

ARIZONA HOUSE OF REPRESENTATIVES  
Fifty-second Legislature – First Regular Session

COMMITTEE ON RURAL AND ECONOMIC DEVELOPMENT

Report of Regular Meeting  
Tuesday January 27, 2015  
House Hearing Room 5 -- 2:00 p.m.

**Convened** 2:36 p.m.

**Recessed**

**Reconvened**

**Adjourned** 3:34 p.m.

**Members Present**

Mrs. Barton  
Mrs. Benally  
Mrs. Gonzales  
Mr. Leach  
Mr. Mendez  
Mr. Pratt  
Mr. Bowers, Vice-Chairman  
Mr. Shope, Chairman

**Members Absent**

**Request to Speak**

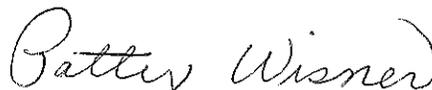
None

**Presentations**

<b><u>Name</u></b>	<b><u>Organization</u></b>	<b><u>Attachments (Handouts)</u></b>
John Stigmon	Economic Collaborative of Northern Arizona	1, 2

**Committee Action**

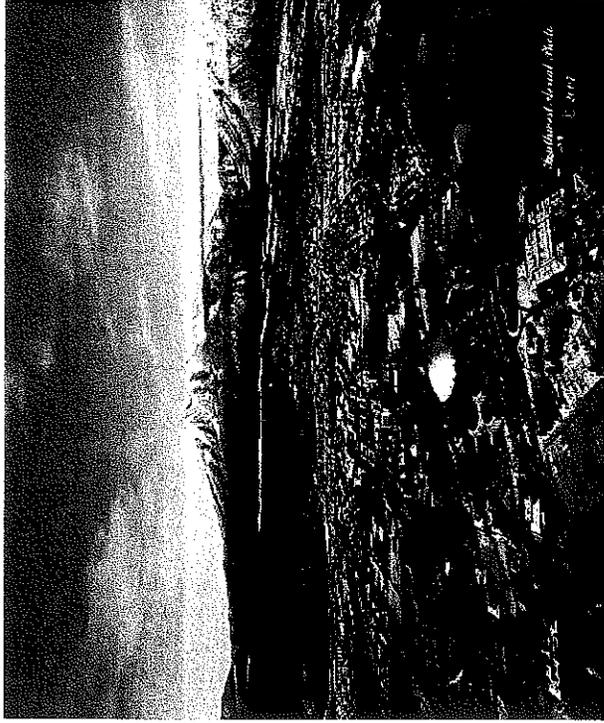
<b><u>Bill</u></b>	<b><u>Action</u></b>	<b><u>Vote</u></b>	<b><u>Attachments (Summaries, Amendments, Roll Call)</u></b>
None			



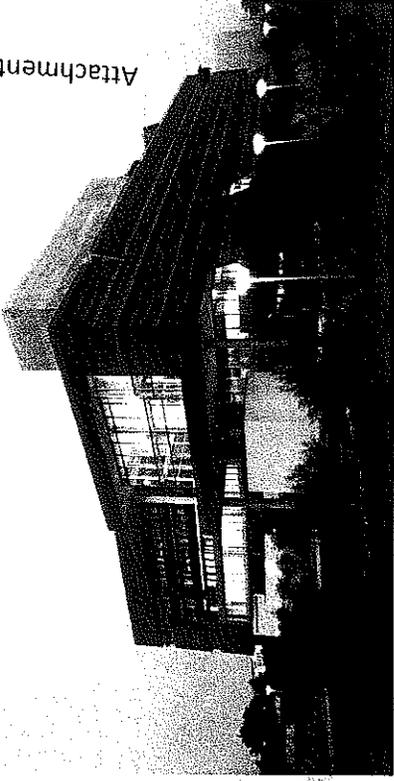
\_\_\_\_\_  
Patty Wisner, Chairman Assistant  
January 27, 2015

(Original attachments on file in the Office of the Chief Clerk; video archives available at <http://www.azleg.gov>)

Economic Collaborative of Northern Arizona



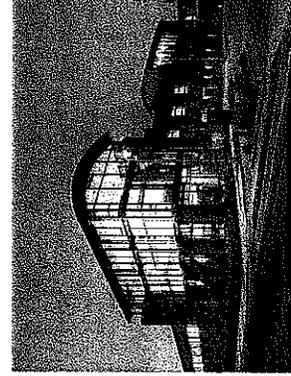
New Jobs



Attachment 1



2015  
WORK PLAN

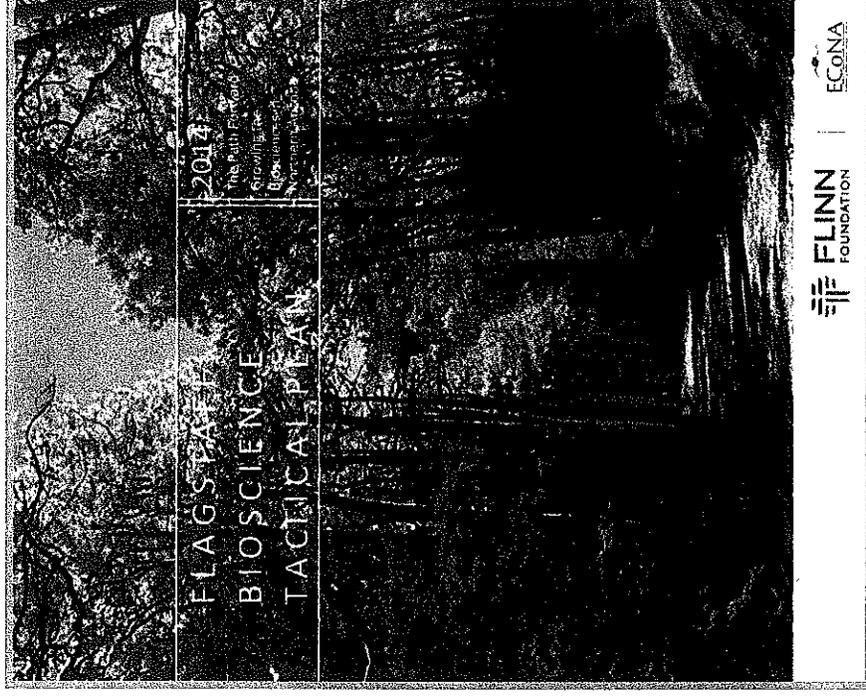


## Sector Strategy

Sector work is an intentional, disciplined, industry and organizational driven process that allows the opportunities in a sector to be realized by insuring the requirements for sector growth come to fruition. Sector tools incorporate businesses retention and expansion, business attraction, redevelopment, infrastructure, capital/investment, and workforce.

## Bioscience Sector

- **Create a Bioscience Research Facilities Plan**  
Develop, with the sector, the types of research facilities needed in the next five and ten year timeframe. Included will be the timelines and investment plan. To start the process we will host a February symposium with several national experts and the sector leadership.
- **Conduct a CLIA/BSL3 Laboratory Feasibility Study**  
Flinn Foundation has granted ECoNA funds to develop a feasibility study to build a new research facility at the NAU Research Park. The lab will provide space for a CLIA and BSL-3 laboratory. The lab would serve the needs of TGEN, Northern Arizona University, Flagstaff Medical Center, bioscience startups, future research institutes, and industry organizations.
- **Complete the 2015 Bioscience Tactical Plan**  
On-going bioscience sector work building on the 2014 plan.
- **Expand work with Arizona Commerce Authority**  
ACA has hired a bioscience portfolio manager, Sergio Gazic. Work in collaboration with Sergio to utilize his expertise, connections, and access to capital.



## Greater Flagstaff's Bioscience Vision

**VISION:** Greater Flagstaff 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.

Source: Arizona's Bioscience Roadmap, December 2002. Revisited 2007 - modified for this report to reflect Flagstaff only.

## Bioscience Sector Continued

- **Continue service with Flinn Foundation, Science Foundation Arizona, AZ Bio, STEM City, BioAccel, and Others**  
Provides connections and access for Northern Arizona Bioscience Sector
  - Flinn Foundation Bioscience Roadmap Steering Committee
  - AZ Bio Membership
  - AZ Bio Government Affairs Committee
  - Science Foundation Arizona STEM Committee
  - Flinn Foundation Grant Partner
  - Flinn Foundation Bioscience Annual Update Event Partner
  - Phoenix Bio-Medical Campus Partner
  - BioAccel Capital Collaboration
  - Flagstaff STEM City Collaborator
  - National Biomarkers Alliance Member
  - Arizona Technology Council

## Manufacturing Sector

- **Complete the 2015 Manufacturing Tactical Plan**  
The Greater Flagstaff Chamber of Commerce created the Northern Arizona Manufacturing Partnership which has will serve as the industry group for the sector work. Also, in collaboration with the Coconino Career Center and ECONA the Greater Flagstaff Chamber of Commerce received a Sector Technical Assistance Grant that will be utilized in development of the 2015 Tactical Plan.



## Manufacturing Sector Continued

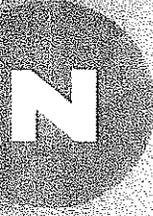
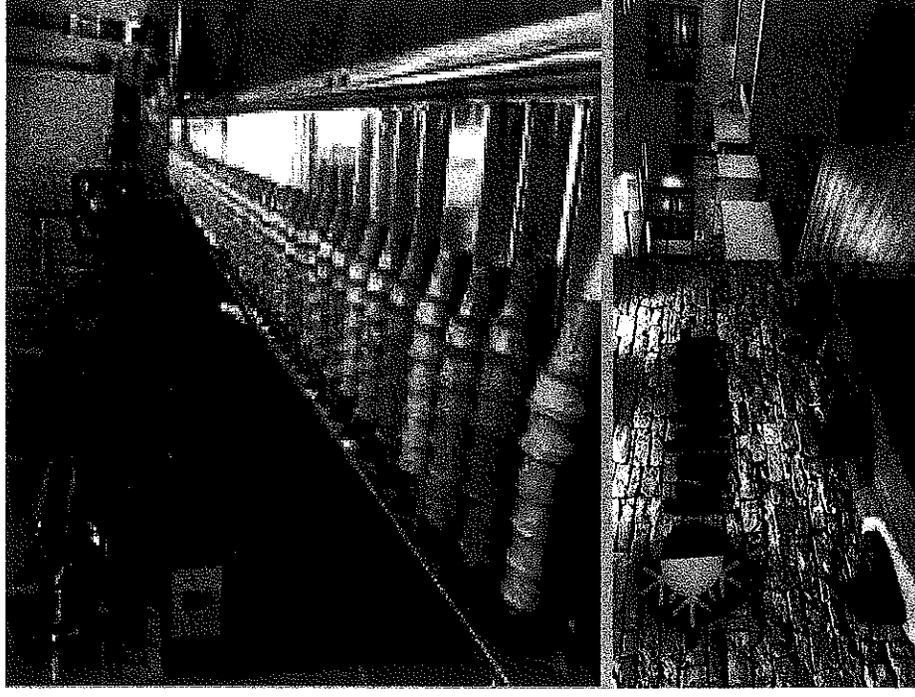
- **Expand Manufacturing Industry Association Collaboration**

ECoNA is already a member and active with the Arizona Technology Council and the Arizona Manufacturers Council. In 2015 we will expand the association contacts to include the National Association of Manufacturers and the Medical Device Manufacturers Association.

## Digital Products Sector

- **Complete the 2015 Digital Products Tactical Plan**  
In the recent years Flagstaff has seen the development of sophisticated digital products companies. These companies

primarily serve markets and customers outside Flagstaff and include national and international markets. 'We are William' produces digital marketing for national companies. Giftcard Zen utilizes advanced algorithms to compete in the gift card resale business. Flagstaff boasts CTO's, software developers and employees from major companies such as Oracle and Pinterest who choose to live in Flagstaff. This is a growing sector. The Greater Flagstaff Chamber of Commerce is now hosting digital products meetings with existing companies. In addition, NACET sponsors events called 'Meet the Geeks'. The Tactical Plan will work with the Chamber, NACET, and industry leaders to grow those companies and also attract new digital products workforce and companies to the region. We expect quality jobs to be created in the sector over the next couple of years.

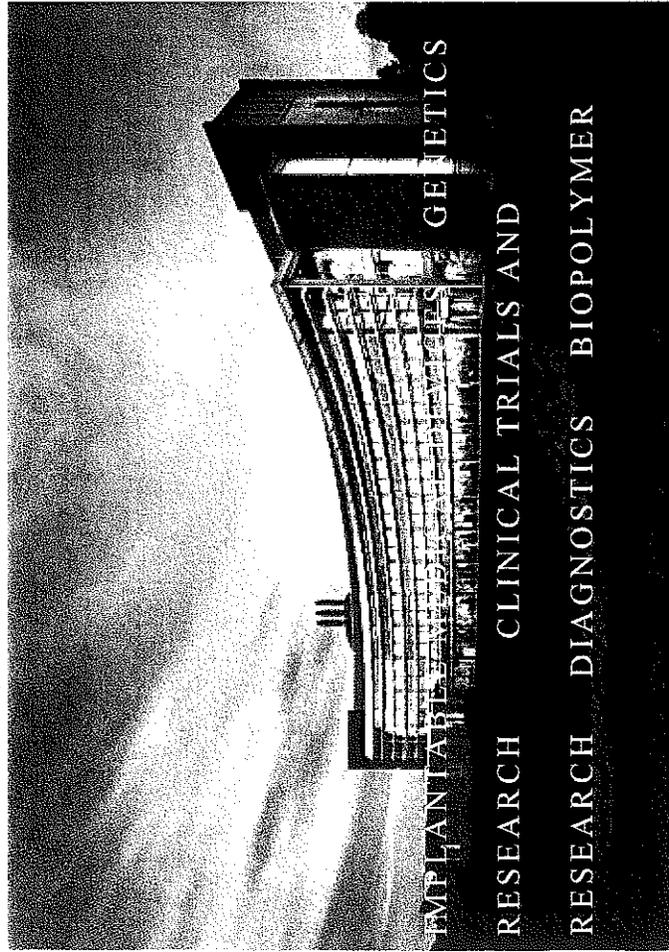


ORACLE

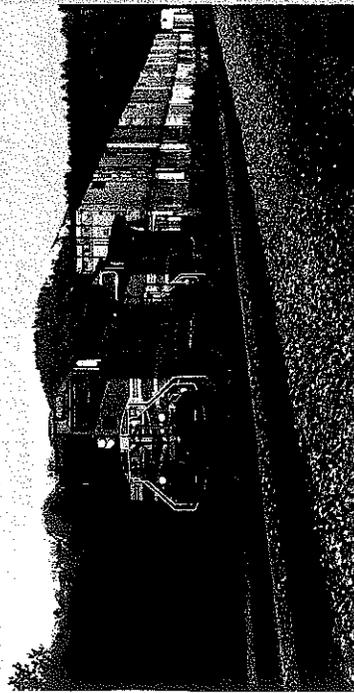
WE ARE WILLIAM.

# 2015 WORK PLAN

# Collaboration



## Business Attraction



Flagstaff and Northern Arizona has much to offer companies or startups looking for a location to expand or start their business. We are a unique community with a strong vision for a high standard of living for all, to be globally competitive, to be economically diverse and resilient, to innovate, and to generate wealth to serve our citizens. We have a strong science-based industry, wonderful climate, sophisticated highly credentialed workforce, skilled regional workforce, access to transcontinental rail, interstate freeways, jet airport, industrial lands, central location to major markets, manufacturing/maker culture, first-class medicine and medical facilities, large research university, top-notch K-12 education, innovative community college, outdoor recreation, astronomy, and an amazing quality of life. After hundreds of tours and presentations to business leaders in the State, we have found for the most part that they are either ignorant or have outdated perceptions. Since the downturn, the business attraction process has become more competitive with states and cities investing more into business attraction. Without using the typical business incentives offered by other states and cities, our strategy has to be unique to our communities and situations. We believe once we get someone to understand our advantages and can get them to visit our region, we have a much stronger chance of convincing them that Northern Arizona is the place to be.

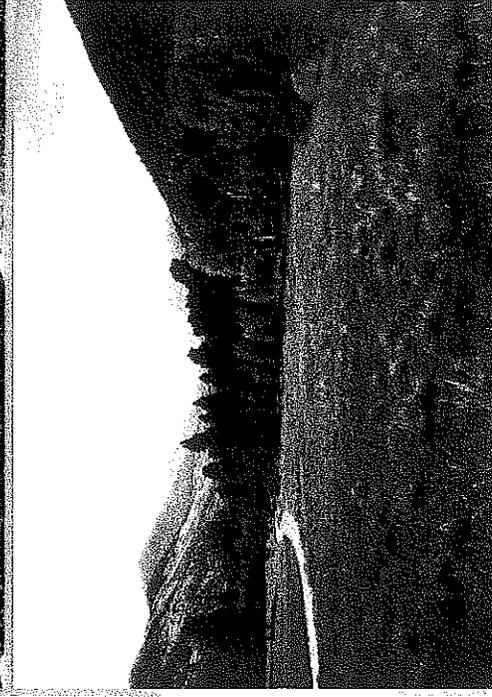
## Branding and Marketing

- **Fund and Complete the Branding Process Started in 2014**

The Business Attraction Committee (BAC) spent significant time interviewing potential community branding firms. 'Northstar Ideas' inclusive process to assist the community in developing its brand and to also understand how the outside business community perceives Northern Arizona was determined to be the best fit. **\$75,000 to be raised.**

## Branding and Marketing Continued

- **Fund and Complete the Marketing Plan started in 2014**  
Once we have our branding process is completed the marketing and advertising plan must be completed. The BAC is considering several firms including SHR Perceptual Branding who is marketing NAH. \$150,000-\$200,000 in funding to be raised.
- **Arizona Commerce Authority - Co-Marketing and Business Attraction**  
The co-marketing program with Arizona Commerce Authority (ACA) begins January 2015. Thanks to David Bentler of APS for the funds match. Depending on the success of this project it may be repeated again later in 2015.
- **Continue Collaboration with Arizona Public Service Economic Development Department**  
APS, under the leadership of David Bentler, has grown its economic development division. They generally are in engaged when companies are looking at infrastructure and opportunity for expansion or growth. They are major advocates for Northern Arizona.
- **Continue Economic Development Presentations in Phoenix and Tucson with the Major Economic and Business Groups**



## Trade Shows

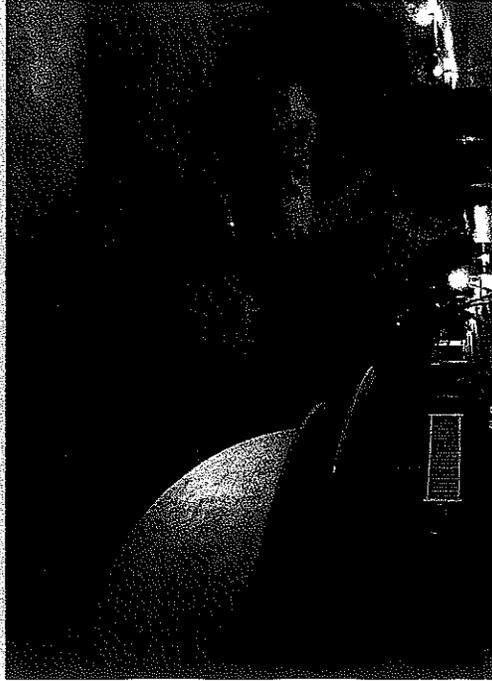
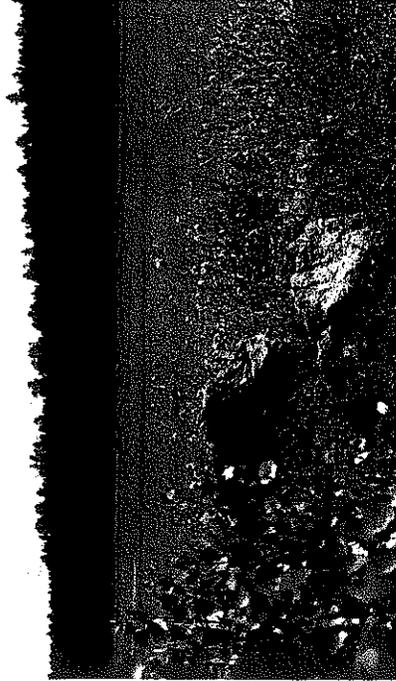
- In Collaboration with the ECoNA Partners Attend the Major Industry Trade Shows and Events:
  - \$20,000 for travel and registration fees to be raised.
    - BIO International
    - AZ Bio
    - Arizona Manufacturers Council Shows
    - National Medical Device Manufacturers Show
    - Food Manufacturers Show
    - International Manufacturing Expo
    - 2015 International CES Show
    - ICSC
    - Arizona Technology Council Events
    - Life Sciences Nation Conference

## Business Attraction Partnerships

- **Arizona Commerce Authority – Business Attraction Division**

ECoNA will continue to work with the Business Attraction division of ACA and respond to the Project Information Forms (PIF)
- **Business Attraction Committee**

The Business Attraction Committee has been active in 2014. We plan to expand the membership and improve the effectiveness of the committee in 2015.



### Business Attraction Partnerships Continued

- **Collaboration with the City of Winslow**  
Winslow has joined ECoNA. Winslow has an extensive inventory of developed industrial land with rail, freeway access, and utilities. This gives the I-40 corridor an opportunity to propose on large industrial projects.
- **City of Flagstaff Economic Development Division**  
ECoNA will continue to work in collaboration with the City of Flagstaff economic development division in targeted recruitment, sales, and marketing for retail and amenities for the region.
- **Business Attraction Strike Team for Due Diligence and Data**  
ECoNA will continue the Business Attraction Team strike team to serve as the welcoming unit that will assist in sophisticated high level due diligence. When a business would like to move forward in either considering the region or establishing themselves in the region ECoNA and the strike team will provide the coordinated on-going communication, assistance, and connections.
- **Collaboration with Coconino County**  
ECoNA will continue to work in collaboration with Coconino County Manager and Supervisors in targeted recruitment, sales, and marketing for retail and amenities for the region.
- **Complete Business Attraction Video – Business Tour**



## Entrepreneurship

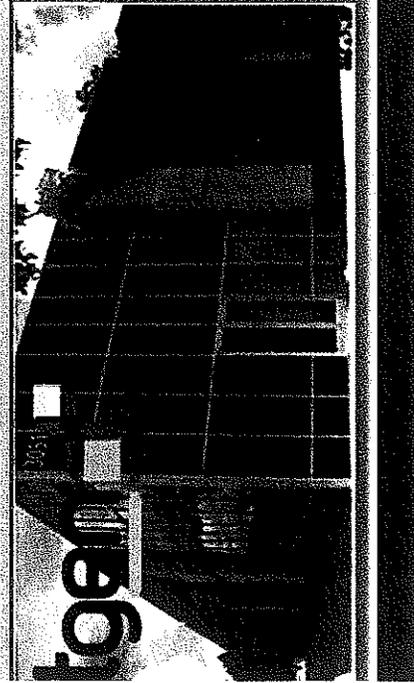
### **Business Startup/Incubation/Acceleration**

A critical component to the success of our vision to start and build successful and sustainable bioscience, technology, digital products, and manufacturing companies will depend on our success of building a highly entrepreneurial environment with a infrastructure, support systems, and capital sources.

- **Continue Collaboration and Engagement with NACET**
  - Innovation Mesa Accelerator
  - Mentor Network
  - Sponsor Startup Weekends
  - Serve on the NACET Board
  - NAU Student Incubator Launchbox
  - Small Business Development Center
- **Continue the Work of the Applied Innovation Program**

ECoNA will continue its work to match tech transfer and startup opportunities with entrepreneurs and capital sources to directly start new businesses. In 2015 an emphasis and priority in working directly with NAU research faculty and the local digital products community.
- **Increased Collaboration and Engagement with NAU Tech Transfer**

Northern Arizona University continues to build its research portfolio adding jobs and new intellectual property. As a result NAU is generating more technology transfer potential and has committed to improving its tech transfer processes and outreach. ECoNA has been invited to work closely with the tech transfer for the purpose of being on the front line with the research faculty to insure that we are guiding the direction the intellectual property towards commercialization.



