

# 100 SUCCESS STORIES



GOVERNMENT FUNDING

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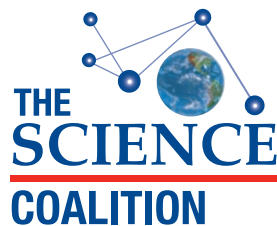
UNIVERSITY RESEARCH

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INNOVATION, COMPANIES, JOBS

## SPARKING ECONOMIC GROWTH

How federally funded  
university research  
creates innovation,  
new companies  
and jobs



APRIL 2010

[www.sciencecoalition.org](http://www.sciencecoalition.org)



## ABOUT THIS REPORT

This report was prepared by The Science Coalition (TSC) to illustrate one way in which federal investment in basic research helps to stimulate the economy. The examples highlighted were provided by the member universities of The Science Coalition (each member was invited to submit a small number of examples). They tell an important story about the role federally funded university-based research plays in the economy of the United States.

*The companies listed represent only a small sampling of the many companies that are the result of federally funded university-based research. This report is provided for illustrative purposes. The information about the companies was collected in 2009.*

The Science Coalition is a nonprofit, nonpartisan organization of more than 40 of the nation's leading public and private research universities. It is dedicated to sustaining the federal government's investment in basic research as a means to stimulate the economy, drive innovation and secure America's global competitiveness.

More information about The Science Coalition is available at [www.sciencecoalition.org](http://www.sciencecoalition.org).



## EXECUTIVE SUMMARY

- The federal government is the primary source of funding for basic research conducted in the United States, providing some 60 percent of funding. The second largest source of basic research funding is the academic institutions themselves.
- Universities conduct the majority of basic research in the United States — 55 percent in 2008. Business and industry conduct less than 20 percent of basic research in the United States.
- Basic research is conducted for the sake of knowledge and is essential to scientific discovery and understanding. Basic research is the first step in the innovation process.
- Innovations that flow from university-based basic research are at the root of countless companies. Companies spun out of research universities have a far greater success rate than other companies, creating good jobs and spurring economic activity.
- The US continues to lead in global research and development expenditures from all sources. However, China and other nations are investing aggressively in R&D in order to enhance their innovation capabilities.
- It is essential to America's global competitiveness and long-term economic health that the United States invest significantly and consistently in basic research year after year.



“The government, university and industry partnership of research-fueled innovation that we have in the United States is the envy of the world. It is at the core of U.S. leadership in such knowledge-intensive industries as biotech, telecommunications, and information technology, giving birth to companies like Genentech, Cisco Systems and Google. As head of a health sciences university, a physician, and former biotech industry executive, I have been involved in every aspect of this virtuous cycle. I know the critical impact that federal funding for basic research makes. There is no question that the public benefit is many times greater than the initial investment. Our continued scientific and technological leadership depends on a continued strong federal investment in research that will drive innovation and our economic well-being.”

Susan Desmond-Hellmann, MD, MPH  
*Chancellor*  
University of California, San Francisco

innovation

This report illustrates some of the economic benefits the United States reaps when companies are created as a result of discoveries in federally funded university laboratories. While there are countless companies that have made use, to varying degrees, of the fruits of academic research, the roots of the 100 companies featured in this report can be *directly* traced to seminal research conducted at a university and sponsored by a federal agency. *Were it not for the federally supported research, these companies — their products and services, and the jobs and economic growth that have resulted — likely would not exist.*

## RETURN ON INVESTMENT

When public money is invested in university-based basic research there is a tremendous return on investment. Research creates jobs directly — for the principal investigator, research team, lab technicians and others who help support the work — and indirectly, through innovations that lead to new technologies, new industries and new companies. University research also is a training ground, educating the next generation of scientists, engineers, doctors, teachers and entrepreneurs. And basic research creates knowledge that leads to the types of discoveries that have a significant impact on society, improving our quality of life, preserving our environment, and enhancing our security.

Universities perform 55 percent of the nation’s “basic” research<sup>1</sup> — that is, research for the sake of knowledge that is essential to scientific discovery and understanding. The bulk of funding for basic research comes from the federal government<sup>2</sup>. Federal support for basic research — provided through many different federal agencies — is based on scientific merit and competitive review. The partnership forged during World War II between the United States government and U.S. universities to conduct research on behalf of the American people continues to be eminently successful. Yet, other nations increasingly are investing aggressively in science to enhance their innovation capabilities and challenge U.S. leadership in this area. Strong and consistent funding for basic research is essential to America’s continued global competitiveness and long-term economic health.

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<sup>1</sup> National Science Foundation, Science and Engineering Indicators, 2010

<sup>2</sup> Ibid

## FROM RESEARCH PROJECT TO CORPORATION

The founding of **Google** is a product of the virtuous cycle of investments in research. **Stanford University** graduate students Larry Page and Sergey Brin, whose basic research was supported by a **National Science Foundation** grant, generated the idea at the root of Google — a better kind of search engine. Today, Google has transformed the way we use the Internet and employs more than 19,000 people.

Another example is North Carolina-based **SAS**. Supported by the U.S. **Department of Agriculture** (USDA), SAS began as a research project at **North Carolina State University** to analyze agricultural data. It is today the world's largest privately held software company and the leader in business analytics software and services. SAS employs more than 11,000 people.



SAS was originally created to analyze crop data through a grant from the Department of Agriculture. Forty years later SAS is used in every industry around the world. There are plenty of success stories still to be told. Federally supported university research is vitally important to keeping America at the forefront of technology innovation.”

Dr. Jim Goodnight

*Chief Executive Officer, SAS*

This report also provides examples of companies that, while they may not (yet) be household names, are nevertheless providing valuable products, technologies and services as a result of innovations grounded in federally funded university-based research. These companies are helping to address critical issues we face as a nation and as a society.

**Sharklet Technologies, Inc.** of Alachua, Florida, has developed a novel approach to combating hospital acquired infections: a surface technology that mimics the qualities of shark skin, which is resistant to bacterial growth. The original research at the **University of Florida** was supported by the U.S. Navy, which sought a non-chemical, antibacterial coating for the hulls of ocean-going ships to prevent the growth of marine algae and barnacles.

**A123 Systems**, founded by **Massachusetts Institute of Technology** (MIT) researchers in 2001, is today at the center of efforts to develop an advanced



Basic research provides the critical ‘seed corn’ for our nation’s technological innovations. Certainly that was true in the case of A123, which grew out of DOE-funded basic research into new battery concepts at MIT and is today developing batteries and battery systems to enable the electrification of transportation and improved efficiency for the ‘smart’ electric grid.”

Yet-Ming Chiang

*Co-Founder, A123 Systems  
Professor, MIT*

battery manufacturing industry in the United States. The company is developing promising new lithium ion batteries that will provide longer lasting power for electric cars. The original materials basic research at MIT was supported by the **Department of Energy**.

ONY, Inc. of Buffalo, New York, created a lung surfactant that has been administered to more than 250,000 premature babies in the United States to assist with their breathing in the first critical hours after birth. The original work by the company founders was conducted at the **University at Buffalo** with support from the **National Institutes of Health**.



Federal funding was essential to the startup of our company, Buffalo BioBlower. There is no way that our company would even exist had we not received the \$1.6 million in startup money from the Department of Defense.”

James F. Garvey, PhD

*Co-founder and Chief Technical Officer,  
Buffalo BioBlower Technologies, LLC  
Professor, University at Buffalo*

## INNOVATION ACROSS THE ECONOMY

The innovation that results from federally funded university-based research isn’t limited to certain sectors of the economy. Rather, the discoveries emanating from university research span the economy, producing innovations in health care, energy, education, communication, entertainment, transportation, manufacturing and defense, among many others. In Tab 4, the companies are listed by their area of innovation.

## Sponsored Research and the 100 Companies

- Department of Agriculture (USDA)
- Department of Commerce (DOC), including:
  - National Institute of Standards and Technology (NIST)
  - National Oceanic and Atmospheric Administration (NOAA)
- Department of Defense (DOD), including:
  - Defense Advanced Research Projects Agency (DARPA)
  - National Geospatial-Intelligence Agency
  - U.S. Air Force
  - U.S. Army
  - U.S. Navy
- Department of Energy (DOE)
- Environmental Protection Agency (EPA)
- Department of Transportation (DOT)
- National Aeronautics and Space Administration (NASA)
- National Institutes of Health (NIH)
- National Science Foundation (NSF)

## WHERE FUNDING COMES FROM

Funding for university-based research comes from many different sources, including the universities themselves, state and local governments, industry, foundations and other organizations. However, the bulk of funding for basic research — some 60 percent<sup>3</sup> — comes from the federal government through a broad range of agencies and programs. The 100 companies highlighted in this report illustrate the breadth of funding sources: the sponsored research at the root of these companies was supported by at least 10 different entities within the federal government.

In Tab 2, the companies are listed according to the agency that sponsored the university research that was integral to their formation.

It is often the case that researchers receive multiple grants over a period of several years from a variety of sources. For instance, the research at the **University of Illinois at Urbana-Champaign** into genetic manipulation of the fermentation process that is at the core of Chicago-based **TetraVitae Bioscience** was supported by the USDA and DOE.



Federally funded research has been instrumental to developing technologies at Chromatin that can increase crop yields and accelerate the development of new crop products. As a result of funding from the DOE, NIH and Department of Commerce, Chromatin's technology is being tested by leading multinational companies and Chromatin is partnering with several emerging technology companies to create crops that sustainably meet growing global demands.”

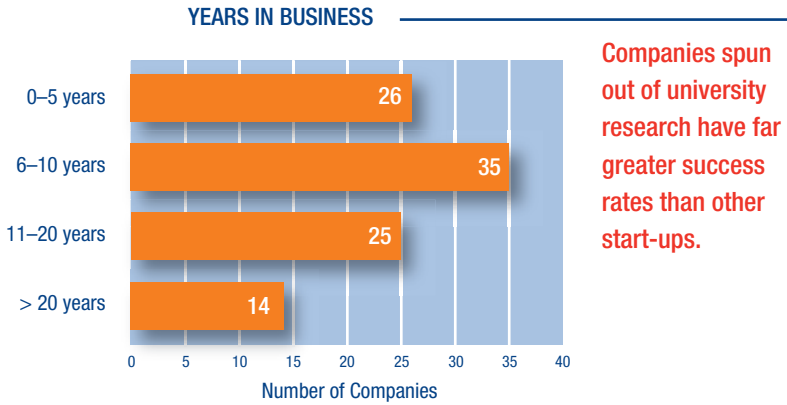
Daphne Preuss  
*President and CEO, Chromatin, Inc.*

<sup>3</sup> National Science Foundation, Science and Engineering Indicators, 2010



## COMPANIES THAT ARE HIGHLY SUCCESSFUL AND CREATING JOBS

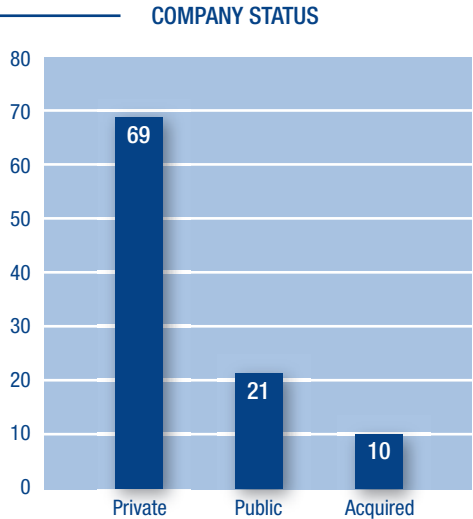
Most of the companies highlighted in this report are small businesses with fewer than 500 employees. These are the companies that today are generating the majority of new jobs in the United States<sup>4</sup>. See Tab 3 for companies listed by number of employees. These companies are also unusually successful: companies spun out of research universities have far greater success rates than other startups<sup>5</sup>. Indeed, of the 100 companies at the heart of this report, 43 were founded ten years or longer ago (in 2000 or earlier). In Tab 5, the companies are listed by their founding date, oldest to newest. Twenty-one companies have gone public. Another 10 companies have been acquired.



**Sixty-nine companies are privately held.**

**Twenty-one companies have gone public.**

**Another 10 have been acquired.<sup>6</sup>**



<sup>4</sup> U.S. Dept. of Labor, Bureau of Labor Statistics, Business Employment Dynamics

<sup>5</sup> Association of University Technology Managers U.S. Licensing Activity Survey FY2007

<sup>6</sup> Number excludes 2009 acquisitions of Genetech, Inc. and Sun Microsystems, Inc.



“University-launched startups can be powerhouses for value creation, becoming public companies at a far greater rate than the average for new businesses. Higher education can play a crucial role not just in spurring pioneering ideas, but in creating entrepreneurs who turn breakthroughs into innovations. The result benefits everyone. For example, 24 University of Southern California-bred startups currently employ some 500 full-time employees, more than half locally in Los Angeles. And 16 of these companies have raised at least \$148 million in financing over the last two years, during the height of the recession.”

Kristztina “Z” Holly

*Vice Provost for Innovation, University of Southern California  
Executive Director, USC Stevens Institute for Innovation*

value

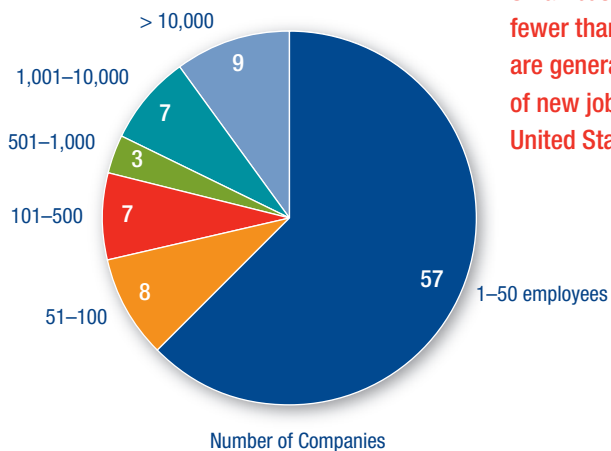


“Our lab at Arizona State University received substantial support from both the Office of Naval Research and the National Science Foundation to develop scanning probe microscopy for biological applications right from the first discovery of the technique (1985-1986). This background led directly to the intellectual property that Molecular Imaging licensed from ASU when it was founded in 1993. Today, Agilent AFM in Chandler is a significant employer of scientists and engineers, manufacturing and further developing the instruments pioneered by Molecular Imaging.”

**Dr. Stuart Lindsay**

*Director, Arizona State University's The Biodesign Institute, Single Molecule Biophysics  
Founder, Molecular Imaging*

## EMPLOYMENT



**Small businesses with fewer than 500 employees are generating the majority of new jobs today in the United States.**

**Notes:** (1) Number of employees was available for 91 of the 100 companies created from federally funded university research; (2) Numbers reflect employees of the acquiring company when there have been acquisitions:

- 1-50 employees, includes two acquisitions
- 101-500 employees, includes two acquisitions
- 1,001-10,000 employees, includes two acquisitions
- More than 10,000 employees, includes four acquisitions

## LOCAL ECONOMIC ENGINES

The economic impact of research universities is felt immediately and directly at the local level. Research universities are a vital component of the local economy in communities across the country. They are often the area's largest employer. They further contribute to the local economy through their purchase of goods and services. Research universities also play an important role in helping to facilitate the transfer of university research results to the public. Often, this is by serving as business incubators that provide the ecosystem necessary to move a company from concept to reality, including mentoring, technical, legal and business support. Importantly, the companies these universities help to create often locate close by, creating local jobs, attracting other research-intensive businesses and stimulating the growth of supporting industries.



“Research universities play an essential role in the economic vitality of their home states and the nation. At University of Michigan, we are involved in every phase of economic development, from the basic research that sparks innovation to teaching the skills that enable entrepreneurs and innovators to succeed, and from collaborating with industry on R&D efforts to assisting organizations through the economic transformation process. We believe that this deep involvement is part of our mission to make both the State of Michigan and the United States competitive and secure in this period of rapid globalization.”

**Stephen Forrest**

*Vice President for Research, University of Michigan*



Federal funds allowed Dr. Shane Farritor and I to investigate the feasibility and technical requirements needed to perform remote surgery with miniature robots. This research developed key pieces of intellectual property and over 30 scientific publications on miniature robotics. With the help of the University of Nebraska, we were able to obtain patents on these key inventions and later licensed this technology to Virtual Incision Corporation, a company that Dr. Farritor and I founded.”

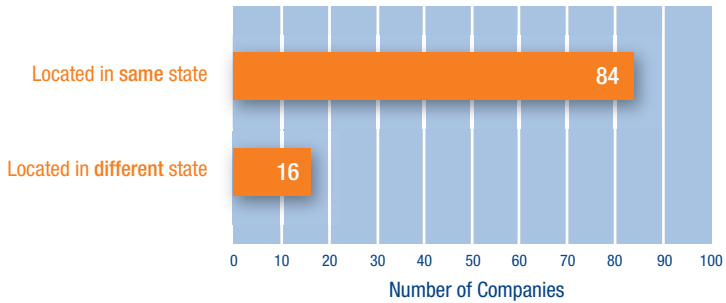
Dmitry Oleynikov

*Co-founder, Virtual Incision Corporation*

*Associate Professor and Surgeon, University of Nebraska Medical Center*

Of the 100 companies highlighted in this report, only 16 originally located in a different state than the university from which they spun out. Two others maintain research and development facilities in the same city as their founding universities, contributing jobs and economic activity. In Tab 1, the companies are listed by university affiliation. Company location can be found in Tab 5.

#### STICKING CLOSE TO HOME





“The core technology of TomoTherapy was developed by National Cancer Institute funding. Each year the technology is responsible for the treatment of tens of thousands of difficult to treat patients. In addition it generates many times its original funding level in salaries and taxes returned to both the U.S. and Wisconsin governments. Federal funding of technology is both economically and scientifically sound.”

