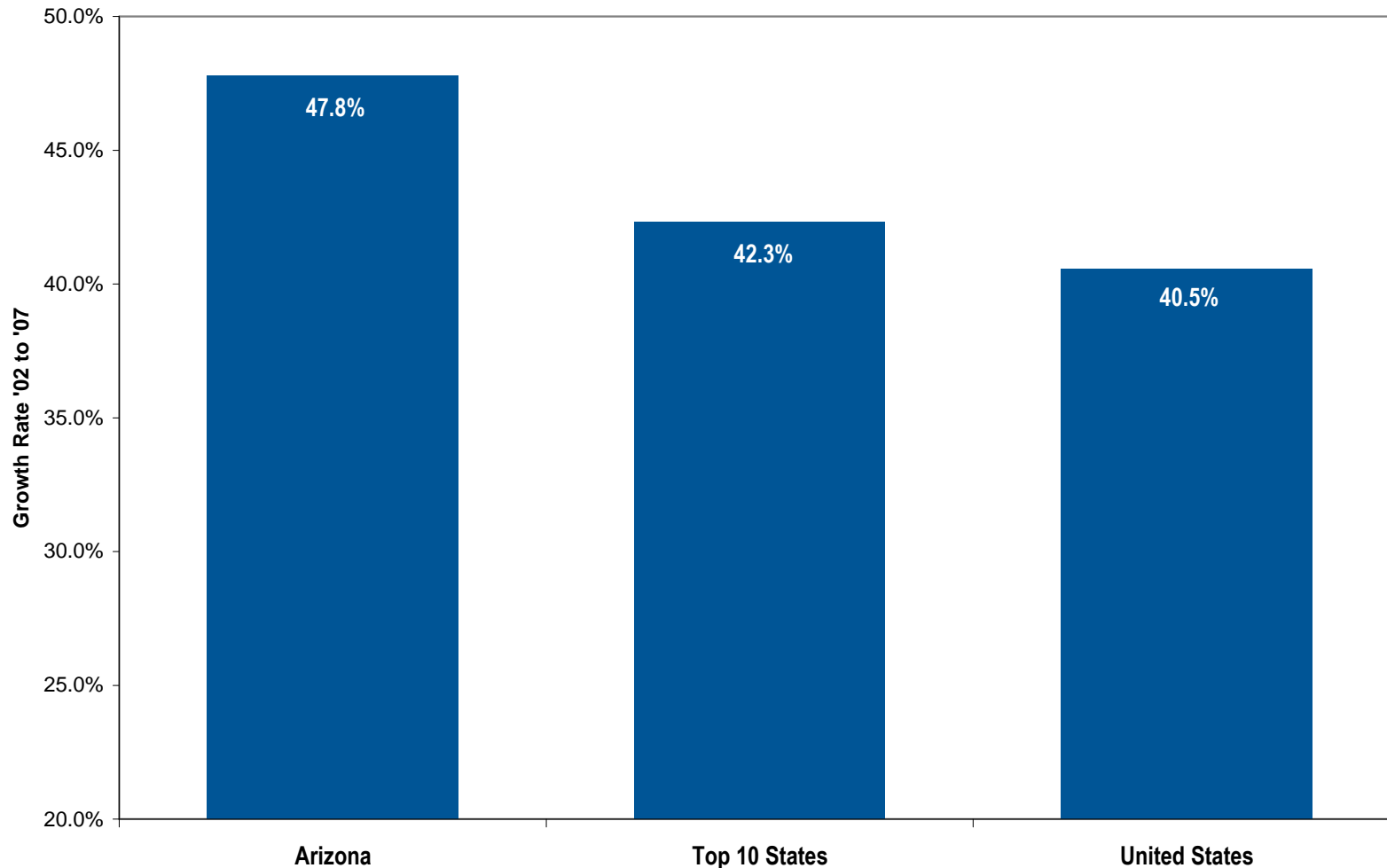
- Overall growth rate in Arizona NIH funding from FY '02 - FY '07 is more than twice both the Top 10 states and U.S. average, driven primarily by significant growth in non-university performers.



Source: NIH, NSF Research Expenditures, and Battelle calculations

Academic bioscience R&D expenditures in Arizona outpacing top 10 states and U.S.

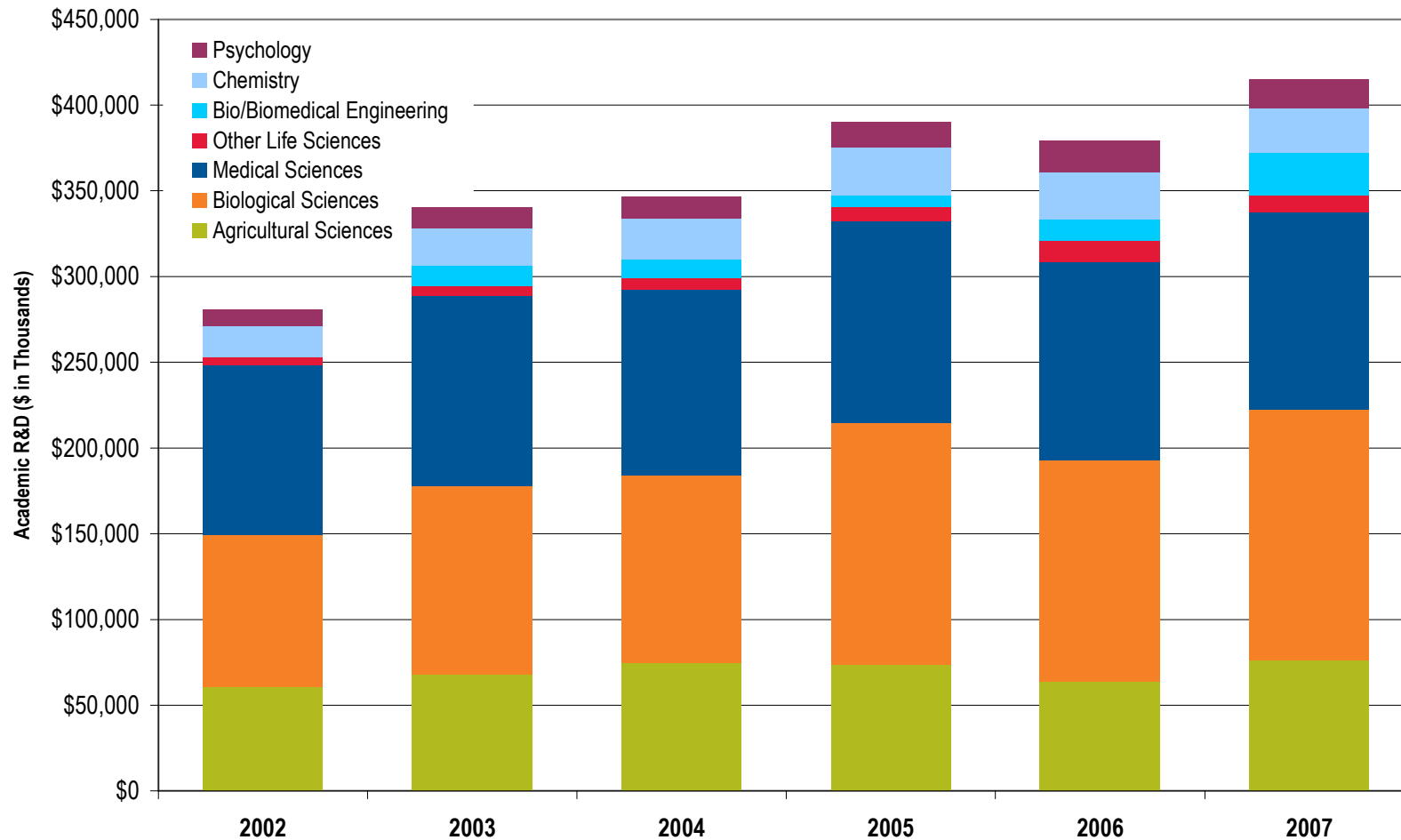
Growth in Bioscience-Related Academic R&D Expenditures: FY '02 - FY '07