## Business Startup/Incubation/Acceleration

- **Collaboration with the Greater Flagstaff Chamber of Commerce Entrepreneur Initiatives**

The Chamber has been a leader in bringing resources and support to the business startup and entrepreneurial activity of the region.

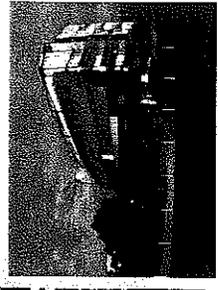
- YES Week – High School Student Entrepreneur Week Long Camp
- Economic Development Committee recognizes the importance of start-up activity
- Small Business Development Center – Partner with NACET
- Julie Pastrick, Chair of the ACA Rural Advisory Council encourages ACA to invest in start-ups

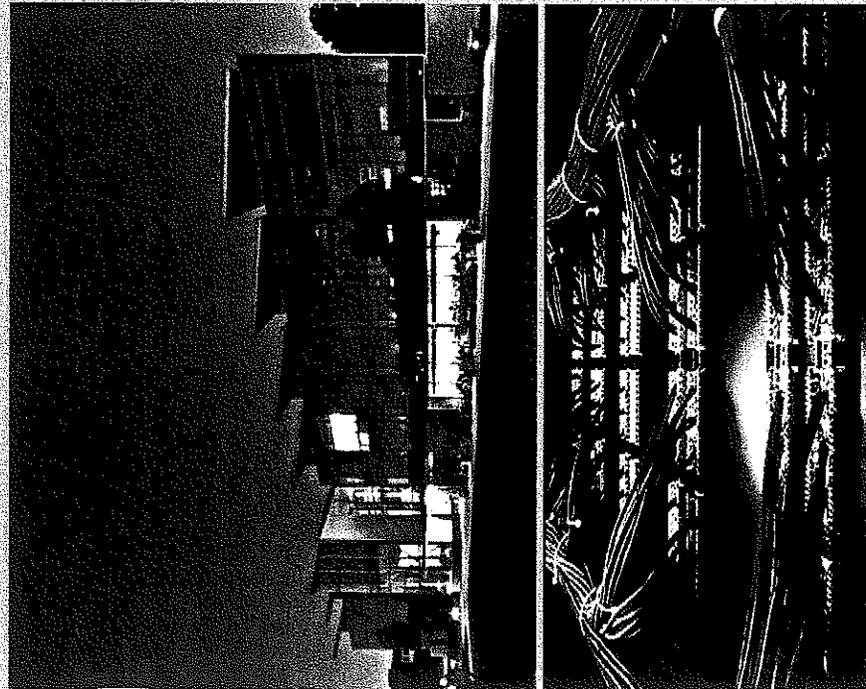
- **Continued Collaboration with the NAU Franke College of Business Entrepreneur Programs**

- Annual Entrepreneurship Week with Nationally Recognized Successful Entrepreneurs – For Example
  - Martin Casado, VM Ware – 2014
  - Michael Jones, Google Ventures – 2013
  - Alan Lobock, Skymall and Integrus Analytic Systems - 2012
- Entrepreneur Support Staff at Innovation Mesa
- Research
- Mentorship
- Startup Weekend Sponsor
- Capstone Projects



Greater  
Flagstaff  
Chamber  
of Commerce





## Business Startup/Incubation/Acceleration

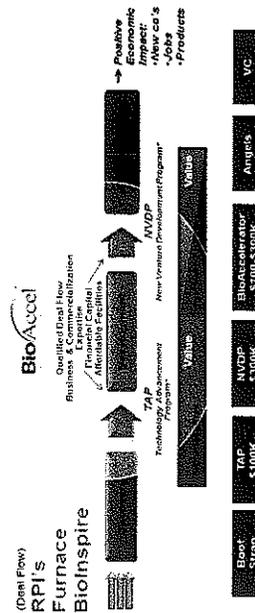
- Continued Entrepreneurship Collaboration with Outside Partners**  
 These partners are willing collaborators bringing expertise, resources, and engagement to Northern Arizona. They are an essential part of our growing entrepreneurial eco-system and have already been critical partners in helping our start-ups succeed. Our goal is to find ways to better leverage and utilize their partnership and resources.

- Bioaccel – Capital Sources for Start-Ups
- ASU Tech Transfer and Skysong Incubator- Tech Transfer
- Flinn Foundation – Capital, Policy, and Grants
- Arizona Commerce Authority – SBIR, Capital, Innovation Grants
- Arizona Commerce Authority – Funding for Innovation Mesa
- AZ Bio Entrepreneurship Programs
- Arizona Technology Council – Access to Capital, Training, Policy
- Kaufmann Foundation – Angel Investment
- Science Foundation Arizona – Capital, Access to Mentors
- Desert Angels - Capital

## Infrastructure

- Develop a Gigabit Network Tactical Plan for the Region**  
 Communities with access to gigabit broadband will have the long term advantage in developing science, technology, and digital products economies. This project will require the collaboration, cooperation, and funding of the major institutions, organizations, governments, and businesses to succeed.

### Bridging the Discovery to Commercialization Gap



\* BioAccel Programs  
 BioAccel  
 Creating Arizona's Bioproducts

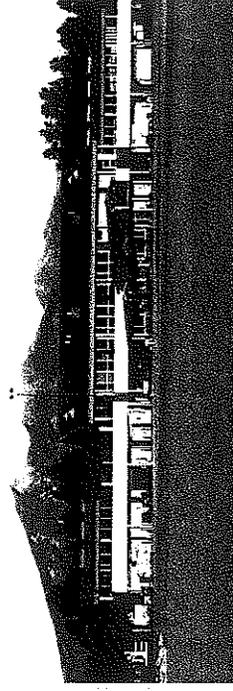
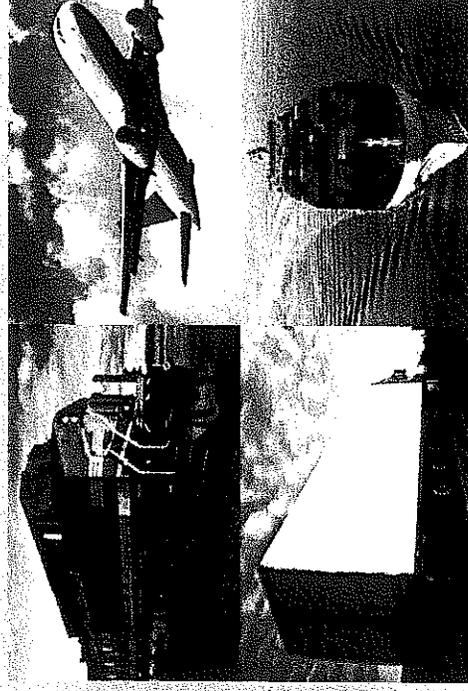
## Infrastructure Continued

- **Transportation Tactical Plan**

Transportation planning decisions and funding have become difficult at best. The continuing fallout of the downturn is the lack of local funds for major transportation projects needed for planned sustainable efficient growth. Flagstaff in particular which relies heavily on tourism faces a growing tourism and visitor market as the national economy improves leading to growth in the Sun Corridor that includes Phoenix, Tucson, Las Vegas, and Southern CA. In addition, we are seeing incremental growth in our major employers that are adding new jobs and new residents to the region. If we are successful in growing startups and attracting high quality companies that will place additional grow pressure. This plan will utilize the sector process to create a viable plan. Potential participants are FMPO, City, County, NAIPTA, NACOG, NAU, FMC, NAH, major employers such as WL Gore, ADOT, Federal Highways, Governor, Congressional and State Legislators.

- **Winslow Intermodal Facility Planning**

The promise of an intermodal facility in Northern Arizona is somewhat driven by the larger economics of the transportation and shipping. The data provided by the most recent ECoNA logistics study indicate that an intermodal facility along the I-40 corridor is closer to a reality as the major west coast ports have rail capacity but have peaked for additional truck traffic. BNSF has been almost completely focused all of its capital and attention to the moving oil in North Dakota and Canada. BNSF is now engaged again is looking at potential locations and capital investments for intermodal truck to rail facilities. After analysis of the I-40 corridor Winslow is the only location with large tracts of industrial land, 600-2000 acres with utilities and rail access. Winslow needs an expansion of the





## Infrastructure Continued

- **Winslow Main Gas Line Extension**

Development of a larger and expanded main gas line to serve industrial customers and also a portion of the City not now served.

## Regional Collaboration - Outreach

There are a number of opportunities for regional collaboration. While ECoNA has made efforts in the past to develop collaborations that serve the interests and create jobs for all regions we are committed to continue that effort.

**I-40 Corridor** – Manufacturing, Bio-Fuel, Intermodal, Tourism, Logistics, Export

**I-17 Corridor** – Tourism, Education, Industrial Development, Export

**Twin Arrows** – Tourism, Workforce Housing, Retail, Industrial Development, Logistics Export

**Page** – Tourism, Manufacturing, Export, Export

**Tuba City** – Tourism, Arts Enterprises, Agriculture, Export

**Williams** – Tourism, Wood Products, Workforce Housing, Manufacturing, Export

**Tusayan/Grand Canyon** - Tourism

**4FRI** – Continued work with Campbell Group and Good Earth Power

## International Business – Export/Import

Continued collaboration to encourage, train, fund, and empower businesses to expand their markets by exporting or developing import partnerships:

- o US Commercial Service
- o Arizona Commerce Authority
- o Greater Phoenix Economic Council
- o Governor's Office
- o Foreign Government Trade Offices and Associations

## Education – Workforce

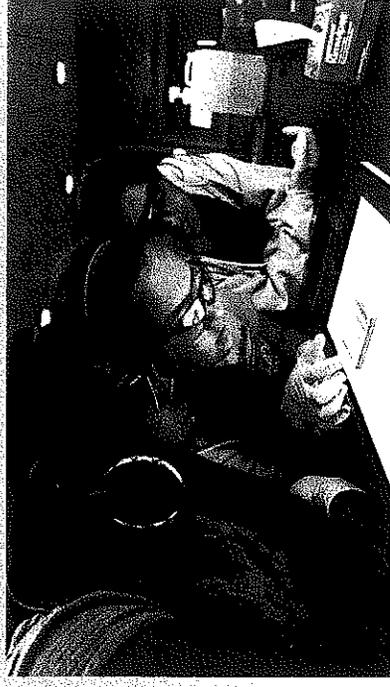
Northern Arizona is fortunate to have significant organizations and institutions with strong innovative leadership that are always looking for ways and initiatives to meet the needs of industry and economic development. The ECoNA role has been to create collaborative opportunities and bring challenges to be to the leadership of these organizations. The past year has seen the sector respond to needs put forth by industry and community. For example FUSD continues win awards and high rankings for its innovative programs in STEM, robotics, and overall achievement. NAU created a cutting edge informatics program and expanded STEM curriculum and majors. The Coconino County Career Center responded with a sophisticated collaborative to assist laid off workers from Walgreens. Coconino Community College has expertly navigated enormous budget challenges that have maximized the opportunities for students and minimized the damage to the workforce training programs.

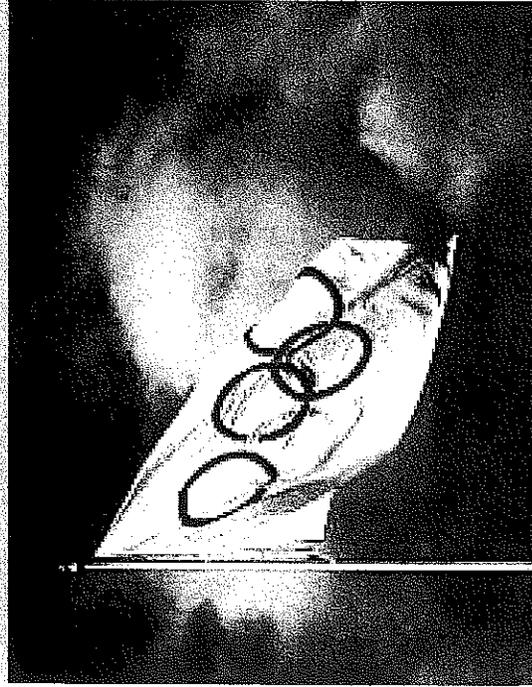
- **Develop a Tactical Plan for Coconino Community College**

Certainly the CCC Board and Executive Leadership has done amazing work to keep CCC moving forward in the face of funding challenges created by the failed override. It is also true however that it has been a long time since the county, community, and industry leadership have come together to work on a plan to strengthen and advance CCC.

- **Continued Collaboration and Support for Various Initiatives:**

Coconino County Career Center	STEM City – Flagstaff 40
Northern Arizona University	Arizona Commerce Authority
CAVIAT	FUSD
Goodwill	Southside Association
Sunnyside Association	



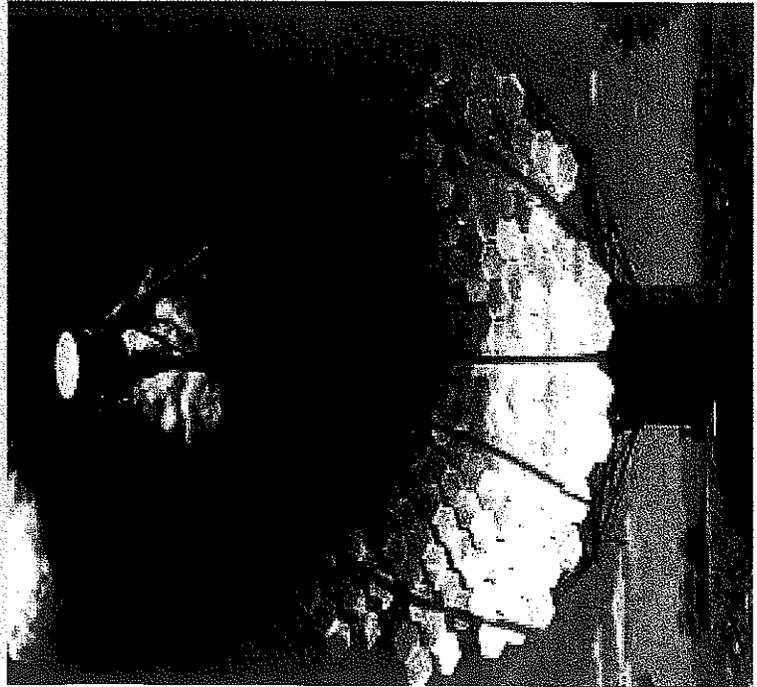


## Special Projects

- Flagstaff Veterans Home
- High Altitude Training – Olympic Rings
- Walgreens
- Events Arena
- Cherenkov Telescope Array
- 4FRI
- SEDI Collaborative Projects
- Northern Arizona Business Capital Loan Fund
- AAED Legislative Work

### ○ **Attract Second Airline with Service to a Major Hub \*\***

A critical element to continued economic growth for the region and in particular to attract the high value companies in the biosciences, digital products, manufacturing, and technology. The effort will be in conjunction with the City Staff, Airport Director, Greater Flagstaff Chamber of Commerce, and Major Employers



## Service, Advocacy, Engagement, Resources

Membership, service and engagement – influence and resources

- AZ Bio
- AAED
- Flinn Foundation
- NACET Board
- Valley Partnership
- Science Foundation Arizona
- Arizona Commerce Authority
- Arizona Technology Council
- Arizona Manufacturers Association
- Alliance for Construction Excellence
- Flagstaff Leaders Trip to Legislature and Congress

# 2015 WORK PLAN

# Collaboration

## ECONA Organizational Growth

- o Financial Sector
- o Expand Non-Profit Sector
- o Development/Real Estate Sector

## Business Expansion and Retention Committee

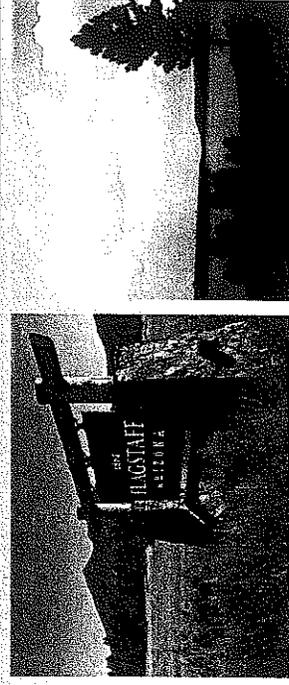
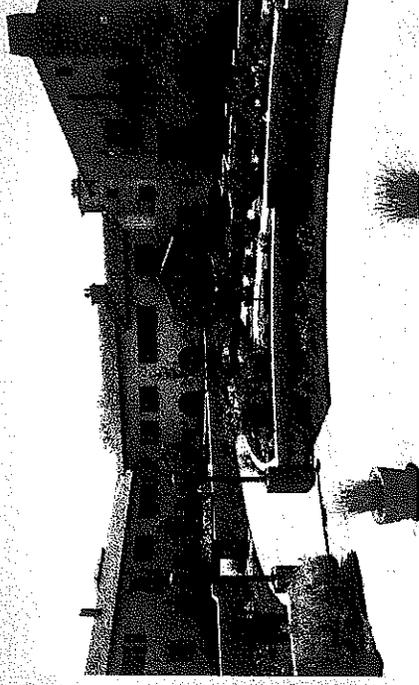
## Redevelopment Committee

## Metrics/Goals

The goal of the work plan has and will continue to be creation of new high quality jobs for the region. Our definition of high quality jobs are jobs that carry benefits, potential for growth, and livable wages for the region. The process to create jobs many times results in capital and investment for research, development, buildings, equipment, design services, local goods and services. The tactical plans for the major sectors also call for the development of capital and investment in the region.

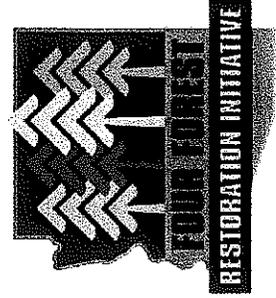
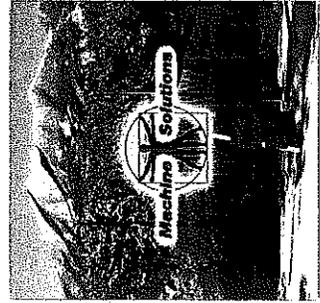
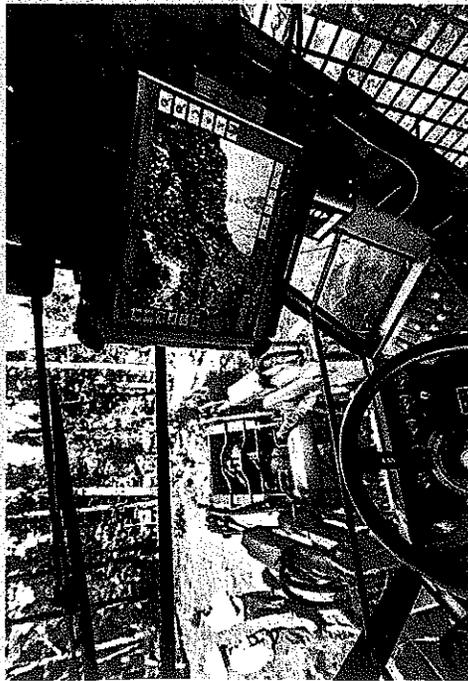
### Job Creation Goals:

Bioscience Sector	50 Jobs
Government Sector	10 Jobs
Manufacturing Sector	25 Jobs
Construction	50 Jobs
Digital Products Sector	25 Jobs
Business Expansion/4FRI	100 Jobs



## Capital and Investment:

<p><b>Bioscience Sector</b>                      TGen                      Machine Solutions                      Prent                      Innovation Mesa Accelerator                      NAU – Research                      NAH/FMC                      Protein Genomics                      WL Gore</p>	<p>\$4.5 Million</p>
<p><b>Government Sector</b>                      City                      County                      NAU                      DES                      Federal</p>	<p>\$10.0 Million</p>
<p><b>Manufacturing Sector</b>                      IML                      New Company Attraction</p>	<p>\$1.5 Million</p>
<p><b>Digital Products Sector</b>                      Gift Card Zen                      Deckers                      NACET                      Software/App Development</p>	<p>\$0.5 Million</p>
<p><b>Business Expansion/4FRI</b>                      Grand Canyon Railway                      Good Earth Power                      Retail                      Hospitality                      Amenities                      Twin Arrows</p>	<p>\$10.0 Million</p>



# FLAGSTAFF BIOSCIENCE TACTICAL PLAN

2014

The Path Forward  
Growing the  
Biosciences in  
Northern Arizona

Attachment 2

# FLAGSTAFF BIOSCIENCE TACTICAL PLAN 2014

FLAGSTAFF has seen tremendous progress in the development of the BIOSCIENCES in the past 10 years. This progress was the result of the groundwork and the influence of the Flinn Foundation Bioscience Roadmap. LEADERS from across the State, including Flagstaff, under the Flinn Foundation leadership have worked together to build the infrastructure, create the strategic framework, make the investments, and implement the policies that have laid the foundation. The Roadmap has set the course for even greater growth and success of the biosciences in Arizona.

The biosciences sector is one Flagstaff's largest sectors employing over 5,300 people and has potential for accelerated growth and improvement.

Generously funded and supported by the Flinn Foundation the Flagstaff 2014 Tactical Plan reflects the collaboration, commitment and investment by the regions bioscience leaders. Under the guidance of the Economic Collaborative of Northern Arizona (ECoNA) in partnership with the Flinn Foundation Bioscience Roadmap the future of the bioscience sector in Northern Arizona LOOKS BRIGHT.

Chris Bavasi  
Chair, Board of Directors  
ECoNA

Richard Bowen  
President  
ECoNA

# WHAT ARE THE BIOSCIENCES?

**From the Flinn Bioscience Roadmap:** The biosciences are lab research. They are manufacturing plants, budding startups, and hospitals. They are disease treatment and prevention, medical devices, and even algae, plants, and agriculture.

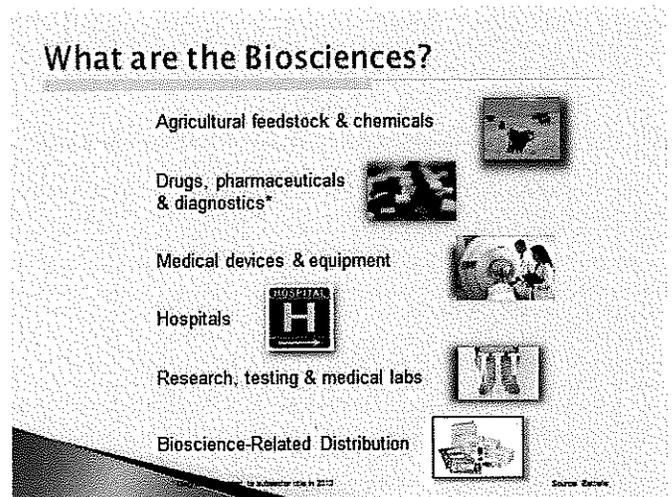
The biosciences serve a diverse set of markets, spanning biomedical drugs, diagnostics and devices, and agricultural and bio-based industrial products. In addition, the bioscience industry involves not only high-value, export-oriented manufacturing activities, but specialty commercial research, development, and testing industries to advance bioscience product development as well as specialty distribution to bring products to market. Together, the biosciences make our world a better place by developing treatments for health afflictions, designing diagnostics to gauge and prevent illness, strengthening our food supply, developing biofuels, and much more.

By combining high-tech research, academia, and product commercialization, the biosciences can serve as an economic driver with high-paying jobs and flourishing companies.