Rock Mackie

*Co-founder and Chairman of the Board, TomoTherapy Incorporated  
Professor, University of Wisconsin-Madison*

## AN INVESTMENT THAT KEEPS ON PRODUCING

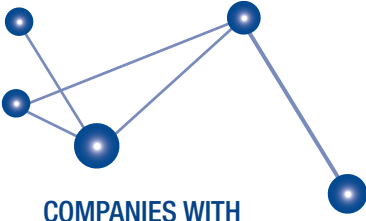
Innovation fueled by basic research has been a cornerstone of the U.S. economy for the last half-century, leading to the creation of countless companies, technologies and products. Federally funded university-based research is essential to America's ability to produce innovation. While the U.S. continues to lead in global research and development expenditures from all sources<sup>7</sup>, China and other nations are investing aggressively in R&D in order to enhance their innovation capabilities.<sup>8</sup>

The American Recovery and Reinvestment Act of 2009 (ARRA) brought an historic infusion of funds for scientific research. While helping to meet some critical needs resulting from previous budget shortfalls, the funding provided by the ARRA was unprecedented and short-term. Scientific research is an ongoing process that requires strong, predictable funding year-in and year-out. A funding tap that runs hot and cold wreaks havoc on the research process and diminishes our ability to benefit from the innovations that flow from it.

It is essential to America's global competitiveness and long-term economic health that the U.S. invest in basic research significantly and consistently year-over-year. This is an investment that pays significant dividends — to our health, security, environment, prosperity and competitiveness — and one the nation can't afford not to make.

<sup>7</sup> National Science Foundation, Science and Engineering Indicators, International R&D Comparisons, 2010

<sup>8</sup> American Society for the Advancement of Science, Guide to R&D Funding Data: International Comparisons, August 2008



## COMPANIES WITH ACADEMIC RESEARCH AT THEIR CORE

In a separate section of this report, we profile an additional 13 companies submitted by the members of The Science Coalition that have academic research at their core, but whose inception can't be traced directly to federally funded research. In some cases, like that of **Hewlett-Packard (HP)**, **Medtronic**, and Ithaca, New York-based **EMF Corporation**, the companies were founded before the current public-private research partnership was established. In other cases, federal research funding played a significant role after the company was founded, often in the form of Small Business Innovation Research (SBIR) grants. These companies also are excellent examples of the impact university-based research has on our economy.

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## 100-PLUS: COMPANIES WITH ACADEMIC RESEARCH AT THEIR CORE

### FEDERAL FUNDING NOT TRACED TO THE FOUNDING TECHNOLOGY

Indicated by “+” throughout report.

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## COMPANIES BY UNIVERSITY

+ Denotes companies created from university research without direct link to federal funding.

### Arizona State University

AzERx, Inc.  
Molecular Imaging, Inc.  
SJT Micropower, Inc. +

### Binghamton University

NanoMas Technologies, Inc.  
Webscalers

### Brown University

Acoustic Magic, Inc.  
Seaside Therapeutics

### Cornell University

EMF Corporation +  
Fingerlakes Aquaculture, Inc.  
Kionix, Inc.  
Pacific Biosciences

### Emory University

GeoVax Labs, Inc.  
Pharmasset, Inc.  
Neuronetics, Inc. +  
Syntermed, Inc.  
Triangle Pharmaceuticals

### Harvard University

Orbital Sciences Corporation  
RainDance Technologies, Inc.

### Indiana University

CS-Keys, Inc.  
FAST Diagnostics, Inc.  
ImmuneWorks  
Information in Place, Inc. +  
Predictive Physiology & Medicine, Inc. +  
Therapeutic Technologies, Inc.

### Johns Hopkins University

Reactive NanoTechnologies, Inc.

### Lehigh University

Lehigh Nanotech

### Massachusetts Institute of Technology

A123 Systems  
Cerulean Pharma, Inc.  
Cognex Corporation  
iRobot Corporation  
Momenta Pharmaceuticals, Inc.

### Michigan Technological University

Aursos, Inc.  
Endres Machining Innovations, LLC +  
IR Telemetrics, Inc. +  
ThermoAnalytics, Inc.

### New York University

Aguru Images with University of  
Southern California  
Perceptive Pixel, Inc. +  
Spin Transfer Technologies  
SUGEN +

### North Carolina State University

BioMarck Pharmaceuticals, Ltd.  
BioResource International, Inc.  
CREE, Inc.  
SAS

### Princeton University

BioNanomatrix, Inc.  
TetraLogic Pharmaceuticals  
Universal Display Corporation  
Vorbeck Materials Corporation

### Stanford University

Amati Communications Corporation  
Cisco Systems, Inc.  
Genentech, Inc. with UC San Francisco  
Google Inc.  
Hewlett-Packard +  
Sun Microsystems, Inc. with UC Berkeley  
SunPower Corporation  
Xenogen

### University at Buffalo

Buffalo BioBlower Technologies, LLC  
Kinex Pharmaceuticals  
ONY, Inc.

### University of California, Berkeley

Cadence Design Systems  
Sun Microsystems, Inc. with Stanford University

### University of California, Irvine

ALEKS Corporation

### University of California, Los Angeles

Agensys, Inc.  
ArmaGen Technologies, Inc.  
Solarmer Energy, Inc.

### University of California, San Francisco

Genentech, Inc. with Stanford University

### University of Chicago

Chromatin, Inc.  
Integrated Genomics  
Maroon Biotech

### University of Florida

Banyan Biomarkers, Inc.  
Sharklet Technologies, Inc.  
Sinmat  
Verenium Corporation

### University of Illinois at Urbana Champaign

Eden Park Illumination, Inc.  
Semiprius  
TetraVitae Bioscience

### University of Kentucky

AllTranz, Inc. +  
Allylix, Inc.  
Mersive Technologies

### University of Maryland

Zymetis, Inc.

### University of Michigan

Arbor Networks  
HealthMedia, Inc.

### University of Minnesota

Image Sensing Systems, Inc.  
Medtronic +

### University of Nebraska

J.A. Woollam Co., Inc.  
LI-COR Biosciences  
Virtual Incision Corporation  
Ximerex, Inc.

### University of Pennsylvania

Advaxis, Inc.  
Avid Radiopharmaceuticals, Inc.  
MicroMRI, Inc.  
PolyMedix, Inc.  
VGX Pharmaceuticals

### University of Rochester

iCardiac Technologies  
Praxis Biologics  
Vaccinex, Inc.

### University of South Florida

Nanopharma Technologies, Inc.  
Natura Therapeutics, Inc.  
Saneron-CCEL Therapeutics, Inc.  
Transgenex Nanobiotech, Inc.

### University of Southern California

Aguru Images with New York University  
Audyssey Laboratories  
Big Stage Entertainment  
Language Weaver  
Response Genetics, Inc.

### University of Texas at Austin

Molecular Imprints, Inc.

### University of Virginia

Adenosine Therapeutics, LLC  
ContraVac +  
Directed Vapor Technologies International, Inc.

### University of Wisconsin–Madison

FluGen, Inc.  
TomoTherapy Incorporated

### Virginia Polytechnic Institute & State University (Virginia Tech)

NanoSonic, Inc.

### Wayne State University

SenSound, LLC

### West Virginia University

Protea Bioscience, Inc.

### Worcester Polytechnic Institute

Active Surface Technologies, Inc.  
Advanced Body Sensing, LLC  
ImagiSonic



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## COMPANIES BY FEDERAL FUNDING AGENCY

### Department of Agriculture (USDA)

Adenosine Therapeutics, LLC  
Fingerlakes Aquaculture, Inc.  
LI-COR Biosciences  
SAS  
TetraVitae Bioscience  
Verenium Corporation

### Department of Defense (DOD)

ArmaGen Technologies, Inc.  
Banyan Biomarkers, Inc.  
Buffalo BioBlower Technologies, LLC  
Cadence Design Systems  
Cisco Systems, Inc.  
CREE, Inc.  
iRobot Corporation  
Kionix, Inc.  
Semiprius  
Solarmer Energy, Inc.  
Transgenex Nanobiotech, Inc.  
Universal Display Corporation

### DOD – Defense Advanced Research Projects Agency (DARPA)

Arbor Networks  
J.A. Woollam Co., Inc.  
Language Weaver  
Molecular Imprints, Inc.  
Sun Microsystems, Inc.  
Universal Display Corporation

### DOD – National Geospatial-Intelligence Agency (NGIA)

Big Stage Entertainment

### DOD – U.S. Air Force

Directed Vapor Technologies International, Inc.  
Eden Park Illumination, Inc.  
J.A. Woollam Co., Inc.

### DOD – U.S. Army

Active Surface Technologies, Inc.  
Advanced Body Sensing, LLC  
Aguru Images  
Directed Vapor Technologies International, Inc.  
ImagiSonix  
J.A. Woollam Co., Inc.  
NanoSonic, Inc.  
ThermoAnalytics, Inc.  
Universal Display Corporation  
Virtual Incision Corporation

### DOD – U.S. Navy

Directed Vapor Technologies International, Inc.  
Sharklet Technologies, Inc.  
Universal Display Corporation  
Xenogen

### Department of Energy (DOE)

A123 Systems  
Directed Vapor Technologies International, Inc.  
Pacific Biosciences  
Semiprius  
Sinmat  
SunPower Corporation  
TetraVitae Bioscience  
Universal Display Corporation  
Verenium Corporation

### Environmental Protection Agency (EPA)

BioMarck Pharmaceuticals, Ltd.  
Lehigh Nanotech

### Department of Transportation (DOT)

Image Sensing Systems, Inc.

### National Aeronautics and Space Administration (NASA)

iRobot Corporation  
J.A. Woollam Co., Inc.  
Orbital Sciences Corporation  
Virtual Incision Corporation  
Vorbeck Materials Corporation

### National Institute of Standards and Technology (NIST)

Sinmat  
Ximerex, Inc.

### National Institutes of Health (NIH)

Adenosine Therapeutics, LLC  
Advaxis, Inc.  
Agensys, Inc.  
ArmaGen Technologies, Inc.  
Aursos, Inc.  
Avid Radiopharmaceuticals, Inc.  
AzERx, Inc.  
BioMarck Pharmaceuticals, Ltd.  
BioNanomatrix, Inc.  
Cerulean Pharma, Inc.  
CS-Keys, Inc.  
FAST Diagnostics, Inc.  
FluGen, Inc.  
Genentech, Inc.

### National Institutes of Health, *continued*

GeoVax Labs, Inc.  
HealthMeda, Inc.  
iCardiac Technologies  
ImmuneWorks  
Integrated Genomics  
Kinex Pharmaceuticals  
Maroon Biotech  
MicroMRI, Inc.  
Momenta Pharmaceuticals, Inc.  
Nanopharma Technologies, Inc.  
Natura Therapeutics, Inc.  
ONY, Inc.  
Pacific Biosciences  
Pharmasset, Inc.  
PolyMedix, Inc.  
Praxis Biologics, Inc.  
Protea Bioscience, Inc.  
Response Genetics, Inc.  
Saneron-CCEL Therapeutics, Inc.  
Syntermed, Inc.  
TetraLogic Pharmaceuticals  
Therametric Technologies, Inc.  
TomoTherapy Incorporated  
Transgenex Nanobiotech, Inc.  
Triangle Pharmaceuticals  
Vaccinex, Inc.  
VGX Pharmaceuticals  
Virtual Incision Corporation  
Xenogen  
Ximerex, Inc.

### National Oceanic and Atmospheric Administration (NOAA)

Zymetis, Inc.

### National Science Foundation (NSF)

Acoustic Magic, Inc.  
ALEKS Corporation  
Allylix, Inc.  
Amati Communications Corporation  
Arbor Networks  
Audyssey Laboratories  
Chromatin, Inc.  
Cognex Corporation  
Directed Vapor Technologies International, Inc.  
Eden Park Illumination, Inc.  
Genentech, Inc.  
Google Inc.  
Integrated Genomics  
J.A. Woollam Co., Inc.  
Kionix, Inc.  
Lehigh Nanotech  
Mersive Technologies  
MicroMRI, Inc.  
Molecular Imaging, Inc.  
NanoMas Technologies, Inc.  
Nanopharma Technologies, Inc.  
Pacific Biosciences  
PolyMedix, Inc.  
RainDance Technologies, Inc.  
Reactive NanoTechnologies, Inc.  
Seaside Therapeutics  
Semiprius  
SenSound, LLC  
Sinmat  
Solarmer Energy, Inc.  
Spin Transfer Technologies  
Vorbeck Materials Corporation  
Webscalers





## SPARKING ECONOMIC GROWTH

How federally funded  
university research  
creates innovation,  
new companies  
and jobs

## COMPANIES BY EMPLOYEES

+ Denotes companies created from university research without direct link to federal funding. Companies in (parentheses) have been acquired; employee count is for the acquiring company. There are nine companies in this report for which employee data was unavailable.

### 1–50 Employees

Acoustic Magic, Inc.  
Active Surface Technologies, Inc.  
Advanced Body Sensing, LLC  
Advaxis, Inc.  
AllTranz, Inc. +  
ArmaGen Technologies, Inc.  
Aursos, Inc.  
Avid Radiopharmaceuticals, Inc.  
(AzERx, Inc.)  
Banyan Biomarkers, Inc.  
Big Stage Entertainment  
BioNanomatrix, Inc.  
Buffalo BioBlower Technologies, LLC  
Chromatin, Inc.  
ContraVac +  
CS-Keys, Inc.  
Directed Vapor Technologies International, Inc.  
Eden Park Illumination, Inc.  
Endres Machining Innovations, LLC +  
EMF Corporation +  
FAST Diagnostics, Inc.  
Fingerlakes Aquaculture, Inc.  
FluGen, Inc.  
GeoVax Labs, Inc.  
ImagiSonix  
ImmuneWorks  
Information in Place, Inc. +  
Integrated Genomics  
IR Telemetrics, Inc. +  
J.A. Woollam Co., Inc.  
Kinex Pharmaceuticals  
Language Weaver  
Lehigh Nanotech  
Maroon Biotech  
MicroMRI, Inc.  
NanoMas Technologies, Inc.  
Nanopharma Technologies, Inc.  
Natura Therapeutics, Inc.  
Neuronetics, Inc. +  
ONY, Inc.  
Pacific Biosciences  
Perceptive Pixel, Inc. +  
PolyMedix, Inc.  
Predictive Physiology & Medicine, Inc. +  
Protea Bioscience, Inc.  
Reactive NanoTechnologies, Inc.  
Response Genetics, Inc.  
Saneron-CCEL Therapeutics, Inc.  
Seaside Therapeutics  
Semiprius

SenSound, LLC  
Sharklet Technologies, Inc.  
Sinmat  
SJT Micropower, Inc. +  
Solarmer Energy, Inc.  
Spin Transfer Technologies  
Syntermed, Inc.  
TetraLogic Pharmaceuticals  
TetraVitae Bioscience  
Therametric Technologies, Inc.  
ThermoAnalytics, Inc.  
Transgenex Nanobiotech, Inc.  
Vaccinex, Inc.  
(VGX Pharmaceuticals)  
Virtual Incision Corporation  
Webscalars  
Ximerex, Inc.

### 51–100 Employees

ALEKS Corporation  
Audyssey Laboratories  
Image Sensing Systems, Inc.  
Kionix, Inc.  
NanoSonic, Inc.  
Pharmasset, Inc.  
RainDance Technologies, Inc.  
Universal Display Corporation

### 101–500 Employees

(Adenosine Therapeutics, LLC)  
(Agensys, Inc.)  
Arbor Networks  
LI-COR Biosciences  
Molecular Imprints, Inc.  
Momenta Pharmaceuticals, Inc.  
Verenium Corporation  
(Xenogen)

### 501–1,000 Employees

Cognex Corporation  
iRobot Corporation  
TomoTherapy Incorporated

### 1,001–10,000 Employees

A123 Systems  
Cadence Design Systems  
CREE, Inc.  
Orbital Sciences Corporation  
SunPower Corporation  
(Triangle Pharmaceuticals)

**More than 10,000 Employees**

(Amati Communications Corporation)

Cisco Systems, Inc.

Genentech, Inc.

Google Inc.

(HealthMedia, Inc.)

Hewlett-Packard +

Medtronic +

(Molecular Imaging, Inc.)

(Praxis Biologics)

SAS

(SUGEN +)



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## COMPANIES BY AREA OF INNOVATION

+ Denotes companies created from university research without direct link to federal funding.

### Agriculture/Life Sciences

BioResource International, Inc.  
Chromatin, Inc.  
Fingerlakes Aquaculture, Inc.

### Antimicrobial Materials/Sterilization

Buffalo BioBlower Technologies, LLC  
Sharklet Technologies, Inc.

### Audio/Visual

Acoustic Magic, Inc.  
Aguru Images  
Audyssey Laboratories  
Mersive Technologies  
Perceptive Pixel, Inc. +

### Behavior/Education/Training

ALEKS Corporation  
HealthMedia, Inc.  
Information in Place +

### Bio Fuels/Bio Chemicals

Allylix, Inc.  
Chromatin, Inc.  
TetraVitae Bioscience  
Verenium Corporation  
Zymetis, Inc.

### Biotechnology/Pharmaceuticals

Adenosine Therapeutics, LLC  
Advaxis, Inc.  
Agensys, Inc.  
AllTranz, Inc. +  
ArmaGen Technologies, Inc.  
Aursos, Inc.  
Avid Radiopharmaceuticals, Inc.  
AzERx, Inc.  
Banyan Biomarkers, Inc.  
BioMarck Pharmaceuticals, Ltd.  
BioNanomatrix, Inc.  
BioResource International, Inc.  
Cerulean Pharma, Inc.  
Chromatin, Inc.  
CS-Keys, Inc.  
FluGen, Inc.  
Genentech, Inc.  
GeoVax Labs, Inc.  
ImmuneWorks

### Biotechnology/Pharmaceuticals, continued

Integrated Genomics  
Kinex Pharmaceuticals  
Maroon Biotech  
Momenta Pharmaceuticals, Inc.  
Nanopharma Technologies, Inc.  
ONY, Inc.  
Pacific Biosciences  
Pharmasset, Inc.  
PolyMedix, Inc.  
Praxis Biologics  
Predictive Physiology & Medicine, Inc. +  
Protea Bioscience, Inc.  
Saneron-CCEL Therapeutics, Inc.  
Seaside Therapeutics  
Sharklet Technologies, Inc.  
SUGEN +  
TetraLogic Pharmaceuticals  
Transgenex Nanobiotech, Inc.  
Triangle Pharmaceuticals  
Vaccinex, Inc.  
VGX Pharmaceuticals  
Ximerex, Inc.

