

# Proven Performance

# Staying Power

**R**esilience defined Arizona's bioscience sector in 2010, the eighth in the 10-year plan that is *Arizona's Bioscience Roadmap*, contributing to the state's gradual emergence from the Great Recession. Bio jobs and wages increased, and with successful pursuit of federal stimulus funding, Arizona reached an all-time high in National Institutes of Health grant support. Bucking economic trends, industry heavyweights expanded their operations in medical devices, research and testing, and drug development. Local bioscience clusters took important steps toward maturity in cities around the state, and growing clinical activities yielded increasingly sophisticated health-care treatment and prevention options.

The *Roadmap* is propelled by a statewide committee network of science, business, and policy experts, plus local leaders who guide regional bioscience strategies in northern and southern Arizona.

Priorities for the *Roadmap* in 2011...

**Preserve gains as budgets tighten:** Facing another major revenue shortfall, the state of Arizona will likely implement broad-based budget reductions over the coming year. Of particular concern to bioscience advocates are the long-term impacts of cuts to higher education, K-12 programs that prepare bio's future workforce, high-return investments like Science Foundation Arizona and the Phoenix Biomedical Campus, initiatives enabling technology commercialization, and the state's critical program for training resident physicians.

**Compete for grants after the "funding cliff":** The federal stimulus law of 2009 provided major but short-term boosts to the grant-making budgets of NIH and the National Science Foundation, and Arizona researchers and the public benefitted substantially. The expiration of stimulus awards will intensify competition among scientists nationwide. Researchers at Arizona institutions will have to collaborate creatively to win the major new grants that will confirm the state's position as a rising bioscience hub in areas such as molecular diagnostics and biosignatures.

**Recruit capital to build a critical mass of bio firms:** An ongoing challenge for Arizona's entrepreneurial community – one common across most of the country – is the scant availability of risk capital to finance the development of new bioscience discoveries into early-stage companies. Although preliminary steps have been taken, additional efforts must be made by the public, private, and nonprofit sectors to attract new risk-capital providers and funds and develop mechanisms to achieve a critical mass of bioscience firms.

## ▶ 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](http://www.flinn.org)

# Road Test

An update of *Roadmap* progress in early 2011 revealed the following data on key measures. Data listed represent the most recent available.

**Jobs:** Arizona bioscience employment continued to grow despite the global recession and large job losses in the state's private sector. In 2009, bioscience jobs in Arizona grew 1.2% while the state's overall private sector lost 8.3%. During the recessionary years of 2008-09, Arizona bioscience jobs increased 7% compared to a loss of 11% in the private sector. Bioscience employment in Arizona **increased 32%** from 2002 to 2009, adding nearly 22,000 jobs for a total of 90,219. The U.S. recorded an 11% gain during this period.

**Firms:** Though the number of Arizona bioscience establishments decreased slightly in 2009, the state recorded a **gain of 28%** from 2002 to 2009, rising from 637 to 813. This compares to a 20% gain for the U.S. Research, testing, and medical labs has the most Arizona establishments among the bioscience subsectors (389) and has grown the fastest since 2002 (57%).

**Wages:** Bioscience workers in Arizona earn an annual salary of \$57,360, on average, compared to \$42,090 for all private-sector employees. Average annual bioscience wages in Arizona grew 3% in 2009 and have **increased 47%** from 2002 to 2009 (not adjusted for inflation).

**NIH Grants:** In 2010, Arizona received funding of \$222.9 million from the National Institutes of Health, the industry gold standard, easily surpassing its all-time high achieved in 2009. This incorporates both ongoing NIH funding and one-time NIH-related stimulus funding that will discontinue in 2011. Arizona secured more than \$93 million in stimulus research funds during these two years. Overall, during 2002-10, Arizona's NIH funding **grew faster (65%)** than the top-10 states (35%) and the overall U.S. (54%).

**R&D Expenditures:** Bioscience-related academic research and development expenditures at Arizona's universities reached an **all-time high of \$437 million** in 2009. This represents a 56% gain since 2002, slightly ahead of the overall U.S. growth (55%), but slightly behind the growth of the top-10 states (58%).

**Venture Capital:** Arizona's levels dropped 11% in 2010 compared to the year prior, while a weakened U.S. bioscience venture investment climate still managed an overall 1% growth. The 2010 total of \$18 million is the **second smallest investment total** since the *Roadmap* launch in 2002.

**Entrepreneurialism:** During 2002-10, Arizona's universities have shown cumulative **steady gains** in 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 18, or 95%**, including substantial progress on 11.