Source: NSF Academic R&D Expenditures Data with Battelle Calculations, 2002 & 2007

R&D increase in FY '07 due to >\$10 million increases in biological and agricultural sciences and biolbiomedical engineering (NSF data)

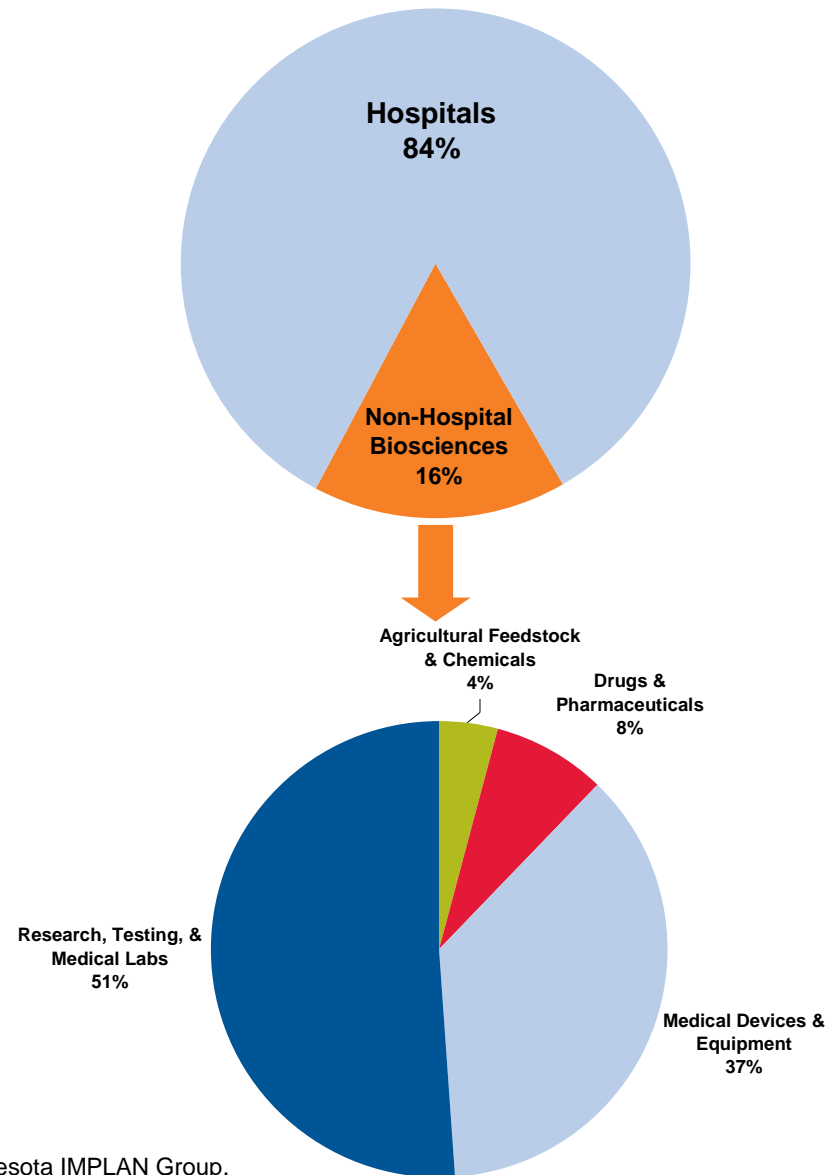
AZ Bioscience-Related Academic R&D by Discipline & Year: FY '02 to '07



Source: NSF Academic R&D Expenditures Data with Battelle Calculations, 2002-2007

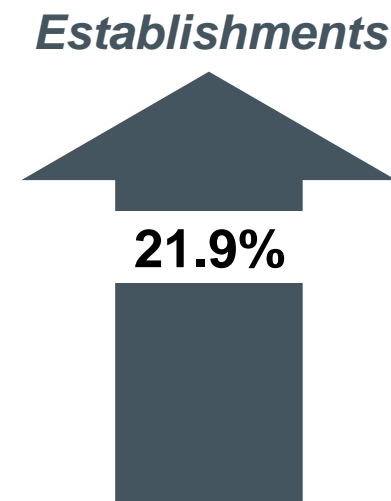
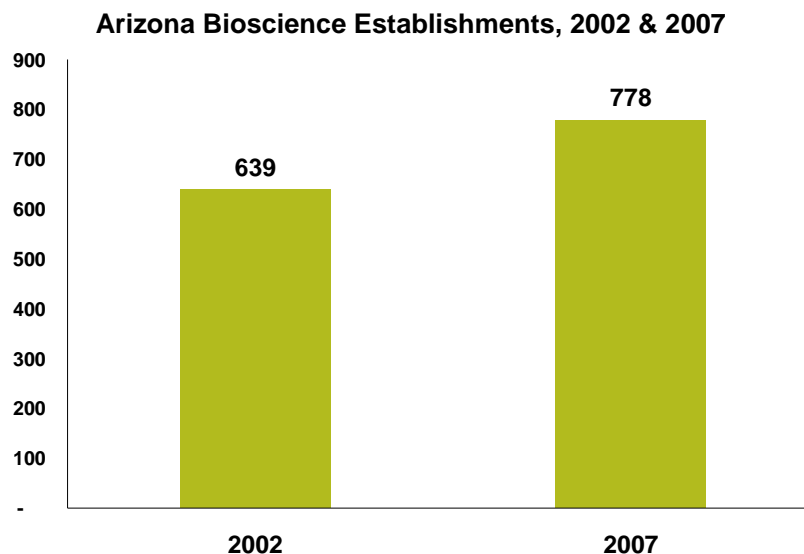
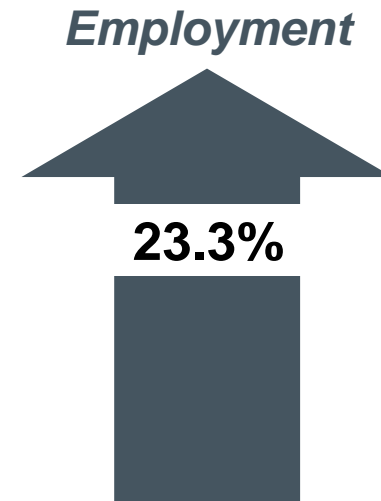
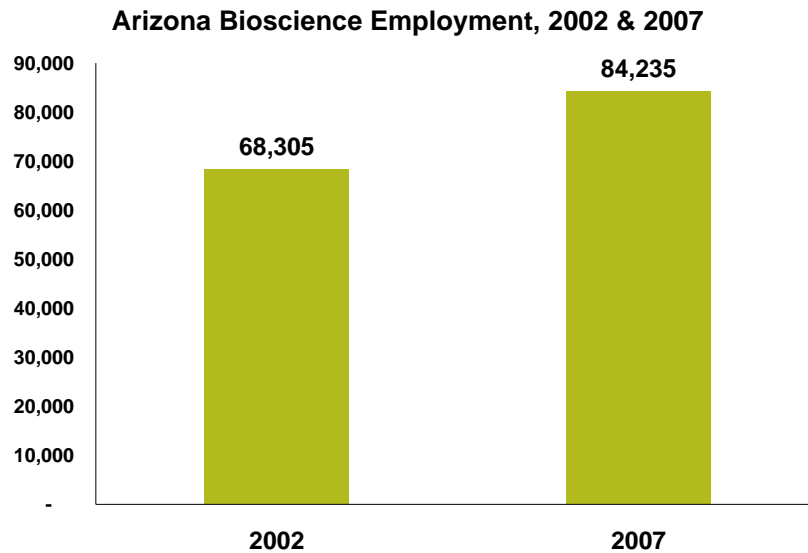
Hospitals dominate bioscience jobs -- with non-hospital bioscience sector growing as fast

- Overall employment in biosciences up by 23% or nearly 16,000 jobs from 2002 to 2007
- **Hospitals** account for the majority of Arizona Bioscience jobs—84 percent in 2007 with 23% job growth since 2002
- **Non-Hospital sector** job growth since 2002 up 24% including:
 - **Research, Testing, & Medical Labs:** 51% of non-hospital employment and up 24% since 2002
 - **Medical Devices:** 37% of non-hospital employment and up 30% since 2002



Source: Battelle analysis of Bureau of Labor Statistics, QCEW data from the Minnesota IMPLAN Group.

