2008 PROGRESS ON ARIZONA'S BIOSCIENCE ROADMAP

Turning the Corner

A PUBLICATION OF THE FLINN FOUNDATION

International contracts, mega grants, spinoffs, acquisitions, new venture funds, and a host of infrastructure advances for tomorrow's knowledge workers marked the year 2008, the sixth in the 10-year plan that is *Arizona's Bioscience Roadmap.* Facility growth continued with vital state funding of the Phoenix Biomedical Campus, new science parks getting off the ground in Tucson and Flagstaff, and the emergence of commercial wet-lab space. Grants from the National Institutes of Health substantially outpaced the nation, as did growth in bioscience jobs and firms.

The Roadmap is propelled by an extensive committee network involving more than 300 statewide experts, plus regional roadmaps in northern and southern Arizona driven by local leaders based on the specific strengths and dynamics of their communities.

Top *Roadmap* priorities for the year ahead…

Molecular Diagnostics: Arizona is carving a potent niche in this emerging area with top scientists, equipment, companies, and a ready infrastructure. The Arizona-based Partnership for Personalized Medicine, kick-started by its linchpin role in the $200 million Luxembourg initiative, looks to expand into new countries working to cut costs and improve health outcomes through diagnostics tests based on protein-level advances.

Commercialization: For the first time, the year's highlights cited above focus primarily on the business end of the biosciences. This signals realization of a goal – that investments in research infrastructure during the *Roadmap's* first five years would translate into commercial gains over the next five. The momentum must continue and accelerate if Arizona is to build a concentration of bioscience firms.

Capital Formation: While significant strides were made in 2008 to launch new tools to generate private investment for early-stage companies, Arizona has miles to go before it truly offers a business environment suitable for entrepreneurs to launch new bioscience companies and place new products on the market.

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**

An update of *Roadmap* progress in late 2008 revealed the following data on key measures.

R&D Expenditures: Bioscience-related academic research and development expenditures at Arizona's universities grew strongly in 2007. The total of $415 million represents a **47.8% gain** since 2002, besting the top-10 states (42.3%) and U.S. average (40.5%).

NIH Grants: Grant funding from the National Institutes of Health, the industry gold standard, grew in 2007 at more than five times the national average. At present, Arizona has surpassed its five-year goal of exceeding the growth rate of the top-10 states. The state's NIH funding **increased by 24.4%** from 2002-07, compared to 11.2% for the top-10 states. Non-university research institutes are leading the way at 27.4%, though the state's public universities are also besting the top-10 states at 16.6%.

Jobs: Arizona bioscience jobs continued to grow at a significantly faster rate than the nation. Bioscience employment **grew 23.3%** during 2002-07, adding nearly 16,000 jobs for a total of 84,235. While the state's fast-growing hospital subsector dominates its bioscience employment, non-hospital bioscience firms are actually growing more rapidly (24.3% during 2002-07).

Firms: The number of bioscience establishments in Arizona **increased 21.9%** during 2002-07, rising from 639 to 778 – 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 research, testing, and labs (35.3%), and drugs and pharmaceuticals (33.3%).

Wages: Bioscience workers in Arizona earn an annual salary of $52,481, on average, compared to $41,044 for all private-sector industries. Arizona annual bioscience wages **increased 34%** during 2002-07.

Venture Capital: The year 2007 ranks as **Arizona's top year** in generating bioscience venture capital investments since the *Roadmap* launch in 2002. However, the state did not achieve its goal of passing $100 million, coming in at $86 million. As has been true of the venture industry nationally, Arizona in 2008 has seen further drops in new investment levels relative to 2007.

Entrepreneurialism: During 2002-07, Arizona's universities have shown **continued 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 17,** including substantial progress on 10.

BIOSCIENCE TIMELINE

Tracking the progress of Arizona's bioscience initiative

2000–01

- Prop. 301 passes, providing $1 billion over 20 years for scientific research at state universities
- Flinn Foundation commits to 10 years of major funding of Arizona biosciences
- BIO5 Institute, then known as IBSB, debuts at UA

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
- Legislature 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

2005

- Critical Path Institute founded in Tucson
- Legislature passes angel tax credit
- NAU introduces SABRE research consortium

2006

- Science Foundation Arizona forms, receives $35 million from State
- Biozona brand debuts
- Phoenix Bioscience High School opens

2007

- W. L. Gore purchases land for Phoenix expansion
- Covance breaks ground on Chandler facility
- Legislature approves $100 million for SFAz
- Classes begin at UA College of Medicine-Phoenix in partnership with ASU
- TGen, ASU Biodesign Institute join Nobel laureate Lee Hartwell to launch Partnership for Personalized Medicine
- TGen spinoff MPI purchased by Caris Diagnostics

2008

- Ventana Medical Systems purchased by Roche Holding AG for $3.4 billion; local expansion planned
- BIO5 awarded $50 million NSF grant to establish iPlant, a cyber-infrastructure for plant sciences
- Investors form TRAC, a $20 million venture-capital fund for Arizona bio
- Legislature commits $470 million for two key facilities at Phoenix Biomedical Campus
- TGen, Partnership for Personalized Medicine awarded primary components of $200 million Luxembourg 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