## Build Research Infrastructure

- **IGC snares giant contracts for cancer project:** The International Genomics Consortium is awarded two federal contracts together worth nearly \$59 million to participate in the Cancer Genome Atlas project. IGC will collect, process, and store tissue samples for genomic research, continuing its role as the project's biospecimen core resource.
- **ASU constructs major research facility:** Arizona State University breaks ground on the \$160 million Industrial Science and Technology Building IV, a multi-use facility of nearly 300,000 square feet. ISTB-IV, being built adjacent to the Bidesign Institute, will include more than 80 laboratories for biological and chemical research.
- **Alzheimer's research assets receive boost:** Banner Alzheimer's Institute wins two federal stimulus grants worth \$9.1 million to more than double its research space and purchase a cyclotron, used to create the radioactive elements used in molecular imaging. The institute receives another \$4.5 million in private-foundation funding for research on Alzheimer's prevention and non-medical support services.
- **UA emphasizes translational research:** The University of Arizona forms a Clinical and Translational Science Institute to help move discoveries faster from the laboratory into the clinical setting. The CTSI, led by Fernando Martinez, director of the BIO5 Institute, is also intended to strengthen UA's competitiveness for a major grant from the National Institutes of Health to join the Clinical and Translational Science Award consortium.
- **SFAz boosts bio-ag sector with new algal-biofuels center:** Science Foundation Arizona CEO William Harris and Gov. Jan Brewer jointly announce establishment of the Arizona Center for Algae Technologies, a new research center to be based at ASU's Polytechnic campus. The center will be launched via \$2 million in discretionary federal stimulus funds and a \$2 million match that SFAz and ASU will help to secure. Meanwhile, research teams at both ASU and UA secure millions more in federal grants for multi-institution studies of algal biofuels.
- **BIO5 Institute expands to Oro Valley:** UA purchases for \$3 million a fully equipped research building in Oro Valley previously occupied by drugmaker sanofi-aventis. UA reopens the facility as BIO5 Oro Valley, a branch of the university's cross-disciplinary bioscience research institute that will focus on drug discovery and development.
- **C-Path receives grant for biosignatures program:** The Tucson-based Critical Path Institute receives \$2.2 million in discretionary federal stimulus funds to create a resource for scientists from around the world to learn to perform and reliably interpret new diagnostic tests, enabling more accurate identification of biomarkers of patients' health status. Separately, C-Path and other Arizona institutions begin developing a collaborative biosignatures research program.
- **TGen, ASU initiate super-fast data link:** The Translational Genomics Research Institute and ASU begin using a new fiber-optic data-transfer link between TGen's facility in Phoenix and the ASU supercomputer in Tempe. The link, developed by Canadian firm Obsidian Strategies, accelerates data transfer by a factor of 100.
- **St. Joseph's joins forces with Phoenix Children's:** St. Joseph's Hospital and Medical Center and Phoenix Children's Hospital announce an agreement to unite their pediatric services. St. Joseph's will move most of its pediatric services to the new Phoenix Children's hospital tower, while some Phoenix Children's research programs will move to St. Joseph's.

## Build Critical Mass of Firms

- **Roche deepens commitment to Ventana:** Officials of Roche Group announce that Ventana Medical Systems Inc., which has grown rapidly since its 2008 acquisition by Roche, will grow even more in southern Arizona. Roche plans to invest \$180 million in capital improvements and add 500 new jobs at Ventana's Oro Valley site over five years.
- **Global biotech firm enters Arizona:** Celgene Corp., a biotechnology company with a market value of roughly \$27 billion, establishes a foothold in Arizona with the \$2.9 billion purchase of Abraxis BioScience Inc., a Los Angeles-based firm that recently opened a \$70 million advanced-manufacturing facility in southwest Phoenix.
- **Imaging firm moves to Phoenix Biomedical Campus:** VisionGate Inc., a medical-imaging company focused on early detection of cancer, relocates its headquarters from Seattle to downtown Phoenix. VisionGate, founded by Alan Nelson, director of the Bidesign Institute at ASU, occupies space on the Phoenix Biomedical Campus in the building that also houses TGen and IGC.
- **Drugmaker sanofi-aventis opens research hub:** Sanofi-aventis officially opens its new Tucson Research Center in Oro Valley's Innovation Park. The 110,000 square-foot facility is the global headquarters for sanofi's combinatorial-chemistry research efforts.
- **Arizona firms get boosts from feds:** Thirty-seven Arizona bioscience companies win a total of more than \$9 million in federal tax credits and grants under the Therapeutic Discovery Project, an element of the federal health-care overhaul. Meanwhile, \$6.3 million in federal stimulus funds are awarded by the National Institutes of Health to four Arizona bio firms: Arcadia BioSciences Inc., Kinetic Muscles Inc., Luceome Biotechnologies LLC, and Valley Fever Solutions Inc.
- **Mayo Clinic plans advanced treatment center:** Mayo Clinic announces a \$182 million radiation-therapy center that will bring to Phoenix proton-beam therapy, a cancer-fighting method that can improve results and minimize damage to healthy tissue. Aiding Mayo's radiation-therapy program is a new partnership with ASU imaging experts.
- **Health-provider merger to aid UA med school:** University Medical Center Corp. and University Physicians Healthcare announce that they will be merging into a single company, University of Arizona Medicine. William Crist, UA vice president for health affairs, notes that the united company will better support the UA College of Medicine, strengthening its research and physician-training operations.
- **NAU/TGen spinoff among new clients at Flagstaff incubator:** The Flagstaff-based Northern Arizona Center for Entrepreneurship and Technology welcomes three new resident clients in the biosciences: Flagship Biosciences LLC, which provides digital histopathology services; PathoGene LLC, a spinoff of Northern Arizona University and TGen North developing molecular diagnostic tools for the detection and investigation of infectious diseases; and Protein Genomics, which manufactures biopolymers for wound healing, tissue regeneration, and dermal filler.
- **Monsanto expands in Pinal County:** Global bio-agriculture company Monsanto purchases a 40,000 square-foot facility in Casa Grande for research and development of biotech cotton, predicting that it will add 50 full-time jobs, and announces a plan to expand operations in Eloy and Maricopa.