As shown in the adjacent graphic, there are six segments that make up the biosciences in Arizona:

- Agricultural feedstock and chemicals
- Drugs, pharmaceuticals, and diagnostics
- Medical devices and equipment
- Research, testing, and medical labs
- Hospitals
- Bioscience-related distribution

The first five were included in the original Bioscience Roadmap, launched in 2002. The sixth category, bioscience-related distribution, is being introduced with this report to align Arizona with the latest national definition of the biosciences by the Biotechnology Industry Organization, the industry's national trade association. Bio-distribution coordinates the delivery of bioscience-related products. It increasingly involves specialized approaches to cold storage and product monitoring, and new technologies such as automated pharmaceutical distribution systems. Three major components, each relatively distinct in its product focus, comprise the bio-distribution subsector—drugs and sundries; medical, dental, and hospital equipment and supplies; and farm supplies. Battelle has developed methodology that isolates the portions of these components that most closely relate to the biosciences. Medical, dental, and hospital equipment and supplies is the largest individual component, accounting for 43 percent of this segment's jobs nationally.



**FLAGSTAFF'S BIOSCIENCE TACTICAL PLAN** models the strategic and tactical actions called out by Arizona's Bioscience Roadmap. The Tactical Plan is a result of many meetings and planning sessions with the bioscience sector leadership in the greater Flagstaff region. Private sector industry, researchers, academia, investors, city officials, county officials, and economic development professionals committed to take the practical actions to insure that the complex and challenging projects that would advance the biosciences in the greater Flagstaff would come to fruition. Certainly the vision, goals, and actions of the regions bioscience leaders are ambitious. The alignment and consensus of the bioscience leaders around the vision, goals, and actions is the powerful tool that will result in the expansion of existing bioscience sector.

The bioscience sector process evaluated the highly successful major bioscience regions such as Boston, San Francisco, and San Diego. It was determined that the assets that are critical contributors and somewhat of a requirement for success and growth in the biosciences is the presence of a major research university(s), research institutes both private and public, growing bioscience industry businesses, bioscience work force availability and training, bioscience laboratories and research parks, bioscience business parks, bioscience business incubators and accelerators, public and private investment capital, and a robust entrepreneurial environment.

Over the past ten years since the inception of the Bioscience Roadmap Flagstaff has

## Flagstaff Bioscience Sector Actions:

### THE COMMUNITY AND INDUSTRY LEADERS WILL:

1. Develop Critical Regional Infrastructure and Support
2. Foster Industry Collaboration
3. Expand Research, Innovation, and Translation
4. Increase Private and Public Investment
5. Create a competitive and highly trained workforce
6. Drive Startup Incubation and Acceleration
7. Support Industry Growth to Achieve Critical Mass



## Greater Flagstaff's Bioscience Vision

**VISION:** Greater Flagstaff 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.

Source: Arizona's Bioscience Roadmap, December 2002. Revised 2007 - modified for this report to reflect Flagstaff only.

continued to evolve in the maturity and growth of its major institutions and businesses. While it can be said that the biosciences are to a certain degree, still in its early stage development in Flagstaff, it can also be said that the major institutions, organizations, and companies have the ability and critical mass to serve as the foundation. This foundation allows for faster and higher quality expansion. The foundation also provides the basic assets for success in the biosciences in the next ten year cycle of the Roadmap. In addition the bioscience start-ups and the biosciences companies that decide to locate in Flagstaff will be a driver of the growth.

In evaluating the potential for the next ten years and in creating the tactical action steps needed to insure the acceleration of the biosciences in Northern Arizona the sector leadership took stock of the current assets and how they will contribute to development of the biosciences in Northern Arizona. With the support and commitment of the bioscience sector leadership to the 2014 Flagstaff Bioscience Tactical Plan, and to future tactical plans that reflect the changing environment, the biosciences in Flagstaff and Northern Arizona will grow at an accelerated rate.

## Bioscience Roadmap Goals

**Entrepreneurial Hub:** Form a hub of bioscience entrepreneurs and new enterprises across Arizona

**Research into Practice:** Increase the ability of research-performing institutions to turn bench research results into improved disease/illness prevention, detection, and treatment, plus bio-agriculture and industrial biotechnology products

**Bio-Talent:** Make Arizona a bio-talent powerhouse where such talent is developed, educated, trained, and retained

**Connectivity:** Promote Arizona to economic partners in neighboring states, Canada, and Mexico as a place where bioscience research, health care delivery, and commercialization seamlessly intersect

**Collaboration:** Pioneer a new level of commitment to partnerships to sustain and enhance the state's "collaborative gene" reputation

## Flagstaff Metro Area

Key Bioscience Subsector	Establishments, Employment Level & Concentration (2013)	Regional Strengths/ Highlights
Medical Devices & Equipment, Diagnostics, Laboratory, and Pharmaceuticals	Establishments: 5 Employed: 2,512 Empl. Growth (12-13): 2%	Flagstaff is highly specialized in medical devices, with more than 15 times the national employment concentration  The regional sector continues to grow at a rapid pace, up 154% since 2002
Research	Establishments: 3	TGEN North Northern Arizona University Flagstaff Medical Center
Hospitals	Establishments: 2 Employed: 2,703 Empl. Growth (12-13): 2%	Flagstaff has a specialized hospitals subsector with 47% greater concentration of hospital jobs relative to the national average and more than 2,700 jobs

Source: Bureau of Labor Statistics

**FLAGSTAFF IS FORTUNATE TO HAVE A GROUP OF ORGANIZATIONS, PRIVATE SECTOR LEADERS, AND PUBLIC SECTOR LEADERS WHO CAN BRING THE RESOURCES, DRIVE, AND INVESTMENT TO IMPLEMENT THE TACTICAL PLAN.**

**NORTHERN ARIZONA UNIVERSITY** has grown its research mission and particularly its bioscience research mission with a specific emphasis on genetics and genomics. As a result the number of bioscience researchers, post docs, graduate student researchers, undergraduate research, potential intellectual property, and potential entrepreneurs has increased. The University has a goal of doubling its research expenditures by 2020 adding significant momentum to the bioscience sector potential. NAU has received national and world-wide recognition for outstanding research and breakthroughs in genetics, bioengineering, and bioscience.

Opened in the beginning of 2008, the Center for Microbial Genetics and Genomics (MGGen) has quickly become one of the most notable scientific facilities in the country for its study of anthrax, plague, and bacteria. MGGen partners with the Translational Genomics Research Institute (TGen) North, established in Flagstaff in 2007. Together, they are pioneering genetic analysis of disease vectors and helping to improve public health, biodefense, and disease outbreak investigations.

**Other NAU Centers and facilities for research in bioengineering, biosciences, and genetics include:**

Biology Department Research

Center for Microbial Genetics and Genomics (MGGen)

Environmental Genetics and Genomics Laboratory (EnGGen)

Gibb Lab

Imaging and Histology Core Facility

Schwartz Laboratory of Microbial Ecology

## Bioscience Infrastructure

### ■ Northern Arizona University – New Health and Science Building

- Expanded Bioscience Laboratory and Research Capacity – 118,247 s.f.
- Under Construction Now – Expected to Open Summer of 2015



# RESEARCH STAFF BIOSCIENCE

In addition to creating the sophisticated and highly trained work force of the future Northern Arizona University boasts a number of organizations driving economic activity and making a substantial and important economic impact in Arizona. Included is the nationally known W.A. Franke College of Business, the NAU Center for Business Outreach, the NAU Office of Economic Development, NAU Center for American Indian Economic Development, Arizona Hospitality Research & Resource Center, NAU Center for American Indian Economic Development, NAU EDA University Center, and the NAU Rural Policy Institute. <http://franke.nau.edu/business-outreach/>

The aforementioned NAU organizations are innovators and drivers of excellence in business incubation and acceleration, entrepreneurial education and training, business outreach, business service and engagement, direct job creation, technology transfer, and business retention and expansion. In addition, the growing world class research at NAU is providing direct economic impact with job creation, intellectual property, technology transfer, business incubation, and development of sophisticated high level workforce demanded by industry.

Northern Arizona University is also engaged in direct economic development as a partner and manager of the regional economic development organization the 'Economic Collaborative of Northern Arizona (ECoNA). [www.econa-az.com](http://www.econa-az.com)

## Bioscience Support Systems

**■ New Bioscience Informatics Program at Northern Arizona University**

- Need identified during Northern Arizona Bioscience Sector Meetings
- As data sets continue to increase exponentially in many different disciplines and areas of research, informatics—big-data research—and the ability to use stored data to answer research questions is critical to the long term viability of the bioscience industry.
- Producing bioscience graduates with Informatics capability



Business

↑

Industry

↓

Academia

<ul style="list-style-type: none"> <li>Business</li> <li>Chemistry</li> <li>Food and food safety</li> <li>Genetics</li> <li>Healthcare</li> <li>Information Systems</li> <li>Mathematics</li> <li>Physics</li> <li>Software</li> </ul>	<p>Industry</p> <p>↑</p> <p>Academia</p>	<ul style="list-style-type: none"> <li>Healthcare</li> <li>Food and food safety</li> <li>Genetics</li> <li>Information Systems</li> <li>Mathematics</li> <li>Physics</li> <li>Software</li> </ul>
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Northern Arizona University's strategic economic development plan recognizes business incubation and advanced venture acceleration are critical components for Northern Arizona's economy to grow and prosper. Northern Arizona has developed a robust and growing knowledge based economy in the biosciences, technology, science based companies, software, advanced manufacturing, astronomical sciences, education, and medical services. Fostering growth and expansion in the knowledge based companies will allow the region's economy to compete nationally and globally.

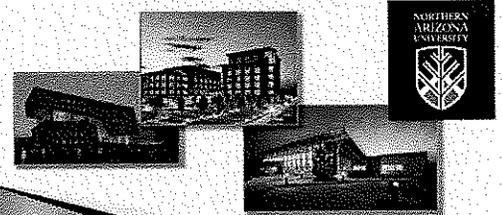
**WL GORE MEDICAL DIVISION** is a mainstay in the bioscience industry in Flagstaff since 1968 with over 2,100 employees, 12 manufacturing and sophisticated research facilities encompassing 1.2 million s.f. on two campuses in Flagstaff. They develop Implantable medical devices and tissue replacement products that are used around the globe. WL Gore is regularly recognized as one of the best places to work by the major trade journals. They continue to innovate with new products. Several new products recently approved by the FDA have led to one new plant being constructed at the Woody Mountain campus and a second new building in development.

WL Gore plans to expand its work force in the Flagstaff region over the next ten years and has been active contributor to the development and implementation of the Tactical Plan. WL Gore brings to the region doctors, biomedical researchers, biomedical engineers, histologists, laboratory technicians, MPE engineers, technologists, and scientists who all lend to the scientific nature of the community and supports the community drive for a STEM excellent community. We know from previous experience that those in the biosciences are attracted to Flagstaff's high quality of life, high quality education, and strong STEM commitment. WL Gore attracts bioscience employees that support these attributes. WL Gore is a potent partner in growing the entire bioscience sector in Flagstaff. [www.goremedical.com](http://www.goremedical.com)

**TGEN NORTH**, Located in Flagstaff, Arizona, nestled in the world's largest Ponderosa Pine forest. TGen North is the heart of TGen's Pathogen Genomics Division, led by Dr. Paul Keim, one of the world's foremost experts in anthrax and other

## Bioscience Infrastructure

- **Northern Arizona University Research Park**
  - In development for future research buildings at Northern Arizona University
  - Will encourage research institutes and research corporations to locate and expand in Flagstaff
  - 50 Acres on Southern Edge of Northern Arizona University

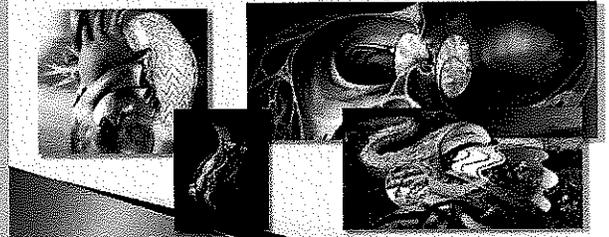


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## Bioscience Industry Growth



- 2100 associates in Flagstaff
- Building new plants in Flagstaff
- Research and Development
- Over 600 associates in Phoenix
- Adding new associates in Flagstaff
- Adding new associates in Phoenix



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dangerous infectious diseases. Dr. Keim is a professor of biology and the Cowden Endowed Chair in Microbiology at Northern Arizona University (NAU). TGen North is a major driver in the bioscience sector. The strategic plan for TGen North has been developed to focus on diagnostic, analytic, forensic and epidemiologic research related to pathogens important to medicine, public health and biodefense. These activities are linked across TGen North's four research centers: 1) Center for Public Health and Clinical Pathogens; 2) Center for Microbiomics and Human Health; 3) Center for Dangerous Pathogens; and 4) Center for Pathogen Information. On April 13, 2007, TGen North

officially opened its doors. David Engelthaler, the former Arizona State Epidemiologist and Arizona Biodefense Coordinator, provides the day-to-day management of TGen North. The research capabilities of the new lab include a variety of PCR-based analyses, genetic sequencing, Biosafety Level 1 and 2 pathogen handling, forensic genetic analysis of biothreat agents, and bioinformatic analyses. TGen North also has access to the new advanced Biosafety Level 3 facilities on the NAU campus and the comprehensive genomic research capabilities of TGen Headquarters in Phoenix. In addition to NAU, TGen North has many local, national and international research partners, including universities, biotech companies, security agencies, health care providers, and public health departments.

## Expand Research Activity

**TGEN North**

- Growing Research Portfolio
- 50+ employees
- Translational and Public Service
- Research and Clinical Partnerships Nationally and Internationally

TGen North programs are funded by multiple federal, local, commercial and non-profit entities that support medical diagnostics, forensic analyses and biodefense-related work including the Department of Defense, Department of Justice, the National Institutes of Health, the Arizona Biomedical Research Commission and others.. The launch and success of TGen North in Flagstaff is a significant step for both establishing a biosciences corridor in Arizona and furthering economic development in Flagstaff.

TGen North is already making great strides in pathogen genomic research including the identification of new diagnostic signatures for pathogens that cause pneumonia and sepsis, analyzing the genome of *Coccidioides posadasii*, which is the cause of Valley Fever, developing and applying new metagenomic analysis tools towards various aspects of the human microbiome, and developing new forensic tools for biothreat agent analysis.

**Mission:** Advancing Public Health, Clinical Medicine and Biodefense through targeted microbial genomics.

**Values:** Team, Leadership, Vision, Responsibility, Growth, Change.

**Strategies:**

- Employ experienced, talented and energetic personnel to provide leadership, conduct research, and provide administrative support

- Focus on research that is important locally and has impacts globally
- Develop and maintain strong local, national and international partnerships with other research institutions, universities, health care providers, biotech companies, public health agencies, security and defense agencies and community groups
- Strive to produce research outcomes that not only positively impact medicine and public health, but that also impact the local community by increasing the standard of living and employment (e.g., attract partners to move to area; develop spin-off companies; etc.)

## Goals:

- Use state of the art genomics to analyze genetic material from pathogens important to medicine, public health, and biodefense
- Develop new genomic diagnostic and analytical tools for pathogen identification and phylogenetic and phenotypic characterization
- Partner with public health officials to conduct molecular epidemiologic analyses to assist with disease outbreak investigations
- Develop the capacity to conduct forensic analysis on genetic material from potential biothreat agents as part of biodefense-related investigations

## Research Centers:

- Center for Public Health and Clinical Pathogens
- Center for Emerging Pathogens and Technologies
- Center for Microbiomics and Human Health
- Center for Pathogen Information
- Center for Food Microbiology and Environmental Health
- Center for Pathogenic Fungal Genomics

## Collaborations:

- TGen North works within the Pathogen Genomics Division and across other TGen Divisions to make best use of TGen's talent and resources
- TGen North is intrinsically linked to NAU's Microbial Genetics and Genomics Laboratory (P. Keim - Director) and collaborates on projects and resources
- TGen North is a Northern Arizona partner of the Biosciences Research Corridor, including TGen HQ, ASU Biodesign, IGC, BIO5, etc.
- TGen North is physically located near the Federal Bureau of Investigation, which will increase connectivity on biodefense activities
- TGen North has a close association with the Arizona Department of Health Services as well as a number of programs within the Centers for Disease Control and Prevention which increases its potential to impact public health

- TGen North has ongoing collaborations with biotechnology companies and healthcare institutions which will help speed the translation of outcomes of bench research to clinical practice
- TGen North has a seat on the Northern Arizona Bioscience Roadmap Steering committee, coordinated by The Flinn Foundation and Battelle.
- TGen North is an active participant and collaborator in the development of the Flagstaff Bioscience Tactical Plan.
- TGen North has close association with the Economic Collaborative of Northern Arizona and the City of Flagstaff

**FLAGSTAFF MEDICAL CENTER** is a regional referral center serving all of Northern Arizona. It is the only Level 1 Trauma center outside of Phoenix and Tucson. As a result it has developed into very large sophisticated medical center with all of the specialties and capabilities of the major urban medical centers. Employing over 2000 employees and adding approximately 100 new employees this next year with anticipated greater growth in the future. FMC is a major employer in Flagstaff. More recently FMC has evolved to be able to take on a research mission. In conjunction with Northern Arizona University, funded by a grant from the Flinn Foundation, FMC has hired a research director and established a research division that is focused on improving outcomes in hospital to home transitions, long term health outcome improvement for chronic disease, and use of informatics to better healthcare outcomes. The research division is an area for continuing growth at FMC as they develop additional partnerships.

## Flagstaff Medical Center



**Flagstaff Medical Center**  
Northern Arizona Healthcare



**Flinn Foundation Grant for research improving outcomes in hospital to home transitional care**  
**In conjunction with Northern Arizona University**  
**First Things First Grant for research in pediatric care**  
**New Stroke Center**  
**Growing Organization**

With more than 270 beds and 200 physicians, and approximately 2,000 employees, FMC provides comprehensive, state-of-the-art healthcare from diagnostic outpatient services to open heart surgery.

The **Heart and Vascular Center of Northern Arizona** offers a comprehensive line of cardiology services including diagnostic, interventional and surgical treatment options and a cardiac rehabilitation program. Our surgical program includes the cutting-edge "beating heart" or off-pump bypass surgery, as well as a noninvasive procedure for patients with atrial fibrillation, the most common heart rhythm disorder.

As the only state-designated **Level 1 Trauma Center** north of Phoenix, FMC provides care to critically injured patients. The Trauma Center ensures that patients in Northern Arizona have access to life-saving care during the Golden Hour that follows a trauma, when immediate care could mean the difference between life and death.

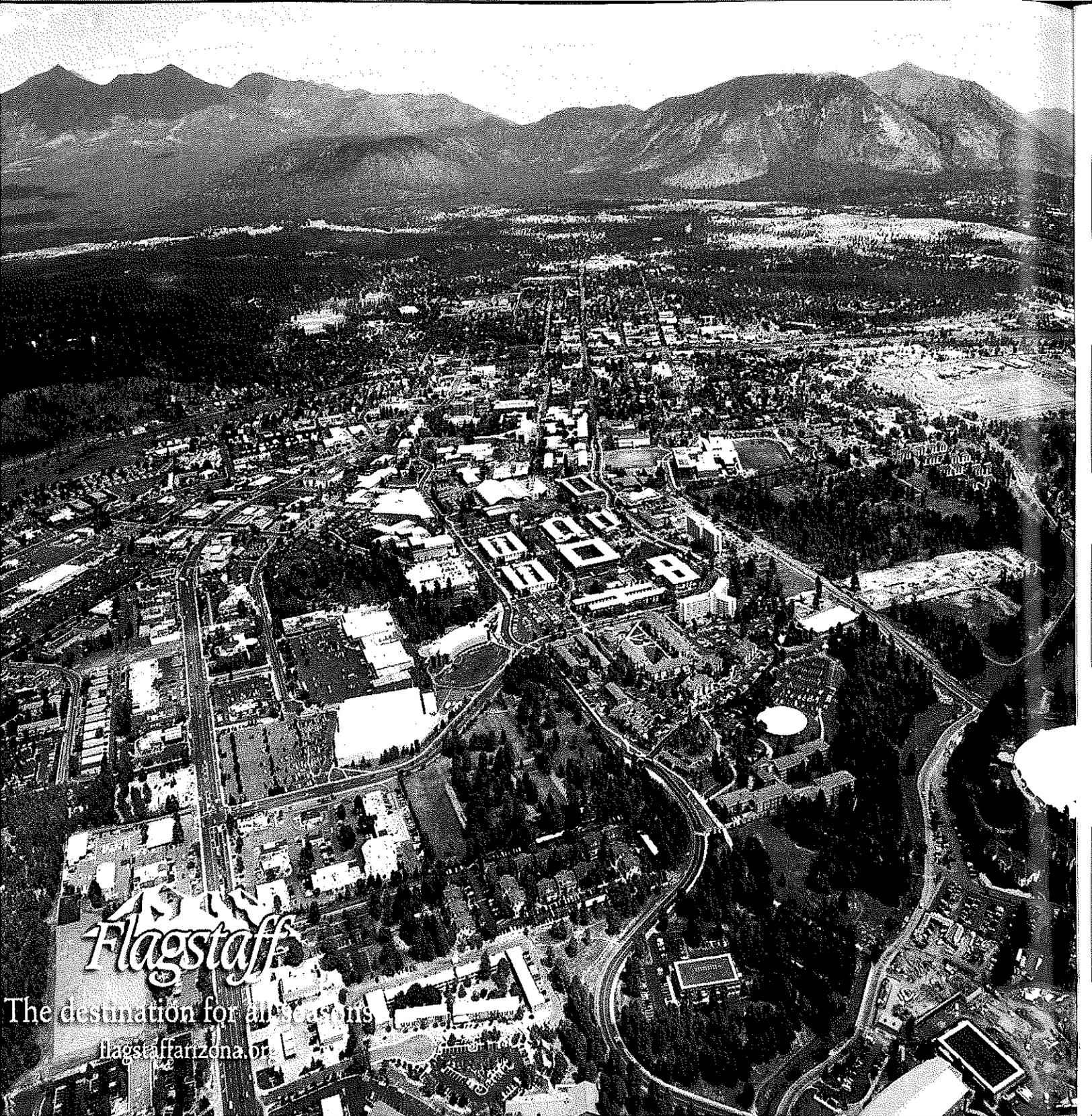
FMC is the only hospital in Northern and Central Arizona to offer advanced, minimally invasive surgical technology using the **da Vinci Robotic Surgical System**. The \$1.5 million system is FDA-approved for use in general, bariatric and urology procedures. FMC was the first hospital in Arizona to use the da Vinci system for weight-loss and general surgery.

The **Spine and Joint Surgery Center** offers a unique approach to those patients who require total joint replacement surgery and spine surgery. At FMC, joint surgery patients are not viewed as ill, rather as healthy individuals, who through this program, can get back to the lifestyle they enjoy. The program focuses on providing exceptional care and patient education.

The **Bariatric Surgery and Weightloss Center** is a comprehensive program that provides not only weight-loss surgery, but patient education and support for morbidly obese patients choosing a surgical solution. FMC is the only hospital north of Phoenix offering weight-loss surgery.

The **Cancer Center** uses a multidisciplinary team approach designed to ensure the cancer patient's treatment is individualized, comprehensive and coordinated. The Cancer Center offers radiation and medical oncologists, physicians, radiation therapists, certified oncology nurses, social workers and dietitians. The **Breast Cancer Resource Center** provides education, resources and support services for women undergoing treatment, and their families.

Additional services include the **Women and Infants' Center**, **Pediatric Intensive Care Unit**, and adjoining **Advanced Life Support/Heart-Lung/ECMO**, and a full array of inpatient and outpatient healthcare services.