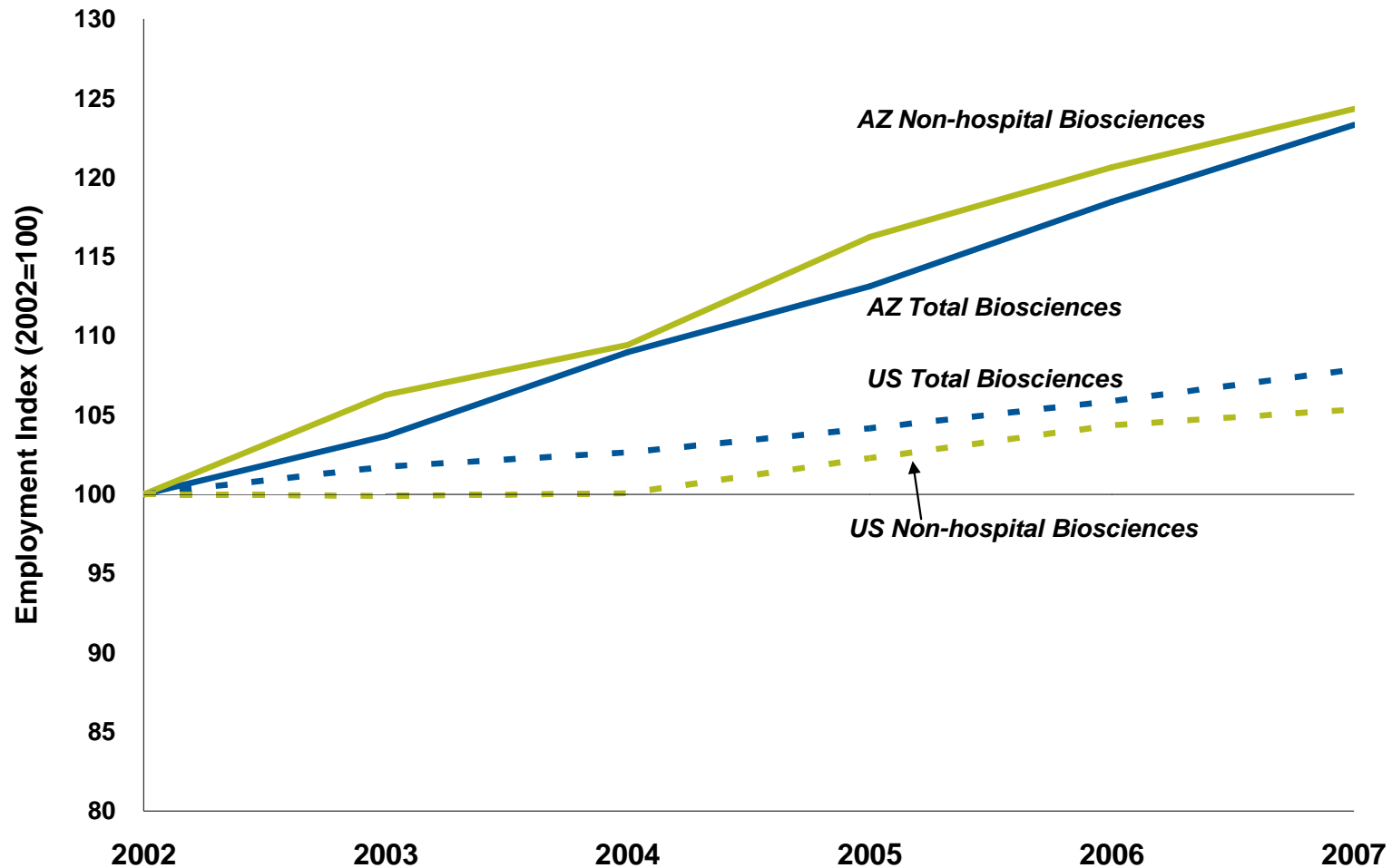
Growth in Arizona bioscience employment and establishments over a 5-year period (2002–07)



Source: Battelle analysis of Bureau of Labor Statistics, QCEW data from the Minnesota IMPLAN Group.

Arizona has experienced much faster job growth in the biosciences compared with the nation

Bioscience Employment Trends, Arizona & U.S. (2002-07)



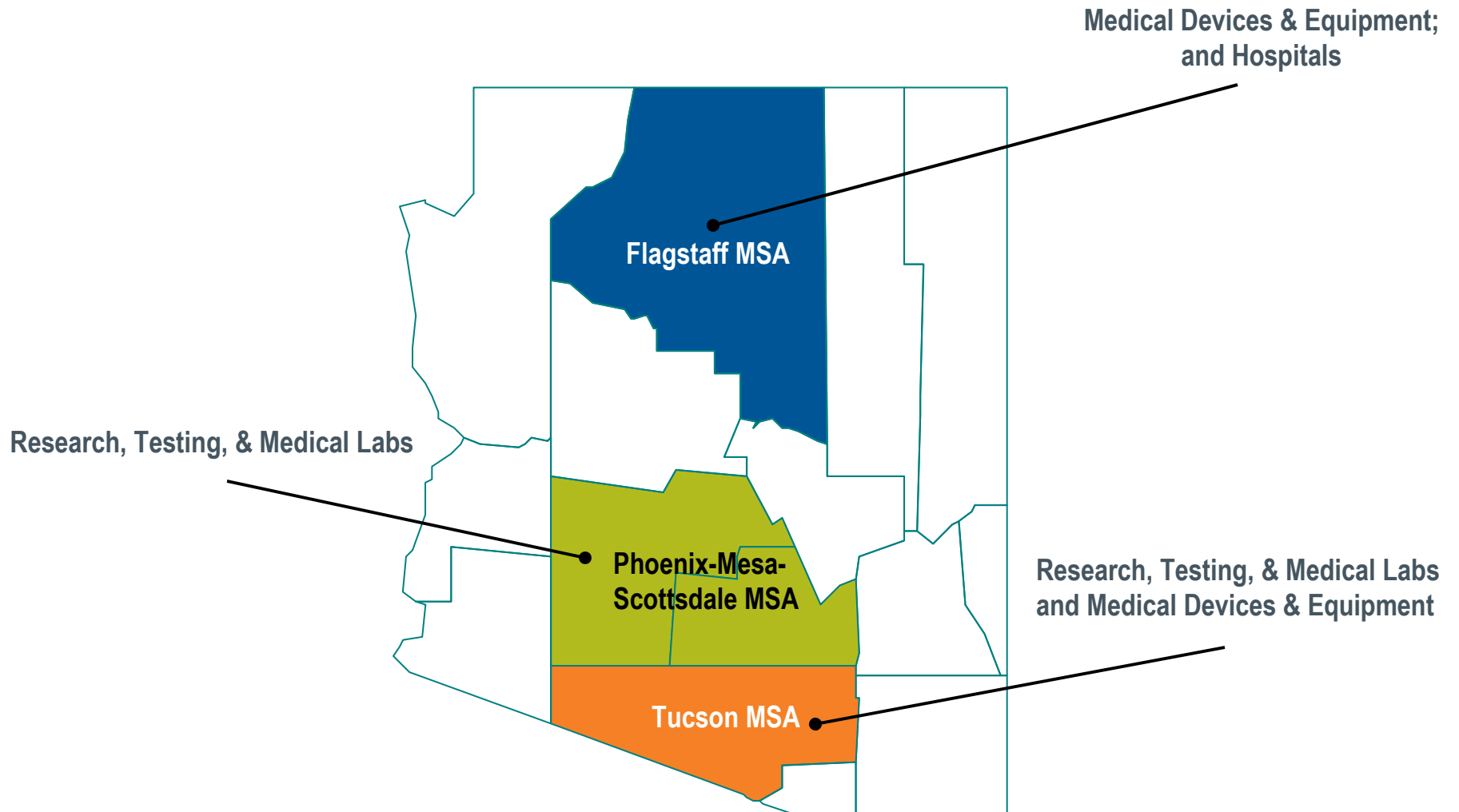
Source: Battelle analysis of Bureau of Labor Statistics, QCEW data from the Minnesota IMPLAN Group.