### Cancer Therapies/Tests

Adenosine Therapeutics, LLC  
Advaxis, Inc.  
Agensys, Inc.  
CS-Keys, Inc.  
Genentech, Inc.  
Kinex Pharmaceuticals  
Nanopharma Technologies, Inc.  
SUGEN +  
TetraLogic Pharmaceuticals  
TomoTherapy Incorporated  
Transgenex Nanobiotech, Inc.  
Vaccinex, Inc.  
VGX Pharmaceuticals  
Xenogen

### Dental

Therametric Technologies, Inc.

### DNA Sequencing

BioNanomatrix, Inc.  
Pacific Biosciences  
RainDance Technologies, Inc.

## Energy Technologies/Renewable Energy

A123 Systems  
NanoMas Technologies, Inc.  
Semiprius  
Solarmer Energy, Inc.  
SunPower Corporation

## Environmental Remediation

Lehigh Nanotech

## Industrial Technologies

Buffalo BioBlower Technologies, LLC  
Cognex Corporation  
Directed Vapor Technologies International, Inc.  
Endres Machining Innovations, LLC +  
EMF Corporation +  
IR Telemetrics, Inc. +  
Kionix, Inc.  
NanoMas Technologies, Inc.  
NanoSonic, Inc.  
Reactive NanoTechnologies, Inc.  
SenSound, LLC  
ThermoAnalytics, Inc.  
Vorbeck Materials Corporation

## Instrumentation/Equipment

J.A. Woollam Co., Inc.  
LI-COR Biosciences  
Molecular Imaging, Inc.  
RainDance Technologies, Inc.

## Internet Technologies

Arbor Networks  
Big Stage Entertainment  
Google Inc.  
Webscalers

## Lighting/Lighting Technologies

Eden Park Illumination, Inc.  
Universal Display Corporation

## Medical Devices/Medical Diagnostics

Active Surface Technologies, Inc.  
Advanced Body Sensing, LLC  
Banyan Biomarkers Inc.  
ContraVac +  
CS-Keys Inc.  
FAST Diagnostics, Inc.  
iCardiac Technologies  
Medtronic +  
Neuronetics, Inc. +  
Predictive Physiology & Medicine, Inc. +  
Response Genetics, Inc.  
Therametric Technologies, Inc.  
TomoTherapy Incorporated  
Virtual Incision Corporation

## Medical Imaging Technologies

Avid Radiopharmaceuticals, Inc.  
Imagisonix  
MicroMRI, Inc.  
Molecular Imaging, Inc.  
Syntermed, Inc.  
Xenogen

## Military/Homeland Security

Advanced Body Sensing, LLC  
Buffalo BioBlower Technologies, LLC  
ImagiSonix  
Information In Place +  
iRobot Corporation  
Mersive Technologies  
Nanopharma Technologies, Inc.  
Thermoanalytics, Inc.

## Nanotechnology

Cerulean Pharma, Inc.  
Lehigh Nanotech  
Molecular Imprints, Inc.  
NanoMas Technologies, Inc.  
NanoSonic, Inc.  
Reactive NanoTechnologies, Inc.  
Sinmat  
Transgenex Nanobiotech, Inc.  
Vorbeck Materials Corporation

## Nutritional Products

Natura Therapeutics, Inc.

## Research Services

iCardiac Technologies  
Integrated Genomics  
Protea Bioscience, Inc.

## Robotics

iRobot Corporation  
Virtual Incision Corporation

## Semiconductors/Semiconductor Technologies

CREE, Inc.  
Kionix, Inc.  
Molecular Imprints, Inc.  
Sinmat  
SJT Micropower, Inc. +

## Space Systems/Space Technologies

Orbital Sciences Corporation  
Vorbeck Materials Corporation

## Specialty Chemicals

Allylix, Inc.

### Technology/Software/Hardware

Arbor Networks  
Big Stage Entertainment  
Cadence Design Systems  
Cisco Systems, Inc.  
Hewlett-Packard +  
Mersive Technologies  
Perceptive Pixel, Inc. +  
SAS  
Spin Transfer Technologies  
Sun Microsystems, Inc.

### Telecommunications

Amati Communications Corporation  
Cisco Systems, Inc.

### Translation

Language Weaver

### Transportation

Image Sensing Systems, Inc.

### Vaccines

FluGen, Inc.  
GeoVax Labs, Inc.  
Praxis Biologics  
VGX Pharmaceuticals



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## COMPANIES BY YEAR FOUNDED AND LOCATION

Information in (parentheses) is for the acquiring company.

COMPANY	LOCATION	YEAR
LI-COR Biosciences	Lincoln, NE	1971
Genentech, Inc.	South San Francisco, CA	1976
SAS	Cary, NC	1976
Cognex Corporation	Natick, MA	1981
Orbital Sciences Corporation	Dulles, VA	1982
Sun Microsystems, Inc.	Santa Clara, CA	1982
Cadence Design Systems	San Jose, CA	1983
Praxis Biologics (Pfizer)	Rochester, NY (New York, NY)	1983
Cisco Systems, Inc.	San Jose, CA	1984
Image Sensing Systems, Inc.	St. Paul, MN	1984
ONY, Inc.	Amherst, NY	1985
SunPower Corporation	San Jose, CA	1985
CREE, Inc.	Durham, NC	1987
J.A. Woollam Co., Inc.	Lincoln, NE	1987
iRobot Corporation	Bedford, MA	1990
Amati Communications Corporation (Texas Instruments)	San Jose, CA (Dallas, TX)	1992
Verenium Corporation	Cambridge, MA	1992
Kionix, Inc.	Ithaca, NY	1993
Molecular Imaging, Inc. (Agilent Technologies, Inc.)	Chandler, AZ (Santa Clara, CA)	1993
Ximerex, Inc.	Blair, NE	1993
ThermoAnalytics, Inc.	Calumet, MI	1994
Universal Display Corporation	Ewing, NJ	1994
Xenogen (Caliper Life Sciences)	Alameda, CA (Hopkinton, MA)	1994
Triangle Pharmaceuticals (Gilead Science, Inc.)	Durham, NC (Foster City, CA)	1995

COMPANY	LOCATION	YEAR
Agensys, Inc. (Astellas Pharma US)	Santa Monica, CA (Deerfield, IL)	1996
ALEKS Corporation	Tustin, CA	1996
Fingerlakes Aquaculture, Inc.	Groton, NY	1996
Therametric Technologies, Inc.	Indianapolis, IN	1996
Integrated Genomics	Chicago, IL	1997
TomoTherapy Incorporated	Madison, WI	1997
Vaccinex, Inc.	Rochester, NY	1997
Google Inc.	Mountain View, CA	1998
HealthMedia, Inc. (Johnson & Johnson)	Ann Arbor, MI (New Brunswick, NJ)	1998
NanoSonic, Inc.	Blacksburg, VA	1998
Pharmasset, Inc.	Princeton, NJ	1998
Adenosine Therapeutics, LLC (Clinical Data)	Charlottesville, VA (Newton, MA)	1999
BioResource International, Inc.	Morrisville, NC	1999
Response Genetics, Inc.	Los Angeles, CA	1999
Syntermed, Inc	Atlanta, GA	1999
Acoustic Magic, Inc.	Sudbury, MA	2000
Arbor Networks	Ann Arbor, MI	2000
Directed Vapor Technologies International, Inc.	Charlottesville, VA	2000
VGX Pharmaceuticals (Inovio Biomedical Corporation)	Philadelphia, PA (Blue Bell, PA)	2000
A123 Systems	Watertown, MA	2001
Chromatin, Inc.	Chicago, IL	2001
GeoVax Labs, Inc.	Atlanta, GA	2001
Molecular Imprints, Inc.	Austin, TX	2001
Momenta Pharmaceuticals, Inc.	Cambridge, MA	2001
Protea Bioscience, Inc.	Morgantown, WV	2001
Reactive NanoTechnologies, Inc.	Hunt Valley, MD	2001
Saneron-CCEL Therapeutics, Inc.	Tampa, FL	2001
Advaxis, Inc.	North Brunswick, NJ	2002
Allylix, Inc.	San Diego, CA	2002
Audyssey Laboratories	Los Angeles, CA	2002
Banyan Biomarkers, Inc.	Alachua, FL	2002
BioMarck Pharmaceuticals, Ltd.	Raleigh, NC	2002
Language Weaver	Marina Del Rey, CA	2002
Maroon Biotech	Chicago, IL	2002

COMPANY	LOCATION	YEAR
PolyMedix, Inc.	Radnor, PA	2002
Sinmat	Gainesville, FL	2002
Transgenex Nanobiotech, Inc.	Tampa, FL	2002
Webscalers	Binghamton, NY	2002
BioNanomatrix, Inc.	Philadelphia, PA	2003
Kinex Pharmaceuticals	Buffalo, NY	2003
MicroMRI, Inc.	Philadelphia, PA	2003
SenSound, LLC	Detroit, MI	2003
ArmaGen Technologies, Inc.	Santa Monica, CA	2004
AzERx, Inc. (Capstone Therapeutics)	Tempe, AZ (Tempe, AZ)	2004
Mersive Technologies	Lexington, KY	2004
Nanopharma Technologies, Inc.	Tampa, FL	2004
Natura Therapeutics, Inc.	Tampa, FL	2004
Pacific Biosciences	Menlo Park, CA	2004
RainDance Technologies, Inc.	Lexington, MA	2004
TetraLogic Pharmaceuticals	Malvern, PA	2004
Active Surface Technologies, Inc.	Worcester, MA	2005
Avid Radiopharmaceuticals, Inc.	Philadelphia, PA	2005
Big Stage Entertainment	Sherman Oaks, CA	2005
Buffalo BioBlower Technologies, LLC	Buffalo, NY	2005
Seaside Therapeutics	Cambridge, MA	2005
Semiprius	Durham, NC	2005
Aguru Images	Los Angeles, CA	2006
Cerulean Pharma, Inc.	Cambridge, MA	2006
CS-Keys, Inc.	Indianapolis, IN	2006
FAST Diagnostics, Inc.	Indianapolis, IN	2006
iCardiac Technologies	Rochester, NY	2006
ImagiSonix	Worcester, MA	2006
ImmuneWorks	Indianapolis, IN	2006
Lehigh Nanotech	Bethlehem, PA	2006
NanoMas Technologies, Inc.	Binghamton, NY	2006
Solarmer Energy, Inc.	El Monte, CA	2006
TetraVitae Bioscience	Chicago, IL	2006
Virtual Incision Corporation	Lincoln, NE	2006
Vorbeck Materials Corporation	Jessup, MD	2006
Zymetis, Inc.	College Park, MD	2006

COMPANY	LOCATION	YEAR
Advanced Body Sensing, LLC	Worcester, MA	2007
Aursos, Inc.	Kalamazoo, MI	2007
Eden Park Illumination, Inc.	Somerset, NJ	2007
FluGen, Inc.	Madison, WI	2007
Sharklet Technologies, Inc.	Alachua, FL	2007
Spin Transfer Technologies	Quincy, MA	2007

## 100-PLUS: COMPANIES WITH ACADEMIC RESEARCH AT THEIR CORE

Federal funding not traced to the founding technology.

COMPANY	LOCATION	YEAR
EMF Corporation	Ithaca, NY	1936
Hewlett-Packard	Palo Alto, CA	1939
Medtronic	Minneapolis, MN	1949
SUGEN (Pfizer)	South San Francisco, CA (New York, NY)	1991
IR Telemetry, Inc.	Houghton, MI	1994
Information In Place, Inc.	Bloomington, IN	1999
SJT Micropower, Inc.	Fountain Hills, AZ	2000
ContraVac	Charlottesville, VA	2002
Neuronetics, Inc.	Malvern, PA	2003
AllTranz, Inc.	Lexington, KY	2004
Predictive Physiology & Medicine, Inc.	Bloomington, IN	2005
Endres Machining Innovations, LLC	Houghton, MI	2006
Perceptive Pixel, Inc.	New York, NY	2007



## SPARKING ECONOMIC GROWTH

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FOUNDER(S): Dr. Yet-Ming Chiang, Dr. Bart Riley and Ric Fulop

EMPLOYEES: 1,740

HEADQUARTERS: Watertown, MA

FOUNDED: 2001

REVENUE: \$52 million FY08

TSC MEMBER INSTITUTION: Massachusetts Institute of Technology

FUNDING AGENCY(S): Department of Energy

# A123 Systems

## *Enabling a New Era of Sustainable Transportation*

CONTACT: A123 Systems  
321 Arsenal Street  
Watertown, MA 02472  
[www.a123systems.com](http://www.a123systems.com)

### ABOUT THE COMPANY:

In the mid-1990s, rechargeable lithium-ion batteries came to be widely used in cell phones and laptop computers due to their small size, light weight and high energy density. However, this first generation technology did not have the additional necessary attributes of high power, improved safety, long life, environmental friendliness, and low cost to enable large-scale applications with true energy impact.

As a professor of Materials Science and Engineering at Massachusetts Institute of Technology (MIT), Yet-Ming Chiang believed that certain metal phosphate compounds he was studying could be the basis for a new class of lithium ion batteries for energy applications. He co-founded Watertown, Massachusetts-based A123 Systems in 2001 to bring this new battery technology into mass production.

A123's first customer was Black & Decker, which used the high-power lithium ion batteries in a new line of power tools. Today the company is helping to bring in a new era of sustainable transportation by building advanced batteries and battery systems for energy efficient vehicles such as in plug-in hybrids (PHEVs) and electric vehicles (EVs). These vehicles include passenger cars as well as trucks and buses. A123 is also developing new energy storage products for the electric grid to increase efficiency, lower emissions, and make the most

of existing assets. The company believes that these products will also assist the integration of renewables such as wind and solar power by smoothing their output and stabilizing the grid.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

A123 Systems was born out of research by Yet-Ming Chiang at MIT and founded in 2001 by Chiang, Bart Riley, who became Chief Technical Officer, and Ric Fulop, Vice President of Business Development and Marketing. Many aspects of A123's core technology were exclusively licensed from MIT through a royalty-based agreement. After a year off in 2002 to help get the company on its feet, Chiang has been back at MIT full-time teaching and continuing his research, and sits on A123's board.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Chiang's materials basic research at MIT was supported by the US Department of Energy.

FOUNDER(S): Bob Feingold  
EMPLOYEES: 6  
HEADQUARTERS: Sudbury, MA  
FOUNDED: 2000  
REVENUE: N/A  
TSC MEMBER INSTITUTION: Brown University  
FUNDING AGENCY(S): National Science Foundation

# Acoustic Magic, Inc.

CONTACT: Acoustic Magic, Inc.  
35 Peakham Road  
Sudbury, MA 01776  
[www.acousticmagic.com](http://www.acousticmagic.com)

## ABOUT THE COMPANY:

Working in Brown University's Division of Engineering, Dr. Harvey Silverman and Dr. Michael Brandstein developed a "beam-forming" technology. This technology, now used by Acoustic Magic, has revolutionized microphones.

Anyone who has spoken at a conference knows how microphones, even "array" microphones, can limit your movement. The beam forming technology used by Acoustic Magic enables the microphone to "find" a speaker, and filters out noise, echoes and reverberations. The speaker can move about the room freely and be heard with great clarity. In a lecture hall, a professor can speak and be heard and recorded, as can students' questions or comments, all with one microphone. On a teleconference, several speakers can talk, and the "Voice Tracker" technology enables them all to be heard clearly. The technology is also used for speech dictation.

## UNIVERSITY-BASED RESEARCH CONNECTION:

Acoustic Magic is a startup company based upon "beam-forming" technology developed by Dr. Harvey Silverman and Dr. Michael Brandstein of Brown University's Division of Engineering.



#### **ROLE OF FEDERAL RESEARCH FUNDING:**

The work of Dr. Brandstein and Dr. Silverman was supported by grants from the National Science Foundation. Seed funding for Acoustic Magic was provided by the Slater Center for Interactive Technologies and the Slater Center for Design & Manufacturing Innovation, two of four technology commercialization centers operating under the auspices of Rhode Island's Samuel Slater Technology Fund.

**FOUNDER(S):** W. Grant McGimpsey, PhD and Christopher R. Lambert, PhD

**EMPLOYEES:** 2

**HEADQUARTERS:** Worcester, MA

**FOUNDED:** 2005

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** Worcester Polytechnic Institute

**FUNDING AGENCY(S):** Department of Defense

# Active Surface Technologies, Inc.

**CONTACT:** Active Surface Technologies, Inc.  
Life Sciences & Bioengineering Center at Gateway Park  
60 Prescott Street  
Worcester, MA 01605

## **ABOUT THE COMPANY:**

Imagine a handheld device that lets clinicians detect early signs of renal failure while there is still time to save a patient's kidneys. Now imagine that the same device can quickly give doctors the information they need to make the best possible decisions about diagnostic tests and treatment. The founders of Active Surface Technologies, Inc. (ASTI) have done more than imagine such technology; they've developed a working prototype and are seeking to bring it to market.

The company is developing a battery-operated handheld device that takes highly accurate measurements of renal disease biomarkers such as potassium, urea, and creatinine and executes two measurement techniques simultaneously in a reusable sensor module. The combination of dual detection and reusable format allows continuous self-calibration, giving the ASTI instrument a significant advantage over single-use instruments currently in the marketplace. In other work, ASTI is developing other thin film technology for medical, sensor, and energy applications.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

Grant McGimpsey is a faculty member in Worcester Polytechnic Institute's Chemistry and Biochemistry Department and director of WPI's Bioengineering

Institute (BEI). Christopher Lambert is an associate research professor in BEI. The technology developed by Active Surface Technologies is the product of many years of research on surface chemistry, thin film devices, nanotechnology, molecular scale devices, micro- and nano-fluidics, and biosensors.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The early R&D on the ASTI sensor device was supported by the Department of Defense through the US Army Medical Research and Materiel Command, which oversees the Army's Telemedicine and Advanced Technologies Research Center (TATRC).