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ADDITIONAL INFORMATION ON ARIZONA BIOSCIENCES CAN BE FOUND AT **WWW.FLINN.ORG, WWW.ARIZONABIOBASICS.COM,** AND **WWW.BIOZONA.ORG.**

2008 PROGRESS

Luxembourg taps TGen, Biodesign: TGen and the Biodesign Institute at ASU have central roles in a $200 million bioscience initiative announced by the government of Luxembourg. A major component marks the first project of the Partnership for Personalized Medicine, an Arizona-based effort involving the two research institutes and Nobel laureate Lee Hartwell of the Fred Hutchinson Cancer Research Center in Seattle. They will help Luxembourg to develop a diagnostic tool for early lung-cancer detection. TGen is also leading another component to establish a tissue bank.

UA earns giant grant, contract: The University of Arizona receives one of the largest grants in state history for scientific research. The university's BIO5 Institute wins a $50 million, five-year National Science Foundation grant to create the iPlant Collaborative, a global center and cyberinfrastructure enabling researchers worldwide to tackle multidisciplinary plant-science challenges. UA also secures a $44 million, six-year National Institutes of Health contract to join the National Children's Study.

C-Path cements role: Tucson's Critical Path Institute facilitates a groundbreaking joint agreement by the U.S. Food and Drug Administration and its European counterpart, the European Medicines Agency, to approve new methods for measuring the potential kidney toxicity of drug candidates. The agencies now will accept data from seven kidney biomarker tests, or measures of particular proteins, developed by a C-Path consortium of 17 major pharmaceutical firms. C-Path also receives a $9 million investment from Science Foundation Arizona, which notes the attention C-Path is attracting to Arizona from global pharmaceutical and biotechnology companies.

Legislature supports SFAz, Biomedical Campus: Lawmakers prepare a tight state budget for fiscal 2009, but spare SFAz, slightly restructuring its funding but leaving its total commitment intact. The budget also includes bonding for $1 billion in deferred infrastructure repairs and construction at the state's universities, including $470 million for two new major research and education facilities at the downtown Phoenix Biomedical Campus.

NAU building named greenest university facility: The U.S. Green Building Council gives Northern Arizona's University's new Applied Research and Development Building a platinum LEED (Leadership in Energy and Environmental Design) rating; the ARD Building's point total marks it as the "greenest" building in Arizona and the greenest university facility in the United States. It houses NAU's Center for Microbial Genetics and Genomics, led by anthrax expert Paul Keim.

ASU announces new multidisciplinary group: ASU establishes a new endeavor in interdisciplinary scientific research, the Complex Adaptive Systems Initiative, to steer research projects in such fields as synthetic biology, sensor technologies and health-care informatics.

Roche completes Ventana purchase: Ventana Medical Systems, the Tucson area's largest biotech employer, is purchased for $3.4 billion by Roche Holding AG, the Swiss pharmaceutical and diagnostics giant that has pursued Ventana since June 2007. Roche says Ventana will maintain its headquarters in Oro Valley, increase its southern-Arizona workforce from 750 to 1,000 by the end of 2009, and make additional investments to expand the firm's local presence.

TGen spins off one firm, sells another: TGen launches its third spinoff, MedTrust Online, a medical-information source for oncologists. Amnestix, founded in 2006 by TGen scientists, is purchased by German drug developer Sygnis Pharma AG in a $6.3 million cash and stock deal. The company is developing drugs for memory-related disorders.

Catapult Bio inks funding deal: Catapult Bio, a TGen-initiated nonprofit dedicated to bringing bioscience research to the marketplace, receives a five-year, $14 million grant from Abraxis BioSciences, Inc, under the leadership of Patrick Soon-Shiong, chairman and CEO. The deal was facilitated by the Greater Phoenix Economic Council. The organization, which plans a March 1 launch, aims to create new companies by maximizing late-stage discovery research.

SenesTech announces international pact: SenesTech Inc. of Flagstaff signs an agreement with the government of Australia to test a new rodent-control product in West Java, Indonesia. The product humanely sterilizes rats that devastate rice crops, a food staple for half of the world.

Firms grow via acquisitions: Medicis, a Scottsdale pharmaceutical firm, will pay up to $300 million for LipoSonix, a Seattle-based company that reduces fat cells via ultrasound technology. Owners of SynCardia Systems Inc., a Tucson manufacturer of bridge-to-transplant artificial hearts, purchase publicly held MicroMed Cardiovascular Inc., of Houston, a manufacturer of ventricular assist devices.

Out-of-state firms arrive: Solis Women's Health, a Texas firm specializing in screening and diagnosing breast cancer, enters the Phoenix market by purchasing BenOra Imaging, a breast-diagnostic firm. DNA Testing Systems moves from Santa Fe, N.M., to Scottsdale, having signed an agreement to sell a biogeographical ancestry test developed by Florida-based DNAPrint Genomics. Medical-testing firm Any Lab Test Now opens its first Arizona facility, offering a range of tests and screenings.

