



Picking Up Speed

IN THE FAST LANE

The year 2007 – the midpoint of the 10-year span of *Arizona's Bioscience Roadmap* – was defined by heightened industry activity. Growth accelerated in bioscience jobs and firms, while company expansions and acquisitions made headlines. Federal research grants slowed after four years of remarkable growth, though notable research discoveries continued to emanate from Arizona, often through collaborative projects across institutions. Science Foundation Arizona helped to further *Roadmap* progress in its first year of funding. Science, technology, engineering, and math (STEM) education attracted attention from decision-makers and funders. And research facilities continued to open statewide, with more planned on the commercial front.

In addition to the *Roadmap's* extensive network of committees, involving some 300 statewide experts, regional roadmaps made traction in northern and southern Arizona. Local leaders are devising initiatives to capitalize on the biosciences based on the particular strengths and dynamics of their communities.

Key *Roadmap* priorities in 2008...

Commercialization: While the first five years of the *Roadmap* focused primarily on strengthening the research infrastructure, attention will increasingly emphasize turning research into technologies, products, jobs, and firms. Research consultant Battelle has identified “signature opportunities” where Arizona has both research strengths and a ready industry base – molecular therapies, vaccines, and diagnostics; advanced medical technologies; and sustainable bio-related technologies. These areas offer opportunities for Arizona to “leapfrog” other states and regions.

Capital formation: The lack of venture capital and other types of risk capital remains a fundamental liability. Arizona must build a stronger resident VC industry, attract out-of-state investors, and offer programs to help entrepreneurs secure capital.

Arizona's Bioscience Roadmap

- > Arizona's long-term plan to bring its bioscience sector to national competitiveness
- > Driven by an extensive collaboration among statewide leaders in science, business, and policy
- > Research and facilitation provided by Battelle
- > Commissioned and coordinated by the Flinn Foundation
- > Translational research component co-sponsored by Arizona Biomedical Research Commission
- > Details available at www.flinn.org

ROAD TEST

A review of *Roadmap* progress in late 2007 revealed the following data on key measures.

R&D expenditures: Bioscience-related academic research and development expenditures at Arizona's universities tapered off slightly in 2006 after increasing every year since 2002. The 2006 total of \$379 million represents a **35% gain** since 2002, slightly trailing the top-10 states (37.3%) and U.S. average (36.2%).

NIH grants: Grant funding from the National Institutes of Health declined in 2006, reflecting a national trend due primarily to NIH budget cuts. However, Arizona felt the slowdown more sharply, decreasing 6.9% in 2006 vs. 1.2% for the nation. This followed a banner year in 2005 when Arizona's growth was 3.5 times higher than that of the nation. Since 2002, the state's NIH funding **has grown by 19.2%**, slightly less than the top-10 states (22.9%) and U.S. average (20.6%).

Jobs: Arizona bioscience jobs are growing at a significantly faster rate than the nation. Bioscience employment **grew 18.5%** during 2002-06, adding more than 12,600 jobs for a total of 80,909. In 2006, jobs grew by 4.7%. While the state's fast-growing hospital subsector dominates its bioscience employment, non-hospital bioscience firms are actually growing more rapidly (20.6% during 2002-06). This compares to a growth rate of 4.3% nationally.

Firms: The number of bioscience establishments in Arizona **increased 16.7%** during 2002-06, rising from 639 to 745 – also a substantially faster rate of growth than the nation. Three of the four subsectors that comprise the non-hospital biosciences showed gains, led by drugs and pharmaceuticals (30.7%) and research, testing, and labs (26.7%). In 2006, the number of establishments increased by 8.3%.

Wages: Bioscience workers in Arizona earn an annual salary of \$48,674, on average, compared to \$39,526 for all private-sector industries. Arizona annual bioscience wages **increased 25%** during 2002-06.

Venture capital: Through three-quarters of 2007, Arizona already has recorded its **most successful year** since 2002 in attracting bioscience venture capital. At \$77 million, the state is more than 75% of the way toward meeting the *Roadmap* goal of \$100 million in 2007.

Entrepreneurialism: During 2002-06, Arizona's universities have shown **substantial gains** in all categories of bioscience intellectual property – invention disclosures, patent applications, patents issued, licenses and options executed, gross license income, and bioscience startup companies.

Implementation: Of the 19 action items recommended by Battelle in 2002 to achieve over 10 years, **progress has been made on 16**, including substantial progress on eight.