Growth in all 5 subsectors has boosted Arizona bioscience industry jobs by 23.3% since 2002

Arizona Bioscience Employment Metrics					
Industry Subsector	2007 Establishments	Percent Change Estab, '02-07	2007 Employment	Percent Change Empl, '02-07	2007 Location Quotient
Total Biosciences	778	21.9%	84,235	23.3%	0.74
Non-Hospital Biosciences	659	17.4%	13,544	24.3%	0.53
Agricultural Feedstock & Chemicals	21	-38.3%	559	0.8%	0.26
Drugs & Pharmaceuticals	36	33.3%	1,108	17.1%	0.18
Medical Devices & Equipment	264	5.3%	4,955	29.6%	0.59
Research, Testing, & Medical Labs	338	35.3%	6,922	24.3%	0.78
Hospitals	119	54.5%	70,691	23.1%	0.80

Source: Battelle analysis of Bureau of Labor Statistics, QCEW data from the Minnesota IMPLAN Group.

Metro area analysis highlights diverse regional bioscience strengths

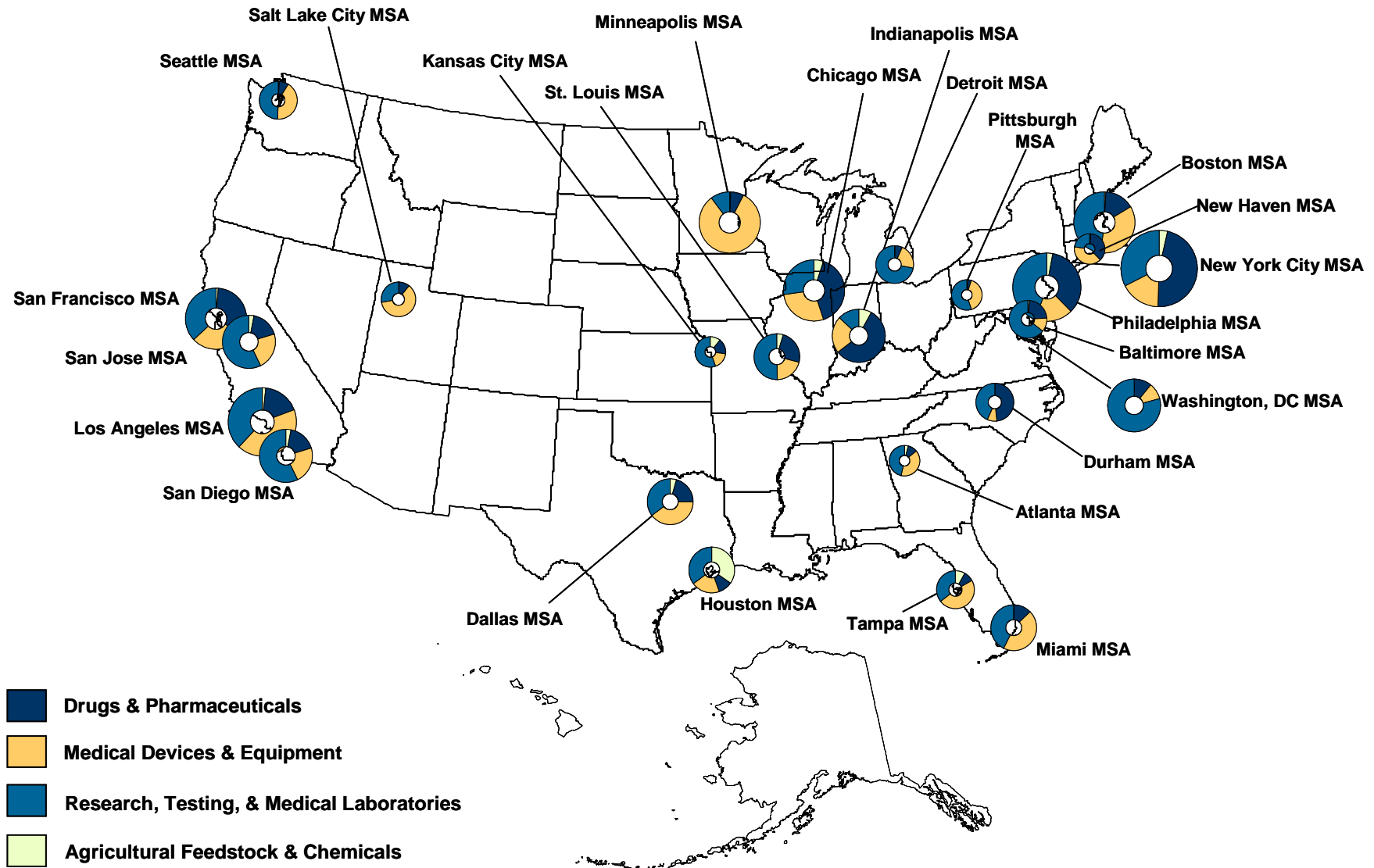


Arizona metro areas demonstrate varied regional bioscience niches

Arizona Metropolitan Area	Key Bioscience Subsector	Establishments, Employment Level & Concentration (2007)	Regional Strengths/Highlights
Flagstaff	Medical Devices & Equipment	Establishments: 8 Employed: 1,673 Empl. Growth ('02-07): 72% Location Quotient: 9.98	<ul style="list-style-type: none"> Flagstaff is highly specialized in medical devices, with 10 times the national employment concentration The regional sector continues to grow at a rapid pace, up 72% since 2002
	Hospitals	Establishments: 3 Employed: 2,485 Empl. Growth ('02-07): 0.3% Location Quotient: 1.40	<ul style="list-style-type: none"> Flagstaff has a specialized hospitals subsector with a 40 percent greater concentration of hospital jobs relative to the national average and nearly 2,500 jobs.
Phoenix-Mesa-Scottsdale	Research, Testing, & Medical Laboratories	Establishments: 216 Employed: 5,107 Empl. Growth ('02-07): 18% Location Quotient: 0.78	<ul style="list-style-type: none"> Phoenix metro area has a large number employed in research, testing, and medical labs—three-quarters of State total The region added 18% to its job base since 2002, driving state growth in the sector
Tucson	Research, Testing, & Medical Laboratories	Establishments: 69 Employed: 1,117 Empl. Growth ('02-07): 18% Location Quotient: 0.93	<ul style="list-style-type: none"> Tucson's research, testing, & medical labs sector employment is well concentrated, nearly matching the national average The region has added 25 establishments in the sector since 2002
	Medical Devices & Equipment	Establishments: 63 Employed: 970 Empl. Growth ('02-07): 34% Location Quotient: 0.86	<ul style="list-style-type: none"> Tucson has an established, growing medical device & equipment subsector with 970 jobs in 2007 across 63 establishments Since 2002, the metro area has boosted sector employment by one third

Source: Battelle analysis of Bureau of Labor Statistics, QCEW data from the Minnesota IMPLAN Group.