# Flagstaff

The destination for all scientists  
[flagstaffarizona.org](http://flagstaffarizona.org)

IMPLANTABLE MEDICAL DEVICES   GENETICS RESEARCH   CLINICAL TRIALS AND  
RESEARCH   DIAGNOSTICS   BIOPOLYMER WOUND HEALING   DRUG TESTING LABORATORIES  
NEUROSCIENCES   SERVICES   GENOMICS   STEM EDUCATION   BIOSCIENCE PRODUCTION  
DEVELOPMENT   BIOMARKER DEVELOPMENT   PATHOGEN GENETICS RESEARCH  
MEDICAL PACKAGING   MEDICAL DEVICE MACHINE   BIOSCIENCE ENGINEERING  
HOSPITALS   ADVANCED TREATMENT   PRECISION MEDICINE   CANCER RESEARCH

## TACTICAL PLAN 2014

**IN THE 2012 AND 2013 THE FLAGSTAFF BIOSCIENCE LEADERSHIP HELD A SERIES OF MEETINGS TO ENGAGE IN THE SECTOR PROCESS.**

**THE SECTOR PROCESS ASKS THE BIOSCIENCE AND COMMUNITY LEADERS WHAT ARE THEIR GOALS AND OPPORTUNITIES IN THE NEXT SEVERAL YEARS:**

**WL GORE PLANS TO BRING NEW PRODUCTS TO MARKET**

**PROTEIN GENOMICS IS GROWING ITS MARKET BASE**

**NORTHERN ARIZONA UNIVERSITY IS EXPANDING BIOSCIENCE RESEARCH**

**TGEN NORTH EXPECTS TO GROW AND TO COMPETE FOR ADDITIONAL SPONSORED RESEARCH**

**PATHOGENE IS DEVELOPING NEW MEDICAL DIAGNOSTICS**

**DEVELOPMENT ENGINEERING SERVICES IS EXPANDING THEIR CLIENT BASE**

**NORTHERN ARIZONA HEALTHCARE IS EXPANDING AND PLANNING GROWTH**

**FLAGSTAFF MEDICAL CENTER AND NORTHERN ARIZONA UNIVERSITY HAVE STARTED A JOINT RESEARCH AND CLINICAL TRIAL PROGRAM**

**PRENT CORPORATION HAS EXPANDED INTO MARKETS IN ASIA AND SOUTH AMERICA - ADDING EMPLOYEES AND EXPANDING THE FLAGSTAFF PLANT**

**SENESTECH IS BUILDING A MANUFACTURING FACILITY AND SIGNED A NATIONAL LICENSING DEAL**

**THE NEXT QUESTION ASKED OF THE SECTOR LEADERS IS WHAT DO YOU REQUIRE TO ACCOMPLISH YOUR GOALS?**

From this sector process and the on-going sector dialogue the following elements of the plan were created to which the community and industry leadership agreed to implement through prioritized investment and action.

# 1. DEVELOP CRITICAL REGIONAL INFRASTRUCTURE AND SUPPORT SYSTEMS

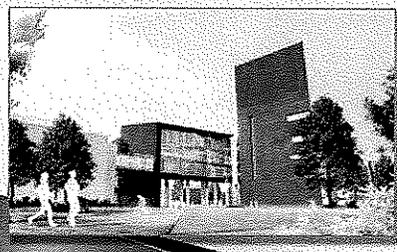
**NORTHERN ARIZONA UNIVERSITY – NEW HEALTH AND SCIENCE LABORATORY BUILDING.** Northern Arizona University has nearly doubled its bioscience majors in the past 10 years. In addition, it has plans to expand significantly its research mission. The Arizona Board of Regents has recognized that a robust and active research program will drive economic development for the State. Many national studies confirm that the environment, discovery, and talent developed by research leads to the start of new companies and to the conditions, workforce, and capital needed to attract companies. Through the bioscience sector process an identified need for the region was additional teaching and research laboratory space. This new laboratory building will allow Northern Arizona University to expand its research but also create the highly trained credentialed work force needed by the growing bioscience industry in Flagstaff and Arizona.

**FLAGSTAFF AIRPORT TECHNOLOGY AND BIOSCIENCE PARK** - Flagstaff is in a unique real estate position in that community is surrounded by public lands that cannot be developed. This has created a shortage of properties that can be developed and has resulted in higher land and building costs. Developing affordable parcels with appropriate infrastructure is a critical long term requirement for bioscience companies and organizations that start, incubate or locate in Flagstaff. The City of Flagstaff has set aside 100 acres at the Flagstaff Airport and has built the utility and road infrastructure at the airpark to accommodate bioscience development.

**INNOVATION MESA PROJECT** – Bioscience startups will drive much of the future growth of the bioscience industry in Flagstaff in the next 10 years. The Northern Arizona Center for Entrepreneurship and Technology (NACET) is a successful business incubator in Flagstaff

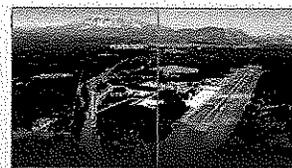
## Bioscience Infrastructure

- **Northern Arizona University – New Health and Science Building**
  - Expanded Bioscience Laboratory and Research Capacity – 118,247 s.f.
  - Under Construction Now – Expected to Open Summer of 2015



## Bioscience Infrastructure

- **Flagstaff Airport Technology and Bioscience Park**
  - Technology park set aside for bioscience and technology companies – Existing Built Space Available
  - 100 Acres with full utilities and roads.
  - APS is building a new substation to increase power available



that began in 2008 in a partnership between Northern Arizona University, City of Flagstaff, and the Economic Development Administration. It is designed to foster and support startup bioscience companies utilizing intellectual property and discovery from Northern Arizona University, TGEN North, Flagstaff Medical Center, and private research organizations. In 2012 Flagship Biosciences, a tier two bioscience company incubated at NACET moved to Denver when they were unable to find suitable laboratory space in the private rental market in Flagstaff. Several other NACET affiliate companies also moved out of Flagstaff for similar reasons. It became apparent that Flagstaff would face similar circumstances with future bioscience companies in the future. Once again the bioscience sector leaders made a significant commitment to fund a 25,000 s.f. biosciences startup accelerator named the Innovation Mesa project which would allow tier two companies the laboratory and manufacturing space needed. The City of Flagstaff has provided the leadership and oversight of the EDA grant and construction of the project. Business incubation and advanced venture acceleration are critical components for Northern Arizona's economy to grow and prosper. Northern Arizona has developed a robust and growing knowledge based economy in the biosciences, technology, science based companies, software, advanced manufacturing, astronomical sciences, education, and medical services. Fostering growth and expansion in the knowledge based companies will allow the region's economy to compete nationally and globally.

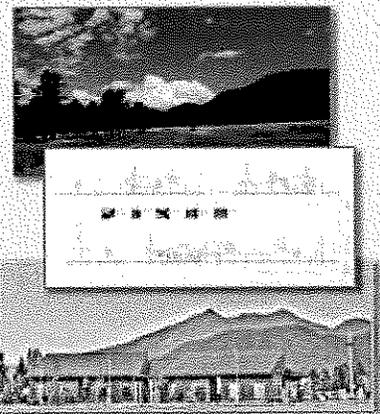
Northern Arizona University (NAU) has been engaged in business and venture incubation in Northern Arizona through a partnership with the Northern Arizona Center for Entrepreneurship and Technology (NACET) and the City of Flagstaff. The partnership has created significant success in the past five years. A study conducted by the NAU Franke College of Business showed that client companies at NACET created 165 new jobs in 2009 and 2010 with an average wage of

\$75,000. Furthermore, through November of 2011, NACET clients have raised over \$68 million in funding and clients spent \$17 million which had a regional economic impact of \$29 million just for 2011.

## Bioscience Infrastructure

### ■ Innovation Mesa Project

- 25,000 s.f. Laboratory Building adjacent to the Northern Arizona Center for Entrepreneurship and Technology (NACET). \$7.8 million dollar project.
- Startup Accelerator
- Allows Tier 2 Bioscience Companies appropriate lab growth space and solves the inability of the private real estate market to meet this demand.
- Construction expected to begin Spring 2014.
- City of Flagstaff, Northern Arizona University, NACET, Arizona Commerce Authority, EDA

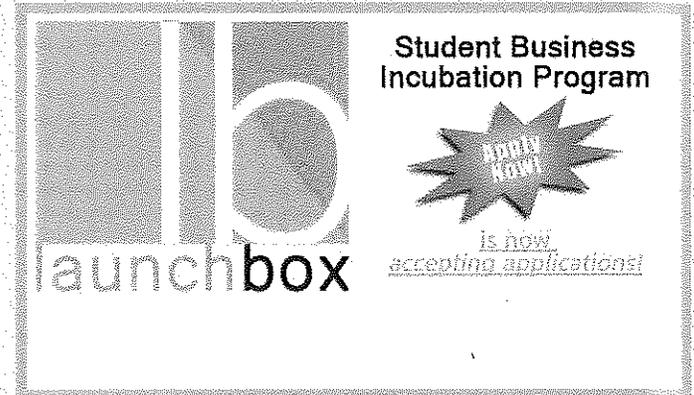


## TACTICAL PLAN 2014

NAU has created new programs and offerings to encourage, educate, and fund students to become entrepreneurs and start businesses while at the University. These programs include our student business incubator 'LaunchBox', Extreme Entrepreneur Tour, and NAU Start-up Weekend.

NAU research scientists along with partners at TGEN North have created intellectual property and discoveries that have been turned into new companies such as Pathogene and Protein Genomics. NAU faculty and students have created new companies that are currently in business incubation and will soon be ready for the venture acceleration as they become tier two companies. In addition the work of NAU in economic development and the NAU collaboration with the regional economic development organization Economic Collaborative of Northern Arizona (ECoNA) is bringing new start-up technology and bioscience companies to the region that will want and need access to venture acceleration facilities and programs.

A problem for business start-ups, entrepreneurs, and existing companies in Northern Arizona region and for most of Arizona for that matter is a lack of venture acceleration programs, facilities and programs. Recently Northern Arizona experienced the loss of a growing tier two digital pathology company, a tier two renewable energy company, and a growing tier two superconductivity company to other states and regions because they could not find appropriate two-tier space or venture acceleration services in Northern Arizona. Without the venture acceleration programs and facilities the region and State's ability to grow and create jobs is slowed and in some cases stymied. Recognizing that venture acceleration is a critical step to expanding the current success in job creation Northern Arizona University is expanding its current venture acceleration work. In addition, NAU is partnering



with NACET and the City of Flagstaff to operate a venture acceleration program in the new Innovation Mesa project. NAU will house its expanded venture acceleration and ongoing business incubation work in the facility.

This venture acceleration facility will be an important step forward for Northern Arizona and Northern Arizona University in accelerating job creation. NAU venture acceleration program accelerates the growth and sustainability of the tier two start-ups through:

1. Access to the technical expertise, mentoring, and consulting of NAU business and engineering faculty, NAU economic development practitioners, research faculty, MBA and engineering graduate students, interns, engineering, marketing, finance, and laboratory equipment.
2. Intellectual property and technology transfer developed by NAU and cooperating universities such as ASU, UA, MIT, Stanford, and many more.
3. Connections to local, state, and national business incubation resources.
4. Assistance and access to capital in the form of grants from the EDA, NSF, NIH, Department of Commerce, SBIR grants, and many more.
5. Access to capital from angel and venture investors.
6. Mentoring from a network of professionals such as patent attorneys, CPA's, experienced entrepreneurs, engineers, as well as sales and marketing professionals.
7. Laboratory, production, and manufacturing space with advanced technology and equipment.
8. Incubation coaching and oversight.

The Innovation Mesa project will provide "soft landing" space for tier two companies developed by NAU faculty and students, Tier 2 companies and graduates exiting NACET's incubation program, and allow new start-up companies wishing to enter to business incubation to have space in the NACET. This project is intended to create over 300 jobs and \$20 million in private investment within the first five years of operation. The addition of wet and dry laboratories in Innovation Mesa is critical to expand and grow existing companies in the region. Currently no private laboratory space is available or anticipated to be



built. This project will allow Northern Arizona to retain local businesses that may have otherwise left the region to seek these types of venture acceleration programs, services and facilities. Specifically, this project and the NAU advanced venture acceleration program provide these benefits:

1. High technology and bioscience startups will result from technology transfer and commercialization of research conducted by NAU faculty and students.
2. Local entrepreneurs will become more competitive in the global market through the technical and business advice from NAU Venture Acceleration Program, NACET staff and their statewide mentors group.
3. Existing firms and new firms will locate in Northern Arizona to take advantage of the Innovation Mesa's facilities and to be near growing industry clusters. However, this facility is unlikely to compete with existing commercial facilities due to small lease areas, non-traditional finance terms, and access to lab space not available in the current commercial real estate market.
4. Native American culturally specific businesses will be encouraged to expand their service areas through guidance from and access to NAU and NACET staff, business leaders, and programs.



Innovation Mesa project is a shared vision with state, local, and private entities. This collaborative partnership involves the City of Flagstaff, Northern Arizona University, Economic Collaborative of Northern Arizona, Northern Arizona Council of Governments, and the Northern Arizona Center for Entrepreneurship and Technology. This collaborative partnership has already shown a proven ability to work together to advance the economic needs of the region.



In addition to the community collaboration Northern Arizona University and NACET have a long standing partnership in business incubation, technology transfer, entrepreneur education, and mentorship. In October 2011 Arizona Gov. Jan Brewer made a \$1 million state investment in a NAU and NACET northern Arizona business incubator partnership furthered and supported research-intensive ventures and small business opportunities in the region, ultimately leading to more local high-wage jobs. The Northern Arizona University/Northern Arizona Center for Emerging



Technologies partnership was established four years ago to support the creation of successful science- and technology-based companies in northern Arizona. The Governor's funding was used to advance the center's existing projects, increase the number of new projects, cultivate spin-off opportunities, provide research opportunities to undergraduates and mentor graduate researchers in start-up business efforts in a true "grow your own" talent initiative.

This advanced venture acceleration program will expand the partnership. NACET and NAU will leverage and expand the resources for venture acceleration. NAU will hold a seat on the Executive Board of NACET. Northern Arizona University and NACET already have a significant statewide business incubation and economic impact with the potential to significantly increase the impact with advanced venture acceleration. NAU and NACET will co-market and co-brand the venture acceleration program in Arizona. NACET currently manages the incubator at Embry Riddle University in Prescott, Center for Entrepreneurial Innovation at Gateway Community College in Downtown Phoenix, Town of Maricopa Business Incubator, and business assistance centers in Prescott and Cottonwood, and a Native American business incubator serving Tribes located in Coconino, Navajo, Apache, and Yavapai counties. NACET is also negotiating to develop incubators in greater Phoenix and other rural communities. Northern Arizona University has campuses in 30 locations in both rural and urban Arizona.

**NORTHERN ARIZONA UNIVERSITY RESEARCH PARK** - Northern Arizona University is the center of the research efforts in Northern Arizona. The Arizona Board of Regents set a goal for the Northern Arizona University to double its research portfolio and expenditures. In addition, the sector process identified opportunities to attract contract research organizations and research institutes. These organizations typically decide to locate a branch or move to the region to avail themselves of the faculty, students, researchers, workforce, facilities and life style of the region. ECoNA is specifically targeting contract research organizations and research institutes in its work to attract new bioscience organizations and companies to Flagstaff. Many of these organizations will seek locations that give them proximity and access to Northern Arizona University, TGEN North, Flagstaff Medical Center, WL Gore, and Coconino Community College. Also, as Northern Arizona University continues to expand its research portfolio additional research facilities will be required. Building sites on the core of the campus are limited. The research park will provide the needed buildings locations for the next series of research buildings. When those facilities are constructed space will be constructed and set aside to accommodate research institutes and contract research organizations.

## Bioscience Infrastructure

### ■ Northern Arizona University Research Park

- In development for future research buildings at Northern Arizona University
- Will encourage research institutes and research corporations to locate and expand in Flagstaff
- 50 Acres on Southern Edge of Northern Arizona University



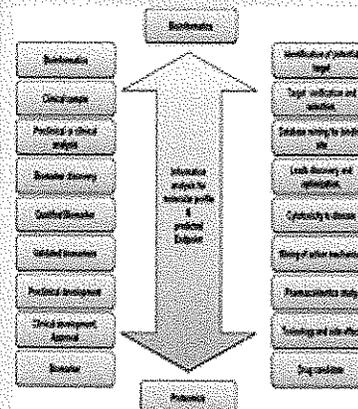
**BIOSCIENCE INFORMATICS PROGRAM AT NORTHERN ARIZONA UNIVERSITY** - In recent years the amount of data developed by bioscience research has grown exponentially. All industries are dealing with the onslaught of data. Many companies are successfully utilizing the data through the development of informatics capabilities. For the biosciences the researchers are spending as much time in front of computers working with data as they do in the laboratory. Clearly informatics is a critical skill set and important if Flagstaff and Arizona is to compete. The Flagstaff bioscience sector identified informatics as one of the main areas of support that Northern Arizona could provide for the long term success and development of the bioscience industry. Northern Arizona University has an existing informatics capacity within specific research units and in the computer science program. However it does not have a formal program that reaches all disciplines and specifically a formal bioscience informatics program

Dr. Bill Grabe, Vice President of Research at Northern Arizona University has made the implementation of a robust informatics programs one of his major priorities. As a result in 2014 NAU purchased a large cluster computer, hired nationally recognized informatics faculty, set aside office and lab space for informatics, and is beginning the new advanced bioscience informatics program fall 2014. Also, Flagstaff Medical Center and Northern Arizona University will share resources to expand the **HEALTHCARE INFORMATICS PROGRAMS** that will serve the healthcare industry and medical research programs.

## Bioscience Support Systems

### ■ New Bioscience Informatics Program at Northern Arizona University

- Need identified during Northern Arizona Bioscience Sector Meetings
- As data sets continue to increase exponentially in many different disciplines and areas of research, informatics—big-data research—and the ability to use stored data to answer research questions is critical to the long term viability of the bioscience industry.
- Producing bioscience graduates with informatics capability



## 2. FOSTER INDUSTRY COLLABORATION

**BIOSCIENCE SECTOR WORK** - For a small community and region, bioscience sector work that creates collaboration by the bioscience sector companies and organizations, is a key accelerator for growth. Flagstaff has strong bioscience potential if the bioscience sector takes intentional actions and creates a clear priority for investments. The bioscience sector developed the following areas of priority and concentration. They also have agreed to collaborate with the community leaders and economic development leaders to implement this tactical plan.

**DEVELOP OPPORTUNITIES AND REQUIREMENTS**- This is the fundamental sector process. Each company and organization outlines the potential/opportunities for expansion and growth. They then agree what is required to insure that the potential/opportunity is realized.

**FOCUS ON THE CLUSTER CONCEPT/INCUBATE NEW BIOSCIENCE COMPANIES** - When a sufficient density and number of similar bioscience entities locate in an area a growth spiral is started when companies, work force, entrepreneurs, capital, and research are attracted by the environment and potential opportunity and success. The sector leaders have agreed to work with their industry contacts and colleagues to encourage them to consider Flagstaff. In addition, the entire sector will support and encourage bioscience start-up companies that will be incubated at NACET. A work plan for each company will be developed. In addition, ECoNA has committed to significant investment and effort to business attraction focused on bioscience companies. The plan includes active engagement in the large bioscience conferences such as the BIO International, AZ Bio, and other specific industry conferences. A recent focus has been to arrange meetings with contract research

### Bioscience Industry Collaboration

#### Bioscience Sector Work

- o **DEVELOP OPPORTUNITIES AND REQUIREMENTS** - define the potential and the need for infrastructure, investment, and support to realize growth in the bioscience industry
- o **FOCUS ON CLUSTER CONCEPT AND INDUSTRY COLLABORATION** to attract other bioscience companies to the region.
- o **INCUBATE NEW BIOSCIENCE COMPANIES**



### Bioscience Industry Collaboration

#### Bioscience Sector Work

- o **GENERAL ECONOMIC DEVELOPMENT** - general economic development to insure a robust community and high quality of life.
- o **DEVELOP APPROPRIATE AFFORDABLE HOUSING OPTIONS** - to insure the diversity of employee demographics. This is an issue that not only affects the biosciences but all industry sectors in flagstaff.
- o **BIOSCIENCE BUSINESS ATTRACTION** - sector will work closely with ECoNA to create a sophisticated business attraction process.



## Bioscience Industry Collaboration

### Bioscience Sector Work

- o **SUPPORT AND INVESTMENT BY MAJOR COMMUNITY AND STATE LEADERSHIP ORGANIZATIONS** - such as Northern Arizona University, the Flinn Foundation, Greater Flagstaff Chamber of Commerce, City of Flagstaff, Coconino County, Coconino County Career Center, Coconino Community College, Flagstaff Forty, Northern Arizona Healthcare, Flagstaff Medical Center, AZBIO, NACET, and the Arizona Commerce Authority is needed to fully realize bioscience potential.
- o **BIOSCIENCE CONFERENCES** - Be Present and Engaged



organizations, research institutes, and foreign bioscience startups looking for a United States foothold. In addition, ECoNA is developing a comprehensive database of bioscience companies and organizations in the United States for active recruitment.

**GENERAL ECONOMIC DEVELOPMENT FOR THE REGION** - This is another fundamental element of sector work. The region must continue a vibrant, competitive, robust, and diverse economy that creates a high quality of life with stellar public assets such as schools, roads, libraries, business incubators, parks, urban trails, recreation centers, and pools. Those communities that are successful in creating the upward positive economic spiral have the resources and the quality of life that encourages growth, attracts new companies, and develops entrepreneurs.

**DEVELOP APPROPRIATE AFFORDABLE HOUSING** Unaffordable housing has been a problem in recruiting and retaining talented employees for the past 15 years. The cause is a basic supply and demand imbalance. With the growth of the Arizona, the attractive mountain life style for second home owners, limited land base, and economic development success in Flagstaff the market is not incentivized to produce affordable housing. The solutions are numerous and can be implemented with a collaborate effort of the entire sector. If the affordable housing problem is not solved bioscience growth will be slowed significantly. The tactical plan calls for a housing summit to develop a specific set of actionable steps to provide housing ranging from subsidized housing, company owned housing, trust land projects, smaller but highly functional homes with unique design elements in neighborhoods with amenities such as community pools, recreations centers, parks, and bike trails.

## Bioscience Industry Collaboration

### Bioscience Sector Work

- o **COLLABORATE WITH AND SUPPORT STATEWIDE BIOSCIENCE EFFORTS** - Flinn Foundation and AZBIO
- o **INCREASE PRIVATE AND PUBLIC INVESTMENT**
  - Critical element to expansion of start-up companies
  - Direct public investment
  - Angel investment
  - Direct investment from major companies such as WL Gore, FMC
  - SBIR, Grants
  - Arizona Commerce Authority Grants
  - Alternative Financing
  - Northern Arizona Capital Fund



**COLLABORATE WITH AND SUPPORT STATEWIDE BIOSCIENCE EFFORTS** - The Flinn Foundation Bioscience Roadmap has been the major force and driver of the growth of the bioscience sector this past ten years. Unquestionably continued political support, education and investment by Arizona's leadership are required for success in the next ten years. Flinn Foundation's continuing commitment to the Bioscience Roadmap for the next ten year period will drive the future

growth and success of the biosciences in Arizona. Flagstaff and ECoNA has benefited greatly from the work of the Flinn Foundation and will support its efforts by participating in the various committees, events, and political advocacy.



Arizona's Bioscience Roadmap, a long-term strategic plan originally commissioned by the Flinn Foundation in 2002 and updated in 2014 with the goal of Arizona becoming globally competitive and a national leader in select areas of the biosciences by 2025.

*Flinn Website Citation* - "Arizona's Bioscience Roadmap 2014-2025: Advancing the Biosciences and Improving Health Outcomes" features five overarching goals, 17 strategies, and 77 potential actions. The goals focus on forming an entrepreneurial hub, turning research into practice, developing bio-talent, connecting research with health care delivery and commercialization, and enhancing the state's "collaborative gene" reputation.



The updated Roadmap plan was compiled by the Battelle Technology Partnership Practice based on research and input from Arizona leaders in science, business, academia, and government, as well as national bioscience experts. Battelle also produced the comprehensive study released in 2002 that found Arizona possessed many of the essential elements needed to become a global leader in niche areas in the biosciences, but must

strengthen its biomedical-research base and build a critical mass of bioscience firms and jobs.