**FOUNDER(S):** Robert S. Capon, Dr. Joel Linden and Dr. Timothy MacDonald

**EMPLOYEES:** 161

**HEADQUARTERS:** Charlottesville, VA

**FOUNDED:** 1999

**ACQUIRED:** 2008

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** University of Virginia

**FUNDING AGENCY(S):** National Institutes of Health, US Department of Agriculture

# Adenosine Therapeutics, LLC

*(Acquired by Clinical Data)*

**CONTACT:** Adenosine Therapeutics, LLC  
PO Box 4632  
Charlottesville, VA 22905  
[www.clda.com](http://www.clda.com)

## **ABOUT THE COMPANY:**

Supported by research grants from the National Institutes of Health and the US Department of Agriculture, the University of Virginia has led research into adenosine, a molecule found in all cells. The body uses adenosine to signal inflammation and tissue injury. Understanding this compound has the potential to unleash therapies to treat heart disease, diabetes, arthritis, cancer and atherosclerosis.

Joel Linden, University of Virginia professor of cardiovascular medicine and Timothy Macdonald, University of Virginia professor of chemistry recognized the power of this research. They collaborated with business leader Robert Capon to establish a startup company based around University of Virginia patents in this area. The company, Adenosine Therapeutics, was acquired in 2008 by Clinical Data, a global pharmaceutical company.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

Since its founding in 1999 by Joel Linden, University of Virginia professor of cardiovascular medicine and Timothy MacDonald, University of Virginia professor of chemistry, Adenosine Therapeutics has maintained its ties to the University of Virginia and its support of university-based research. In collaboration with many different researchers, the company participated in a large

number of Small Business Innovation Research grants, thereby enabling basic and translational research with federal funding. This research has resulted in over 20 patents held by University of Virginia and nearly \$3 million in sponsored research by the company. In addition, tens of millions of dollars of University of Virginia basic research grants have been won using Adenosine Therapeutics compounds, and over 100 scientific papers have been published on the pharmacology and physiology of adenosine. The company has given over one million dollars to the University of Virginia Patent Foundation, employed numerous University of Virginia students, and has also participated in business school cases at the Darden Business School.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Research uncovering adenosine's role in cell signaling and the development of specialized molecules has been supported by grants from the National Institutes of Health and the US Department of Agriculture.

**FOUNDER(S):** Yitzhak Mendelson, PhD and R. James Duckworth, PhD

**EMPLOYEES:** 2

**HEADQUARTERS:** Worcester, MA

**FOUNDED:** 2007

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** Worcester Polytechnic Institute

**FUNDING AGENCY(S):** Department of Defense

# Advanced Body Sensing, LLC

**CONTACT:** Advanced Body Sensing, LLC  
Life Sciences & Bioengineering Center at Gateway Park  
60 Prescott Street  
Worcester, MA 01605  
[www.absensing.com](http://www.absensing.com)

## **ABOUT THE COMPANY:**

Founded by experienced researchers in biomedical instrumentation and electrical and computer engineering, Advanced Body Sensing is dedicated to the development of wireless wearable physiological sensors. The vision of Advanced Body Sensing is to develop robust wearable physiological sensors for wireless monitoring of vital signs. Current research areas include biomedical sensors for noninvasive applications, pulse oximetry, photoplethysmography, spectrophotometry, patient monitoring, physiological signal processing, real-time physiological data acquisition, and wearable sensors.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

Yitzhak Mendelson and James Duckworth are faculty members in Worcester Polytechnic Institute's (WPI) Biomedical Engineering and Electrical and Computer Engineering departments, respectively. Building on more than 20 years of research they have completed at WPI, the company is developing a small, wearable, wireless, physiological sensor for noninvasive status monitoring. It is designed to be used by soldiers during combat missions, firefighters, high risk mission specialists, and mass casualties in disaster areas. The system will facilitate remote triage and improved casualty status assessment.

#### **ROLE OF FEDERAL RESEARCH FUNDING:**

The research that led to development of Advanced Body Sensing's wearable pulse oximetry technology was supported by the Department of Defense through the US Army's Telemedicine and Advanced Technologies Research Center (TATRC).

FOUNDER(S): Yvonne Paterson, PhD  
EMPLOYEES: 9  
HEADQUARTERS: North Brunswick, NJ  
FOUNDED: 2002  
REVENUE: \$65,736 FY08  
TSC MEMBER INSTITUTION: University of Pennsylvania  
FUNDING AGENCY(S): National Institutes of Health

# Advaxis, Inc.

## *Technology in Immunotherapy*

CONTACT: Advaxis, Inc.  
The Technology Centre of New Jersey  
675 U.S. Route 1, Suite 117  
North Brunswick, NJ 08902  
[www.advaxis.com](http://www.advaxis.com)

### ABOUT THE COMPANY:

Advaxis, Inc. is a biotechnology company that uses a live genetically modified infectious microorganism to activate the immune system to treat cancer, infectious disease or allergic syndromes.

### UNIVERSITY-BASED RESEARCH CONNECTION:

Based on more than 20 years of innovative work by Yvonne Paterson, PhD, Professor of Microbiology at the University of Pennsylvania, it has been found that the unique microbe *Listeria monocytogenes* is capable of stimulating numerous aspects of the immune system simultaneously, coordinating innate, humoral (antibody) and cellular adaptive immune responses in an extremely effective response to existing cancers and other diseases. Unlike other therapeutic approaches, in pre-clinical research Advaxis' *Listeria* technology has been able to consistently demonstrate complete therapeutic responses resulting in complete tumor regression.

### ROLE OF FEDERAL RESEARCH FUNDING:

The basic research at the University of Pennsylvania that led to the development of this technology was supported by research grants from the National Institutes of Health.



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FOUNDER(S): Dr. Donald B. Rice and Dr. Arie Beldegrun

EMPLOYEES: 1,900 (Astellas Pharma US)

HEADQUARTERS: Santa Monica, CA

FOUNDED: 1996

ACQUIRED: 2007

REVENUE: N/A

TSC MEMBER INSTITUTION: University of California, Los Angeles

FUNDING AGENCY(S): National Institutes of Health

# Agensys, Inc.

(Acquired by Astellas Pharma US)

CONTACT: Astellas Pharma US  
Three Parkway North  
Deerfield, IL 60015  
[www.astellas.us](http://www.astellas.us)

## ABOUT THE COMPANY:

In 1996, Dr. Don Rice and researchers from the Urology Department at the David Geffen School of Medicine at University of California, Los Angeles (UCLA), founded UroGenesys, now called Agensys. The company got its start when the UCLA researchers, funded by the National Institutes of Health, discovered genes associated with certain solid tumor cancers. These discoveries led to the development of antibody treatments for those cancers.

Company co-founder Dr. Arie Beldegrun told *Medical News Today* “As clinicians and scientists, we wanted to build on the discoveries made in our individual labs to help move cancer research forward from the bench to the bedside.”

The company started with four patents and a handful of employees and has grown into a robust biotechnology company that conducts antibody R&D for 14 different types of cancer and is capable of bringing a product all the way through early-stage clinical trials. The company has discovered and developed a large portfolio of novel clinically relevant targets for prostate, bladder, pancreatic, and kidney cancers. Agensys was acquired by Astellas Pharma US, the US affiliate of Tokyo-based Astellas Pharma, Inc., in December 2007.

When Astellas Pharma acquired Agensys in 2007, a portion of the selling price went to UCLA as part of a groundbreaking licensing agreement in which the university received part equity in the firm as partial consideration.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Agensys, Inc. was founded as UroGenesys in 1996 by Dr. Don Rice and researchers from the Urology Department at the David Geffen School of Medicine at UCLA. The early goal was to discover genes and develop drugs to use in the treatment of prostate cancer. Toward that aim, the UCLA Office of Intellectual Property licensed four patents to the fledgling company, which used them to raise \$8 million in the first round of venture capital financing.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The National Institutes of Health funded the UCLA research that led to discoveries patented by Agensys' founders, such as their proprietary target Prostate Stem Cell Antigen (PSCA).

FOUNDER(S): Dr. Craig Miller and Saul Orbach

EMPLOYEES: N/A

HEADQUARTERS: Los Angeles, CA

FOUNDED: 2006

REVENUE: N/A

TSC MEMBER INSTITUTION: New York University and University of Southern California

FUNDING AGENCY(S): Department of Defense

# Aguru Images

## *Simply Achieving Reality*

CONTACT: Aguru Images  
5335 McConnell Avenue  
Los Angeles, CA 90066  
[www.aguruimages.com](http://www.aguruimages.com)

### ABOUT THE COMPANY:

Aguru is a computer graphics company whose technology can be used in applications from strikingly accurate digital images in motion pictures, to videos and computer games to renderings by interior, fashion, architectural and industrial designers. The technology addresses the thorny problem of making computer generated 3-D images look realistic. In fact, just about anyone who wants realistic lighting on everything from faces to brushed aluminum to fabrics can benefit from Aguru's technology.

Aguru uses "virtually lighting" technology licensed from two major research universities: New York University's Courant Institute of Mathematical Sciences and the University of Southern California's Institute for Creative Technologies.

### UNIVERSITY-BASED RESEARCH CONNECTION:

Aguru Images merged brilliant academic discoveries from universities on opposite sides of the United States — New York University (NYU) and the University of Southern California (USC).

The company has used science from researchers at NYU's Courant Institute of Mathematical Sciences and USC's Institute for Creative Technologies as well as from Paul Debevec, a research associate professor at USC's Institute for

Creative Technologies Graphics Lab who had come up with a complementary technology. Debevec's Light Stage 2 process was used by Sony Pictures Image Works to create photorealistic digital actors as part of its Academy Award-winning visual effects in "Spider Man 2," the Academy Award-nominated visual effects in "Superman Returns," and most recently "Spider Man 3."

**ROLE OF FEDERAL RESEARCH FUNDING:**

The USC Institute for Creative Technologies' basic research funding came from the US Army, through the Department of Defense.

**FOUNDER(S):** Dr. Jean-Claude Falmagne

**EMPLOYEES:** 75

**HEADQUARTERS:** Tustin, CA

**FOUNDED:** 1996

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** University of California, Irvine

**FUNDING AGENCY(S):** National Science Foundation

# ALEKS Corporation

**CONTACT:** ALEKS Corporation  
15641 Red Hill Avenue, Suite 150  
Tustin, CA 92780  
[www.aleks.com](http://www.aleks.com)

## **ABOUT THE COMPANY:**

ALEKS Corporation is a leader in the creation of web-based, artificially intelligent educational software. ALEKS assessment and learning technologies were originally developed by a team of cognitive scientists and software engineers at the University of California, Irvine, with major funding from the National Science Foundation. ALEKS is founded on ground-breaking research in mathematical cognitive science and applied mathematics. Through adaptive questioning, ALEKS accurately assesses a student's knowledge state and then delivers targeted instruction on the exact topics a student is most ready to learn.

ALEKS has been used by millions of students in more than 50 academic subjects ranging from basic math to precalculus at thousands of institutions throughout the world.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

In 1993, Dr. Jean-Claude Falmagne assembled a team of software engineers, mathematicians, and cognitive scientists at University of California, Irvine. Dr. Falmagne's team created the core of the ALEKS interactive software system for portions of the arithmetic and algebra curricula. In May 1997, ALEKS

Corporation and the University of California entered into an exclusive world-wide license.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Dr. Falmagne's software was developed with support from grants from the National Science Foundation.

FOUNDER(S): Thomas Jurgensen, JD and Joseph Noel, PhD

EMPLOYEES: N/A

HEADQUARTERS: San Diego, CA

FOUNDED: 2002

REVENUE: N/A

TSC MEMBER INSTITUTION: University of Kentucky

FUNDING AGENCY(S): National Science Foundation

# Allylix, Inc.

*Innovative Products from Nature's Blueprints*

CONTACT: Allylix, Inc.  
6020 Cornerstone Court, Suite 260  
San Diego, CA 92121  
[www.allylix.com](http://www.allylix.com)

## ABOUT THE COMPANY:

Using proprietary technology developed in 2002 at the University of Kentucky's College of Agriculture and the Salk Institute for Biological Studies, Allylix has developed a way to produce a group of natural products called "terpenes" at low cost. In nature, plants produce minute quantities of terpenes to serve a number of different functions. Some are flavors and fragrances, others are anti-fungal and anti-viral and still others are insect repellents. Despite their enormous potential commercial value to the flavor and fragrance, insect repellent and pharmaceutical industries, terpenes have been underexploited because of high production costs. Allylix's proprietary technology platform has changed that.

Allylix's technology could soon make your fruit juice taste more citrusy when the company's version of nookatone is commercialized. Nookatone, one of three sesquiterpenes that Allylix is working with, is a grapefruit flavor that will be produced using yeast grade fermentation. Allylix recently licensed technology to a leading clean technology company to produce a specific class of terpenes for use in the development of fuels and fuel additives.



**UNIVERSITY-BASED RESEARCH CONNECTION:**

Allylix, Inc., a technology leader in the science and low-cost production of terpenes, is using proprietary technology developed in 2002 at the University of Kentucky's College of Agriculture and the Salk Institute for Biological Studies. Allylix has a research and development center at the University of Kentucky's Coldstream Research Campus in Lexington.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Early work that led to technologies used by Allylix received support from National Science Foundation.

FOUNDER(S): Dr. John Cioffi

EMPLOYEES: 26,300 (TI)

HEADQUARTERS: San Jose, CA

FOUNDED: 1992

ACQUIRED: 1998

REVENUE: N/A

TSC MEMBER INSTITUTION: Stanford University

FUNDING AGENCY(S): National Science Foundation

# Amati Communications Corporation

*(Acquired by Texas Instruments)*

CONTACT: Texas Instruments  
12500 TI Boulevard  
Dallas, TX 75243  
[www.ti.com](http://www.ti.com)

## ABOUT THE COMPANY:

In 1992, many people were touting fiber optic cables as the answer to growing consumer demand for bandwidth. Stanford researchers developed technology related to Discrete Multi-Tone (DMT) technology, the technology that came to be used in Asymmetric Digital Subscriber Line (ADSL) which provides broadband internet access to homes and businesses around the world. ADSL was revolutionary because it enabled use of the common telephone line to transmit large amounts of data quickly — at rates 30–100 times faster than the 56K analog modems.

In 1992, Stanford's Office of Technology Licensing issued an exclusive license to four patents to Amati Communications Corporation, which was founded by Stanford Professor John Cioffi. In 1995, Amati merged with ICOT, which was then acquired by Texas Instruments in 1998.

## UNIVERSITY-BASED RESEARCH CONNECTION:

Amati Communications Corporation began as a research project by Prof. John Cioffi and graduate students Jacky Chow, Peter Chow, Minnie Ho and Huiling Lou at Stanford University.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Dr. Cioffi's early research was supported in part by the National Science Foundation.

**FOUNDER(S):** Dr. Farnam Jahanian and Dr. G. Robert Malan  
**EMPLOYEES:** 125  
**HEADQUARTERS:** Chelmsford, MA  
**FOUNDED:** 2000  
**REVENUE:** \$40 million FY08  
**TSC MEMBER INSTITUTION:** University of Michigan  
**FUNDING AGENCY(S):** Department of Defense, National Science Foundation

# Arbor Networks

## *How Networks Grow*

**CONTACT:** Arbor Networks  
6 Omni Way  
Chelmsford, MA 01824  
[www.arbornetworks.com](http://www.arbornetworks.com)

### **ABOUT THE COMPANY:**

Arbor Networks is an online security company launched in 2000 by University of Michigan Computer Science professor Dr. Farnam Jahanian and doctoral student G. Robert Malan, who had developed technology in the University of Michigan Software Systems Lab.

The company boasts a 70 percent market share and 300 customers around the world. Their security solutions, which manage and protect the entire network — from the network core to the broadband edge — are deployed in the backbones of all the major service provider and MSO networks across the globe, including MCI, Sprint, AT&T, Earthlink, Asia Netcom and British Telecom. In 2006, Arbor Networks was named one of the twenty fastest growing private companies in North America.

### **UNIVERSITY-BASED RESEARCH CONNECTION:**

The company was launched in 2000 by University of Michigan computer science professor Dr. Farnam Jahanian and doctoral student G. Robert Malan, who had developed the technology in the U-M Software Systems Lab. Dr. Jahanian serves as Chairman of the Board and Dr. Malan as Chief Technology Officer.

Arbor Networks maintains R&D facilities in Ann Arbor, Michigan and has added over 60 jobs and an estimated \$20 million to the local economy.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The network security research conducted at the University of Michigan Software Systems Lab was supported by a \$1.5 million grant from the Department of Defense, through the Defense Advanced Research Projects Agency (DARPA). Earlier networking research was supported by grants from the National Science Foundation.

FOUNDER(S): William M. Partridge, MD

EMPLOYEES: 6

HEADQUARTERS: Santa Monica, CA

FOUNDED: 2004

REVENUE: \$430,000 FY08

TSC MEMBER INSTITUTION: University of California, Los Angeles

FUNDING AGENCY(S): Department of Defense, National Institutes of Health

# ArmaGen Technologies, Inc.

## *Biotechnology for the Brain*

CONTACT: ArmaGen Technologies, Inc.  
914 Colorado Avenue  
Santa Monica, CA 90401  
[www.armagen.com](http://www.armagen.com)

### ABOUT THE COMPANY:

In the 1980s, Dr. William Partridge, Professor of Medicine and Endocrinology at the University of California, Los Angeles (UCLA), and his research team were the first to show that there were receptor systems along the human blood-brain barrier (BBB) that acted as transport systems. In the two decades since, they have continued their research and, with the help of funding from the National Institutes of Health and the Department of Defense, have developed what they call “molecular Trojan horses” that can effectively deliver various drugs and gene therapies to the brain. ArmaGen Technologies, Inc. was founded in 2004 to use this technology to develop therapeutic products for treatment of conditions including Alzheimer’s disease, Parkinson’s disease, stroke, and brain cancer.