Arizona does not (yet) show up on the national map of major bio centers



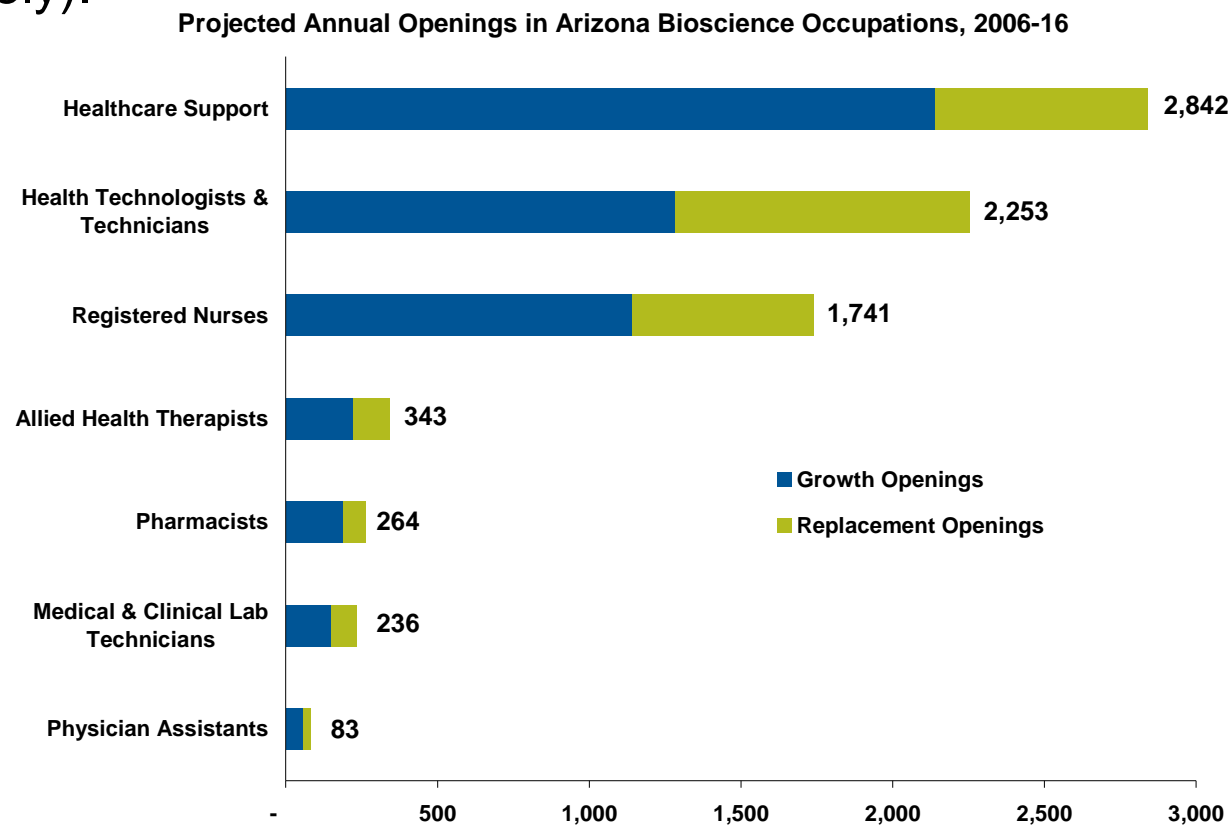
Arizona bioscience workers earn \$11,000/yr more than workers in the overall State private sector in 2007

Major Industries & Bioscience Subsectors	Avg. Annual Wages, 2006	Avg. Annual Wages, 2007	Increase, 06-07
Management of Companies and Enterprises	\$ 66,311	\$ 74,293	12.0%
Drugs & Pharmaceuticals	\$ 56,274	\$ 62,540	11.1%
Professional, Scientific, and Technical Services	\$ 57,527	\$ 62,192	8.1%
Research, Testing, & Medical Laboratories	\$ 57,031	\$ 60,564	6.2%
Finance and Insurance	\$ 58,895	\$ 59,487	1.0%
Manufacturing	\$ 57,627	\$ 58,402	1.3%
Total Non-Hospital Biosciences	\$ 53,369	\$ 56,634	6.1%
Information	\$ 51,151	\$ 53,337	4.3%
Total Biosciences	\$ 48,674	\$ 52,481	7.8%
Hospitals	\$ 47,763	\$ 51,685	8.2%
Medical Devices & Equipment	\$ 48,958	\$ 51,651	5.5%
Health Care and Social Assistance	\$ 42,962	\$ 44,912	4.5%
Transportation and Warehousing	\$ 42,151	\$ 44,154	4.8%
Construction	\$ 40,907	\$ 42,526	4.0%
Real Estate and Rental and Leasing	\$ 43,008	\$ 42,306	-1.6%
Total Private Sector	\$ 39,526	\$ 41,044	3.8%
Agricultural Feedstock & Chemicals	\$ 39,875	\$ 40,449	1.4%
Retail Trade	\$ 28,393	\$ 28,492	0.3%

Source: Battelle analysis of BLS, QCEW data from the Minnesota IMPLAN Group. Wages are in current dollars (not adjusted for inflation).




Bio-related occupational employment projections reveal not only strong expected growth but also a high need for replacement workers

- Among overall primary bioscience occupations (both clinical and non-clinical), latest projections for 2006-16 show a 10-year expected growth rate for bio-related jobs at twice that for all occupations (32% vs. 15%, respectively).









Source: Battelle analysis of Occupational Employment Projections data from the Arizona LMI Office.




Arizona's Bioscience Roadmap implementation

-  Substantial Progress – 10
-  Progress – 7
-  Not Yet Implemented – 2






- Three Actions Moved to Substantial due to SFAz programs
- Progress has been seen on nearly 90% of the actions included in the December 2002 Arizona's Bioscience Roadmap




Arizona Roadmap potential strategies and actions

Strategy 1	Action	Status
Build the state's research infrastructure of outstanding talent, modern facilities and equipment, around selective technology platforms and core competencies	Establish statewide fund to enhance bioscience research	
	Stimulate research collaboration among universities/hospitals/other research organizations	
	Establish a Matching Challenge Program to connect industry and researchers	
	Increase help to entrepreneurs to secure federal funds (SBIR/STTR)	
	Secure federal investments to build Arizona's bioscience capacity	
	Adequately fund higher education including bond financing for capital projects	





-  Substantial Progress
-  Progress
-  Not Yet Implemented




Arizona Roadmap potential strategies and actions

Strategy 2	Action	Status
<p>Build a critical mass of bioscience firms by increasing the birthrate and reducing the death rates of Arizona's bioscience firms and encouraging the commercialization of research discoveries</p>	<p>Provide in-depth, comprehensive, entrepreneurial assistance support to start-up and emerging bioscience companies</p>	
	<p>Support prototype development and proof of concept activities from research to commercialization</p>	
	<p>Invest at earliest stages of firm formation through an Arizona BioSeed Fund</p>	
	<p>Provide wet lab space through support of bioscience accelerators/incubators/wet lab space in and around research parks</p>	
	<p>Provide a mechanism for Arizona universities to take equity in start-up companies</p>	





-  Substantial Progress
-  Progress
-  Not Yet Implemented




Arizona Roadmap potential strategies and actions

Strategy 3	Action	Status
Offer a business climate and environment that supports, sustains, and encourages the growth of bioscience enterprises, small and large, to start, expand and remain in Arizona	Revise state/local economic development programs to support the growth, expansion and selective recruitment of biosciences firms	
	Establish Technology Zones around existing and proposed concentrations of bioscience and other technology industries	
	Form a strong statewide bioscience trade association with regional chapters	
	Initiate a statewide image, marketing and business development effort to market Arizona as a location for bioscience firms	