UA establishes research partnership with Canon: UA and Canon USA Inc. agree to establish a collaborative research-and-development operation in digital photography and medical imaging, initially funded by a $3 million research grant from Canon, at UA's Science and Technology Park.

Venture group forms for Arizona bio: Leading Phoenix-area bioscience and investment professionals announce the formation of the Translational Accelerator LLC, a private, Arizona-based $20 million bioscience venture-capital group. TRAC becomes Arizona's first venture fund established to target early-stage bioscience companies. Investments will support firms located in Arizona or planning to move to the state.

AERO establishes "fund of funds": The Arizona Economic Resource Organization, a nonprofit created last year to coordinate the state's economic-development efforts, receives $325,000 to launch a "fund of funds" to commercialize high-technology innovations.

Legislature expands R&D tax credit: The technology community scores a long-sought victory when Arizona legislators pass an expanded research-and-development tax credit. Beginning in 2009, companies will receive a 22 percent tax credit – up 2 percentage points – on R&D expenses up to $2.5 million, with an additional increase for expenses exceeding that amount.

Bio trade groups join forces: The Arizona BioIndustry Association merges with its Tucson-based counterpart, the Bioindustry Organization of Southern Arizona. The move gives the trade association a more-representative statewide structure, including a statewide board of directors and a Flagstaff presence.

Flagstaff incubator opens, UA BioPark breaks ground: The Northern Arizona Center for Emerging Technologies, a Flagstaff-based high-technology business incubator, celebrates its grand opening and assumes leadership of NAU's technology-transfer activities. On Tucson's South Side, developers break ground on the multi-use site that will include UA's Arizona Bioscience Park.

Phoenix Council allocates funds for wet labs: A Phoenix City Council subcommittee recommends allocating $792,000 in bond money to build wet-lab space of 5,000 square feet or more at GateWay Community College. The proposed project would help address a local shortage in affordable lab space for startup bioscience companies.

Sen. Kyl named BIO Legislator of the Year: U.S. Sen. Jon Kyl, R-Ariz., is named Legislator of the Year for 2007-08 by the Biotechnology Industry Organization, the nation's largest biotech trade group.

Bio companies secure venture funds: Among Arizona bioscience firms receiving venture-capital funding are Ulthera Inc., a therapeutic ultrasound device manufacturer in Mesa ($22.5 million); Cayenne Medical Inc., a sports-medicine device firm in Scottsdale ($15 million); Zounds, a hearing-aid developer in Mesa ($8.7 million); Regenesis Biomedical Inc., a regenerative medicine firm in Scottsdale ($2.8 million); and Medipacs Inc., an infusion-pump maker in Tucson ($1.7 million).

2008 PROGRESS

Helios endows TGen internship program: Helios Education Foundation donates $6.5 million to support the Helios Scholars internship program at TGen for the next 25 years. The program supports 45 high-school, undergraduate, and graduate students each summer.

NAU snares grants for math and science education: NSF awards NAU $2.9 million to bolster the preparation of its graduate students in the biosciences, funding graduate fellows and placing them in K-12 classrooms several hours each week. Freeport-McMoRan Copper & Gold Inc. makes a $500,000 gift to boost science and engineering programs at NAU and expand efforts to promote interest in math and science among grade-school students.

Governor creates STEM center: Gov. Janet Napolitano announces that her office and several public and private partners have formed an organization to strengthen science, technology, engineering and mathematics (STEM) education in Arizona. The center's director is Darcy Renfro, formerly the governor's higher-education policy adviser.

SFAz program grows to nation's largest: SFAz awards $8.8 million to Arizona's three public universities to support the second cohort of Graduate Research Fellows. With 100 new fellows joining 80 second-year fellows, the program is now the largest of its kind nationwide. Forty percent of the new fellows are conducting bioscience-related research.

Phoenix Council tags funds for bio high schools: The Phoenix City Council approves $5.7 million in Capital Improvement Program Bond funding for small specialty high schools. One grant will establish a medical-sciences school on the Bioscience High School campus in downtown Phoenix; another will establish a biotechnology, engineering, and nursing school at Paradise Valley High School. Meanwhile, Flagstaff conducts initial planning toward its own STEM high school.

Community colleges strengthen bio programs: Chandler-Gilbert Community College launches a biomedical-research-technology program, joining two other Maricopa Community Colleges with formalized biosciences programs. South Mountain Community College strengthens its bioscience portfolio by earning a $290,000 Expanding Undergraduate Bioscience Engagement Track grant from the U.S. Department of Agriculture to support student research and links with area high schools.

Bioscience High earns top marks: Bioscience High School achieves the top passing rate in Maricopa County on the AIMS mathematics test. Statewide, Bioscience High has the second-highest passing rate among all high schools, trailing only University High School, a Tucson academic-magnet school.