### UNIVERSITY-BASED RESEARCH CONNECTION:

ArmaGen Technologies, Inc. was founded in 2004 by Dr. William Partridge, Professor of Medicine and Endocrinology at UCLA. The company is a spin-off from Dr. Partridge’s laboratory at UCLA. When it was founded in 2004, ArmaGen signed a patent agreement with the University of California that gave the company exclusive license rights to pending and world-wide issued patents comprising a broad patent estate covering multiple technology

platforms for the delivery to the brain, and other organs, of drugs, recombinant proteins, and non-viral gene medicines.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Dr. Pardridge's research at UCLA has been funded by the National Institutes of Health and the Department of Defense. ArmaGen has received recent awards from the National Institute of Neurological Disorders and Stroke (NINDS) at NIH (September 2008) and the US Army (June 2008).

**FOUNDER(S):** Dr. Sunil Bharitkar, Philip Hilmes, Tomlinson Holman and Chris Kyriakakis

**EMPLOYEES:** less than 75

**HEADQUARTERS:** Los Angeles, CA

**FOUNDED:** 2002

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** University of Southern California

**FUNDING AGENCY(S):** National Science Foundation

# Audyssey Laboratories

**CONTACT:** Audyssey Laboratories  
350 S. Figueroa Street, Suite 233  
Los Angeles, CA 90071  
[www.audyssey.com](http://www.audyssey.com)

## ABOUT THE COMPANY:

Audyssey Laboratories is an audio sound technology company that has created a high-tech sound system that produces accurate, enveloping and distortion-free sound everywhere in one's listening room. Audyssey Laboratories has developed world class sound technologies for home, business and automotive use.

In late 1996, the National Science Foundation established a unique research center at University of Southern California (USC) that focused on immersive technologies. A key component of the Integrated Media Systems Center (IMSC) is the Immersive Audio Laboratory that was founded by Chris Kyriakakis and Tomlinson Holman. Over the past 10 years Tom and Chris have conducted research in audio signal processing, acoustics, and psychoacoustics.

The results of their interdisciplinary research have been published in more than 100 technical journals and several books. One of the most challenging problems that they addressed was the comprehensive understanding of the negative effects of room acoustics on sound reproduction. It took five years of intense research and experimentation and more than \$6 million in research funds to fully understand and solve this intricate problem. No other facility in the world had the scientific expertise and the resources to fundamentally examine and solve this problem.



**UNIVERSITY-BASED RESEARCH CONNECTION:**

Audyssey Laboratories was conceived at the prestigious Immersive Audio Laboratory at the University of Southern California in Los Angeles, California. Dr. Sunil Bharitkar, Philip Hilmes, Prof. Tomlinson Holman, and Prof. Chris Kyriakakis were all involved in conceiving and creating the technology that was the basis for “spinning out” the company in July, 2002. Today, they are, respectively, Audyssey’s Vice President for Research, Vice President for Engineering, Chief Scientist, and Chief Technology Officer.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The National Science Foundation established the research center at USC that focused on immersive technologies, where Audyssey was conceived.

FOUNDER(S): Dr. Seth Donahue  
EMPLOYEES: 6  
HEADQUARTERS: Kalamazoo, MI  
FOUNDED: 2007  
REVENUE: N/A  
TSC MEMBER INSTITUTION: Michigan Technological University  
FUNDING AGENCY(S): National Institutes of Health

# Aursos, Inc.

CONTACT: Aursos, Inc.  
350 E. Michigan Avenue, Suite 500  
Kalamazoo, MI 49007  
[www.aursos.com](http://www.aursos.com)

## ABOUT THE COMPANY:

Why is it that, while humans begin to show reduced bone mass and strength after even short periods of inactivity, black bears can hibernate for up to seven months and emerge without any loss in bone mass or strength? Dr. Seth Donahue and researchers at Michigan Technological University thought it was a question worth asking. The result was the isolation of a “bone-building biomarker” in the blood of black bears, which has great promise for osteoporosis treatment and prevention.

Aursos was founded in March of 2007. The company has licensed Dr. Donahue’s technology with an eye toward commercializing the therapeutic compounds found in black bears for the treatment and prevention of osteoporosis.

## UNIVERSITY-BASED RESEARCH CONNECTION:

Aursos is based upon patent-pending research discoveries from the laboratory of Dr. Seth Donahue at Michigan Technological University. The company has continued to sponsor research and validation of the technology in Dr. Donahue’s lab.

## **ROLE OF FEDERAL RESEARCH FUNDING:**

The research validating Dr. Donahue's discoveries was sponsored by the Michigan Universities Commercialization Initiative and the National Institutes of Health. Aursos, with partner Proteos, Inc. in Kalamazoo, Michigan, has received critical National Institutes of Health Small Business Technology Transfer funding for follow-on laboratory validation work conducted at Michigan Technological University.

**FOUNDER(S):** Daniel M. Skovronsky, MD, PhD

**EMPLOYEES:** 16

**HEADQUARTERS:** Philadelphia, PA

**FOUNDED:** 2005

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** University of Pennsylvania

**FUNDING AGENCY(S):** National Institutes of Health

# Avid Radiopharmaceuticals, Inc.

**CONTACT:** Avid Radiopharmaceuticals, Inc.  
3624 Market Street, 5th Floor  
Philadelphia, PA 19104  
[www.avidrp.com](http://www.avidrp.com)

## **ABOUT THE COMPANY:**

Avid is a clinical-stage, product-focused molecular imaging company with significant expertise and IP in the field of molecular brain imaging. Chronic diseases such as Alzheimer's disease, Parkinson's disease, dementia with Lewy bodies, and diabetes with mellitus affect tens of millions of people worldwide. Avid is working to develop novel molecular imaging agents that allow the detection of the earliest stages of these diseases, before clinical symptoms develop.

Avid has developed proprietary targeting agents to image amyloid plaques and is currently testing these compounds in clinical trials for the detection of Alzheimer's disease. Avid has demonstrated proof of mechanism in human trials with these agents. The Avid team is also developing novel agents targeted to the vesicular monoamine transporter (VMAT-2) to image pathology in dementia with Lewy bodies (DLB), Parkinson's disease (PD), and has a research project in diabetes mellitus (DM). These agents have the potential to revolutionize early diagnosis and monitoring of disease.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

The molecular imaging agents at the core of Avid's work were originally developed by Dr. Hank Kung at the University of Pennsylvania. Dr. Kung, Professor of Radiology and Pharmacology at the University of Pennsylvania, serves as

Avid's Chief Scientific Advisor, Chairman of the Scientific Advisory Board. He is regarded as a world leader in research and development of innovative radiopharmaceuticals for diagnosis of brain diseases including Alzheimer's disease and Parkinson's disease.

Avid founder Dr. Daniel Skovronsky was previously Scientific Director of High Throughput Screening and Drug Discovery at the Center for Neurodegenerative Disease Research at the University of Pennsylvania. He has more than 20 peer-reviewed publications and several National Institutes of Health funded grants on Alzheimer's disease research.

#### **ROLE OF FEDERAL RESEARCH FUNDING:**

The basic research at the University of Pennsylvania that led to the development of this technology was supported by research grants from the National Institutes of Health.

**FOUNDER(S):** Dr. Colleen Brophy, Lokesh Joshi and Dr. Alyssa Panitch

**EMPLOYEES:** 22 (Capstone)

**HEADQUARTERS:** Tempe, AZ

**FOUNDED:** 2004

**ACQUIRED:** 2006

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** Arizona State University

**FUNDING AGENCY(S):** National Institutes of Health

# AzERx, Inc.

*(Acquired by Capstone Therapeutics)*

**CONTACT:** Arizona Engineered Therapeutics, Inc.  
1275 West Washington  
Tempe, AZ 85281  
[www.capstonethx.com](http://www.capstonethx.com)

## **ABOUT THE COMPANY:**

Arizona Engineered Therapeutics Inc. (AzERx), a new company based on the research of three Arizona State University (ASU) professors, was formed in May 2004 to develop a drug that would be beneficial to people who have suffered a specific type of stroke induced by a subarachnoid hemorrhage in the brain. In February 2006, the company was acquired by OrthoLogic, Inc., a biotechnology company committed to developing a pipeline of novel therapeutic peptides and other molecules aimed at helping patients with under-served medical conditions. (OrthoLogic is today known as Capstone Therapeutics.)

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

The primary compound of AzERx is based on the research of Dr. Colleen Brophy, director of the Center for Protein and Peptide Therapeutics at Arizona State University's Biodesign Institute, and Lokesh Joshi, an associate professor and Dr. Alyssa Panitch, an assistant professor, both in the Harrington Department of Bioengineering of the Ira A. Fulton School of Engineering. Their AZX100 is a novel synthetic pre-clinical 24-amino acid peptide, one of a new class of compounds in the field of smooth muscle relaxation and fibrosis. AZX100 is currently being evaluated for commercially significant medical applications such as the treatment of pulmonary disease, the prevention of

hypertrophic and keloid scarring and intimal hyperplasia. Capstone has an exclusive worldwide license to AZX100.

**ROLE OF FEDERAL RESEARCH FUNDING:**

AZX100 was discovered at ASU with funding from the National Institutes of Health.

**FOUNDER(S):** Nancy Denslaw, Ron Hayes and Kevin Wang

**EMPLOYEES:** 26

**HEADQUARTERS:** Alachua, FL

**FOUNDED:** 2002

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** University of Florida

**FUNDING AGENCY(S):** Department of Defense

# Banyan Biomarkers, Inc.

**CONTACT:** Banyan Biomarkers, Inc.  
12085 Research Drive  
Alachua, FL 32615  
[www.banyanbio.com](http://www.banyanbio.com)

## **ABOUT THE COMPANY:**

There is currently no simple point-of-care blood test that emergency room physicians can use to establish whether a patient has brain trauma, or how severe it is. Banyan Biomarkers is the leader in developing blood test-based diagnostic products for the detection of traumatic brain injury (TBI). Banyan research has identified unique and proprietary biomarkers present in the patient's blood following injury to the brain. Detecting these biomarkers will provide the indications of brain trauma essential for earlier intervention and management. Accurate and early diagnosis in acute care environments can significantly simplify decisions about patient management including whether to admit, discharge or to administer other time consuming, expensive and often inaccurate diagnostic tests including computed tomography (CT) and magnetic resonance imaging (MRI) scans. Simple, rapid diagnostic tools will immensely facilitate allocation of the medical resources required to treat TBI and other brain injuries in military combat and civilian emergencies.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

The company was founded by University of Florida (UF) scientists Ron Hayes, Kevin Wang and Nancy Denslow with the vision of developing and commercializing biomarker diagnostic tests. Wang and Hayes established the Center



for Traumatic Brain Injuries Studies and the Center for Neuroproteomics and Biomarkers within UF's Evelyn F. and William McKnight Brain Institute. These programs have focused on neuroproteomic approaches for identifying potential brain injury biomarkers, and the use of animal models and clinical studies to reveal relationships between biomarkers and brain injury. These studies have produced an extensive pipeline of potential biomarkers which have been licensed to Banyan Biomarkers.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The enabling research was focused on developing a fast way for military doctors to diagnose traumatic brain injury in the field and was funded by the Department of Defense.

FOUNDER(S): John Kraft, Jon Snoddy and Jonathan Strietzel

EMPLOYEES: 22

HEADQUARTERS: Sherman Oaks, CA

FOUNDED: 2005

REVENUE: N/A

TSC MEMBER INSTITUTION: University of Southern California

FUNDING AGENCY(S): Department of Defense

# Big Stage Entertainment

CONTACT: Big Stage Entertainment  
15303 Ventura Boulevard, Suite 1050  
Sherman Oaks, CA 91403  
[www.bigstage.com](http://www.bigstage.com)

## ABOUT THE COMPANY:

Starting with federally funded research from the University of Southern California, Big Stage Entertainment developed breakthrough technology that allows users to easily create a life-like 3-D avatar of themselves. The avatars can be integrated into everything from famous movie scenes, TV shows and video games, to music videos, short video clips, virtual worlds, still images, user-generated content, instant messages, e-mails, social networks and more — instantly.

Chief Technology Officer Jon Snoddy, Chief Scientist Doug Fidaleo and their extraordinary team took what was formerly a complex, expensive, time-consuming process and made it available to any consumer with a digital camera to create a life-like 3-D-animated version of themselves in about 30 seconds.

With Big Stage's 3-D capture technology, users take three simple pictures of themselves with a digital camera and upload them to the Web, where they are quickly converted into a life-like 3-D avatar. Big Stage's proprietary technology automatically maps the contours of a user's face to generate an incredibly accurate replica of the user, fully equipped for animation. In under a minute, the avatar is born and fully alive through realistic movement and gestures. Users can then style it with a host of accessories, from hair to eyeglasses, tattoos, hats and more.

After users create and style their avatars, they can drop them into the library of Big Stage-enabled (BSE) user and professionally created content. This highly personalized content can then be shared by users across social networks, mobile phones and more.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Big Stage's life-like avatar creation system stems from advanced stereo reconstruction technology funded by multiple government grants as part of a nine-year cumulative research project at the University of Southern California.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Funding for the advanced stereo reconstruction technology was provided by the National Geospatial-Intelligence Agency, part of the Department of Defense, among other federal agencies.

**FOUNDER(S):** Kenneth Adler, PhD; Allen F. Gant and Indu Parikh, PhD

**EMPLOYEES:** N/A

**HEADQUARTERS:** Durham, NC

**FOUNDED:** 2002

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** North Carolina State University

**FUNDING AGENCY(S):** Environmental Protection Agency, National Institutes of Health

# BioMarck Pharmaceuticals, Ltd.

*Breathing new life into respiratory treatment*

**CONTACT:** BioMarck Pharmaceuticals, Ltd.  
Westpark Corporate Center  
4364 South Alston Avenue  
Durham, NC 27713-2280  
[www.biomarck.com](http://www.biomarck.com)

## **ABOUT THE COMPANY:**

BioMarck Pharmaceuticals, founded in 2002, is dedicated to the discovery and development of new drugs for the treatment of pulmonary diseases and disorders – such as bronchitis, asthma and cystic fibrosis — that are associated with the over-secretion of mucus and pulmonary inflammation. BioMarck’s Chief Scientist, Dr. Kenneth Adler of the Department of Molecular Biomedical Sciences at North Carolina State University (NCSU), is one of the best respected researchers in the field of airway disease. His research has been continuously funded by the National Institutes of Health for more than two decades and has also been supported by funding from the Environmental Protection Agency. His discoveries at NCSU provided the platform “MARCKS technology” for BioMarck.

BioMarck recently announced that the United States Patent and Trademark Office issued the company two new patents enhancing its intellectual property portfolio in support of its current lead drug for the treatment of chronic obstructive pulmonary disease.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

BioMarck’s platform technology is based on the research of Dr. Kenneth Adler of the Department of Molecular Biomedical Sciences at North Carolina State

University. BioMarck has licensed the “MARCKS technology” on a worldwide exclusive basis and includes therapeutic peptides and their analogs for the treatment of respiratory diseases related to mucus hypersecretion and inflammation in diseases such as asthma, COPD, cystic fibrosis, and rhinitis and certain non-respiratory diseases.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Development of the MARCKS technology at NCSU was supported by funding from the National Institutes of Health and the Environmental Protection Agency.

FOUNDER(S): Han Cao  
EMPLOYEES: 4  
HEADQUARTERS: Philadelphia, PA  
FOUNDED: 2003  
REVENUE: N/A  
TSC MEMBER INSTITUTION: Princeton University  
FUNDING AGENCY(S): National Institutes of Health

# BioNanomatrix, Inc.

*We show you the whole picture*

CONTACT: BioNanomatrix, Inc.  
3701 Market Street, 4th Floor  
Philadelphia, PA 19104  
[www.bionanomatrix.com](http://www.bionanomatrix.com)

## ABOUT THE COMPANY:

Until now, whole genome analysis has been slow, complicated and expensive. But in his laboratory in the Department of Electrical Engineering at Princeton University, Professor Stephen Chou developed a technology that could lead to a way to sequence DNA “so fast and cheap that an entire human genome can be read in eight hours for \$100 or less.” BioNanomatrix was founded in 2003 with technology exclusively licensed from Princeton University. The company’s development programs are partly supported by grants from the National Institutes of Health and the US Defense Advanced Research Projects Agency (DARPA). The company is also collaborating with commercialization partners for nearer-term applications.

The affordability, speed and simplicity of the technology are expected to make the routine use of genetic information feasible for genetic diagnostics, personalized medicine and biomedical research.

“If the company succeeds, a physician could biopsy a cancer patient’s tumor, sequence all its DNA, and use that information to determine a prognosis and prescribe treatment — all for less than the cost of a chest X-ray,” according to Technology Review Magazine. “If the ailment is lung cancer, for instance, the doctor could determine the particular genetic changes in the tumor cells and order the chemotherapy best suited to that variant.”

#### **UNIVERSITY-BASED RESEARCH CONNECTION:**

BioNanomatrix technology was developed at Princeton University in Professor Stephen Chou's laboratory in the Department of Electrical Engineering. Professor Chou, working in collaboration with Han Cao, on a project funded by the Defense Department's Advanced Research Projects Agency (DARPA), developed the company's core single-molecule nanoscale whole genome analysis technology. BioNanomatrix's technology is exclusively licensed from Princeton University. Han Cao serves as Chief Science Officer at BioNanomatrix.

#### **ROLE OF FEDERAL RESEARCH FUNDING:**

The work at Princeton that led to the technology behind BioNanomatrix was funded in part by the Department of Defense through its Defense Advanced Research Projects Agency (DARPA). The company's ongoing development programs are partly supported by grants from the National Institutes of Health and an \$8.8 million government award to jointly develop a platform capable of sequencing the entire human genome at a cost of just \$100.

FOUNDER(S): Giles C. Shih, PhD and Jason C.H. Shih, PhD

EMPLOYEES: N/A

HEADQUARTERS: Morrisville, NC

FOUNDED: 1999

REVENUE: N/A

TSC MEMBER INSTITUTION: North Carolina State University

FUNDING AGENCY(S): US Department of Agriculture

# BioResource International, Inc.

*Harnessing the natural power of enzymes*

CONTACT: BioResource International, Inc.  
627 Davis Drive, Suite 600  
Morrisville, NC 27560  
[www.briworldwide.com](http://www.briworldwide.com)

## ABOUT THE COMPANY:

BioResource International (BRI) is a global biotechnology company focused on the discovery and development of enzymes to enhance and protect animal and human health. BRI's patented Versazyme™ is a feed additive that has been shown to improve the nutritional value of feed in a number of academic and commercial feeding trials. In addition, BRI has developed an enzyme product called Valkerase™ that can turn poultry feathers into a digestible and nutritious poultry feed additive.