-  Substantial Progress
-  Progress
-  Not Yet Implemented

Arizona Roadmap potential strategies and actions

Strategy 4	Action	Status
<p>Encourage the state's citizens to become a more informed citizenry in the biosciences and encourage young people to explore and pursue scientific and technical careers</p>	<p>Create capacity to understand and address health policy issues from review boards, central data banks, to ethics and public policy reviews</p>	
	<p>Address future talent pool by making improvements in science and math in K-12 through graduate education</p>	
	<p>Encourage talent to remain in the state by expanding co-op and internship programs</p>	
	<p>Address the need to attract top graduate students to clinical research opportunities in Arizona</p>	

-  Substantial Progress
-  Progress
-  Not Yet Implemented

Achieving Impact



Transferring Discoveries to Marketplace

Arizona higher education progress in biosciences technology transfer: Growth in ideas, patents, income

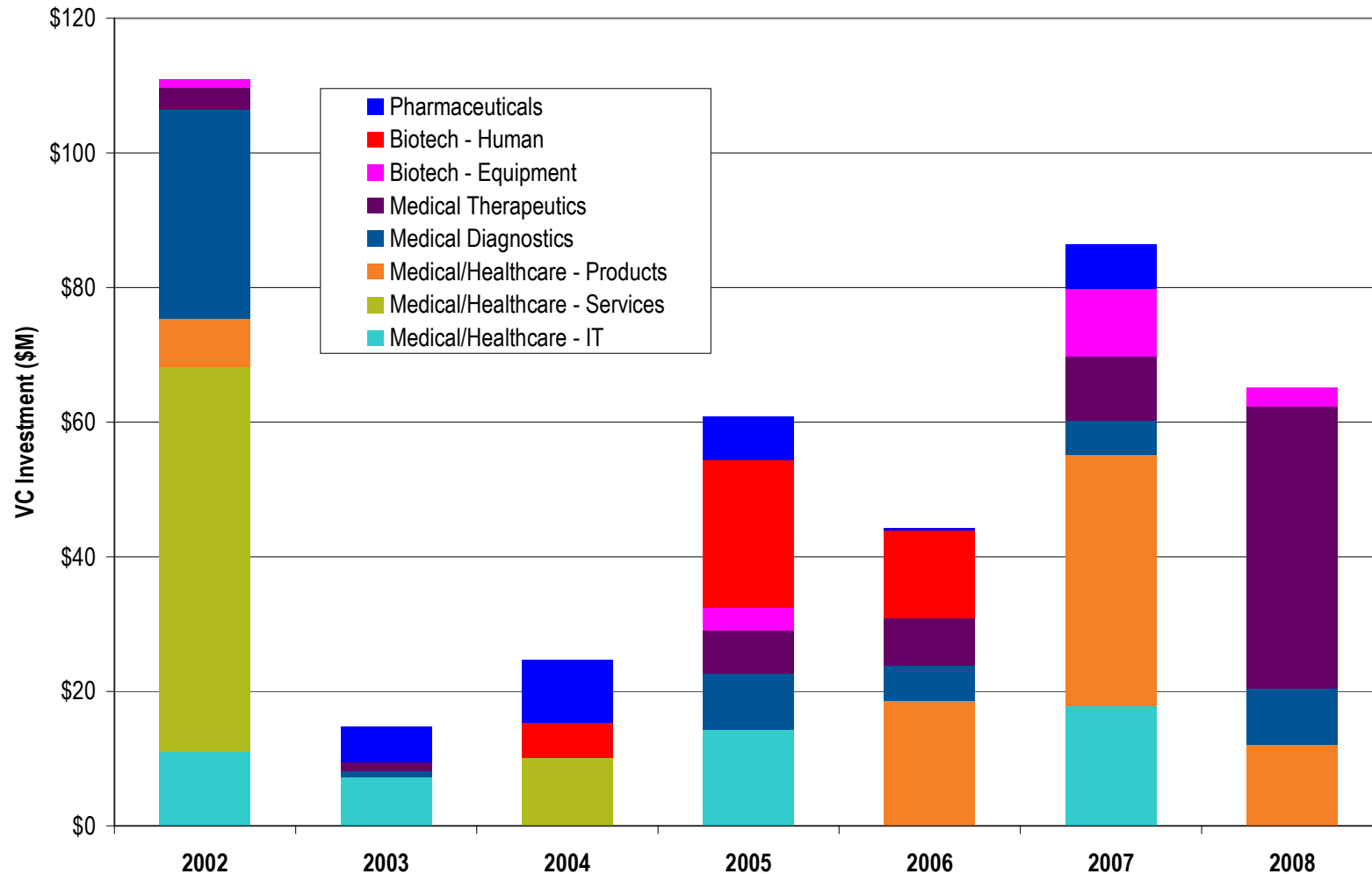
Metric	2002	2003	2004	2005	2006	2007	2008
Invention Disclosures Received	93	94	84	136	119	103	107
Total U.S. Patent Applications Filed	59	70	70	59	42	110	101
U.S. Patents Issued	13	12	19	16	20	25	15
Licenses & Options Executed	20	19	25	33	30	26	23
Adjusted Gross License Income Received	\$1,845,889	\$1,129,999	\$1,727,272	\$1,857,508	\$3,318,339	\$3,044,167	\$1,517,913
Bioscience Startups from University IP	2	6	11	10	5	5	3

Arizona bioscience VC: Larger share of deals, firms, investments – but <1.0% of national pool

Total VC Investments in Arizona and the U.S., 2002 - 2008						
Metric	ARIZONA			U.S.		
	Biosciences	All Industries	Bioscience Share of Total VC	Biosciences	All Industries	Bioscience Share of Total VC
Number of Deals	60	203	30%	7,266	30,022	24%
Number of Individual Companies Invested In	24	95	25%	2,791	12,567	22%
Investment in \$Millions	\$407	\$1,311	31%	\$62,589	\$245,685	25%

Likely total VC decline from 2007 – Medical Therapeutics reaches all-time annual high

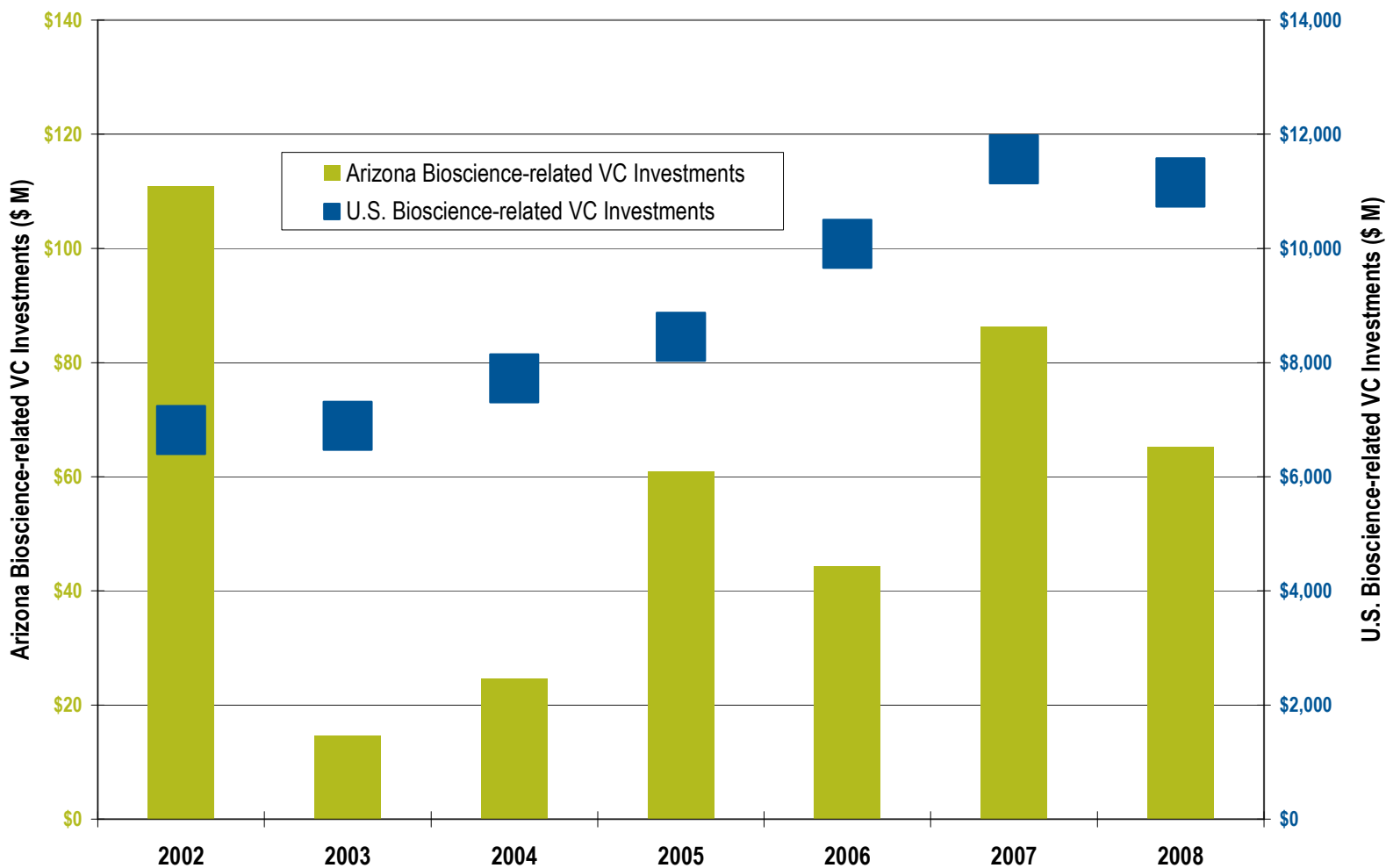
Distribution of Arizona Bioscience VC Investments by Segment and Year, 2002 - 2008