BIOSCIENCE TIMELINE

2000

- Prop. 301 passes, providing \$1 billion over 20 years for scientific research at state universities

2001

- Flinn Foundation commits to 10 years of major funding of Arizona biosciences
- BIO5 Institute debuts at UA (known then as IBSB)

2002

- Bioindustry Organization of Southern Arizona forms in Tucson
- TGen created following \$90 million fundraising effort; IGC locates in Arizona
- Arizona's Bioscience Roadmap* launched

2003

- ASU's Biodesign Institute established
- Arizona Biomedical Collaborative created
- State approves \$440 million to build university research facilities
- State's bio cluster group reorganizes as Arizona BioIndustry Association

2004

- UA, ASU agree to partner on medical school in downtown Phoenix
- \$100 million for bioscience/healthcare training approved for Maricopa Community Colleges
- First building of Biodesign Institute opens

2005

- Critical Path Institute founded in Tucson
- TGen headquarters, Mayo Collaborative Research Building open
- Legislators pass angel tax credit
- NAU introduces SABRE research consortium

2006

- Science Foundation Arizona forms
- Arizona 21st Century Fund created, funded by \$35 million from State
- Biozona brand debuts
- Phoenix Bioscience High School opens
- BIO5 facility and second building of Biodesign Institute open

2007

- W. L. Gore announces plans to expand into Phoenix from Flagstaff
- TGen North opens in Flagstaff
- Covance breaks ground on Chandler facility
- Plans advance for bioscience/tech parks in Tucson, Flagstaff
- Legislature approves \$25 million for Phoenix Biomedical Campus, \$100 million for SFAz
- Classes begin at UA College of Medicine-Phoenix in partnership with ASU
- Two TGen affiliate companies purchased



BUILD RESEARCH INFRASTRUCTURE

- **Nobel laureate selects Arizona:** TGen and the Biodesign Institute at Arizona State University team with Nobel laureate Lee Hartwell of the Fred Hutchinson Cancer Research Center in Seattle on a \$45 million effort to advance personalized medicine. Funded by the Virginia G. Piper Charitable Trust and the Flinn Foundation, the project aims to study the body's proteins to develop personalized diagnostic tools to improve healthcare outcomes and reduce medical costs. Funds are included to involve additional statewide research organizations.
- **Medical school opens, prepares to expand:** The University of Arizona College of Medicine-Phoenix in partnership with ASU welcomes its first class of 24 students after earning accreditation in record time. The Legislature includes \$25 million in the state budget for components of the Phoenix Biomedical Campus, including funds for the medical school to increase its class size to 48 and to design two major education and research facilities.
- **SFAz receives and awards millions:** Science Foundation Arizona (SFAz) concludes its first year of grantmaking by awarding \$23 million to Arizona institutions to strengthen scientific, engineering, and medical research programs. The Legislature commits \$100 million to SFAz over four years, subject to a private match. The Stardust Charitable Group satisfies the first-year match via a \$25 million grant.
- **C-Path hits stride:** Tucson's Critical Path Institute (C-Path) achieves several successes to bring about safer and faster drug development, including: 1) Raising to 17 the number of major pharmaceutical firms sharing drug-safety protocols with one another; 2) Serving as a model for a successful bill in Congress to authorize expanded public-private partnerships in drug development; 3) Landing a \$2.1 million grant from SFAz to team with Ventana Medical Systems and work with the FDA to develop standards for diagnostic tests designed to guide selection of effective, personalized drug therapies.
- **Research facilities debut statewide:** Major facilities open for business, including: UA's BIO5 Institute and a cancer clinic at the University Medical Center in Tucson; TGen North and Northern Arizona University's Applied Research and Development building in Flagstaff; the Arizona Biomedical Collaborative in downtown Phoenix; and a second research building at Sun Health Research Institute in Sun City.

BUILD CRITICAL MASS OF FIRMS

- **Companies choose Arizona:** Cancer Treatment Centers of America selects Goodyear for its fifth hospital facility, expected to provide 420 jobs. Los Angeles-based Abraxis BioScience opens a Phoenix site employing 85. Semafore Pharmaceuticals of Indianapolis announces plans for a Scottsdale facility to be initially staffed by 20. Caris Diagnostics of Irvine, Texas, opens a pathology lab near the Tempe-Phoenix border.
- **Covance breaks ground:** Global drug-development services firm Covance breaks ground on a 300,000-square-foot laboratory in Chandler. Between 300 and 400 will be employed at the site. The company also purchases 27 additional acres east of the property.
- **TGen affiliates purchased:** Molecular Profiling Institute, TGen's first spinoff, is bought for \$40 million by Caris Diagnostics. TGen affiliate Systems Medicine, with offices in Scottsdale and Tucson, is purchased for \$20 million in stock by Seattle cancer-therapy firm Cell Therapeutics.
- **Local companies expand:** W. L. Gore & Associates, a medical-device manufacturer and major Flagstaff employer, expands within Flagstaff and announces plans to build facilities in north Phoenix that could employ up to 800. In Chandler, Agilent Technologies opens a new facility that more than triples the size of its local atomic force microscope operations. In Oro Valley, pharmaceutical giant sanofi-aventis breaks ground on a \$40 million research facility that will expand its local staffing capacity to 108 employees.
- **Science-park plans advance:** UA completes a land swap with KB Homes, paving the way for construction of a 65-acre bioscience park in south Tucson. When completed, the park will house up to 2.4 million square feet of office and lab space. In Flagstaff, the city furthers plans to develop a science and technology park with up to 200,000 square feet of office and lab space. At the site, construction begins on a business incubator, the Northern Arizona Science, Technology, and Clean Energy Center.
- **Biomedical plaza planned for downtown Phoenix:** The City of Phoenix and the Plaza Cos. announce plans for an \$80 million, 270,000-square-foot lab and office building next to the Phoenix Biomedical Campus. Designed for biomedical, physician, and research firms, the complex is expected to open in late 2008.