BRI, in collaboration with researchers in the United States and Europe, has also developed a patented process that can be used to disinfect instruments and equipment that may transmit BSE ("Mad Cow Disease") and the human form of the disease, CJD (Creutzfeldt-Jakob Disease).

## UNIVERSITY-BASED RESEARCH CONNECTION:

Research conducted by Dr. John Shih of the Department of Poultry Science at North Carolina State University resulted in several inventions related to improving animal health and nutrition. The technology, now exclusively licensed to BRI, was further developed in NC State's Technology Incubator.



**ROLE OF FEDERAL RESEARCH FUNDING:**

Development of the technology was supported by funding from the US Department of Agriculture.

**FOUNDER(S):** Dr. James F. Garvey and Dr. John Lordi

**EMPLOYEES:** 8

**HEADQUARTERS:** Buffalo, NY

**FOUNDED:** 2005

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** University at Buffalo

**FUNDING AGENCY(S):** Department of Defense

# Buffalo BioBlower Technologies, LLC

**CONTACT:** Buffalo BioBlower Technologies, LLC  
4455 Genesee Street  
Buffalo, NY 14225  
[www.buffalobioblower.com](http://www.buffalobioblower.com)

## **ABOUT THE COMPANY:**

Buffalo BioBlower Technologies develops products that instantaneously sterilize high-volume airstreams; all spores, bacteria and viruses in the airstream are killed. BioBlower products are based on patented technology that uses compressive heating to sterilize air. No chemicals, radiation or filters are required. Additionally, a BioBlower moves as well as sterilizes the air, eliminating the need for fans required in HEPA filtration, radiation and other competitive technologies. Potential applications include healthcare facilities, military, homeland defense, emergency response, pharmaceutical production, and food production, among others.

In 2008, tests conducted by the US Department of Defense (DOD) found that the BioBlower destroyed biological agents to a level of better than one part per million. The company is currently completing a DOD contract to scale up the BioBlower technology to allow for protection of an entire building from external biological attack.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

Buffalo BioBlower Technologies was incorporated in 2005 to commercialize BioBlower™ technology invented at the University at Buffalo where the

inventors and founders of the Company, Dr. John Lordi and Dr. Jim Garvey, are both professors.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Initial development of the technology was funded by the Department of Defense, the University at Buffalo and NYSTAR (New York State Foundation for Science, Technology and Innovation).

**FOUNDER(S):** Richard Newton, James Soloman and Alberto Sangiovanni-Vincentelli  
**EMPLOYEES:** 4,900  
**HEADQUARTERS:** San Jose, CA  
**FOUNDED:** 1983 as SDA Systems; merged with ECAD in 1987  
**REVENUE:** \$ 1 Billion FY08  
**TSC MEMBER INSTITUTION:** University of California, Berkeley  
**FUNDING AGENCY(S):** Department of Defense

# Cadence Design Systems

**CONTACT:** Cadence Design Systems  
2655 Seely Avenue  
San Jose, CA 95134  
[www.cadence.com](http://www.cadence.com)

## ABOUT THE COMPANY:

To keep pace with market demand for more performance and functionality in today's mobile phones, digital cameras, computers, automotive systems and other electronics products, manufacturers pack billions of transistors onto a single chip. This would not be technologically possible without "electronic design automation" (EDA).

Cadence Design Systems (started as SDA Systems in 1983 and renamed after its merger with ECAD in 1987) is one of the world's leading EDA companies. It had its roots in University of California, Berkeley's research program in design automation, which received funding from the Department of Defense. It is now the second largest firm in the electronic design automation industry.

Cadence customers use their software, hardware, and services to overcome a range of technical and economic hurdles. Cadence's technologies help customers create mobile devices with longer battery life. Designers of ICs for game consoles and other consumer electronics speed their products to market using Cadence hardware simulators to run software on a 'virtual' chip — long before the actual chip exists. Cadence bridges the traditional gap between chip designers and fabrication facilities, so that manufacturing challenges can be addressed early in the design stage.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

SDA Systems (now known as Cadence Design Systems) was formed by James Solomon, a University of California, Berkeley alumnus, and two faculty members in the department of electrical engineering at UC Berkeley, Richard Newton and Alberto Sangiovanni-Vincentelli, to support and improve upon SPICE and other electronic design automation software developed at UC Berkeley. In 1993, Cadence established the Cadence Research Laboratories (CRL) in Berkeley to focus on advanced research in Electronic Design Automation. CRL maintains a variety of collaborations with other research institutions and universities. But it is particularly involved with the University of California, Berkeley.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Development of SPICE and other electronic design automation programs at UC Berkeley was funded by the Department of Defense.

FOUNDER(S): Ram Sasiskharan, PhD and Shiladitya Sengupta, PhD

EMPLOYEES: N/A

HEADQUARTERS: Cambridge, MA

FOUNDED: 2006

REVENUE: N/A

TSC MEMBER INSTITUTION: Massachusetts Institute of Technology

FUNDING AGENCY(S): National Institutes of Health

# Cerulean Pharma, Inc.

## *Pioneering the Field of Nanobiology*

CONTACT: Cerulean Pharma, Inc  
161 First Street  
Cambridge, MA 02142  
[www.ceruleanrx.com](http://www.ceruleanrx.com)

### ABOUT THE COMPANY:

Nanopharmaceuticals are a revolutionary new approach to designing drugs within ultra-small particles and enhancing their properties with the goal of creating improved therapies for fighting disease.

Within the field of nanopharmaceuticals, Cerulean Pharma is uniquely focused on a next-generation approach it calls nanobiology. Cerulean's nanobiology-based drug development is based on a deep understanding of the complex biological microenvironment of human disease combined with engineering therapies on a nanoscale, enabling the creation of breakthrough drugs that optimally target the root causes of disease. Cerulean is focused on the therapeutic areas of oncology and autoimmune and inflammatory diseases.

An example of Cerulean's nanobiology focus is its first technological application, the Nanocell. Licensed exclusively from the Massachusetts Institute of Technology (MIT), Cerulean uses its proprietary Nanocell technology to develop multi-compartmental nanoparticle-based therapeutics in which two or more drugs with varied release times are packaged within the Nanocell, allowing for sequential delivery of the drugs, optimizing the location, time and combinatorial effect of two therapies while minimizing toxicities.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Cerulean Pharma, originally called Tempo Pharmaceuticals, was co-founded by Ram Sasisekhran of Massachusetts Institute of Technology and Shiladitya Sengupta of Harvard Medical School. Both continue to serve as scientific advisors to the company. In addition, Sasisekharan serves as a member of the Board of Directors, and is the Edward Hood Taplin Professor of Health Sciences & Technology and Biological Engineering at MIT. Sengupta is an Assistant Professor at Harvard Medical School.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The basic research behind the Nanocell technology was conducted at MIT with support from the National Institutes of Health.

FOUNDER(S): Dr. Daphne Preuss

EMPLOYEES: 30

HEADQUARTERS: Chicago, IL

FOUNDED: 2001

REVENUE: N/A

TSC MEMBER INSTITUTION: University of Chicago

FUNDING AGENCY(S): National Science Foundation

# Chromatin, Inc.

*Unlocking the hidden potential in nature*

CONTACT: Chromatin, Inc.  
3440 South Dearborn Street, Suite 280  
Chicago, IL 60616  
[www.chromatininc.com](http://www.chromatininc.com)

## ABOUT THE COMPANY:

Chromatin's patented mini-chromosome technologies enable the development of new seed products and the delivery of multiple genetic traits. Consumers, growers, seed companies, and processors derive greater value from crop plants through the application of Chromatin's technologies. More efficient and faster product development, greater product differentiation, and creation of novel products are among the benefits Chromatin's technologies deliver to these users.

Chromatin is now entering the bioenergy feedstock market, where there are significant opportunities to create and capture value using the company's transformation technology. Chromatin's first feedstock products are targeting crops such as switchgrass, miscanthus, sorghum and sugarcane where the addition of traits can improve crop and sugar yield and allow digestion of cellulosic fiber. Chromatin is also using this synthetic biology technology to develop scalable and competitive solutions for the North American cellulosic biofuels market.

## UNIVERSITY-BASED RESEARCH CONNECTION:

Dr. Daphne Preuss did pioneering research into chromosomes and chromosome assembly at the University of Chicago. Working with Arabidopsis, a weed variant of mustard, she invented techniques for identifying the location of



centromeres and for inserting gene plasmids. In 2000, the team secured its first of many patents through the University of Chicago; in 2004 the company received \$7.3 million in funding.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The majority of Dr. Preuss' enabling work was funded by National Science Foundation grants.

**FOUNDER(S):** Leonard Bosack and Sandra Lerner  
**EMPLOYEES:** 66,129  
**HEADQUARTERS:** San Jose, CA  
**FOUNDED:** 1984  
**REVENUE:** \$39.5 Billion FY08  
**TSC MEMBER INSTITUTION:** Stanford University  
**FUNDING AGENCY(S):** Department of Defense

# Cisco Systems, Inc.

## *Changing the Way We Work*

**CONTACT:** Cisco Systems, Inc.  
170 West Tasman Drive  
San Jose, CA 95134  
[www.cisco.com](http://www.cisco.com)

### **ABOUT THE COMPANY:**

Cisco Systems, Inc. is the world's leading supplier of computer networking products, systems, and services. Cisco was born 25 years ago out of a need to address a simple problem: Husband and wife Len Bosack and Sandy Lerner, both working for Stanford University, wanted to email each other from their respective offices located in different buildings but couldn't due to technological shortcomings. A technology had to be invented to deal with disparate local area protocols. In solving their problem the multi-protocol router was born. Since then Cisco has helped shape the Internet and transformed how people connect, communicate and collaborate.

### **UNIVERSITY-BASED RESEARCH CONNECTION:**

Len Bosack and Sandra Lerner both earned their graduate degrees at Stanford University and were employed by the university in the early 1980s. Bosack was the Director of Computer Facilities for Stanford's Department of Computer Science, and Lerner was Director of Computer Facilities for Stanford's Graduate School of Business. In his role at Stanford's Department of Computer Sciences, Bosack was instrumental in Stanford's participation in the evolving Department of Defense-funded Internet.

## **ROLE OF FEDERAL RESEARCH FUNDING:**

Bosack was involved in Stanford's Department of Defense-funded work through the Defense Advanced Research Projects Agency (DARPA) to develop the Internet.

**FOUNDER(S):** Marilyn Matz, Dr. Robert J. Shillman and William Silver

**EMPLOYEES:** 729

**HEADQUARTERS:** Natick, MA

**FOUNDED:** 1981

**REVENUE:** \$243 million FY08

**TSC MEMBER INSTITUTION:** Massachusetts Institute of Technology

**FUNDING AGENCY(S):** National Science Foundation

# Cognex Corporation

**CONTACT:** Cognex Corporation  
One Vision Drive  
Natick, MA 01760  
[www.cognex.com](http://www.cognex.com)

## **ABOUT THE COMPANY:**

Founded in 1981 by three academics, Cognex is the world's largest supplier of industrial machine vision. Cognex vision systems and sensors help companies improve their manufacturing quality and performance by eliminating defects, verifying assembly, and tracking and capturing information at every stage of production. Cognex vision systems perform tasks that are difficult or impossible for people to do reliably and consistently — such as finding very small product defects on high-speed production lines, capturing and recording complex identification information, and guiding robots. The TV-like cameras that Cognex makes equip computers with artificial eyesight, without which razor blades could not be made in quantity — and semiconductor chips could not be made at all. And the three founding academics? They are still actively engaged in the company's day-to-day operations.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

Cognex Corporation was founded by Dr. Robert J. Shillman, a lecturer in human visual perception at the Massachusetts Institute of Technology (MIT). Dr. Shillman decided to leave academia to start Cognex, investing his life savings into the company. He invited two MIT graduate students — Marilyn Matz and Bill Silver — to embark on this business venture with him, offering

free bicycles to convince them to leave MIT for a summer. What began as a summer job for Marilyn and Bill turned out to be the start of a career, as they stayed on to help co-found the company. These three individuals gave Cognex its start — and its name, which was derived from the phrase “Cognition Experts.” Today, Shillman is Cognex’s Chairman and CEO, Matz is Senior Vice President of the Vision Software Business Group, and Silver is Senior Vice President and Senior Fellow, pursuing research into new product areas. The company continues to focus heavily on its technology. A 2004 *Fortune* article about Cognex noted, “More than 100 of its employees possess advanced degrees in industrial machine vision — the largest concentration of such specialists at any university or company.”

#### **ROLE OF FEDERAL RESEARCH FUNDING:**

Cognex was founded to develop a commercial product based on research in machine vision that Dr. Shillman carried out as a National Science Foundation Fellow at MIT.

**FOUNDER(S):** Calvin H. Carter, Jr., Eric Hunter, Neil Hunter and John Palmour  
**EMPLOYEES:** 3,168  
**HEADQUARTERS:** Durham, NC  
**FOUNDED:** 1987  
**REVENUE:** \$131 million FY08  
**TSC MEMBER INSTITUTION:** North Carolina State University  
**FUNDING AGENCY(S):** Department of Defense

# CREE, Inc.

**CONTACT:** CREE, Inc.  
4600 Silicon Drive  
Durham, NC 27703  
[www.cree.com](http://www.cree.com)

## **ABOUT THE COMPANY:**

Cree, Inc. is a market-leading innovator and manufacturer of semiconductors that enhance the value of LED solid-state lighting, power and communications products by significantly increasing their energy performance. Cree customers range from innovative lighting fixtures makers to defense-related federal agencies.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

The scientific work that led to the founding of Cree, Inc. began in the early 1980s at North Carolina State University (NCSU), where brothers Eric Hunter and Neal Hunter, along with Calvin Carter, began investigating the physical and electronic properties of silicon carbide (SiC), a rare, naturally occurring material. Their first work was funded by the Office of Naval Research (ONR), which hoped to develop processes for the production of microwave transistors from SiC that would supply the basis for higher power electronic systems for military aircraft.

The physical characteristics of silicon carbide led researchers to believe that the material possessed significant advantages over the semiconductor materials being used at the time, such as silicon. It was thought that silicon carbide-based devices would be able to operate at much higher temperatures, much higher power and voltage levels, and much higher frequencies than those made

from silicon. It was also believed that blue light emitting LEDs could be produced from silicon carbide. The problem with silicon carbide is that it was difficult to work with — it is extremely hard, which makes it difficult to cut into wafers and etch with circuits; its crystals have to be grown at temperatures above 3,500 degrees Fahrenheit; and the crystals have to be grown carefully because silicon carbide can crystallize in more than 100 atomic arrangements, many of which make the end product unusable.

The NCSU team found ways around many of these barriers; it developed proprietary processes for growing bulk SiC in single crystalline form, for applying SiC films, and for dry etching the material. In July 1987 the core group of scientists left NCSU and formed Cree Research, Inc. in Research Triangle Park, North Carolina.

#### **ROLE OF FEDERAL RESEARCH FUNDING:**

The research that led to CREE was supported in part by the Department of Defense Office of Naval Research.

**FOUNDER(S):** Robert J. Hickey, PhD, Derek J. Hoelz, PhD, Linda H. Malkas, PhD, and Lauren Schnaper, MD

**EMPLOYEES:** 5

**HEADQUARTERS:** Indianapolis, IN

**FOUNDED:** 2006

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** Indiana University

**FUNDING AGENCY(S):** National Institutes of Health

# CS-Keys, Inc.

*Changing the way pathologists see cancer*

**CONTACT:** CS-Keys, Inc.  
2461 Directors Row, Suite K  
Indianapolis, IN 46241  
[www.cs-keys.com](http://www.cs-keys.com)

## **ABOUT THE COMPANY:**

What if a simple tissue or blood test could help doctors quickly tell whether tumors are benign or cancerous? It could mean earlier, less invasive therapies, fewer treatment-related problems and, ultimately, more cancer survivors. This was the challenge tackled by researchers at Indiana University (IU). The product of their research, which was largely funded by the National Institutes of Health and the National Cancer Institute, is CS-Keys. The company has already identified a “biomarker” that distinguishes healthy cells from cancerous cells and can detect the diseased cells when there are only a few present.

The company plans to develop, manufacture, and distribute inexpensive cancer-specific blood and tissue tests that can be used in doctors’ offices. Though research has focused primarily on breast cancer to date, findings can also be applied to other cancers, including those of the esophagus, cervix, and ovaries.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

CS-Keys was founded to develop and commercialize products based on Indiana University research.



**ROLE OF FEDERAL RESEARCH FUNDING:**

Approximately \$7 million in federal funding from the National Institutes of Health and its National Cancer Institute was directed at IU's basic science, which formed the foundation of the technology being developed for commercialization by CS-Keys.

FOUNDER(S): Dr. Haydn Wadley

EMPLOYEES: 15

HEADQUARTERS: Charlottesville, VA

FOUNDED: 2000

REVENUE: \$2.4 million FY08

TSC MEMBER INSTITUTION: University of Virginia

FUNDING AGENCY(S): Department of Defense, Department of Energy,  
National Science Foundation

# Directed Vapor Technologies International, Inc.

*Coating technology for the future*

CONTACT: Directed Vapor Technologies International, Inc.  
2 Boar's Head Lane  
Charlottesville, VA 22903  
[www.directedvapor.com](http://www.directedvapor.com)

## ABOUT THE COMPANY:

In the mid-1990s, University of Virginia Professor Haydn Wadley and his team of researchers invented a revolutionary new coating method that could be used by manufacturers. The technology they created, "Directed Vapor Deposition (DVD)," is akin to "spray painting" coating. It can be used on such products as turbine engines, batteries and liquid crystal displays. DVD allows coatings to be applied faster, with a greater variety of materials, with greater control and at lower cost than other methods. Directed Vapor Technologies International, Inc. (DVTI) was formed in 2000 to capitalize on Dr. Wadley's patents associated with this coating method.