Source: Thomson Reuters VentureXpert with Battelle Calculations

Arizona tends to follow the national trend

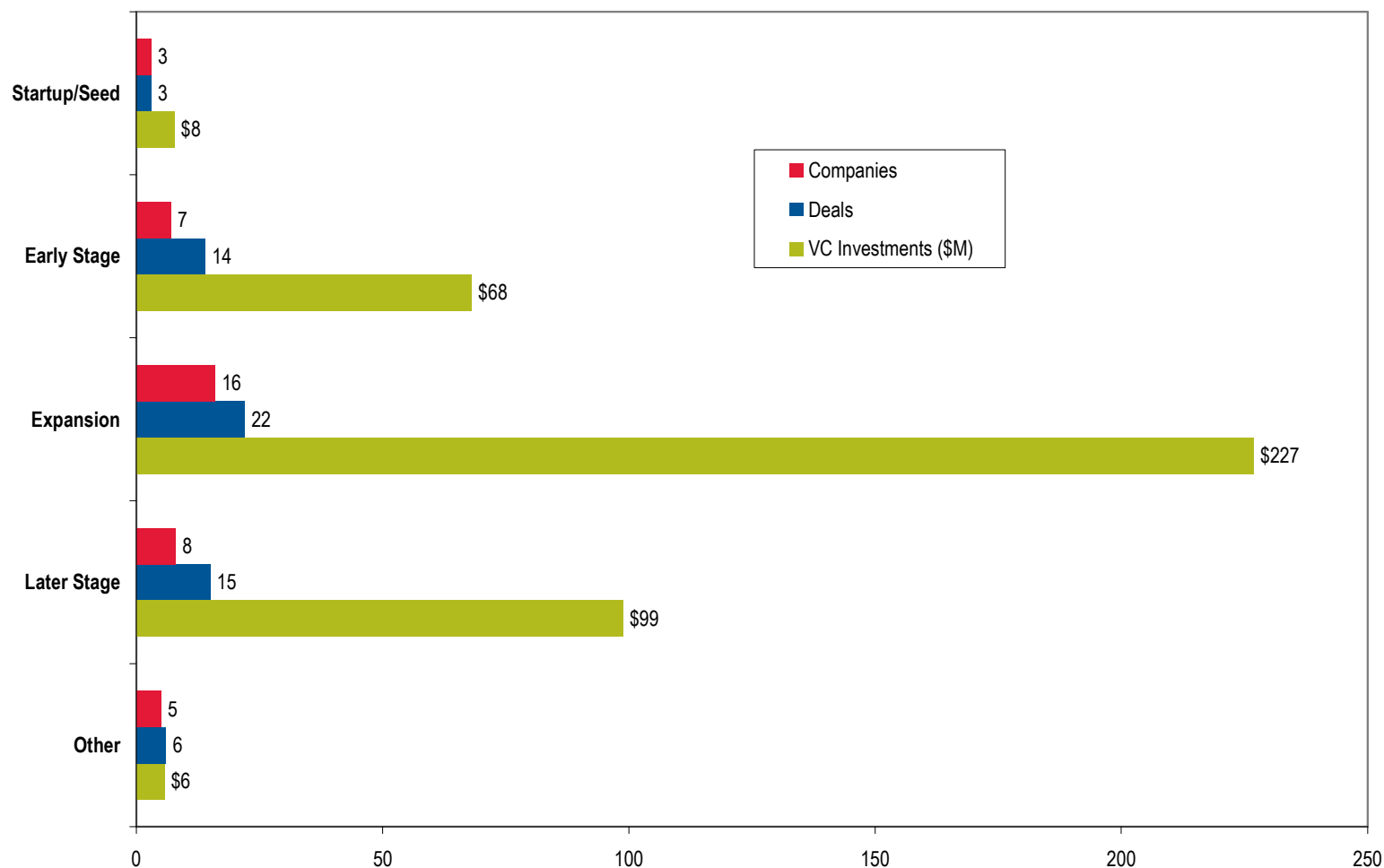
Comparison of Bioscience-related VC Investment Trends: Arizona & U.S., 2002 - 2008