ENHANCE BUSINESS ENVIRONMENT

- **VC funding regains stride:** After losing steam in 2006, venture-capital investments in Arizona bioscience firms set a pace to make 2007 the best year since 2002. Major investments include Zounds, a Mesa hearing-aids firm (\$34 million, three deals); Carefx Corp., a medical-software firm in Scottsdale (\$17.8 million); High Throughput Genomics of Tucson (\$10 million); and medical-device maker Cayenne Medical of Scottsdale (\$9.5 million).
- **'Biozona' unveiled on global stage:** Arizona's statewide identity in the biosciences – Biozona – is introduced to national and international audiences for the first time at BIO, the world's largest biotechnology trade show. Arizona's booth at the exhibition hall is redesigned around the theme, developed by a statewide group of communications and marketing officials. A delegation of more than 50 science and economic-development leaders represents the state at the four-day event in Boston.
- **Bio trade association hires industry veteran:** The Arizona BioIndustry Association hires a new CEO, C. Robert (Bob) Eaton, who led MdBio, a successful bioscience industry support group in Maryland. Eaton will help to shepherd an effort underway to expand the association's statewide service into Tucson and Flagstaff by partnering with the Bioindustry Organization of Southern Arizona and bioscience leaders in northern Arizona.
- **Tax credits benefit early-stage companies:** Early-stage high-tech and bioscience firms in Arizona receive a boost from the angel tax credit passed by the Legislature in 2006. The Arizona Department of Commerce reports that \$1.68 million in credits has been provided to investors.
- **Bioscience highlighted in Tucson economic strategy:** Tucson's economic development group – Tucson Regional Economic Opportunities – releases an economic blueprint that includes strengthening the region's science and technology base through collaboration with UA.
- **Napolitano earns BIO 'Governor of Year':** The Washington D.C.-based Biotechnology Industry Organization honors Gov. Janet Napolitano as its 2007 Governor of the Year, recognizing her support of the biosciences in Arizona and her leadership on behalf of the biosciences during her term as Chair of the National Governors Association.

PREPARE WORKFORCE, EDUCATE CITIZENS

- **Science, math education advances:** Several developments bolster science and math education in Arizona high schools:
 - The Arizona Board of Education approves a measure to require additional science and math credits to graduate.
 - NAU lands a \$3.4 million grant from ExxonMobil and the Helios Education Foundation for a program to nearly double the number of science and math teachers the university produces.
 - UA receives \$3 million from the National Science Foundation to promote science education in public schools. The grant enables university students to serve as science mentors in K-12 classrooms.
 - SFAz awards \$3.2 million to nine projects to advance Arizona K-12 education in science, technology, engineering, and math. The program encourages collaborative approaches with industry, nonprofits, or local governments.
 - The state budget includes new funding for various efforts to strengthen science and math education and achievement.
- **Southern Arizona workforce effort funded:** A \$5 million federal grant funds an initiative to prepare southern Arizona's workforce for high-tech and science jobs. The program involves Pima, Cochise, Santa Cruz, and Yuma counties.
- **Bioscience High School facility opens:** Phoenix Union High School District officials celebrate the opening of Phoenix Bioscience High School's permanent facility on a two-acre site north of the Phoenix Biomedical Campus. The school's 150 students previously had been housed at nearby Phoenix Preparatory Academy.
- **TGen internship program lands grant:** TGen lands a \$380,000 grant from the Helios Education Foundation to bolster its internship program, now known as the Helios Scholars Program. The funding will support summer internships for 50 qualified high school, undergraduate, and graduate students.
- **High school bio programs inventoried:** A report on Arizona high school bioscience education programs finds that formal efforts are scattered throughout the state, though they lack in funding and coordination at the state level. The report and inventory of programs, co-sponsored by Salt River Project and the Flinn Foundation, is available at www.flinn.org.