Battelle has tracked performance data throughout the first decade, which was reported in these annual brochures. In future years, metrics will continue to be commissioned and reported publicly by the Flinn Foundation. The Roadmap has been and will continue to be guided by Arizona's Bioscience Roadmap Steering Committee, which is comprised of about 100 state leaders in science, business, economic development, and government that meet quarterly.

Here is the vision for Arizona's Bioscience Roadmap 2014-2025:

*"Arizona is globally competitive and a national leader in the biosciences in such fields as precision medicine, cancer, neurosciences, bioengineering, diagnostics, and agricultural biotechnology. It excels in offering a deep talent base, a critical mass of entrepreneurs and enterprises, and clinical excellence to turn discovery into firms, products, and talent."*

**Arizona's statewide industry Association, AZBio** - *AZBio Website Citation* - is committed to working with its members across Arizona to support the industry. They build the biosciences industry in Arizona by providing access to the key resources, connections and information in Arizona's biosciences community. This provides the foundation to be able to Connect, Collaborate,

Innovate and Succeed; thus supporting the growth of a thriving economic environment for Arizona's Bioscience Industry today and in the future.

**AZBio** is the State Affiliate of the Biotechnology Industry Organization (BIO) located in Washington, D.C. and is acknowledged as such by the international bioscience organization, BIO. We work very closely with BIO on national issues and opportunities to bring Arizona and the members of our Arizona Bioscience Community to the national and international stage. AZBio also works with AdvaMed, PhRMA and other national and international organizations to move Arizona's Bioscience Industry forward faster.



A team effort is required to support and grow Arizona's entire bioscience industry, including all the individuals, institutions and companies that comprise it, into a greater position of national and international leadership and prominence. Working together, Arizona's bioscience industry has made great progress toward attaining this goal in recent years. Arizona's achievements in bioscience are a source of genuine pride for the state.

**AZBio major activities include:**

- Connections across Arizona's growing bioscience, medical device and bio agricultural communities throughout the State
- Connections to Venture Capital and Angel Resources as well as discounts at key investment conferences nationwide
- A Unified Voice advocating locally and nationally on key issues that affect our industry and the opportunity to Fly In to Washington DC as part of an industry wide coalition to meet with our legislators
- Committees where you can get engaged: Government Affairs, Workforce/Education, Outreach, Events
- A showcase for your company via AZBio.org, AZBio Signature Events, AZBio Partner Events and AZBio Media Relationships as well as national conferences including the BIO International Convention and the AdvaMed Med Tech Conference
- Educational Events, EXPOs and statewide Awards
- Executive Leadership Discussions on local and national issues
- Discounts and Savings on the products and services your business needs via Bio Business Solutions



- Weekly communications so you stay In the Loop on what is happening across our industry
- Relationships and affiliations with BIO, AdvaMed, and PhRMA
- Collaboration with bioscience organizations across the United States as part of our active participation in the Council of State Bioscience Associations

**ECoNA** and the **Flagstaff bioscience sector** will continue to be members and active participants in **AZBio**.

## 3. EXPAND RESEARCH, INNOVATION, AND TRANSLATION

Research at Northern Arizona University, TGen North, Flagstaff Medical Center, WL Gore, Development Engineering Services, Protein Genomics, and Pathogene creates hundreds of high paying jobs. Research, translation and innovation are the basis for future bioscience companies. The powerhouse bioscience regions such as Boston and San Diego have a foundation of strong research universities, research institutes, and contract research organizations. Many academic studies have looked at the importance of research to a region's ability to grow a bioscience based economy. The conclusion of the vast majority of studies is that basic research by itself builds an ecosystem that fosters growth of existing bioscience companies and encourages bioscience startups to form. Many studies go further to show that when basic research is matched with translational research and entrepreneurial researchers, the number, quality, and success of bioscience startups increases significantly.

In addition, research partnerships drive bioscience growth. For example TGen North holds partnerships with labs and researchers globally. They regularly have researchers from other countries traveling to work in Flagstaff and vice versa with TGen researchers traveling to other countries. These partnerships increase the opportunity and potential for expansion of the existing organizations and also to attract partners to establish branches or divisions in Flagstaff. Northern Arizona University researchers also travel

**Expand Research Activity**

**tgen NORTH**

- **TGEN North**
  - Growing Research Portfolio
  - 50+ employees
  - Translational and Public Service
  - Research and Clinical Partnerships Nationally and Internationally

**Expand Research Activity**

- **Flagstaff Medical Center**
  - Flinn Foundation Grant for research improving outcomes in hospital to home transitional care
  - In conjunction with Northern Arizona University
  - First Things First Grant for research in pediatric care
- **Tech Transfer Collaboration**
  - NAU Ventures, NAU Innovations
  - ASU, UA, MIT, SFA, TGEN, AZFurnace
  - Incubating new companies and creating entrepreneurs with IP with commercial potential
  - NAU Student LaunchBox, NACET

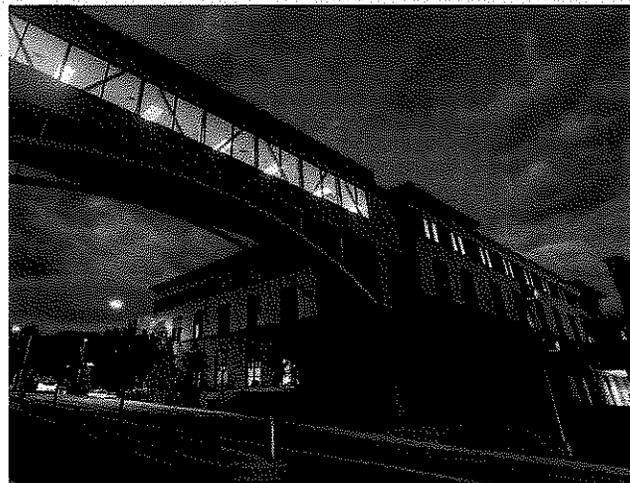
Logos: Flagstaff Medical Center Northern Arizona Healthcare, NAU Ventures, CURFACE, nacet, NAU INNOVATIONS, launchbox.

the globe and work with international and national partners on a variety of projects.

In ECoNA's bioscience business attraction efforts the fact that Flagstaff has a robust and active research base provides the credibility to pursue advanced bioscience companies and startups. Also, Flagstaff sector leaders have committed to continue their drive and aggressiveness in pursuing research funding whether it be grants, sponsored research, or company R&D. Flagstaff leaders also agree to develop the eco-system that will allow Flagstaff to take advantage of research opportunities when presented.

The sector research leaders are committed to expanding research and are developing and implementing individual plans within their organizations for research expansion. In many cases research expansion for translation to diagnostics, medical devices, medical treatments, health programs, clinical trials and healthcare informatics.

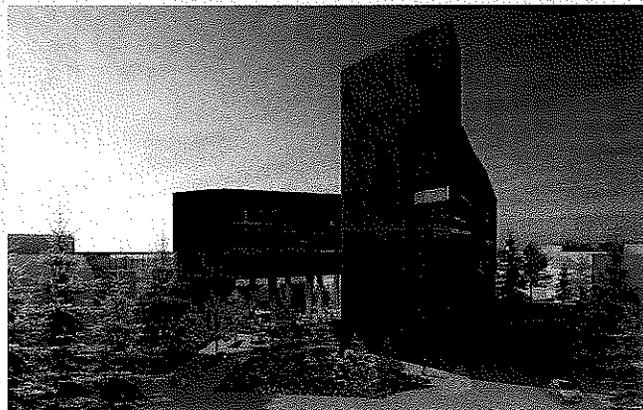
**TGEN NORTH** – Plans to build BSL-3 Laboratory that will grow their capacity to compete for grants. Also the BSL-3 Laboratory will be made available to qualified private companies and research institutes that need this safety level facility. Also, TGen is planning to pursue more sponsored research projects, continue to operate its FDA center for food borne outbreak, expand NAU research partnerships, and hire new staff.



**FMC RESEARCH DIVISION** – Flagstaff Medical Center has added a research department and hired a director. The initial research project is a partnership with Northern Arizona University that is developing a clinical study on improving long term outcomes for patients with chronic diseases and conditions. This is the first of a series of planned research projects. FMC and NAU plan to seek other grant opportunities

**OPPORTUNISTIC RESEARCH** - Flagstaff research entities have the commitment, capital, facilities, and partners to take advantage of serendipitous research opportunities.

**NORTHERN ARIZONA UNIVERSITY** – The Arizona Board of Regents have established metrics for the improvement and expansion of research activity at all three state universities. Northern Arizona University has established a goal to double research expenditures by the year 2020. In addition NAU is investing heavily, in bioscience informatics which was a need identified by the



sector process. NAU has adopted a proven model of aggressively pursuing and recruiting national research faculty with high research productivity that also attract other research faculty to work in collaboration.

**WL GORE MEDICAL PRODUCTS** – WL Gore continues to research and develop innovative new medical devices. They have plans to introduce several new medical devices to the market in the next couple of years which will create the need for additional plants and employees. WL Gore is also interested in seeing the research infrastructure grow in Flagstaff for the purpose of expanding the highly credentialed work force and job opportunities for trailing partners/spouses.

**PROTEIN GENOMICS/DEVELOPMENT ENGINEERING SERVICES** – Protein Genomics and Development Engineering Services continue expand their research portfolio creating new polymer based wound healing and skin products. They are expanding their market share and plan to add additional employees in the next year.

**ECONA SECTOR WORK** – working with the Flagstaff bioscience leaders ECoNA will develop a research facility master plan. Major research facilities especially those with extensive laboratories require many years of planning and development. In addition, once a major lab facility is approved there are several more years for design and construction. It is important to have a master plan for the sector leaders to utilize in convincing owners, boards, and governments that facilities and funding are needed.

## TECHNOLOGY TRANSFER, INNOVATION, INCUBATION

**‘CREATING AND GROWING NEW BIOSCIENCE COMPANIES FROM RESEARCH INNOVATION AND TRANSLATION IS A PRIMARY GOAL FOR THE TACTICAL PLAN. ATTRACTING BIOSCIENCE COMPANIES TO ARIZONA WILL BE DIFFICULT AT BEST. HOWEVER, CREATING AND GROWING OUR OWN IS WELL WITHIN THE REACH OF NORTHERN ARIZONA AND FLAGSTAFF’**

**TECHNOLOGY TRANSFER** – The bioscience industry growth in Flagstaff will depend on starting new companies from the translated intellectual property developed by the basic research conducted at all three Arizona research universities, TGEN North, and collaborating research universities connected to the region through Northern Arizona University, TGEN, WL Gore, Development Engineering Services, Pathogene, and others.

ECoNA's role is to create the programs and processes to encourage and provide resources to the bioscience entrepreneurs and investors. Also to connect with those who are creating the translated intellectual property for the purpose of creating new bioscience companies.

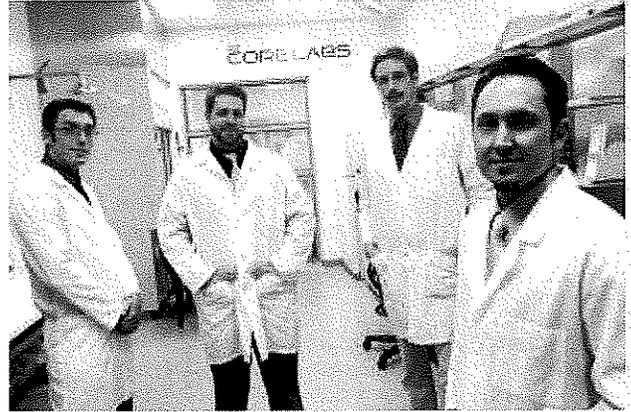
In addition to connecting, ECoNA will also actively develop potential companies partnering with the regions business development assets, existing companies, and statewide bioscience partners. The purpose is to increase the creation rate for new companies by directly developing the structure, and in some cases the assets, of a potential new company to assist bioscience researchers, investors, and entrepreneurs in starting bioscience companies. **The goal is to put in place 10 companies over the next two years.**

Organizations in Flagstaff that are resources for commercialization of research and IP:

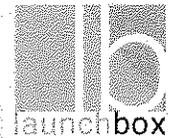
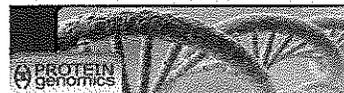
## NAU VENTURES

### NAU VENTURES' OBJECTIVES

- To disseminate, for the public benefit, and through the use of worldwide patent and copyright systems, new and useful knowledge generated by NAU research.
- To license NAU inventions to industry in order to promote the commercial development of inventions toward practical application for the benefit of the public.
- To utilize the value of NAU inventions to promote a culture of open innovation between NAU and the private sector.

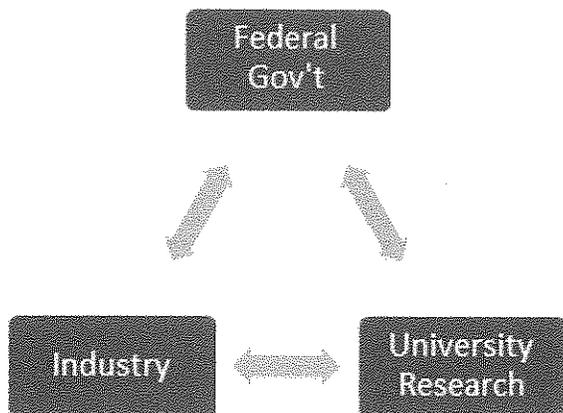


## NAU INNOVATIONS



# TACTICAL PLAN 2014

- To provide revenue for supporting further research which, in turn, may facilitate the discovery of more new inventions.



Universities contribute in many ways to the growing technology and knowledge-based economy. They graduate the next generation of leaders for emerging industries. They train the specialized labor force – professional and knowledge workers necessary for the operation of technology companies. They create a dynamic and intellectually stimulating society, which attracts and retains that work force.

Universities also attract and concentrate significant amounts of funding to conduct scientific research in a wide range of areas (COGR, 2). That research in turn leads to new knowledge

which is published, and that shared knowledge leads to new products and processes for the marketplace adding new jobs throughout the economy. (COGR, 2)

This dynamic involvement with industry creates new demands on the university to manage these activities so that the institution's primary goal of education research and dissemination of knowledge are not compromised, but rather are augmented, with conflicts minimized and managed. Generally, this is accomplished through the development and implementation of university policies governing such areas as scientific integrity, conflict of interest and intellectual property.

## **DEVELOPMENT ENGINEERING SERVICES**

DES is a bioengineering firm with expertise in research, product development, business, marketing, and sales. Their areas of focus include: pharmaceuticals, medical devices, and cell-based therapies. They use a variety of research approaches to solve clients' needs.

Successful product development efforts have taken technology from the benchtop to the bedside including patent claim structure, research grant funding, clinical trials, product scale-up, and commercial distribution. We have experience managing teams responsible for clinical, regulatory, manufacturing, and packaging of commercialized biomedical technology.



**Development Engineering Sciences, LLC**

## **NAU INNOVATIONS**

NAU *Innovations* catalyzes discovery and manages the transfer of research outcomes from the university to the private sector for the benefit of regional, national and global communities. *Innovations* provides resources and technical assistance to NAU researchers from the earliest stages of IP development, helping to both generate and disseminate cutting-edge research results that can compete in the 21st century marketplace.

**NAU INNOVATIONS**



## Principal Objectives

- To encourage and enable NAU researchers to discover and develop innovations that will have commercial, research and educational value
- To license NAU inventions to industry in order to promote commercial development and practical application for the benefit of the public
- To utilize the value of NAU inventions to promote a culture of “open innovation” between NAU and the private sector
- To generate revenue that can support the NAU research enterprise and facilitate the development of innovation



## ARIZONA FURNACE

The Furnace Technology Transfer Accelerator is an innovative startup accelerator designed to form, incubate and launch new companies. Each company is created to license technology and intellectual property from Arizona’s premiere research institutions, in partnership with Dignity Health Arizona, NAU Innovations, Arizona State University’s Entrepreneurship & Innovation Group, Thunderbird School of Global Management, Mayo Clinic, and BioAccel. Furnace is an intensive, nine-month accelerator experience for startups that provides seed funding, office space, and access to top industry mentors to commercialize discoveries made in Arizona laboratories.

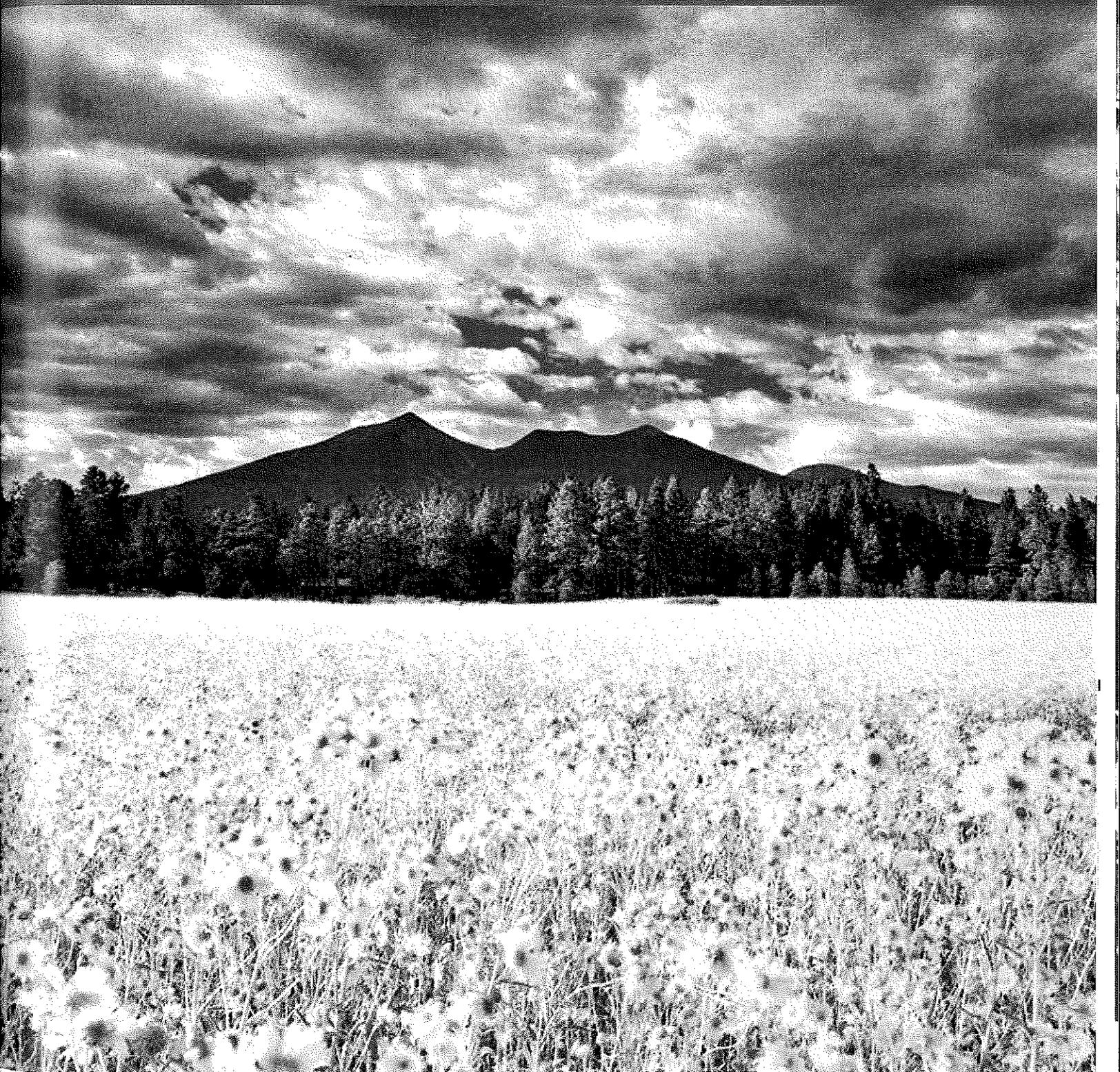
## TGEN NORTH

TGen North has ongoing collaborations with biotechnology companies and healthcare institutions which will help speed the translation of outcomes of bench research to clinical practice.

# FURNACE



PLANTABLE MEDICAL DEVICES GENETICS RESEARCH CLINICAL TRIALS AN  
RESEARCH DIAGNOSTICS BIOPOLYMER WOUND HEALING DRUG TESTING LABS  
ROSCIENCES SERVICES GENOMICS STEM EDUCATION BIOSCIENCE PRODU  
VELOPMENT BIOMARKER DEVELOPMENT PATHOGEN GENETICS RESEARCH  
DICAL PACKAGING MEDICAL DEVICE MACHINE BIOSCIENCE ENGINEERING  
PITALS ADVANCED TREATMENT PRECISION MEDICINE CANCER RESEARCH



## 4. INCREASE PRIVATE AND PUBLIC INVESTMENT

Flagstaff has been active in garnering investments in the past 10 years with nearly a billion dollars in new facilities, venture capital, angel capital, SBIR grants, Federal, State, and local grants to support the biosciences in the region. These investments are core to the ability of the region to compete in the marketplace. Going forward the investment strategy and sources of investment will determine the speed at which the bioscience sector can grow. Many of regions bioscience leaders feel strongly that investment strategy has reached a point in a competitive marketplace that propriety is appropriate where allowed. Hence our discussion in this report will be somewhat limited on specifics. Certainly the specific plans are available to the Flinn Foundation staff and to specific funders.



The Flinn Foundation Bioscience Roadmap and the bioscience sector work in the region provided the investment strategy. The regions industry and public sector leaders are committed to developing strategies and investment models that accelerate the investment funds to grow the bioscience leaders.

Certainly investments are somewhat driven by the larger economy, business cycles, health of the State's economy and subsequent impact on the resources of governments. Notwithstanding the larger drivers this tactical plan will continue to pursue with non-profit, government, and private resources investment in the base infrastructure, research, and jobs to continue the growth of the biosciences.



The bioscience investments in the region going forward will be diverse and accomplished by a number of Flagstaff companies, Federal and State governments, industry organizations, foundations, and non-profits. They will include investment in infrastructure, new jobs, and in research and development. These Flagstaff entities have made the commitment to accelerate the scale and frequency of their investment. ***ECoNA is currently working with each entity to develop a two, five, and ten year investment plan.***

With the regions potential and opportunity we expect that the following areas of investment will be the priorities and sources for future investments in the region:

**Business Attraction** – ECoNA and its member agencies are working to attract new bioscience companies, contract research organizations, research institutes who will invest capital and create new jobs for the region.

**The Arizona Commerce Authority** – Bioscience business attraction, innovation funds, direct investments in infrastructure, business incubation, tax credits, technical assistance for existing businesses.

**Angel and Venture Capital** - Bioscience start-ups in Flagstaff have received \$100 million in capital over the past five years. ECoNA, NACET, NAU and others are working to expand the angel and VC networks. **We have developed a proprietary work plan for 2015 to build and expand on the relationships with angels and VC outside of Arizona.**



**Flagstaff Chamber of Commerce** - Developing and investing in a business mentoring program that will allow bioscience startups and existing companies access to sophisticated credentialed and professional mentors such as patent attorneys, CPA's, sales and marketing professionals, finance and investment professionals at no cost. In addition, the Chamber is participating in Northern Arizona Business Capital Fund designed to provide growth capital for bioscience companies.