Source: Thomson Reuters VentureXpert with Battelle Calculations

Arizona VC Investments by Stage

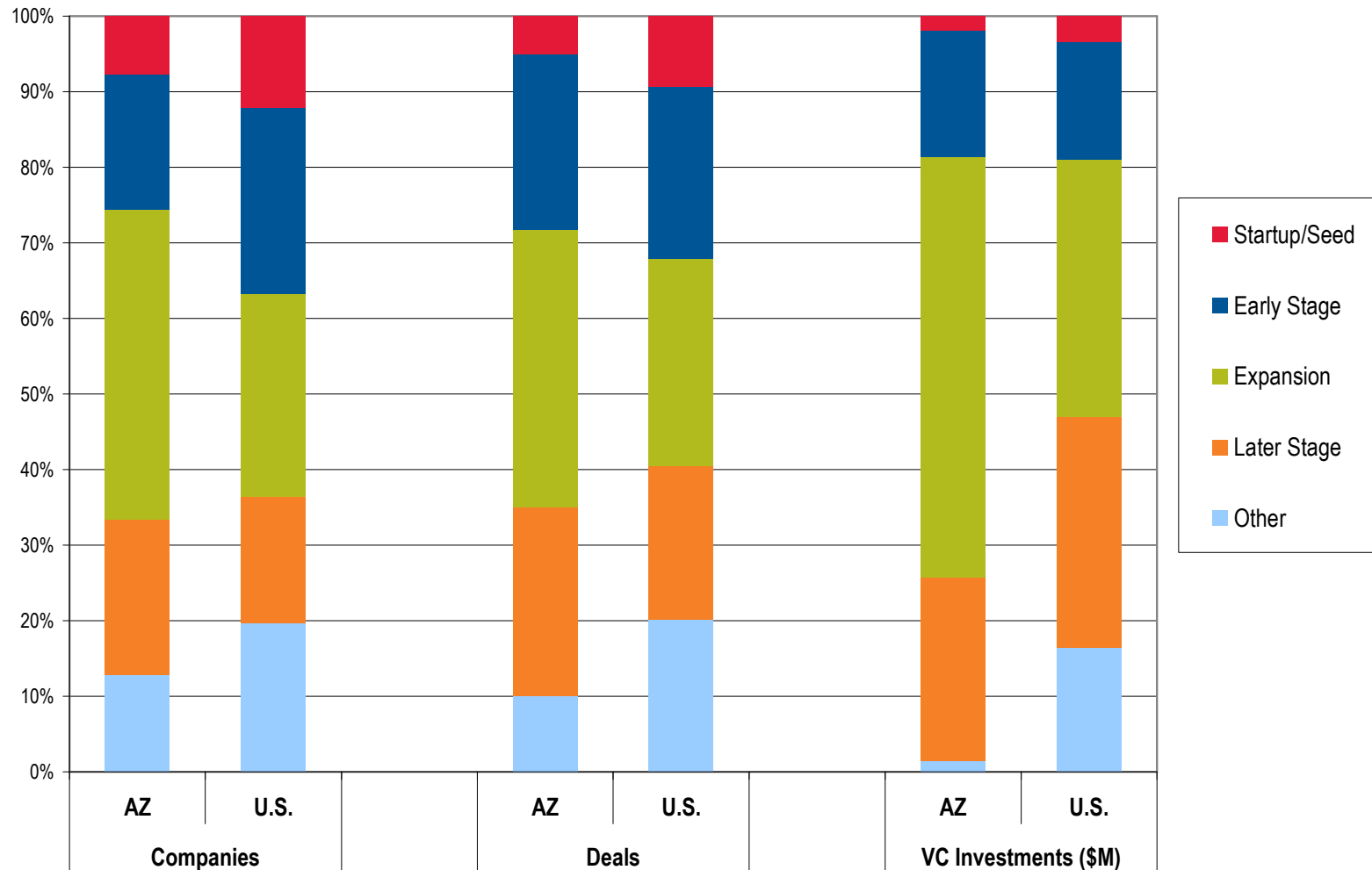
Arizona VC Investments, Bioscience Industry by Stage, 2002 - 2008



Source: Thomson Reuters VentureXpert with Battelle Calculations

VC bio startup/seed stage shares now below nation in companies, deals, and dollars

Share of VC Investments in Biosciences by Stage for AZ and the U.S., 2002 - 2008

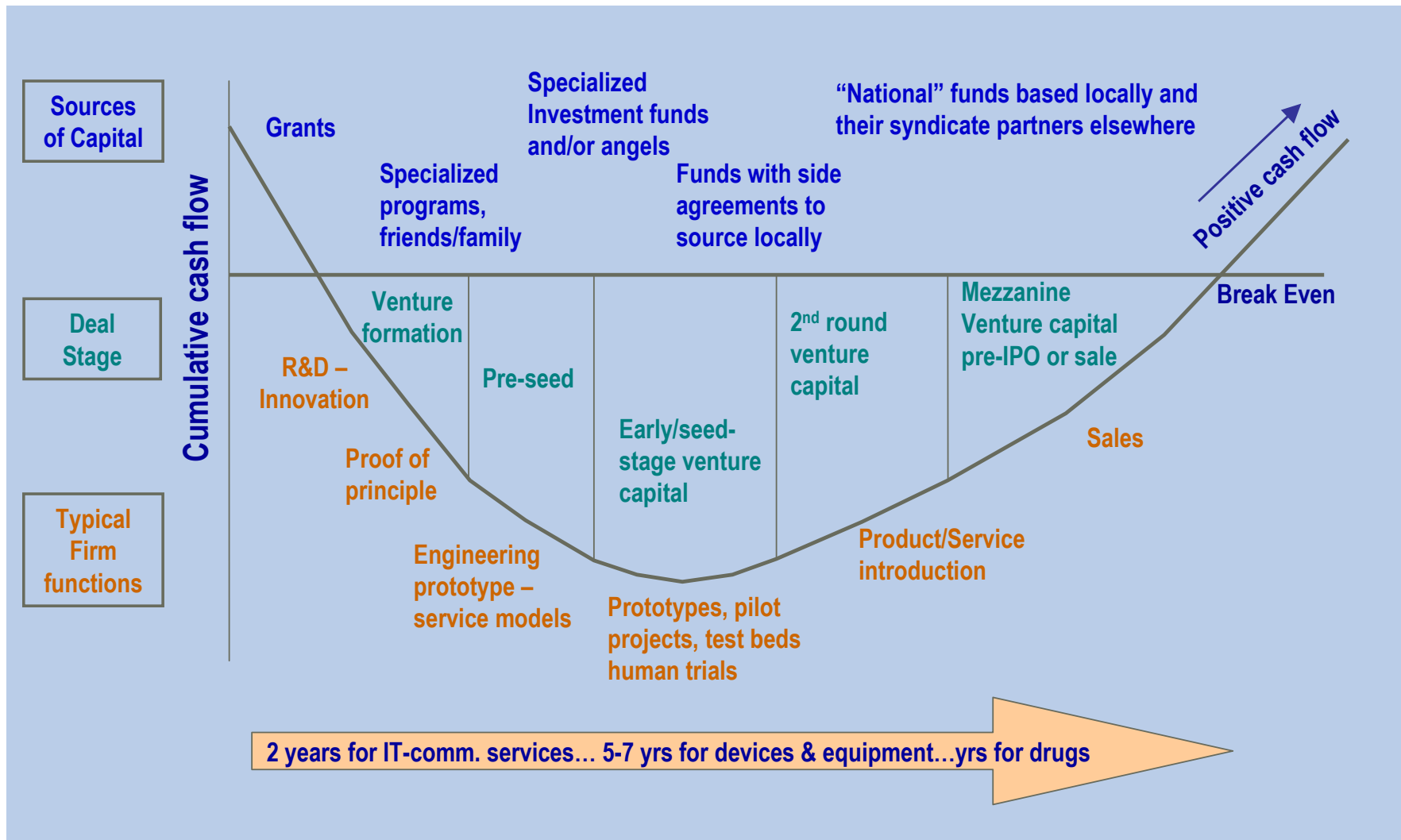


Source: Thomson Reuters VentureXpert with Battelle Calculations

Arizona's Gaps & Opportunities



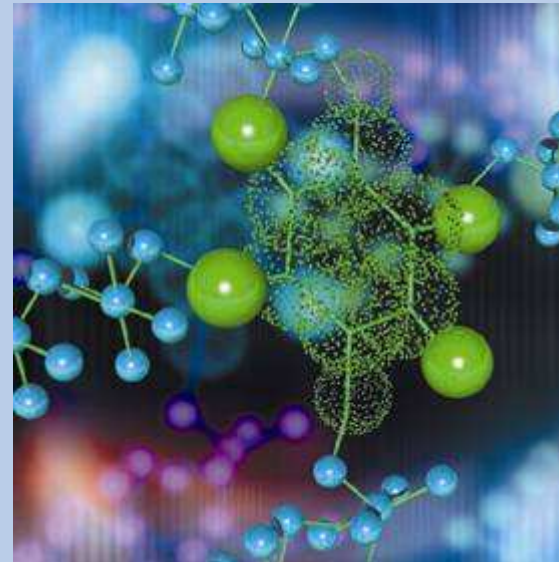
Research discoveries: “Valley of Death”



Challenges and Gaps in Arizona's Technology Commercialization

Three Key Gaps:

- Commercialization Tools
- Business Mentoring
- Creating Capital



Contact

Walter H. Plosila, Ph.D.

Senior Advisor

Battelle's Technology Partnership Practice

Voice: (330) 421-4283

E-mail: bfppinn@roadrunner.com

Web site: www.battelle.org/tpp