## UNIVERSITY-BASED RESEARCH CONNECTION:

Directed Vapor Deposition (DVD) is a novel physical vapor deposition tool invented at the University of Virginia in the School of Engineering and Applied Science Material Laboratory under the direction of Haydn Wadley, PhD.

DVTI recently opened a 6,000 sq. ft. manufacturing facility in Albemarle County, Virginia, and maintains its relationship with the University by hiring interns, recent graduates and alumni. The company has sponsored research at the University in the amount of \$150,500. The company also works closely

with the University of Virginia Patent Foundation to manage DVTI's extensive intellectual property portfolio.

As the university's publication *Explorations* reports, "Wadley sees himself engaged in the interrelated activities of training students and doing basic research at the frontiers of materials science and physics. While his focus is on fundamental research, there are occasions when his work has led to patentable discoveries. Wadley believes that having University of Virginia intellectual property available to be licensed by startup companies is an important way to further economic development... he stresses that the decline in industrial research and development makes the role of universities even more critical."

#### **ROLE OF FEDERAL RESEARCH FUNDING:**

Development of the technologies behind DVTI was supported by grants from the Department of Defense through the Office of Naval Research, NAVAIR, Air Force Research Labs, and Army Research Labs, as well as the Department of Energy and National Science Foundation.

FOUNDER(S): J. Gary Eden and Sung-Jin Park

EMPLOYEES: 9

HEADQUARTERS: Somerset, NJ

FOUNDED: 2007

REVENUE: N/A

TSC MEMBER INSTITUTION: University of Illinois at Urbana-Champaign

FUNDING AGENCY(S): Department of Defense, National Science Foundation

# Eden Park Illumination, Inc.

CONTACT: Eden Park Illumination, Inc.  
903 N. Country Fair Road  
Champaign, IL 61821  
[www.edenpark.com](http://www.edenpark.com)

## ABOUT THE COMPANY:

Eden Park Illumination, Inc. was founded in May 2007, to develop and commercialize products based on new lighting technology called Microplasma. The company is committed to developing earth-friendly products and its activities encompass the research, development, manufacturing and commercialization of Microplasma Lighting™ systems for use in architectural projects. Microplasma is an earth-friendly, mercury-free light source with a long expected lifetime.

The company's co-founders, University of Illinois professors Gary Eden and Sung-Jin Park, are recognized world leaders in this field, with many years of research at the University of Illinois at Urbana-Champaign.

In May 2009, the company was awarded The Red Herring Top 100 Award, which recognizes the most promising startup technology companies on the continent. The company is also a nominee for the World Technology Network 2009 Technology Award.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Eden Park Illumination was founded by University of Illinois at Urbana-Champaign professors Gary Eden and Sung-Jin Park who are leaders in the areas of research, development and commercialization of Microplasma.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The work of professors Eden and Park at the University of Illinois Laboratory for Optical Physics and Engineering received support from the National Science Foundation and the Department of Defense, through the US Air Force Office of Scientific Research.

**FOUNDER(S):** Dr. Bruce Molitoris and James Strickland  
**EMPLOYEES:** 3  
**HEADQUARTERS:** Indianapolis, IN  
**FOUNDED:** 2006  
**REVENUE:** N/A  
**TSC MEMBER INSTITUTION:** Indiana University  
**FUNDING AGENCY(S):** National Institutes of Health

# FAST Diagnostics, Inc.

**CONTACT:** FAST Diagnostics, Inc.  
351 West 10th Street, Suite 210  
Indianapolis, IN 46202

## **ABOUT THE COMPANY:**

FAST Diagnostics is a medical technology company that has a patent-pending device and technology that will provide rapid and accurate measurement of kidney function. This technology will provide hospitals an important new tool for diagnosing kidney problems. Approximately seven percent of general hospital patients and 15 percent of intensive care unit patients suffer from acute kidney injury. Current measurement standards are trailing indicators, and thus, can take several days to indicate the presence of acute kidney injury. The new FAST Diagnostics test will provide a true measure of the glomerular filtration rate (kidney function) in 30 minutes.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

Founder, Dr. Bruce Molitoris is a professor in the Indiana University School of Medicine and is director of its Indiana Center for Biological Microscopy, where he uses some of the most sophisticated microscopy systems in the world to fuel his research. Molitoris also serves as the FAST Diagnostics medical director.

#### **ROLE OF FEDERAL RESEARCH FUNDING:**

The research conducted at Indiana University, which formed the basis for the intellectual property behind FAST Diagnostics was supported by funding from the National Institutes of Health (NIH).

FOUNDER(S): Dr. Michael Timmons  
EMPLOYEES: 11  
HEADQUARTERS: Groton, NY  
FOUNDED: 1996  
REVENUE: \$2 million FY08  
TSC MEMBER INSTITUTION: Cornell University  
FUNDING AGENCY(S): US Department of Agriculture

# Fingerlakes Aquaculture, Inc.

*Fresh from the great indoors*

CONTACT: Fingerlakes Aquaculture, Inc.  
502 E. Cortland Road  
Groton, NY 13073  
[www.tilapiaforyou.com](http://www.tilapiaforyou.com)

## ABOUT THE COMPANY:

Fingerlakes Aquaculture, Inc. is a high-tech and large-scale producer of branded, farm-raised fish. Fingerlakes utilizes an environmentally friendly indoor recirculating aquaculture system (RAS) to produce premium-quality fresh tilapia that can be eaten by customers within hours of the fish leaving the facility.

Fingerlakes production facility in Groton, New York, has the capacity to produce 1.25 million pounds of tilapia per year, which serves customers throughout the Eastern United States and Canada.

Fingerlakes Aquaculture is the largest indoor aquaculture facility in New York State, and one of the largest in North America.

## UNIVERSITY-BASED RESEARCH CONNECTION:

Founder, Dr. Michael Timmons, is a faculty member in Cornell University's Department of Biological and Environmental Engineering. Fingerlakes utilizes technology that was developed by the Cornell Aquaculture Program.

The Aquafilter technology was patented through the Cornell Research Foundation (CRF), and Fingerlakes has an exclusive worldwide license to use and distribute the technology. The Fingerlake's Aquafilter is a key to cost effectiveness.



The Aquafilter cleans the water efficiently, allowing the fish to grow quickly and convert a substantial amount of feed to body mass. As a result, production using Aquafilter technology is significantly higher than production using older technology, and operating costs per pound drop substantially.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The research that led to development of Fingerlakes technology was supported by the US Department of Agriculture.

**FOUNDER(S):** Dr. Yoshihiro Kawaoka, Dr. Gabriele Neumann and Paul V. Radspinner

**EMPLOYEES:** 8

**HEADQUARTERS:** Madison, WI

**FOUNDED:** 2007

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** University of Wisconsin-Madison

**FUNDING AGENCY(S):** National Institutes of Health

# FluGen, Inc.

*Focused on influenza*

**CONTACT:** FluGen, Inc.  
545 Science Drive  
Madison, WI 53711  
[www.flugen.com](http://www.flugen.com)

## **ABOUT THE COMPANY:**

The method for making influenza vaccines hasn't changed much since it was first created in the 1930s: A team of experts decides which viruses to target. Then chicken eggs are injected with the viruses and grown to create the vaccine. However, avian flu expert Dr. Yoshihiro Kawaoka and Dr. Gabriele Neumann at the University of Wisconsin-Madison have pioneered a new method, producing vaccine within cells (rather than embryonic chicken eggs), which will dramatically increase the speed and reduce the expense of making vaccines.

FluGen has licensed this technology and is an emerging leader in the development, production, and delivery of influenza vaccines and related infectious disease products. The new method could lead to the need for smaller facilities and means faster production of appropriate vaccines, critical in the event of a pandemic.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

FluGen was co-founded by Paul V. Radspinner and researchers Dr. Yoshihiro Kawaoka and Dr. Gabriele Neumann at the University of Wisconsin-Madison. The company licenses technology developed by the researchers at the UW-Madison Influenza Research Institute and patented by the Wisconsin Alumni Research Foundation (WARF).

**ROLE OF FEDERAL RESEARCH FUNDING:**

Initial and ongoing funding for both Dr. Kawaoka's and Dr. Neumann's research is provided by the National Institutes of Health.

**FOUNDER(S):** Herb Boyer and Robert Swanson

**EMPLOYEES:** 11,000

**HEADQUARTERS:** South San Francisco, CA

**FOUNDED:** 1976

**REVENUE:** \$13.4 billion FY08

**TSC MEMBER INSTITUTION:** University of California, San Francisco and Stanford University

**FUNDING AGENCY(S):** National Institutes of Health, National Science Foundation

# Genentech, Inc.

*In business for life*

**CONTACT:** Genentech, Inc.  
1 DNA Way  
South San Francisco, CA 94080  
[www.gene.com](http://www.gene.com)

## **ABOUT THE COMPANY:**

The story of how Herbert Boyer, a faculty member at University of California, San Francisco (UCSF) and Stanford University professor Stanley Cohen discovered recombinant DNA technology — over pastrami and corned beef sandwiches at a convention in Hawaii — has become the stuff of legends. The subsequent pioneering university-based research was supported by grants from the National Institutes of Health and the National Science Foundation and opened the door to the whole world of genetic engineering.

Boyer went on to establish Genentech, a leading biotechnology company. Established in 1976, it played a significant role in the formation of the biotechnology industry. Genentech develops and manufactures drugs for asthma, rheumatoid arthritis, blood clots, and a variety of cancers. In March 2009, Genetech became a wholly owned member of the Roche Group.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

Genentech was established by Herbert Boyer, a faculty member at University of California, San Francisco, in collaboration with Robert Swanson of Kleiner Perkins, a venture capital partnership. Genentech capitalized on recombinant DNA technology developed by Boyer at UCSF and Stanley Cohen at Stanford University.

## **ROLE OF FEDERAL RESEARCH FUNDING:**

Boyer and Cohen's pioneering research on recombinant DNA technology was supported by grants from the National Institutes of Health and the National Science Foundation.

**FOUNDER(S):** Donald G. Hildebrand and Dr. Harriet Robinson

**EMPLOYEES:** 12

**HEADQUARTERS:** Atlanta, GA

**FOUNDED:** 2001

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** Emory University

**FUNDING AGENCY(S):** National Institutes of Health

# GeoVax Labs, Inc.

## *Vaccines serving humanity*

**CONTACT:** GeoVax Labs, Inc.  
1256 Briarcliff Road  
Atlanta, GA 30306  
[www.geovax.com](http://www.geovax.com)

### **ABOUT THE COMPANY:**

In 1998 Dr. Harriet Robinson and her research team at the Emory Vaccine Center and Yerkes National Primate Research Center began working on a vaccine that could fight off HIV in uninfected people and potentially reduce the virus in those already infected by 100- to 1,000-fold. Emory and Dr. Robinson's team formed a company called GeoVax, now a \$100 million publicly held company.

The company aspires to develop, manufacture, and clinically test AIDS vaccines and obtain regulatory approval of these vaccines in the United States and in specified international markets. GeoVax is in the process of conducting five clinical trials. Successful results from all phase 1 trials of GeoVax's vaccines supported the initiation of the phase 2 trials of the company's product candidates. GeoVax's phase 2 human trials began in January 2009 and involve 225 participants at sites in the United States and South America.

### **UNIVERSITY-BASED RESEARCH CONNECTION:**

GeoVax's recombinant DNA and MVA AIDS vaccines were initially developed at Emory University by Dr. Harriet Robinson, in collaboration with researchers at the National Institute of Allergy and Infectious Diseases (NIAID) and the US Centers for Disease Control and Prevention (CDC). These vaccines com-

prise the major HIV-1 subtypes (A, B and C), and can be used alone or in combination, depending on a local infection.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Development of the Emory technologies was supported by grants from the National Institutes of Health. GeoVax's human trials are conducted by HIV Vaccine Trials Network established and funded by the NIH.

**FOUNDER(S):** Sergey Brin and Larry Page  
**EMPLOYEES:** 19,835  
**HEADQUARTERS:** Mountain View, CA  
**FOUNDED:** 1998  
**REVENUE:** \$21.7 billion FY08  
**TSC MEMBER INSTITUTION:** Stanford University  
**FUNDING AGENCY(S):** National Science Foundation

# Google Inc.

## *Search, Ads & Apps*

**CONTACT:** Google Inc.  
1600 Amphitheatre Parkway  
Mountain View, CA 94043  
[www.google.com](http://www.google.com)

### **ABOUT THE COMPANY:**

Google Inc. provides advertising and global Internet search solutions as well as intranet solutions via an enterprise search appliance. Google Inc. maintains an index of websites and other online content, which it makes freely available via its search engine to anyone with an Internet connection. It is focused on building products and services on its websites that benefit Google's users and let them find relevant information quickly and easily.

### **UNIVERSITY-BASED RESEARCH CONNECTION:**

Google Inc. began as a research project by Larry Page, who was soon joined by Sergey Brin, while they were both PhD students at Stanford University. They hypothesized that a search engine that analyzed the relationships between websites would produce a better ranking of results than existing techniques, which ranked results according to the number of times the search term appeared on a page. Their search engine was originally nicknamed "BackRub" because the system checked the backlinks to estimate the importance of a site.

### **ROLE OF FEDERAL RESEARCH FUNDING:**

Development of the search engine "BackRub" was supported by grants from the National Science Foundation.



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FOUNDER(S): Dr. Victor Strecher

EMPLOYEES: 118,700 (Johnson & Johnson)

HEADQUARTERS: New Brunswick, NJ (Johnson & Johnson)

FOUNDED: 1998

ACQUIRED: 2008

REVENUE: N/A

TSC MEMBER INSTITUTION: University of Michigan

FUNDING AGENCY(S): National Institutes of Health

# HealthMedia, Inc.

*(Acquired by Johnson & Johnson)  
Revolutionizing behavior change*

CONTACT: HealthMedia, Inc.  
130 South First Street  
Ann Arbor, MI 48104  
[www.healthmedia.com](http://www.healthmedia.com)

## ABOUT THE COMPANY:

University of Michigan professor Victor J. Strecher, PhD is an expert in health behavior and health education. He knew that ubiquitous health brochures did little to help people improve their health or change their behavior. The only way to help, he recognized, was to offer personalized counseling services, a prohibitively expensive solution for the masses. In 1998, using the pioneering research of the Health Media Research Laboratory (HMRL) at the University of Michigan, funded in part by the National Cancer Institute, he founded HealthMedia and developed a methodology and technology that effectively emulates a health coaching session, but without the coach.

HealthMedia, Inc. is the global leader in scalable behavior change interventions with outcomes. HealthMedia's proven outcomes increase compliance, reduce medical utilization, and increase productivity — boosting profitability for health plans, employers, pharmaceutical companies, and behavioral health organizations. A fusion of their own unique technology and proven behavioral science, HealthMedia delivers individually tailored behavior change interventions for health and wellness, disease management, behavioral health, and medication compliance.

Clients include Kaiser Permanente, UPS, Cleveland Clinic, Johnson & Johnson, GSK, and eight Blue Cross Blue Shield organizations across the United States.

HealthMedia partners include APS Healthcare, Corphealth, Health Dialog, Wellsource, and SHPS. In October 2008, Johnson & Johnson acquired HealthMedia, Inc.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Founded in 1998, by Dr. Victor Strecher, a leading expert in health behavior and health education at the University of Michigan, HealthMedia's products are backed by more than 20 years of behavioral science research born out of the Health Media Research Laboratory (HMRL) at the University of Michigan.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The primary source of funding for Dr. Strecher's University of Michigan research was the National Institutes of Health through the National Cancer Institute.

FOUNDER(S): Jean-Philippe Couderc, PhD

EMPLOYEES: N/A

HEADQUARTERS: Rochester, NY

FOUNDED: 2006

REVENUE: N/A

TSC MEMBER INSTITUTION: University of Rochester

FUNDING AGENCY(S): National Institutes of Health

# iCardiac Technologies

CONTACT: iCardiac Technologies  
150 Allens Creek Road  
Rochester, NY 14618  
[www.icardiac.com](http://www.icardiac.com)

## ABOUT THE COMPANY:

iCardiac Technologies was formed in 2006 to develop and market drug safety technology. This technology allows for a more accurate and reliable method to analyze data from electrocardiograms (ECGs) and other types of heart monitors to determine whether an experimental drug is toxic for the heart. The iCardiac software allows researchers to evaluate data produced by ECGs — including the QT interval — to identify specific risks associated with a new drug. The QT interval measures the process of ventricular repolarization — the split second period between the heart's contraction and recovery phase that represents an important determinant of a drug's safety.

Since the 1990s, a wide range of drugs from anti-migraines and antihistamines to diuretics have been found to cause heart arrhythmias in certain people. In rare cases, arrhythmias can lead to sudden cardiac death. The FDA now mandates that all drugs in development go through a QT study to determine if a drug prolongs the QT interval on an electrocardiogram. QT prolongation has been associated in clinical studies with heart arrhythmias.

The company, which is based in Rochester, New York, provides clinical trial contract services to several pharmaceutical companies. In 2006, the company entered into a multi-year research partnership with Pfizer to develop advanced cardiac safety biomarkers.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

The iCardiac technology consists of software created by University of Rochester Medical Center biomedical engineer Jean-Philippe Couderc, PhD. It evolved from the University of Rochester's Heart Research Follow-up Program, which is home to an international database of an inherited condition (called long QT syndrome) that is similar to the drug-induced syndrome.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The software was developed with the support of the National Institutes of Health.

FOUNDER(S): Dr. Panos Michalopoulos  
EMPLOYEES: 80  
HEADQUARTERS: St. Paul, MN  
FOUNDED: 1984  
REVENUE: \$26.5 million FY08  
TSC MEMBER INSTITUTION: University of Minnesota  
FUNDING AGENCY(S): Department of Transportation

# Image Sensing Systems, Inc.

CONTACT: Image Sensing Systems, Inc.  
500 Spruce Tree Centre  
1600 University Avenue West  
St. Paul, MN 55104  
[www.imagesensing.com](http://www.imagesensing.com)

## ABOUT THE COMPANY:

As traffic backs up across the country and around the world, demand grows for the traffic monitoring products of Image Sensing Systems.