**Federal Government** – Research grants, EDA loan funds, technical assistance, SBIR Grants – ***Working with our partners we will develop a specific plan with commitments from each sector member to apply and seek certain federal funds.***

**State Government** – ECoNA and the bioscience sector partners are supporting the Universities request to the legislature for \$1.0 billion research infrastructure funding now called the Research II bill. The first research bill passed in 2004 provided debt service to the universities to bond \$500 million to build research facilities. A recent study by ASU demonstrated that the return on investment was an initial Gross State Product (GSP) of \$1.5 billion and an expected \$300 million GSP going forward. The study also suggests that the construction projects and the research activity from the Research II is forecasted to produce \$3 billion in new GSP in the period FY17 to FY21 and produce \$480 million in annual GSP in the subsequent years

**Private** – Company capital and borrowing for expansion and growth, venture capital, angel capital, and direct funding. For example WL Gore is investing in Flagstaff with new plants and additional jobs. Prent Corporation has expanded its market share in Asia and South America resulting in investment to expand the manufacturing facility and add new jobs. Northern Arizona Business Capital Fund loans funds to bioscience growth companies. ECoNA is working with its member agencies in the work of business expansion and retention to assist in growth. In addition, ***ECoNA, in conjunction with the private sector companies and public bioscience organizations have developed a proprietary 2015 investment plan.***

**Major Community Investors** – Building the bioscience sector has been and will continue to be a collaborative of the major investors in the community concerned about creating a robust and resilient economy and quality of life. Their investments are outlined in this tactical plan. Future investments will be outlined in the 2015 and 2016 tactical plans developed under the leadership of ECoNA. Going forward the major community investors are the City of Flagstaff, Flagstaff Medical Center/Northern Arizona Healthcare, WL Gore, Northern Arizona University, TGEN North, Flagstaff 40, City of Flagstaff, Nestle Purina, Flagstaff Chamber of Commerce, Coconino County, and Arizona Commerce Authority.

## 5. CREATE A COMPETITIVE AND HIGHLY TRAINED WORKFORCE

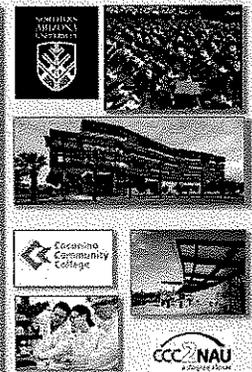
Flagstaff enjoys an amazing quality of life in a beautiful setting with amenities such as a major university, urban scale medical center, community college, great employers, astronomical observatories, a world class symphony, robust and active arts, and outstanding public schools. This is good for attracting the talented, highly credentialed work force to Flagstaff. In addition, Flagstaff is fortunate to have Northern Arizona University, Coconino Community College, Flagstaff Public Schools, and Charter Schools all highly regarded for their excellence and national reputations. They are the pipeline to produce the competitive and highly trained workforce in the region.

Many of employers also require talent and highly credentialed professionals that cannot be found in the region or State. When a good position is available in Flagstaff experienced people with deep resumes from around the country tend to apply for those roles. Once again a good thing for Flagstaff employers. Unfortunately for Flagstaff there are challenges that potential employees face when they consider working in Flagstaff. The challenges include difficulty of trailing partner/spouse finding jobs in their field. There is a tendency for the partner/spouses to also be professionals. While Flagstaff has a very high proportion of professional and high quality jobs for trailing partners/spouse, the economy has not produced enough of these types of jobs to keep pace with the jobs needed. A secondary challenge is the high cost of housing in Flagstaff. The bioscience sector leadership has identified solving these two issues as requirements for their success. ECoNA has adopted the solution of these issues as a main focus.

**NORTHERN ARIZONA UNIVERSITY** – has nearly tripled the number of STEM graduates in the past five years. Bioscience related majors are the vast majority of

### Workforce Development

- **NAU Bioscience and Allied Health Program Growth**
  - Graduating more bioscience majors with anticipated growth for the near future
  - Expanding genetics and genomics programs
  - Expanded Allied Health enrollment and graduates in Flagstaff and at the Phoenix Biomedical Campus
  - Undergraduate research programs
- **Coconino Community College**
  - Customized training for industry – For example anatomy and physiology classes for WL Gore engineers
  - CCC to NAU Program
  - Allied Health Programs



the STEM graduate growth. The universities plans include continued growth of bioscience majors with a significant focus on genetics, genomics, and bioinformatics.

In addition, NAU in partnership with UofA, has created Physician Assistant, Occupational Therapy, and Physical Therapy programs at the Phoenix Bio-Medical Campus (PBC) . Northern Arizona University just completed renovating shell space in the PBC to accommodate future plans to increase the number of number and size of the cohorts doubling the number of graduates from these programs. In 2015 NAU will open a new facility on the Flagstaff campus that will allow the allied health programs on the main campus to expand.

Lastly, Northern Arizona University has been nationally recognized for innovative programs that have allowed undergraduate research students research experience normally reserved for graduate students. Many undergraduate research students are publishing papers, engaging in sophisticated research, and creating new patents and discovery. This research experience is putting NAU students in favorable position to compete for the most prestigious graduate school research programs. NAU continues to expand the undergraduate research program as funding allows.

**COCONINO COMMUNITY COLLEGE** - Has developed a reputation for innovative programs that increase the number of STEM related majors and students matriculating from community college to the University. The 'CCC 2 NAU' program was a first of its kind in the country. CCC students were automatically enrolled at NAU with full access to NAU facilities, dining halls, residence halls, and athletic events.

In addition, CCC has been flexible in designing programs to serve the needs of the bioscience industry. For example CCC designed a non-traditional curriculum and course sequence for WL Gore mechanical and electrical engineers to learn human anatomy and physiology. CCC continues to produce high quality nurses for Flagstaff Medical Center and skilled trades for the medical device manufacturers, health care organizations, and education institutions.

## Workforce Development

### Greater Flagstaff Chamber of Commerce

- Skills 4 Workplace Success
- Signature workforce development initiative partners Chamber members with middle- and high-school classrooms to explore careers available in STEM



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## Workforce Development

### Coconino County Career Center

#### Advanced Manufacturing Sector Excellence

**STRATEGIES**  
Broad Based Collaboration between Economic and Workforce Development in the Manufacturing Sector  
Identify STEM Impact within Advanced Manufacturing  
Participate in the Flagstaff Chamber of Commerce Manufacturing Roundtables  
Identify Emerging Manufacturers  
Innovation Summit

**REBRAND**  
Directly Impacting the emerging workforce by developing a new vision  
Re-Branding Advanced Manufacturing as a Career Option for Youth  
Upsetting the Image of Advanced Manufacturing Careers  
Strengthen the Youth Workforce Pipeline  
Long Term Sustainable Educational Plans



**ACTION**  
Developing strong ties with individual employers across the Coconino Advanced Manufacturing Sector  
Coconino Advanced Manufacturing Sector  
Convening Partner in Advanced Manufacturing and Site Reliance Sector Team  
Addressing CHES Sector Training Needs  
Customizing Industry specific Training  
Incorporating ACA Sector Strategy Initiatives

**OPTIMIZE**  
Identifying and addressing workforce needs across the Manufacturing Sector  
Investment in Capacity Building through Core Lab Partnership  
On-the-Job Training and Internships to Enhance Experience  
Advancement of Industry Specific Skills through College Certifications

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## BIOSCIENCE SECTOR WORK FORCE DEVELOPMENT INITIATIVES:

**SKILLS FOR WORK PLACE SUCCESS** – Developed by the Greater Flagstaff Chamber of Commerce in collaboration with the bioscience companies and organizations in Flagstaff to bring middle school and high schools students into the work place for hands on learning and work place experiences. The intent is to interest students in bioscience careers.

**ADVANCED MANUFACTURING SECTOR EXCELLENCE** – A comprehensive program to improve the regions advanced manufacturing sector including the bioscience manufacturers with a major focus on work force development and STEM education.

## Workforce Development

**STEM CITY**  
Science • Technology • Engineering • Math

- For Schools:**
  - More community support for STEM curriculum needs
  - More STEM-Business support into the schools
  - More STEM oriented teachers staying in, or attracted to, Flagstaff
  - Improved standardized test scores
- For Business:**
  - Higher-educated, locally grown work force
  - More innovation in the workplace
  - Easier to attract high-quality staff and their families
- For the Community:**
  - More innovation in the community Economic Development
  - Better jobs to prevent brain drain
  - Greater tax base to support community needs and cultural and recreation assets
  - Better educated citizens
- For STEM based institutions:**
  - Improved Faculty/staff recruitment and retention
  - Accelerated innovation
  - Better schools for families
  - A sustainable model for workforce development

AMERICA'S FIRST STEM CITY

**STEM CITY** – Flagstaff has declared itself to be America's first STEM City. This declaration, while self-proclaimed, is a serious statement to the bioscience community statewide and nationally that Flagstaff see's significant value in creating a STEM intensive community. This initiative is promoted by a coalition of the community leaders and major organizations to insure that the community was intentional in making investment and support for developing innovative and cutting edge STEM opportunities for Flagstaff students. Bioscience industry employees will benefit from unique opportunities their children will have living in an STEM City.

**FLAGSTAFF UNIFIED SCHOOL DISTRICT**

- STEM as a teaching strategy, not a program
  - SFAz Grant for Killip Elementary
  - Hellos Grant for K-12: Teaching and Learning Continuum
  - Apple Distinguished Program 2013-2015 for iRead
  - Focused magnet programs for STEM and/or college prep

**FLAGSTAFF UNIFIED SCHOOL DISTRICT**

- FUSD Aspen Intel Mathematics Project : NAU, ADE, FUSD – focused professional learning to improve teacher math content knowledge and pedagogy.
- ITQ (Improving Teacher Quality – AZ Board of Regents Strengthening Instructional Leadership in Mathematics
- Gear Up – EXPLORE testing for 8<sup>th</sup> graders
- Collaboration - technology, Center for Science Teaching and Learning, GK-12, NAU Teach
- STEM event : April 2, 2014
- Rodel Exemplary Teacher program

## 6. DRIVE STARTUP INCUBATION AND ACCELERATION

CREATING AND GROWING NEW BIOSCIENCE COMPANIES FROM RESEARCH INNOVATION AND TRANSLATION IS A PRIMARY GOAL FOR THE TACTICAL PLAN. ATTRACTING BIOSCIENCE COMPANIES TO ARIZONA WILL BE DIFFICULT AT BEST. HOWEVER, CREATING AND GROWING OUR OWN IS WELL WITHIN THE REACH OF NORTHERN ARIZONA AND FLAGSTAFF.

### CONTINUE THE EXPANSION AND GROWTH OF THE NACET

The Flagstaff Bioscience Sector leadership has made a significant commitment to creating the assets that will support and develop new bioscience companies. Over the past five years \$10 million has been invested to build and operate the Northern Arizona Center for Entrepreneurship and Technology, a bioscience and technology business incubator. **The goal of the tactical plan is the expansion of the incubator, continued investment, and creation of five new bioscience companies over the next year.**

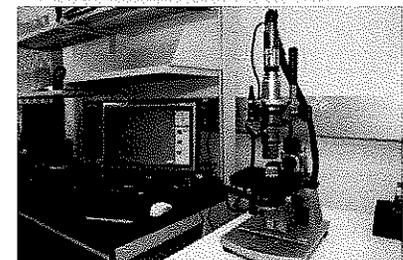
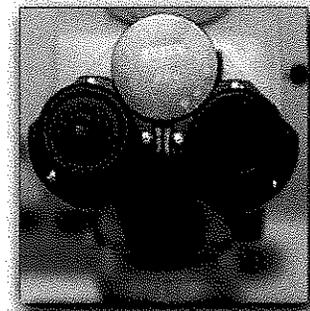
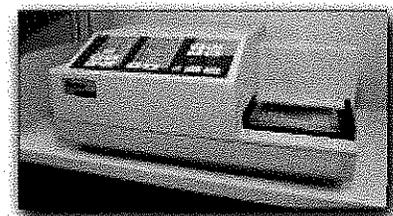
### GROW THE AZ CORE LAB EQUIPMENT

Core Labs were created to provide bioscience startups affordable access to expensive but essential laboratory equipment. Since the creation of AZ Core Labs the system has expanded from NACET to other locations in the state. The Core Lab has important equipment for bioscience startups. For example electron scanning microscopes, supercomputer access, Molecular Devices, VMax Plate Readers, High Resolution Digital Microscopes, and DNA Sequencers. **The tactical plan calls for additional investments to expand the equipment available.**

ECoNA's Role is to assist in the process to start new businesses by bringing researchers, IP, capital, and entrepreneurs together.

## Bioscience Startup Incubation

- **NACET**
  - Northern Arizona Center for Entrepreneurship and Technology
  - Bioscience and Technology Incubator
- **Innovation Mesa**
  - Startup Accelerator
- **Launchbox**
  - NAU Student Business Incubator
- **Core Labs**
  - Sophisticated Lab Equipment for Bioscience Startups
- **NAU Startup Weekend**
  - Accelerated Startup Process



# TACTICAL PLAN 2014

## **EXPAND NORTHERN ARIZONA UNIVERSITIES STARTUP WEEKEND AND LAUNCHBOX STUDENT INCUBATOR. CREATE A BIOSCIENCE FOCUSED STUDENT INCUBATOR.**

Northern Arizona University in collaboration with NACET operates several key business startup programs designed to encourage, engage, and support students in creating startups. While a majority of students attending the university will become employees a percentage will become entrepreneurs who start bioscience startups. These programs have had significant success now with a track record of several hundred students starting some type of business including a handful of bioscience startup attempts. A portion of the student startups are selected for investment and incubation in the on-campus student business incubator. **The goal of the tactical plan is to grow the bioscience related business opportunities with student entrepreneurs.**



## **7. SUPPORT INDUSTRY GROWTH TO ACHIEVE CRITICAL MASS**

### **■ Critical Mass**

Flagstaff and Arizona have great potential for growing and sustaining a robust and diverse bioscience economy. Under the leadership of the Flinn Foundation, through the strategic process of the Bioscience Roadmap, Flagstaff and Arizona have built the foundation upon which acceleration of the growth of the bioscience economy is realistic and possible. Following the example of cities and regions with a strong and thriving bioscience industry such as Boston, San Francisco Bay Area, and San Diego Flagstaff must utilize the resources and support provided in the next ten years of the Bioscience Roadmap process to create, as fast as possible, the density and activity level needed to reach critical mass that will kick-start the growth spiral. The experience of other successful bioscience regions show that the number and size of existing bioscience companies and organizations, research institutes, bioscience startups, university

research, tech transfer, attracted bioscience companies, capital, and available sophisticated workforce must reach a density that then begins to attract like and build upon itself. Flagstaff has benefited over the years from the Flinn Foundation Arizona Bioscience Roadmap project. It has provided clear direction and a model for collaboration for the entire state. Clearly the future success of the biosciences in a State like Arizona is predicated on the continuing collaborative effort and significant public and private investment.

## BIOSCIENCE SECTOR PROFILES – COMMITMENT TO EXCELLENCE AND GROWTH

Flagstaff is a small community of 65,000 with a unique geographic location located among the country's most beautiful landscapes and national parks. However, it is also relatively isolated from major cities and the associated resources. Therefore the tools and techniques to grow the bioscience industry reflect Flagstaff's unique character, location, and challenges.

ECoNA and sector leaders are acutely aware of their role and responsibility to grow the industry to achieve critical mass. While Flagstaff is fortunate to have sophisticated companies, organizations, and talents it also recognizes the larger competitive environment with disruptive technologies, global access, business cycles, evolving regulatory requirements, risk, and business climates. The sector leaders also realize that the industry must engage together to maximize opportunities and be intentionally focused on its state, national, and international connections and resources. **ECoNA will continue to promote, convene, organize, and directly manage programs to insure the success of the sector.**

## EXPECTED GROWTH IN THE INDUSTRY IN 2014

### WL GORE

<http://www.goremedical.com/productsbycondition/>

**Develops and manufacturers medical implantables for these conditions:**

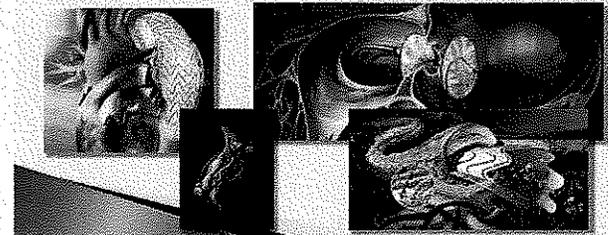
- Abdominal Aortic Aneurysm (AAA)
- Abdominal Wall Reconstruction
- Atrial Septal Defects (ASD)
- AV Access & Dialysis
- Biliary Disease
- Cardiac

## Bioscience Industry Growth



*Creative Technologies  
Worldwide*

- 2100 associates in Flagstaff
- Building new plants in Flagstaff
- Research and Development
- Over 600 associates in Phoenix
- Adding new associates in Flagstaff
- Adding new associates in Phoenix



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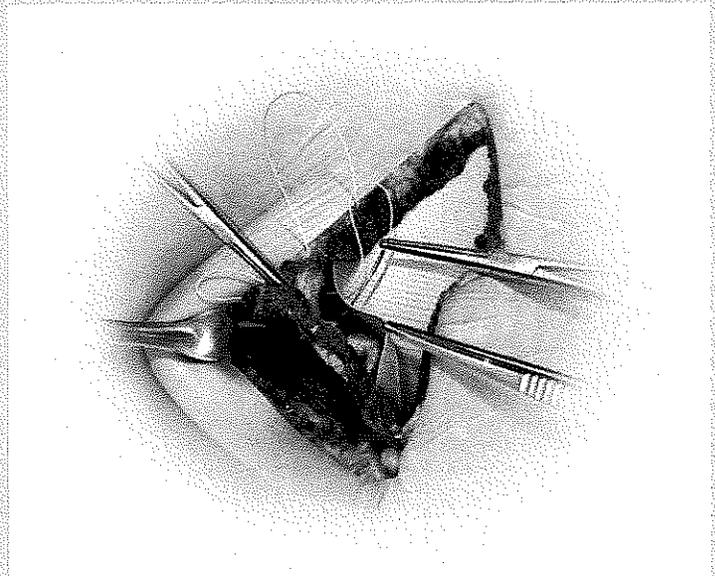
# TACTICAL PLAN 2014

- Carotid Artery Stenosis
- Cerebral Infarction
- Cerebral Spinal Fluid Leakage
- Colon Disease
- Embolic Protection
- Heart Defect
- Hernia
- Intracranial Hypertension
- Lung Disease
- Obesity
- Peripheral Disease (PAD) (PVD)
- Portal Hypertension & Liver Disease
- Spinal Disc Disease
- Stroke
- Thoracic Aortic Aneurysm (TAA)
- Trauma

## • Specialty

- Bariatric Surgery
- Cardiovascular
- Colorectal Surgery
- Endovascular and Interventional
- Gastroenterology
- General Surgery
- Hernia
- Interventional Cardiology
- Interventional Radiology
- Neurosurgery
- Pediatric Cardiovascular
- Peripheral Disease (PAD) (PVD)
- Spine Surgery
- Thoracic Surgery
- Vascular Surgery

WL Gore expects that over 500,000 of their products will be implanted in patients this next year. They are a \$3 billion dollar a year company. WL Gore states that over the history of the medical division 35 million products have been implanted. They expect to build new plants and hire new people in the next year.



**NORTHERN ARIZONA HEALTHCARE (NAH)**

Serves as the major hospital system in Northern Arizona and the regional referral center with the only level 1 trauma center outside of Phoenix and Tucson. It boasts all of the specialties of a major urban system. Because the land area NAH covers is large they maintain a fleet of eight fixed wing aircraft and eight helicopters. NAH is expanding this next year with a new facility in Camp Verde. NAH also manages several other community hospitals, clinics, and primary care facilities in rural underserved areas of Northern Arizona.

Because of the changing dynamics in healthcare and the strength of the NAH system it anticipates growth through acquisition and building new modern healthcare facilities in regions not now served. As a result of system expansion job growth is expected.

**PATHOGENE**

Pathogene is a local bioscience startup company utilizing IP licensed from TGEN. Pathogene was acquired this past year by DxNA. ECoNA is in negotiations with DxNA to expand Pathogene and their research arm to the Innovation Mesa Building.

**FLAGTAFF MEDICAL CENTER**

Within the NAH system Flagstaff Medical Center is the largest medical center holding the level 1 trauma center designation and providing the services normally expected at a major comprehensive urban medical center. Because of consolidation and mergers in healthcare organizations arising from the dynamic healthcare environment, evolving technology, and a growing partnerships there is significant structural change occurring at FMC.

FMC is planning for growth in the next several years resulting in new healthcare jobs to Flagstaff.

**Bioscience Industry Growth**

**Northern Arizona Healthcare**

Based in Flagstaff.

Parent corporation to:

- Flagstaff Medical Center
- Verde Valley Medical Center
- Sedona Medical Center.

Growing enterprise with expanding medical services and facilities across Northern Arizona

**Bioscience Industry Growth**

**PATHOGENE**

- Developing Novel Molecular Diagnostics to Improve the Treatment and Prevention of Infectious Diseases
- PathoGene is currently focused on commercializing intellectual property (IP) licensed from TGen
- Founded by Dr. Paul Keim, Dr. Thomas Vorphal, David Engelthaler, and William Gibbs.

**Flagstaff Medical Center**

**Flagstaff Medical Center**  
Northern Arizona Healthcare

With more than 270 beds and 200 physicians, and approximately 2,000 employees, FMC provides comprehensive, state-of-the-art, feedback from diagnostic centers services to open heart surgery.

Flagstaff Medical Center, offers a comprehensive line of cardiology services including diagnostic, interventional and surgical treatment options and a post-operative program. Our surgical program includes the cutting-edge "keyhole" or off-pump bypass surgery, as well as a minimally-invasive procedure for patients with atrial fibrillation, the most common heart rhythm disorder.

As the only state-designated Level 1 Trauma Center, north of Phoenix, FMC provides care to critically injured patients. The Trauma Center assures that patients in Northern Arizona have access to life-saving care during the Golden Hour that follows a trauma, when immediate care could mean the difference between life and death.

FMC is the only hospital in Northern and Central Arizona to offer advanced, minimally-invasive surgical technology using the robotically-assisted approach. The \$1.5 million system is FDA-approved for use in general, urologic and urology procedures. FMC was the first hospital in Arizona to use the da Vinci system for nephrectomy and prostatectomy.

The **Verde Valley Medical Center** offers a unique approach to those patients who require total joint replacement surgery and spine surgery. At FMC, joint surgery patients are not treated as ill, rather as healthy individuals, who through the program, can get back to the lifestyle they enjoy. The program focuses on providing exceptional care and patient education.

The **Verde Valley Medical Center** offers a comprehensive program that provides not only weight-loss surgery, but pre-surgical education and support for morbidly obese patients seeking a surgical solution. FMC is the only hospital north of Phoenix offering this life-changing surgery.

The **Cancer Center** uses a multidisciplinary team approach designed to ensure the cancer patient's treatment is individualized, comprehensive and coordinated. The Cancer Center offers radiation and medical oncology, gynecology, melanoma therapies, medical oncology, nursing, social services and dietetics. The Breast Cancer Resource Center provides education, resources and support services for women undergoing treatment, and their families.

Additional services include the **Women's Health Center**, the **Men's Health Center** and **Adoptive Immunization Services**.

**First Foundation Grant for research improving outcomes in hospital to home transition care in conjunction with Northern Arizona University**

**First Things First Grant for research in pediatric care**

**New Stroke Center**

**Growing Organization**

Innovate and Succeed; thus supporting the growth of a thriving economic environment for Arizona's Bioscience Industry today and in the future.

**AZBio** is the State Affiliate of the Biotechnology Industry Organization (**BIO**) located in Washington, D.C. and is acknowledged as such by the international bioscience organization, **BIO**. We work very closely with **BIO** on national issues and opportunities to bring Arizona and the members of our Arizona Bioscience Community to the national and international stage. **AZBio** also works with AdvaMed, PhRMA and other national and international organizations to move Arizona's Bioscience Industry forward faster.



A team effort is required to support and grow Arizona's entire bioscience industry, including all the individuals, institutions and companies that comprise it, into a greater position of national and international leadership and prominence. Working together, Arizona's bioscience industry has made great progress toward attaining this goal in recent years. Arizona's achievements in bioscience are a source of genuine pride for the state.