## Enhance Business Environment

- ▶ **State establishes new economic-development group:** By executive order, Gov. Jan Brewer creates the Arizona Commerce Authority, a public-private partnership designed to attract and retain firms in key growth areas, especially aerospace and defense, science and technology, and solar and renewable energy. The group, supported by \$10 million in federal stimulus funding, is overseen by a board of prominent Arizona business leaders.
- ▶ **UA forms new engine for technology transfer:** UA creates the nonprofit University of Arizona Research Corporation to help university discoveries move from the laboratory to the marketplace. The organization, which will operate under the auspices of the UA Foundation, will aid innovators in licensing their technology, forming new companies, protecting intellectual property, and attracting venture-capital investment.
- ▶ **C-Path leads global drug consortia:** A coalition of pharmaceutical companies assembled by C-Path to find better treatments for tuberculosis receives crucial backing of the U.S. Food and Drug Administration via a new policy to cut the approval time for combinations of experimental drugs to fight TB. Separately, C-Path's Coalition Against Major Diseases, a consortium of drug makers, patient groups, and representatives of regulatory and research bodies, launches a comprehensive public database of records from some 4,000 participants in clinical trials for drugs aimed at treating Alzheimer's disease.
- ▶ **Commercialization endeavors earn stimulus funds:** Gov. Brewer awards a total of \$3.5 million in discretionary federal stimulus funds to university-related commercialization endeavors. Grants of \$1 million go to both ASU's Venture Catalyst program and NAU's collaboration with NACET, and UA's Arizona Center for Innovation receives \$1.5 million.
- ▶ **Chandler opens tech incubator:** The Innovations Technology Incubator opens in Chandler, with UA and InNexus BioScience as two of its prominent early tenants. The incubator, housed at a former Intel research site, is made possible by a \$5.7 million investment from the City of Chandler.
- ▶ **BioAccel, ASU, UA aim for better healthcare:** The Healthcare Transformation Institute, a nonprofit organization focused on making the health-care delivery system more effective and efficient, is launched under the leadership of ASU professor Denis Cortese, previously the Mayo Clinic president and CEO; and Patrick Soon-Shiong, founder and chairman of Abraxis BioScience Inc. Incubated by BioAccel, the institute is funded jointly by ASU, UA, and Soon-Shiong.
- ▶ **ASU draws clinical trials to Arizona:** The Center for Healthcare Innovation and Clinical Trials at ASU's College of Nursing and Health Innovation reaches an agreement to become the fifth global prime site partner for Quintiles Transnational Corp., the world's largest manager of clinical trials. The arrangement will enhance the recruitment of Arizona physicians and nurses who can identify patients for participation in various therapeutic developers' clinical trials.
- ▶ **State provides assistance for R&D:** Gov. Brewer signs Senate Bill 1254, updating Arizona's tax credit for research and development. Under the revised law, young companies with fewer than 150 employees that would be unlikely to have taxable income will be able to earn back funds for the R&D tax credits they claim.

## Prepare Workforce, Educate Citizens

- **UA breaks ground on med-school building:** Construction begins on the Health Sciences Education Building on the downtown Phoenix Biomedical Campus. The \$187 million facility will allow the UA College of Medicine-Phoenix to increase the number of medical students it enrolls from 48 to 120 students per year. The building will also enable a much larger role for NAU's allied-health programs on the campus.
- **Stimulus grant funds Biomedical Campus facility:** UA receives a competitive \$15 million federal stimulus grant from the National Institutes of Health to construct a 22,000-square-foot laboratory support facility to serve researchers from multiple institutions on the Phoenix Biomedical Campus.
- **SFAz initiates program for post-docs:** Science Foundation Arizona announces the establishment of the Bisgrove Scholars post-doctoral program to attract promising early-career researchers to Arizona's public universities. SFAz will invest an initial \$1.9 million in the program; after five years, SFAz will place an additional \$5 million in an endowment for the program, to be matched by \$25 million from the universities.
- **Tech park gets K-12 STEM school:** The Vail School District breaks ground on its first K-12 school, the Vail Academy and High School, at the UA Science and Technology Park. The school, which will house 225 K-8 students and 225 high-school students, and is the first K-12 school at a university park, emphasizes STEM (science, technology, engineering, and mathematics) education.
- **Phoenix Children's, UA med school team up:** The UA College of Medicine and Phoenix Children's Hospital sign an affiliation agreement, enabling establishment of a new academic department, joint research projects, and revenue exchanges to preserve federal funding for graduate medical education.
- **State funds preserve SFAz graduate fellowships:** Gov. Brewer allocates \$3.1 million in STEM grants to SFAz to support its Graduate Research Fellowship program and expand the Engineering Pathways program at rural community colleges. A total of \$1.6 million was awarded to the Graduate Research Fellowship program and \$1.5 million to the Engineering Pathways program. Separately, the governor awarded a \$100,000 stimulus grant to seed a statewide drive to strengthen STEM education.
- **Universities initiate new bio degree programs:** ASU launches a master's degree in regulatory science and health safety. At NAU, plans are announced to offer a bachelor's degree in biomedical informatics; master's degrees in science education and physician's assistant; and doctoral degrees in nursing practice and occupational therapy. UA establishes a new department and bachelor's-degree program in biomedical engineering.
- **Paradise Valley STEM high school opens:** The Center for Research in Engineering, Science and Technology, a specialty high school on the campus of Paradise Valley High School, opens with more than 100 freshman students. The school, funded by a \$3.2 million grant from the city of Phoenix in partnership with the Western Maricopa Education Center, aims to increase students pursuing STEM careers.

## 2000-02

- Prop. 301 passage secures \$1 billion over 20 years for university research
- Flinn Foundation commits to 10 years of major funding of Arizona biosciences
- BIO5 Institute, then known as IBSB, debuts at UA
- Bioindustry Organization of Southern Arizona forms in Tucson
- TGen created following \$90 million fundraising effort; IGC locates in Arizona
- *Arizona's Bioscience Roadmap* launched

## 2003-04

- ASU's Biodesign Institute established
- Arizona Biomedical Collaborative created
- Legislature approves \$440 million to build university research facilities
- State's bio cluster group reorganizes as Arizona BioIndustry Association
- UA, ASU agree to partner on medical school in downtown Phoenix
- \$100 million for bioscience/healthcare training approved for Maricopa Community Colleges

## 2005-06

- Critical Path Institute founded in Tucson
- Legislature passes angel tax credit
- NAU introduces SABRE research consortium
- Science Foundation Arizona forms
- Biozona brand debuts
- Phoenix Bioscience High School opens

## 2007

- W. L. Gore purchases land for Phoenix expansion
- Classes begin at UA College of Medicine-Phoenix
- TGen, ASU Biodesign Institute join Nobel laureate Lee Hartwell to launch Partnership for Personalized Medicine
- Caris Diagnostics purchases MPI, created by IGC in partnership with TGen

## 2008

- Roche buys Ventana Medical Systems for \$3.4 billion
- BIO5 wins \$50 million grant to establish iPlant cyberinfrastructure
- Investors form TRAC, a \$20 million fund for Arizona bio companies
- Luxembourg awards TGen and Partnership for Personalized Medicine primary contracts in \$200 million bio project
- Arizona BioIndustry Association and BIO-SA merge, form AZBio
- Legislature passes expanded R&D tax credit
- NACET, high-tech incubator, opens in Flagstaff

## 2009

- BioAccel, known initially as Catapult Bio, launches to boost bio startups
- TGen forms strategic alliance with Van Andel Research Institute
- Covance opens Chandler drug-development facility
- ASU, Chandler, GateWay Community College, Surprise, and UA secure millions for new high-tech incubators, accelerators, and research parks
- Manager selected for Arizona Fund of Funds
- UA breaks ground on Arizona Bioscience Park

## 2010

- C-Path assumes leadership of global collaborations to tackle tuberculosis, Alzheimer's
- UA breaks ground on Health Sciences Education Building on Phoenix Biomedical Campus
- Governor creates Arizona Commerce Authority to steer economic development
- IGC secures \$59 million for key role in Cancer Genome Atlas project
- Roche announces major expansion of Oro Valley's Ventana Medical Systems