**AZBio major activities include:**

- Connections across Arizona's growing bioscience, medical device and bio agricultural communities throughout the State
- Connections to Venture Capital and Angel Resources as well as discounts at key investment conferences nationwide
- A Unified Voice advocating locally and nationally on key issues that affect our industry and the opportunity to Fly In to Washington DC as part of an industry wide coalition to meet with our legislators
- Committees where you can get engaged: Government Affairs, Workforce/Education, Outreach, Events
- A showcase for your company via **AZBio.org**, **AZBio Signature Events**, **AZBio Partner Events** and **AZBio Media Relationships** as well as national conferences including the **BIO International Convention** and the **AdvaMed Med Tech Conference**
- Educational Events, EXPOs and statewide Awards
- Executive Leadership Discussions on local and national issues
- Discounts and Savings on the products and services your business needs via **Bio Business Solutions**



- Weekly communications so you stay In the Loop on what is happening across our industry
- Relationships and affiliations with BIO, AdvaMed, and PhRMA
- Collaboration with bioscience organizations across the United States as part of our active participation in the Council of State Bioscience Associations

**ECoNA** and the **Flagstaff bioscience sector** will continue to be members and active participants in **AZBio**.

### 3. EXPAND RESEARCH, INNOVATION, AND TRANSLATION

Research at Northern Arizona University, TGen North, Flagstaff Medical Center, WL Gore, Development Engineering Services, Protein Genomics, and Pathogene creates hundreds of high paying jobs. Research, translation and innovation are the basis for future bioscience companies. The powerhouse bioscience regions such as Boston and San Diego have a foundation of strong research universities, research institutes, and contract research organizations. Many academic studies have looked at the importance of research to a region's ability to grow a bioscience based economy. The conclusion of the vast majority of studies is that basic research by itself builds an ecosystem that fosters growth of existing bioscience companies and encourages bioscience startups to form. Many studies go further to show that when basic research is matched with translational research and entrepreneurial researchers, the number, quality, and success of bioscience startups increases significantly.

In addition, research partnerships drive bioscience growth. For example TGen North holds partnerships with labs and researchers globally. They regularly have researchers from other countries traveling to work in Flagstaff and vice versa with TGen researchers traveling to other countries. These partnerships increase the opportunity and potential for expansion of the existing organizations and also to attract partners to establish branches or divisions in Flagstaff. Northern Arizona University researchers also travel

#### Expand Research Activity



- **TGEN North**
  - Growing Research Portfolio
  - 50+ employees
  - Translational and Public Service
  - Research and Clinical Partnerships Nationally and Internationally




#### Expand Research Activity

- **Flagstaff Medical Center**
  - Finn Foundation Grant for research improving outcomes in hospital to home transitional care
  - In conjunction with Northern Arizona University
  - First Things First Grant for research in pediatric care
- **Tech Transfer Collaboration**
  - NAU Ventures, NAU Innovations
  - ASU, UA, MIT, SFA, TGEN, AZFurnace
  - Incubating new companies and creating entrepreneurs with IP with commercial potential
  - NAU Student LaunchBox, NACET







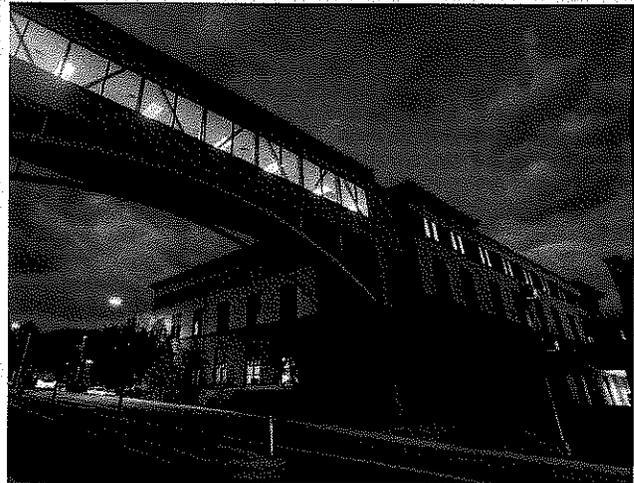


the globe and work with international and national partners on a variety of projects.

In ECoNA' s bioscience business attraction efforts the fact that Flagstaff has a robust and active research base provides the credibility to pursue advanced bioscience companies and startups. Also, Flagstaff sector leaders have committed to continue their drive and aggressiveness in pursuing research funding whether it be grants, sponsored research, or company R&D. Flagstaff leaders also agree to develop the eco-system that will allow Flagstaff to take advantage of research opportunities when presented.

The sector research leaders are committed to expanding research and are developing and implementing individual plans within their organizations for research expansion. In many cases research expansion for translation to diagnostics, medical devices, medical treatments, health programs, clinical trials and healthcare informatics.

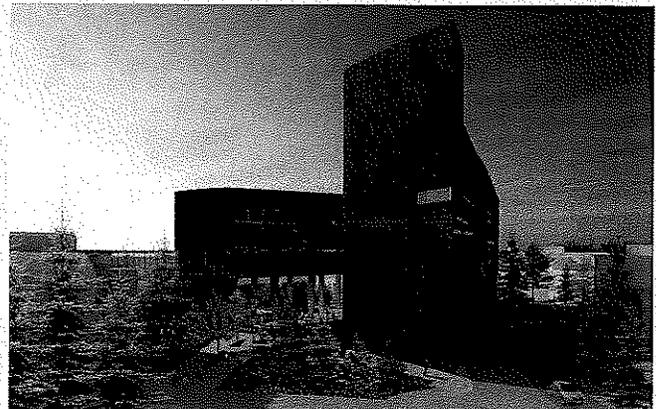
**TGEN NORTH** - Plans to build BSL-3 Laboratory that will grow their capacity to compete for grants. Also the BSL-3 Laboratory will be made available to qualified private companies and research institutes that need this safety level facility. Also, TGen is planning to pursue more sponsored research projects, continue to operate its FDA center for food borne outbreak, expand NAU research partnerships, and hire new staff.



**FMC RESEARCH DIVISION** - Flagstaff Medical Center has added a research department and hired a director. The initial research project is a partnership with Northern Arizona University that is developing a clinical study on improving long term outcomes for patients with chronic diseases and conditions. This is the first of a series of planned research projects. FMC and NAU plan to seek other grant opportunities

**OPPORTUNISTIC RESEARCH** - Flagstaff research entities have the commitment, capital, facilities, and partners to take advantage of serendipitous research opportunities.

**NORTHERN ARIZONA UNIVERSITY** - The Arizona Board of Regents have established metrics for the improvement and expansion of research activity at all three state universities. Northern Arizona University has established a goal to double research expenditures by the year 2020. In addition NAU is investing heavily, in bioscience informatics which was a need identified by the



sector process. NAU has adopted a proven model of aggressively pursuing and recruiting national research faculty with high research productivity that also attract other research faculty to work in collaboration.

**WL GORE MEDICAL PRODUCTS** – WL Gore continues to research and develop innovative new medical devices. They have plans to introduce several new medical devices to the market in the next couple of years which will create the need for additional plants and employees. WL Gore is also interested in seeing the research infrastructure grow in Flagstaff for the purpose of expanding the highly credentialed work force and job opportunities for trailing partners/spouses.

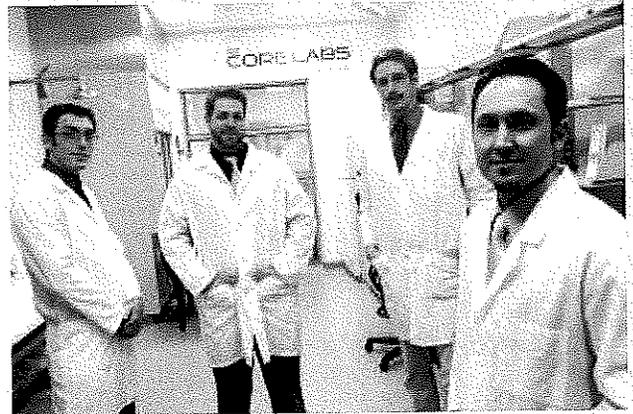
**PROTEIN GENOMICS/DEVELOPMENT ENGINEERING SERVICES** – Protein Genomics and Development Engineering Services continue expand their research portfolio creating new polymer based wound healing and skin products. They are expanding their market share and plan to add additional employees in the next year.

**ECONA SECTOR WORK** – working with the Flagstaff bioscience leaders ECoNA will develop a research facility master plan. Major research facilities especially those with extensive laboratories require many years of planning and development. In addition, once a major lab facility is approved there are several more years for design and construction. It is important to have a master plan for the sector leaders to utilize in convincing owners, boards, and governments that facilities and funding are needed.

## TECHNOLOGY TRANSFER, INNOVATION, INCUBATION

**‘CREATING AND GROWING NEW BIOSCIENCE COMPANIES FROM RESEARCH INNOVATION AND TRANSLATION IS A PRIMARY GOAL FOR THE TACTICAL PLAN. ATTRACTING BIOSCIENCE COMPANIES TO ARIZONA WILL BE DIFFICULT AT BEST. HOWEVER, CREATING AND GROWING OUR OWN IS WELL WITHIN THE REACH OF NORTHERN ARIZONA AND FLAGSTAFF’**

**TECHNOLOGY TRANSFER** – The bioscience industry growth in Flagstaff will depend on starting new companies from the translated intellectual property developed by the basic research conducted at all three Arizona research universities, TGEN North, and collaborating research universities connected to the region through Northern Arizona University, TGEN, WL Gore, Development Engineering Services, Pathogene, and others.

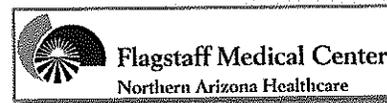
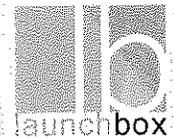


ECoNA's role is to create the programs and processes to encourage and provide resources to the bioscience entrepreneurs and investors. Also to connect with those who are creating the translated intellectual property for the purpose of creating new bioscience companies.



In addition to connecting, ECoNA will also actively develop potential companies partnering with the regions business development assets, existing companies, and statewide bioscience partners. The purpose is to increase the creation rate for new companies by directly developing the structure, and in some cases the assets, of a potential new company to assist bioscience researchers, investors, and entrepreneurs in starting bioscience companies. **The goal is to put in place 10 companies over the next two years.**

NAU INNOVATIONS



**NAU VENTURES**

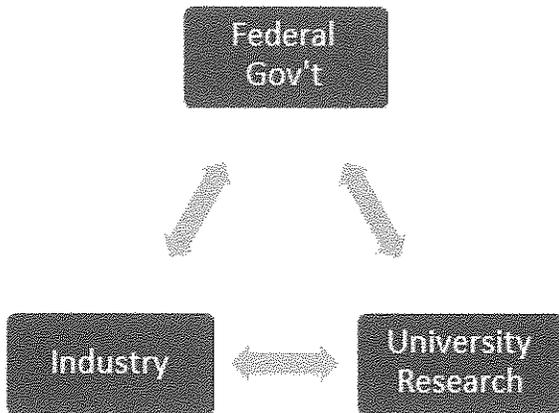
**NAU VENTURES' OBJECTIVES**

- To disseminate, for the public benefit, and through the use of worldwide patent and copyright systems, new and useful knowledge generated by NAU research.
- To license NAU inventions to industry in order to promote the commercial development of inventions toward practical application for the benefit of the public.
- To utilize the value of NAU inventions to promote a culture of open innovation between NAU and the private sector.



# TACTICAL PLAN 2014

- To provide revenue for supporting further research which, in turn, may facilitate the discovery of more new inventions.



Universities contribute in many ways to the growing technology and knowledge-based economy. They graduate the next generation of leaders for emerging industries. They train the specialized labor force – professional and knowledge workers necessary for the operation of technology companies. They create a dynamic and intellectually stimulating society, which attracts and retains that work force.

Universities also attract and concentrate significant amounts of funding to conduct scientific research in a wide range of areas (COGR, 2). That research in turn leads to new knowledge

which is published, and that shared knowledge leads to new products and processes for the marketplace adding new jobs throughout the economy. (COGR, 2)

This dynamic involvement with industry creates new demands on the university to manage these activities so that the institution's primary goal of education research and dissemination of knowledge are not compromised, but rather are augmented, with conflicts minimized and managed. Generally, this is accomplished through the development and implementation of university policies governing such areas as scientific integrity, conflict of interest and intellectual property.

## **DEVELOPMENT ENGINEERING SERVICES**

DES is a bioengineering firm with expertise in research, product development, business, marketing, and sales. Their areas of focus include: pharmaceuticals, medical devices, and cell-based therapies. They use a variety of research approaches to solve clients' needs.

Successful product development efforts have taken technology from the benchtop to the bedside including patent claim structure, research grant funding, clinical trials, product scale-up, and commercial distribution. We have experience managing teams responsible for clinical, regulatory, manufacturing, and packaging of commercialized biomedical technology.

# DES<sup>SM</sup>

**Development Engineering Sciences, LLC**

## **NAU INNOVATIONS**

NAU *Innovations* catalyzes discovery and manages the transfer of research outcomes from the university to the private sector for the benefit of regional, national and global communities. *Innovations* provides resources and technical assistance to NAU researchers from the earliest stages of IP development, helping to both generate and disseminate cutting-edge research results that can compete in the 21st century marketplace.

## **NAU INNOVATIONS**



## Principal Objectives

- To encourage and enable NAU researchers to discover and develop innovations that will have commercial, research and educational value
- To license NAU inventions to industry in order to promote commercial development and practical application for the benefit of the public
- To utilize the value of NAU inventions to promote a culture of “open innovation” between NAU and the private sector
- To generate revenue that can support the NAU research enterprise and facilitate the development of innovation



## ARIZONA FURNACE

The Furnace Technology Transfer Accelerator is an innovative startup accelerator designed to form, incubate and launch new companies. Each company is created to license technology and intellectual property from Arizona’s premiere research institutions, in partnership with Dignity Health Arizona, NAU Innovations, Arizona State University’s Entrepreneurship & Innovation Group, Thunderbird School of Global Management, Mayo Clinic, and BioAccel. Furnace is an intensive, nine-month accelerator experience for startups that provides seed funding, office space, and access to top industry mentors to commercialize discoveries made in Arizona laboratories.

# FURNACE



## TGEN NORTH

TGen North has ongoing collaborations with biotechnology companies and healthcare institutions which will help speed the translation of outcomes of bench research to clinical practice.



ANTABLE MEDICAL DEVICES GENETICS RESEARCH CLINICAL TRIALS AN  
ARCH DIAGNOSTICS BIOPOLYMER WOUND HEALING DRUG TESTING LABS  
OSCIENCES SERVICES GENOMICS STEM EDUCATION BIOSCIENCE PRODU  
LOPMENT BIOMARKER DEVELOPMENT PATHOGEN GENETICS RESEARCH  
CAL PACKAGING MEDICAL DEVICE MACHINE BIOSCIENCE ENGINEERING  
ITALS ADVANCED TREATMENT PRECISION MEDICINE CANCER RESEARCH



## 4. INCREASE PRIVATE AND PUBLIC INVESTMENT

Flagstaff has been active in garnering investments in the past 10 years with nearly a billion dollars in new facilities, venture capital, angel capital, SBIR grants, Federal, State, and local grants to support the biosciences in the region. These investments are core to the ability of the region to compete in the marketplace. Going forward the investment strategy and sources of investment will determine the speed at which the bioscience sector can grow. Many of regions bioscience leaders feel strongly that investment strategy has reached a point in a competitive marketplace that propriety is appropriate where allowed. Hence our discussion in this report will be somewhat limited on specifics. Certainly the specific plans are available to the Flinn Foundation staff and to specific funders.



The Flinn Foundation Bioscience Roadmap and the bioscience sector work in the region provided the investment strategy. The regions industry and public sector leaders are committed to developing strategies and investment models that accelerate the investment funds to grow the bioscience leaders.

Certainly investments are somewhat driven by the larger economy, business cycles, health of the State's economy and subsequent impact on the resources of governments. Notwithstanding the larger drivers this tactical plan will continue to pursue with non-profit, government, and private resources investment in the base infrastructure, research, and jobs to continue the growth of the biosciences.



The bioscience investments in the region going forward will be diverse and accomplished by a number of Flagstaff companies, Federal and State governments, industry organizations, foundations, and non-profits. They will include investment in infrastructure, new jobs, and in research and development. These Flagstaff entities have made the commitment to accelerate the scale and frequency of their investment. ***ECoNA is currently working with each entity to develop a two, five, and ten year investment plan.***

With the regions potential and opportunity we expect that the following areas of investment will be the priorities and sources for future investments in the region:

**Business Attraction** – ECoNA and its member agencies are working to attract new bioscience companies, contract research organizations, research institutes who will invest capital and create new jobs for the region.

**The Arizona Commerce Authority** – Bioscience business attraction, innovation funds, direct investments in infrastructure, business incubation, tax credits, technical assistance for existing businesses.

**Angel and Venture Capital** - Bioscience start-ups in Flagstaff have received \$100 million in capital over the past five years. ECoNA, NACET, NAU and others are working to expand the angel and VC networks. **We have developed a proprietary work plan for 2015 to build and expand on the relationships with angels and VC outside of Arizona.**



**Flagstaff Chamber of Commerce** - Developing and investing in a business mentoring program that will allow bioscience startups and existing companies access to sophisticated credentialed and professional mentors such as patent attorneys, CPA's, sales and marketing professionals, finance and investment professionals at no cost. In addition, the Chamber is participating in Northern Arizona Business Capital Fund designed to provide growth capital for bioscience companies.

**Federal Government** – Research grants, EDA loan funds, technical assistance, SBIR Grants – *Working with our partners we will develop a specific plan with commitments from each sector member to apply and seek certain federal funds.*

**State Government** – ECoNA and the bioscience sector partners are supporting the Universities request to the legislature for \$1.0 billion research infrastructure funding now called the Research II bill. The first research bill passed in 2004 provided debt service to the universities to bond \$500 million to build research facilities. A recent study by ASU demonstrated that the return on investment was an initial Gross State Product (GSP) of \$1.5 billion and an expected \$300 million GSP going forward. The study also suggests that the construction projects and the research activity from the Research II is forecasted to produce \$3 billion in new GSP in the period FY17 to FY21 and produce \$480 million in annual GSP in the subsequent years

**Private** – Company capital and borrowing for expansion and growth, venture capital, angel capital, and direct funding. For example WL Gore is investing in Flagstaff with new plants and additional jobs. Prent Corporation has expanded its market share in Asia and South America resulting in investment to expand the manufacturing facility and add new jobs. Northern Arizona Business Capital Fund loans funds to bioscience growth companies. ECoNA is working with its member agencies in the work of business expansion and retention to assist in growth. In addition, *ECoNA, in conjunction with the private sector companies and public bioscience organizations have developed a proprietary 2015 investment plan.*

**Major Community Investors** – Building the bioscience sector has been and will continue to be a collaborative of the major investors in the community concerned about creating a robust and resilient economy and quality of life. Their investments are outlined in this tactical plan. Future investments will be outlined in the 2015 and 2016 tactical plans developed under the leadership of ECoNA. Going forward the major community investors are the City of Flagstaff, Flagstaff Medical Center/Northern Arizona Healthcare, WL Gore, Northern Arizona University, TGEN North, Flagstaff 40, City of Flagstaff, Nestle Purina, Flagstaff Chamber of Commerce, Coconino County, and Arizona Commerce Authority.

## 5. CREATE A COMPETITIVE AND HIGHLY TRAINED WORKFORCE

Flagstaff enjoys an amazing quality of life in a beautiful setting with amenities such as a major university, urban scale medical center, community college, great employers, astronomical observatories, a world class symphony, robust and active arts, and outstanding public schools. This is good for attracting the talented, highly credentialed work force to Flagstaff. In addition, Flagstaff is fortunate to have Northern Arizona University, Coconino Community College, Flagstaff Public Schools, and Charter Schools all highly regarded for their excellence and national reputations. They are the pipeline to produce the competitive and highly trained workforce in the region.

Many of employers also require talent and highly credentialed professionals that cannot be found in the region or State. When a good position is available in Flagstaff experienced people with deep resumes from around the country tend to apply for those roles. Once again a good thing for Flagstaff employers. Unfortunately for Flagstaff there are challenges that potential employees face when they consider working in Flagstaff. The challenges include difficulty of trailing partner/spouse finding jobs in their field. There is a tendency for the partner/spouses to also be professionals. While Flagstaff has a very high proportion of professional and high quality jobs for trailing partners/spouse, the economy has not produced enough of these types of jobs to keep pace with the jobs needed. A secondary challenge is the high cost of housing in Flagstaff. The bioscience sector leadership has identified solving these two issues as requirements for their success. ECoNA has adopted the solution of these issues as a main focus.

**NORTHERN ARIZONA UNIVERSITY** – has nearly tripled the number of STEM graduates in the past five years. Bioscience related majors are the vast majority of

### Workforce Development

- **NAU Bioscience and Allied Health Program Growth**
  - Graduating more bioscience majors with anticipated growth for the near future
  - Expanding genetics and genomics programs
  - Expanded Allied Health enrollment and graduates in Flagstaff and at the Phoenix Biomedical Campus
  - Undergraduate research programs
- **Coconino Community College**
  - Customized training for industry – For example anatomy and physiology classes for WL Gore engineers
  - CCC to NAU Program
  - Allied Health Programs



the STEM graduate growth. The universities plans include continued growth of bioscience majors with a significant focus on genetics, genomics, and bioinformatics.

In addition, NAU in partnership with UofA, has created Physician Assistant, Occupational Therapy, and Physical Therapy programs at the Phoenix Bio-Medical Campus (PBC) . Northern Arizona University just completed renovating shell space in the PBC to accommodate future plans to increase the number of number and size of the cohorts doubling the number of graduates from these programs. In 2015 NAU will open a new facility on the Flagstaff campus that will allow the allied health programs on the main campus to expand.

Lastly, Northern Arizona University has been nationally recognized for innovative programs that have allowed undergraduate research students research experience normally reserved for graduate students. Many undergraduate research students are publishing papers, engaging in sophisticated research, and creating new patents and discovery. This research experience is putting NAU students in favorable position to compete for the most prestigious graduate school research programs. NAU continues to expand the undergraduate research program as funding allows.

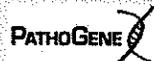
**COCONINO COMMUNITY COLLEGE** – Has developed a reputation for innovative programs that increase the number of STEM related majors and students matriculating from community college to the University. The ‘CCC 2 NAU’ program was a first of its kind in the country. CCC students were automatically enrolled at NAU with full access to NAU facilities, dining halls, residence halls, and athletic events.

In addition, CCC has been flexible in designing programs to serve the needs of the bioscience industry. For example CCC designed a non-traditional curriculum and course sequence for WL Gore mechanical and electrical engineers to learn human anatomy and physiology. CCC continues to produce high quality nurses for Flagstaff Medical Center and skilled trades for the medical device manufacturers, health care organizations, and education institutions.

## Workforce Development

### Greater Flagstaff Chamber of Commerce

- Skills 4 Workplace Success
- Signature workforce development initiative partners Chamber members with middle- and high-school classrooms to explore careers available in STEM



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## Workforce Development

### Coconino County Career Center Advanced Manufacturing Sector Excellence

**STRATEGY**  
Broad Based Collaborator between Economic and Workforce Development in the Manufacturing Sector  
Identify STEM Interest within Advanced Manufacturing  
Participate in the Flagstaff Chamber of Commerce Manufacturing Roundtables  
Identify Emerging Manufacturers  
Innovation Summit

**REERAND**  
Directly Impacting the emerging workforce by developing a new vision  
Re-branding Advanced Manufacturing as a Career Option for Youth  
Opposing the Image of Advanced Manufacturing Careers  
Strengthens the Youth Workforce Pipeline  
Long Term Sustainable Educational Plans



**ACTION**  
Developing strong ties with individual employers across the Coconino Advanced Manufacturing Sector  
Convening Partners to Advanced Manufacturing and Bio Science Sector Issues  
Addressing Cross Sector Training Needs  
Customizing Industry Specific Training  
Incorporating ACA Sector Training Initiatives

**OPTIMIZE**  
Identifying and addressing workforce needs across the Manufacturing Sector  
Investment in 'Capacity Building' through Core Lab Partnership  
On-the-Job Training and Internships to Enhance Experience  
Attachment of Industry Requisite Skills through College Certifications

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## BIOSCIENCE SECTOR WORK FORCE DEVELOPMENT INITIATIVES:

**SKILLS FOR WORK PLACE SUCCESS** – Developed by the Greater Flagstaff Chamber of Commerce in collaboration with the bioscience companies and organizations in Flagstaff to bring middle school and high schools students into the work place for hands on learning and work place experiences. The intent is to interest students in bioscience careers.

**ADVANCED MANUFACTURING SECTOR EXCELLENCE** – A comprehensive program to improve the regions advanced manufacturing sector including the bioscience manufacturers with a major focus on work force development and STEM education.

### Workforce Development

**STEM CITY**  
Flagstaff, Arizona  
Science • Technology • Engineering • Math

- For Schools:**
  - More community support for STEM curriculum needs
  - More STEM-Business support into the schools
  - More STEM oriented teachers staying in, or attracted to, Flagstaff
  - Improved standardized test scores
- For Business:**
  - Higher-educated, locally grown work force
  - More innovation in the workplace
  - Easier to attract high-quality staff and their families
- For the Community:**
  - More innovation in the community
  - Economic Development
  - Better jobs to prevent brain drain
  - Greater tax base to support community needs and cultural and recreation assets
  - Better educated citizens
- For STEM based institutions:**
  - Improved Faculty/staff recruitment and retention
  - Accelerated innovation
  - Better schools for families
  - A sustainable model for workforce development

**AMERICA'S FIRST STEM CITY**

**STEM CITY** – Flagstaff has declared itself to be America’s first STEM City. This declaration, while self-proclaimed, is a serious statement to the bioscience community statewide and nationally that Flagstaff see’s significant value in creating a STEM intensive community. This initiative is promoted by a coalition of the community leaders and major organizations to insure that the community was intentional in making investment and support for developing innovative and cutting edge STEM opportunities for Flagstaff students. Bioscience industry employees will benefit from unique opportunities their children will have living in an STEM City.

**FLAGSTAFF UNIFIED SCHOOL DISTRICT**

- STEM as a teaching strategy, not a program
  - SFAz Grant for Killip Elementary
  - Helios Grant for K-12 Teaching and Learning Continuum
  - Apple Distinguished Program 2013-2015 for iRead
  - Focused magnet programs for STEM and/or college prep

**FLAGSTAFF UNIFIED SCHOOL DISTRICT**

- FUSD Aspen Intel Mathematics Project : NAU, AOE, FUSD – focused professional learning to improve teacher math content knowledge and pedagogy
- ITQ (Improving Teacher Quality – AZ Board of Regents Strengthening Instructional Leadership in Mathematics
- Gear Up – EXPLORE testing for 8<sup>th</sup> graders
- Collaboration - technology, Center for Science Teaching and Learning, GK-12, NAU Teach
- STEM event : April 2, 2014
- Rodel Exemplary Teacher program

## 6. DRIVE STARTUP INCUBATION AND ACCELERATION

CREATING AND GROWING NEW BIOSCIENCE COMPANIES FROM RESEARCH INNOVATION AND TRANSLATION IS A PRIMARY GOAL FOR THE TACTICAL PLAN. ATTRACTING BIOSCIENCE COMPANIES TO ARIZONA WILL BE DIFFICULT AT BEST. HOWEVER, CREATING AND GROWING OUR OWN IS WELL WITHIN THE REACH OF NORTHERN ARIZONA AND FLAGSTAFF.

### CONTINUE THE EXPANSION AND GROWTH OF THE NACET

The Flagstaff Bioscience Sector leadership has made a significant commitment to creating the assets that will support and develop new bioscience companies. Over the past five years \$10 million has been invested to build and operate the Northern Arizona Center for Entrepreneurship and Technology, a bioscience and technology business incubator. **The goal of the tactical plan is the expansion of the incubator, continued investment, and creation of five new bioscience companies over the next year.**

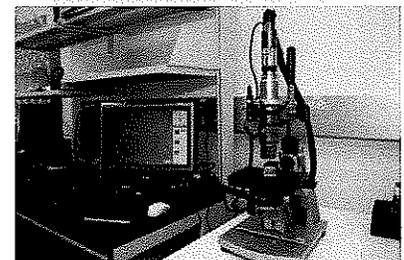
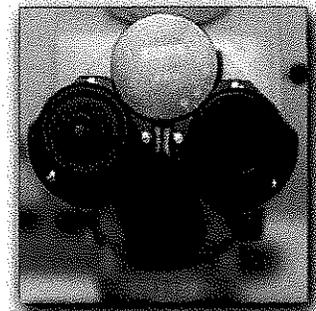
### GROW THE AZ CORE LAB EQUIPMENT

Core Labs were created to provide bioscience startups affordable access to expensive but essential laboratory equipment. Since the creation of AZ Core Labs the system has expanded from NACET to other locations in the state. The Core Lab has important equipment for bioscience startups. For example electron scanning microscopes, supercomputer access, Molecular Devices, VMax Plate Readers, High Resolution Digital Microscopes, and DNA Sequencers. **The tactical plan calls for additional investments to expand the equipment available.**

ECONA's Role is to assist in the process to start new businesses by bringing researchers, IP, capital, and entrepreneurs together.

## Bioscience Startup Incubation

- **NACET**
  - Northern Arizona Center for Entrepreneurship and Technology
  - Bioscience and Technology Incubator
- **Innovation Mesa**
  - Startup Accelerator
- **Launchbox**
  - NAU Student Business Incubator
- **Core Labs**
  - Sophisticated Lab Equipment for Bioscience Startups
- **NAU Startup Weekend**
  - Accelerated Startup Process



## **EXPAND NORTHERN ARIZONA UNIVERSITIES STARTUP WEEKEND AND LAUNCHBOX STUDENT INCUBATOR. CREATE A BIOSCIENCE FOCUSED STUDENT INCUBATOR.**

Northern Arizona University in collaboration with NACET operates several key business startup programs designed to encourage, engage, and support students in creating startups. While a majority of students attending the university will become employees a percentage will become entrepreneurs who start bioscience startups. These programs have had significant success now with a track record of several hundred students starting some type of business including a handful of bioscience startup attempts. A portion of the student startups are selected for investment and incubation in the on-campus student business incubator. **The goal of the tactical plan is to grow the bioscience related business opportunities with student entrepreneurs.**



## **7. SUPPORT INDUSTRY GROWTH TO ACHIEVE CRITICAL MASS**

### **■ Critical Mass**

Flagstaff and Arizona have great potential for growing and sustaining a robust and diverse bioscience economy. Under the leadership of the Flinn Foundation, through the strategic process of the Bioscience Roadmap, Flagstaff and Arizona have built the foundation upon which acceleration of the growth of the bioscience economy is realistic and possible. Following the example of cities and regions with a strong and thriving bioscience industry such as Boston, San Francisco Bay Area, and San Diego Flagstaff must utilize the resources and support provided in the next ten years of the Bioscience Roadmap process to create, as fast as possible, the density and activity level needed to reach critical mass that will kick-start the growth spiral. The experience of other successful bioscience regions show that the number and size of existing bioscience companies and organizations, research institutes, bioscience startups, university

research, tech transfer, attracted bioscience companies, capital, and available sophisticated workforce must reach a density that then begins to attract like and build upon itself. Flagstaff has benefited over the years from the Flinn Foundation Arizona Bioscience Roadmap project. It has provided clear direction and a model for collaboration for the entire state. Clearly the future success of the biosciences in a State like Arizona is predicated on the continuing collaborative effort and significant public and private investment.

## BIOSCIENCE SECTOR PROFILES - COMMITMENT TO EXCELLENCE AND GROWTH

Flagstaff is a small community of 65,000 with a unique geographic location located among the country's most beautiful landscapes and national parks. However, it is also relatively isolated from major cities and the associated resources. Therefore the tools and techniques to grow the bioscience industry reflect Flagstaff's unique character, location, and challenges.

ECoNA and sector leaders are acutely aware of their role and responsibility to grow the industry to achieve critical mass. While Flagstaff is fortunate to have sophisticated companies, organizations, and talents it also recognizes the larger competitive environment with disruptive technologies, global access, business cycles, evolving regulatory requirements, risk, and business climates. The sector leaders also realize that the industry must engage together to maximize opportunities and be intentionally focused on its state, national, and international connections and resources. **ECoNA will continue to promote, convene, organize, and directly manage programs to insure the success of the sector.**

## EXPECTED GROWTH IN THE INDUSTRY IN 2014

### WL GORE

<http://www.goremedical.com/productsbycondition/>

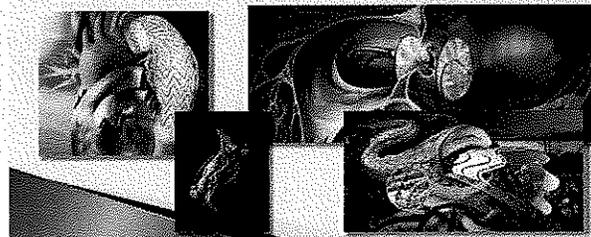
### Develops and manufacturers medical implantables for these conditions:

- Abdominal Aortic Aneurysm (AAA)
- Abdominal Wall Reconstruction
- Atrial Septal Defects (ASD)
- AV Access & Dialysis
- Biliary Disease
- Cardiac

## Bioscience Industry Growth



- 2100 associates in Flagstaff
- Building new plants in Flagstaff
- Research and Development
- Over 600 associates in Phoenix
- Adding new associates in Flagstaff
- Adding new associates in Phoenix



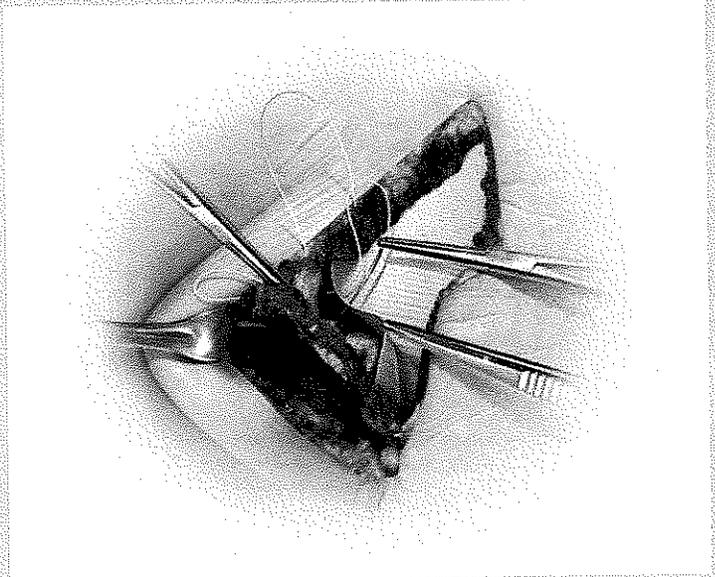
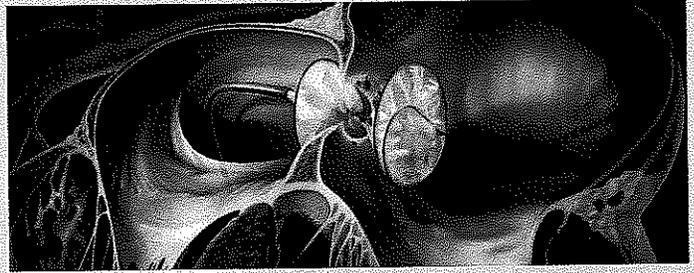
# TACTICAL PLAN 2014

- Carotid Artery Stenosis
- Cerebral Infarction
- Cerebral Spinal Fluid Leakage
- Colon Disease
- Embolic Protection
- Heart Defect
- Hernia
- Intracranial Hypertension
- Lung Disease
- Obesity
- Peripheral Disease (PAD) (PVD)
- Portal Hypertension & Liver Disease
- Spinal Disc Disease
- Stroke
- Thoracic Aortic Aneurysm (TAA)
- Trauma

## • Specialty

- Bariatric Surgery
- Cardiovascular
- Colorectal Surgery
- Endovascular and Interventional
- Gastroenterology
- General Surgery
- Hernia
- Interventional Cardiology
- Interventional Radiology
- Neurosurgery
- Pediatric Cardiovascular
- Peripheral Disease (PAD) (PVD)
- Spine Surgery
- Thoracic Surgery
- Vascular Surgery

WL Gore expects that over 500,000 of their products will be implanted in patients this next year. They are a \$3 billion dollar a year company. WL Gore states that over the history of the medical division 35 million products have been implanted. They expect to build new plants and hire new people in the next year.



**NORTHERN ARIZONA HEALTHCARE (NAH)**

Serves as the major hospital system in Northern Arizona and the regional referral center with the only level 1 trauma center outside of Phoenix and Tucson. It boasts all of the specialties of a major urban system. Because the land area NAH covers is large they maintain a fleet of eight fixed wing aircraft and eight helicopters. NAH is expanding this next year with a new facility in Camp Verde. NAH also manages several other community hospitals, clinics, and primary care facilities in rural underserved areas of Northern Arizona.

Because of the changing dynamics in healthcare and the strength of the NAH system it anticipates growth through acquisition and building new modern healthcare facilities in regions not now served. As a result of system expansion job growth is expected.

**PATHOGENE**

Pathogene is a local bioscience startup company utilizing IP licensed from TGEN. Pathogene was acquired this past year by DxNA. ECoNA is in negotiations with DxNA to expand Pathogene and their research arm to the Innovation Mesa Building.

**FLAGSTAFF MEDICAL CENTER**

Within the NAH system Flagstaff Medical Center is the largest medical center holding the level 1 trauma center designation and providing the services normally expected at a major comprehensive urban medical center. Because of consolidation and mergers in healthcare organizations arising from the dynamic healthcare environment, evolving technology, and a growing partnerships there is significant structural change occurring at FMC.

FMC is planning for growth in the next several years resulting in new healthcare jobs to Flagstaff.

**Bioscience Industry Growth**

**Northern Arizona Healthcare**

Based in Flagstaff

Parent corporation to:

- Flagstaff Medical Center
- Verde Valley Medical Center
- Sedona Medical Center.

Growing enterprise with expanding medical services and facilities across Northern Arizona

Verde Valley Medical Center  
Sedona Campus

**Bioscience Industry Growth**

**PATHOGENE**

- Developing Novel Molecular Diagnostics to Improve the Treatment and Prevention of Infectious Diseases
- Pathogene is currently focused on commercializing intellectual property (IP) licensed from TGEN
- Founded by Dr. Paul Keim, Dr. Thomas Vorphal, David Engelthaler, and William Gibbs.

**Flagstaff Medical Center**

**Flagstaff Medical Center**  
Northern Arizona Healthcare

With more than 270 beds and 200 physicians, and approximately 2,000 employees, FMC provides comprehensive, state-of-the-art healthcare from diagnostic studies to heart transplant surgery.

As the only extended-care Level I Trauma Center north of Phoenix, FMC provides care to critically injured patients. The Trauma Center ensures that patients in Northern Arizona have access to life-saving care during the Golden Hour that follows a trauma, when immediate care could mean the difference between life and death.

FMC is the only hospital in Northern and Central Arizona to offer advanced, minimally-invasive surgical technology using the **Robotic Assisted Surgical System**. The \$1.5 million system is designed for use in general, gynecologic and urology procedures. FMC was the first hospital in Arizona to use the da Vinci system for weightloss and cancer surgery.

The **Robotic Assisted Surgical System** offers a unique approach to those patients who require joint replacement surgery and spine surgery. As with other surgery centers, are not viewed as ill, rather as healthy individuals, who through this program, can get back to the lifestyle they enjoy. The program focuses on providing exceptional care and patient education.

The **Robotic Assisted Surgical System** is a comprehensive program that provides not only weightloss surgery, but bariatric education and support for morbidly obese patients choosing a surgical solution. FMC is the only hospital north of Phoenix offering weightloss surgery.

The **Robotic Assisted Surgical System** uses a multidisciplinary team approach designed to ensure the cancer patient's treatment is individualized, comprehensive and coordinated. The Cancer Center offers radiation and medical oncology, pathology, radiation therapy, certified oncology nurses, social workers and dietitians. The Breast Cancer Resource Center provides education, resources and support services for women undergoing treatment, and their families.

Additional services include the **Robotic Assisted Surgical System**, the **Robotic Assisted Surgical System**, and a full array of inpatient and outpatient healthcare services.

**Five Foundation Grant for research improving outcomes in hospital to home transitional care in conjunction with Northern Arizona University**

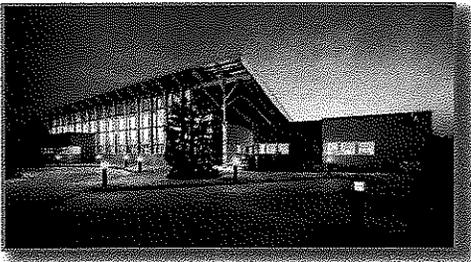
**First Things First Grant for research in pediatric care**

**New Stroke Center**

**Growing Organization**

**PROTEIN GENOMICS**

A Flagstaff based bioscience Start-up Company Protein Genomics revenue is growing with market acceptance of its products. They will be one of the first tier two companies to move into the Innovation Mesa once completed summer 2015. They are expecting to add approximately 10 jobs this next year.



**DEVELOPMENT ENGINEERING SERVICES**

A Flagstaff based bioscience start-up Development Engineering Services revenue is growing with expansion of their client base and services provided. They will be one of the first tier two companies moving into Innovation Mesa. DES hires a number of NAU graduate students. They expect to add additional employees in the next year.

**SENESTECH**

A Flagstaff based bioscience start-up utilizing IP developed at Northern Arizona University and several other cooperating universities. Senestech is experiencing significant growth and recently signed a major license deal with Neogen. This past year Senestech built a new manufacturing facility. Senestech also received national press in the New York Times, Wall Street Journal, bloomberg, Los Angeles Times, Discovery Channel. They expect continued growth and will be adding new employees in the next year.



**Bioscience Industry Growth**



Founded by Dr. Burt Ensley.

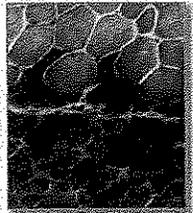
Management Team:  
Dr. Burt Ensley  
Dr. Robert Keller  
Warren Carsey

NACET Client

Protein Genomics carries out research and development on sophisticated, high performance biopolymers for potential applications in the wound healing, tissue regeneration, dermal filler and personal care markets.

They currently produce human tropoelastin (Elastatropin®) and human keratin (Keracyte®) for over the counter (OTC) and wound closure applications. These unique biomaterials were prohibitively expensive until we developed low cost manufacturing methods. Other, similar biopolymers are in the development stage.

They design these materials at the genetic (DNA) level, and can produce customized structural proteins that precisely follow human genetic profiles.



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**Bioscience Industry Growth**

**DES**

Development Engineering Services

Management Team:  
Dr. Robert Keller  
Robert G. Audet  
Robert Diller  
Aaron Tabor  
Hans Machula

NACET Client

DES has expertise in commercial worldwide management of research, product development, business, marketing, and sales within the biotechnology industry.

They have managed R&D projects for new product development using resorbable and non-resorbable polymer technology, catheter, balloon, and metal alloy technology. Previous product development efforts have included pharmaceuticals, devices, and cell-based therapies.

Successful product development efforts have taken technology from the benchtop to the bedside including patent claim structure, research grant funding, clinical trials, product scale-up, and commercial distribution. We have experience managing teams responsible for clinical, regulatory, manufacturing, and packaging of commercialized biomedical technology.



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**Bioscience Industry Growth**



SenesTech, Inc.

Cheryl Dyer, Ph.D.-Co-Founder & President

Loretta Mayer, Ph.D.-Co-Founder & Chief Scientific Officer

Kennan Kaester-Corporate General Counsel

Tom Ottmar-Vice President of Business Development

SenesTech is a platform biotechnology company specializing in reproductive physiology

Their mission: SenesTech aims to provide for the more humane treatment of animals, to improve the quality of human life, and to enhance environmental stewardship through global application of our animal fertility control technology.

They believe that with the application of our product, we will be able to significantly reduce rodent populations in urban settings as well as reduce damage to rice and other grain crops by population control in agricultural settings. The resulting increase in food yields could feed at least an additional 300 million people annually. In urban settings rodents transmit diseases and damage infrastructure. Application of our product will decrease rodent populations resulting in a proportional decrease in disease transmission and economic damage. SenesTech is developing strategic partnerships to accelerate the transition of its platform technology into marketable products.



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## PRENT CORPORATION

Prent is a packaging supplier to the medical industry. WL Gore is one of their customers. This past year the plant manager for Prent was promoted to Vice President for Operations for the entire company but will remain based in Flagstaff. In the past year Prent has had success in growing market share in Asia and South America and will need to ramp up production to serve the new customers. The expanded production and facilities will be in Flagstaff resulting in new jobs.

## MACHINE SOLUTIONS

Machine Solutions began as a start-up in Flagstaff almost 15 years ago. They design and engineer sophisticated machines for the medical device industry. Over its history they have grown to over 75 employees. Last year venture capital group Forsyth Capital invested in Machine Solutions. The past year saw a reduction in workforce with efficiency measures being implemented. Going forward though Machine Solutions expects continued growth and is hiring engineers and machine builders in the next year. The long term outlook is positive.

## NORCHEM

Norchem is Flagstaff based start-up and has grown to one of the larger production laboratory companies in the industry providing services primarily in the area of substance abuse testing. Their customers are nationwide. They continue to innovate creating novel testing protocols and technology. Norchem has continued to expand their market share and expect continued growth.

## Bioscience Industry Growth



### Medical Packaging Innovative. Reliable. Functional.

Prent is the world's leading manufacturer of medical thermoform packaging and the winner of more WorldStar packaging awards than anybody else in the pharmaceutical and medical packaging categories. Medical manufacturers have come to rely on us to provide them with cost-effective, rigid plastic packaging solutions that work on multiple fronts:

- Functional sterile plastic packaging
- Innovative plastic designs to solve new industry challenges
- Concurrent package design with device engineering
- Precision thermoforming of complex package features
- Cost savings through creative designs and materials



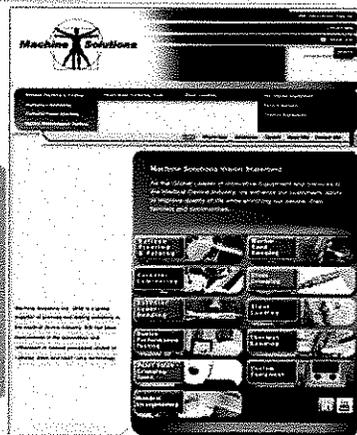
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## Bioscience Industry Growth



### Partnership with Forsyth Capital

"Machine Solutions' leading technology, global reach and management team make it an ideal opportunity for Forsyth Capital in our core sector of capital equipment," explained Ryan Gable, managing director and co-founder of Forsyth Capital. "We are honored to partner with Machine Solutions and are honored they chose us to help take them to the next level. We look forward to the partnership and applying the resources that Forsyth Capital provides through our relationship with Barry Virehmiller Companies to continue the strong history and growth of Machine Solutions."



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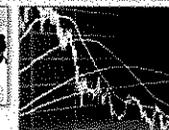
## Bioscience Industry Growth

Norchem is situated at an elevation of 7,000 feet in beautiful northern Arizona. Our secure laboratory houses the latest state of the art automation and instrumentation.

Their laboratory is equipped with the latest technology to meet the needs of our clients. Lean work practices utilizing advanced liquid-handling robotics make our specimen processing methods "the industry leader" for quality and speed. High throughput chemistry analyzers capable of performing over 4,500 immunoassay tests per hour are used for screening urine and oral fluid specimens. For specialty screening and confirmation testing we utilize the power of LC/MS/MS, GC/MS and GC/FID. Our results are certified to the highest forensic standards using these state of the art technologies.

At Norchem, we work to create a safer society by providing businesses and governmental agencies with science, technology and management tools that will aid them in fighting substance abuse.

**NORCHEM**  
IMPROVING OUTCOMES



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