Image Sensing Systems designs computer software and hardware that help keep traffic flowing and help traffic managers monitor the roadways. The company's systems are used in about 60 countries around the world.

“With the proliferation of traffic surveillance cameras, it’s impossible for an individual to monitor every camera,” explains Ken Aubrey, Image Sensing Systems CEO. “Our computer-enabled detection software extracts key information so a human doesn’t have to. For instance, our devices can detect if there’s a stopped vehicle in the road, or if a vehicle is going the wrong direction, or if a pedestrian is on the road, or if there’s debris on the road.”

When the system detects a potential problem, it will flag a person in the traffic control center to investigate.

Typically, the firm’s systems are used to monitor intersections, bridges, highways and tunnels. For instance, in China, its system is used to monitor the 200 cameras installed in the 11-mile long Zhongnanshan tunnel.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Image Sensing Systems, Inc., (ISS) was founded in 1984 by University of Minnesota Civil Engineering Professor Dr. Panos Michalopoulos, who saw the potential for using video cameras and computers in real-life traffic applications to help resolve problems.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Dr. Michalopoulos' research was partially funded by the Federal Highway Administration, part of the Department of Transportation.

FOUNDER(S): James Duckworth, PhD, Peder Pedersen, PhD, and Thomas L. Szabo, PhD

EMPLOYEES: 3

HEADQUARTERS: Sterling, MA

FOUNDED: 2006

REVENUE: N/A

TSC MEMBER INSTITUTION: Worcester Polytechnic Institute

FUNDING AGENCY(S): Department of Defense

# ImagiSonix

*Enabling Ultrasound Imaging Everywhere*

CONTACT: ImagiSonix  
36 Westland Farm Road  
Sterling, MA 01564  
[www.imagisonix.com](http://www.imagisonix.com)

## ABOUT THE COMPANY:

Formed by experienced researchers in medical ultrasound and computer engineering, ImagiSonix is dedicated to furthering the portability and accessibility of diagnostic ultrasound imaging. The company seeks to:

- Make diagnostic capabilities available for emergency use, rural health, disaster sites, and military forward echelons by configuring the ultrasound imaging system for practical use under a wide range of situations.
- Facilitate the distribution of ultrasound image and video data through wireless and web-based communications for better diagnostic evaluation.
- Develop accurate freehand 3D imaging capabilities for quantitative image analysis and quicker diagnosis.
- Improve training of EMTs, medics, and trauma physicians in the diagnosis of trauma through the use of injury mimicking phantoms.
- Develop ultra-lightweight high-quality imaging system.
- Enhance the capabilities of the ultrasound system by developing algorithms for ready detection of life-threatening conditions.



#### **UNIVERSITY-BASED RESEARCH CONNECTION:**

R. James Duckworth and Peder Pedersen are faculty members in the Electrical and Computer Engineering Department at Worcester Polytechnic Institute. The company grew out of their research on portable medical ultrasound technology developed initially for use in battlefield medicine. The ultrasound unit and computer are integrated into a vest that can be worn by a medic. The device is operated with a touch screen and the images are projected on video goggles, making it easy to use in the field. The system also incorporates wireless technology, so images captured by the scanner can be transmitted to a nearby laptop or, over wireless communications networks, to physicians in distant medical centers. The system, which can also be carried in a small duffle, is ideal for use in emergency medicine and has been tested in life flight helicopters.

#### **ROLE OF FEDERAL RESEARCH FUNDING:**

The research that led to development of the ImagiSonix technology was supported by the Department of Defense through the US Army's Telemedicine and Advanced Technologies Research Center (TATRC).

FOUNDER(S): Dr. David Wilkes  
EMPLOYEES: 2  
HEADQUARTERS: Indianapolis, IN  
FOUNDED: 2006  
REVENUE: N/A  
TSC MEMBER INSTITUTION: Indiana University  
FUNDING AGENCY(S): National Institutes of Health

# ImmuneWorks

CONTACT: ImmuneWorks  
351 West Tenth Street  
Indianapolis, IN 46202  
[www.immuneworks.com](http://www.immuneworks.com)

## ABOUT THE COMPANY:

For those with advanced lung disease or damage, a lung transplant has been a way to buy a little more time. However, patients who receive newly transplanted lungs have just a 50/50 chance of being alive five years later. ImmuneWorks researchers say they may be able to improve survival rates. They found a way to suppress the autoimmune response by conditioning the body with small doses of a protein, collagen V, before lung transplantation. (When a patient has a lung transplant, the body thinks the collagen V that is released is a bad thing, and the autoimmune response kicks in to get rid of it.)

“If you know what the trigger is, you might be able to educate the body not to respond,” said David Wilkes, co-founder and chief scientific officer of ImmuneWorks. He also is a professor of medicine, microbiology and immunology at Indiana University (IU); he directs the medical school’s Center for Immunobiology. “We think we’ve found a key trigger,” he said.

Human clinical trials for developing the pharmaceutical-grade collagen compound are underway.

ImmuneWorks is also working on developing effective treatments for serious lung diseases like idiopathic pulmonary fibrosis (IPF), which accounts for about the same number of deaths each year as breast cancer. The company has

already identified triggers for IPF and is working on blood tests that can diagnose the disease as well as monitor a patient's progress during treatment.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

The company was founded by Indiana University School of Medicine researchers; it resides in the Indiana University Emerging Technologies Center.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The work by Dr. Wilkes at IU to discover the disease mechanism underlying lung transplant rejection and the progression of IPF was funded by the National Institutes of Health.

**FOUNDER(S):** Robert Haselkorn, PhD and Michael J. Sadowsky, PhD

**EMPLOYEES:** 13

**HEADQUARTERS:** Chicago, IL

**FOUNDED:** 1997

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** University of Chicago

**FUNDING AGENCY(S):** National Institutes of Health, National Science Foundation

# Integrated Genomics

## *Solutions in Microbial Genomics*

**CONTACT:** Integrated Genomics  
2201 W Campbell Park Drive, Suite 15  
Chicago, IL 60612-3547  
[www.integratedgenomics.com](http://www.integratedgenomics.com)

### **ABOUT THE COMPANY:**

Chicago-based Integrated Genomics specializes in research in microbial genomics, biochemistry, and gene expression. These products and services are based on ERGO™, a web-based genome analysis platform. The company's scientists have broad experience in both in silico and wet lab sequencing, research and development with more than 100 relevant publications in these areas. Integrated Genomics has particularly long-standing relationships and active research in the area of lactic acid bacteria and pathogenic microbes, as well as a broad customer base across industry, academic and government institutions.

### **UNIVERSITY-BASED RESEARCH CONNECTION:**

Cofounder Dr. Robert Haselkorn is the F.L. Pritzker Distinguished Service Professor at the University of Chicago and a member of the National Academy of Sciences. He has published more than 200 papers in the field of molecular genetics and is a world-renowned authority on the genetics of photosynthetic bacteria and cyanobacteria.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Throughout his career, Dr. Haselkorn's laboratory has been funded primarily through federal grants from the National Institutes of Health and National Science Foundation.

FOUNDER(S): Colin Angle, Dr. Rodney Brooks and Helen Greiner

EMPLOYEES: 538

HEADQUARTERS: Bedford, MA

FOUNDED: 1990

REVENUE: \$298.6 million FY09

TSC MEMBER INSTITUTION: Massachusetts Institute of Technology

FUNDING AGENCY(S): Department of Defense, NASA

# iRobot Corporation

## *Robots that Make a Difference*

CONTACT: iRobot Corporation  
8 Crosby Drive  
Bedford, MA 01730  
[www.irobot.com](http://www.irobot.com)

### ABOUT THE COMPANY:

iRobot was founded in 1990 when Massachusetts Institute of Technology (MIT) scientists Colin Angle and Helen Greiner teamed up with their professor, Dr. Rodney Brooks, with the vision of making practical robots a reality. Their goal was to develop robotics and artificial intelligence technologies in order to produce and market robots. Today, iRobot has grown to a \$299 million public company that employs more than 500 of the robot industry's top professionals, including mechanical, electrical and software engineers and related support staff.

iRobot Corporation provides robots that enable people to complete complex tasks in a better way. For more than 20 years, the company has developed proprietary technology incorporating advanced concepts in navigation, mobility, manipulation and artificial intelligence to build military, industrial and consumer-focused robots. The most well known robot the company makes is the iRobot Roomba, the floor vacuuming robot. In all, more than five million iRobot home robots have been sold worldwide.

For very different markets, the military and public safety organizations worldwide, iRobot has created several products. One major product for military use is the iRobot 510 PackBot. This robot provides soldiers with a tool to identify and dispose of roadside bombs and other unexploded ordnance while keeping

them at safe distances. PackBot robots have performed tens of thousands of missions in Iraq and Afghanistan and are credited with saving soldiers' lives.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

iRobot was founded in 1990 when Massachusetts Institute of Technology roboticists Colin Angle and Helen Greiner teamed up with their professor Dr. Rodney Brooks with the vision of making practical robots a reality.

**ROLE OF FEDERAL RESEARCH FUNDING:**

iRobot emerged from the federally funded work on robotics that was being done at MIT. Funding agencies included NASA and the Defense Advanced Research Projects Agency (DARPA), part of the Department of Defense.

FOUNDER(S): Dr. John A. Woollam

EMPLOYEES: 40

HEADQUARTERS: Lincoln, NE

FOUNDED: 1987

REVENUE: N/A

TSC MEMBER INSTITUTION: University of Nebraska

FUNDING AGENCY(S): Department of Defense, NASA, National Science Foundation

# J.A. Woollam Co., Inc.

## *Ellipsometry Solutions*

CONTACT: J.A. Woollam Co., Inc.  
645 M Street, Suite 102  
Lincoln, NE 68508-2243  
[www.jawoollam.com](http://www.jawoollam.com)

### ABOUT THE COMPANY:

Starting as a spin-off from the University of Nebraska-Lincoln, the J.A. Woollam Company has rapidly grown to become a worldwide leader in the manufacturing of spectroscopic ellipsometers for non-destructive thin film and bulk material characterization. Spectroscopic ellipsometry has become the standard for measuring thin film thickness and optical constants and is used for characterization of all types of materials: dielectrics, semiconductors, metals, organics, and more. J.A. Woollam Company has been perfecting this technology for 20 years and has secured over 100 patents internationally. The company employs more than 40 people, the majority of whom are engineers and scientists dedicated to the advancement of ellipsometry. Each system is hand-assembled using custom-machined aluminum and high quality optics and electronics. The Woollam Co. has multiple worldwide distributors and over 60 percent of annual sales are exported globally.

### UNIVERSITY-BASED RESEARCH CONNECTION:

J.A. Woollam Company was founded in 1987 as a spinoff company from ongoing research by Dr. John A. Woollam, a physics and electrical engineering professor at University of Nebraska-Lincoln (UNL). The Woollam Company has continued to partner with UNL on many research projects over the past



20 years to further the knowledge and applications of ellipsometry. The Woollam Company and UNL recently completed a joint STTR Phase I contract with the US Army. Based on the success of this joint research project, the US Army has asked the Woollam Company and UNL to continue this research with a Phase 2 contract. UNL recently received research funding from the National Science Foundation-supported Nebraska EPSCoR program and will partner with the Woollam Company in another collaborative research project.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Dr. Woollam’s research has been funded by Small Business Innovation Research (SBIR) grants from the National Science Foundation, the Department of Defense — through the Defense Advanced Research Projects Agency (DARPA), US Air Force, US Army — and NASA. This funding played an essential role in growing J.A. Woollam Co., Inc. to further develop its spectroscopic ellipsometers and continue meaningful research partnerships with the University of Nebraska.

**FOUNDER(S):** Allen Barnett, PhD, Lyn Dyster, PhD, David Hangauer, PhD, and Johnson Lau, MD

**EMPLOYEES:** 12

**HEADQUARTERS:** Buffalo, NY

**FOUNDED:** 2003

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** University at Buffalo

**FUNDING AGENCY(S):** National Institutes of Health

# Kinex Pharmaceuticals

**CONTACT:** Kinex Pharmaceuticals  
701 Ellicott Street  
Buffalo, NY 14203  
[www.kinexpharma.com](http://www.kinexpharma.com)

## **ABOUT THE COMPANY:**

Kinex Pharmaceuticals is developing next generation anti-cancer drugs that target the molecular basis of disease. The company uses a proprietary technology platform to generate compounds that inhibit the Protein Kinase and Phosphatase family of proteins.

Mimetica™ is Kinex Pharmaceuticals' patented technology for generating small molecule inhibitors of kinases and phosphatases that bind in the substrate pocket. The key advantage of the new protein kinase inhibitors that Kinex is developing is that because of the unique binding site against which these compounds are targeted, there is a greatly reduced chance that patients will develop resistance to these drugs — a problem that already has rendered ineffective some of the first marketed protein kinase inhibitors.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

Kinex was formed in 2003 based on the basic research of David Hangauer, PhD, associate professor of medicinal chemistry in the Department of Chemistry in University at Buffalo's College of Arts and Sciences. Kinex is commercializing Hangauer's unique method for designing and synthesizing anti-cancer compounds. Phase I clinical testing of Kinex's lead compound, KX-01, has been completed. A second compound is in pre-clinical testing.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The original research conducted at University at Buffalo was supported with funding from the National Institutes of Health.

**FOUNDER(S):** Timothy J. Davis and Gregory J. Galvin  
**EMPLOYEES:** 95  
**HEADQUARTERS:** Ithaca, NY  
**FOUNDED:** 1993  
**REVENUE:** N/A  
**TSC MEMBER INSTITUTION:** Cornell University  
**FUNDING AGENCY(S):** Department of Defense, National Science Foundation

# Kionix, Inc.

**CONTACT:** Kionix, Inc.  
36 Thornwood Drive  
Ithaca, NY 14850-1263  
[www.kionix.com](http://www.kionix.com)

## **ABOUT THE COMPANY:**

Kionix, Inc. designs and manufactures silicon micro machined inertial sensors. It offers microfluidic systems, microrelays, micromirror arrays, accelerometers, gyroscopes, and combination sensors. The company serves the automotive, consumer electronics, wireless communications, pharmaceutical research, and biotechnology industries.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

Kionix's founding technology was developed by Cornell University engineering faculty. Kionix's motion sensors are based on more than 30 Cornell technologies that involve MicroElectroMechanical Systems (MEMS) and motion sensing. Kionix has an exclusive license to the technology from the Cornell University Research Foundation. The company's founders received their doctoral degrees from the College of Engineering, and two members of Kionix's board of directors are Cornellians. Several employees are also Cornell graduates.

## **ROLE OF FEDERAL RESEARCH FUNDING:**

The Cornell work that became the technology basis for Kionix was supported by the Department of Defense and the National Science Foundation.

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FOUNDER(S): Dr. Kevin Knight, Dr. Daniel Marcu and William Wong

EMPLOYEES: 50

HEADQUARTERS: Marina del Rey, CA

FOUNDED: 2002

REVENUE: N/A

TSC MEMBER INSTITUTION: University of Southern California

FUNDING AGENCY(S): Department of Defense

# Language Weaver

*Accelerating the Way the World Communicates*

CONTACT: Language Weaver  
4640 Admiralty Way, Suite 1210  
Marina del Rey, CA 90292  
[www.languageweaver.com](http://www.languageweaver.com)

## ABOUT THE COMPANY:

Language Weaver provides organizations with the ability to translate large volumes of information into one or more languages, at high speed and with great accuracy.

Daniel Marcu, Kevin Knight and William Wong founded the company in 2002 when Marcu and Knight were teaching at the University of Southern California's Information Sciences Institute (ISI); Wong was their student. Language Weaver actually grew out of what Knight calls a "watershed workshop" in 1999. Knight's workshop discovered that the translation protocols developed for one language could move seamlessly to another without having to start over from scratch with each new tongue. The group's work enabled it to win all-important research funds, and within two years, the commercial venture began.

Most machine-translation systems work with individual words or use complicated sets of translation guidelines, which must be devised by linguists and coded by hand. Language Weaver, on the other hand, uses innovative technology that overcomes many of the problems of traditional automated translation. Rather than use the rules of language to provide the basis of converting from one language to another, Language Weaver uses statistical measures that analyze

the frequency of phrases, sentences and relationships within the text, and then convert them to the targeted foreign language.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Language Weaver’s technology was developed at the University of Southern California’s Information Sciences Institute (USC/ISI).

**ROLE OF FEDERAL RESEARCH FUNDING:**

Development of the technology behind Language Weaver was funded through a federal grant from Defense Advanced Research Projects Agency (DARPA), part of the Department of Defense.

FOUNDER(S): Dr. Wei-xian Zhang

EMPLOYEES: 6

HEADQUARTERS: Bethlehem, PA

FOUNDED: 2006

REVENUE: N/A

TSC MEMBER INSTITUTION: Lehigh University

FUNDING AGENCY(S): Environmental Protection Agency, National Science Foundation

# Lehigh Nanotech

*Transforming environmental remediation*

CONTACT: Lehigh Nanotech  
115 Research Drive  
Bethlehem, PA 18015  
[www.lehighnanotech.com](http://www.lehighnanotech.com)

## ABOUT THE COMPANY:

Lehigh Nanotech's product is used to clean up landfills, former chemical and manufacturing plants, and superfund sites.

The technology, invented at Lehigh University by Dr. Wei-xian Zhang, is used to clean up a wide range of soil and groundwater sites contaminated with toxic materials, heavy metals, fertilizers and pesticides. Nanotechnology holds great promise for meeting environmental challenges, according to Dr. Zhang,

Lehigh Nanotech uses iron-based nanoparticles to remove contaminants from soil and groundwater. Zhang says nanotechnology can improve environmental technologies such as treatment, remediation, and sensing. Nanotechnology can also improve manufacturing processes — for example, making them more efficient and less wasteful.

Zhang, an associate professor of civil and environmental engineering at Lehigh, has won praise for his invention from the US Environmental Protection Agency (EPA) and from such prominent journals as *Chemical & Engineering News* and MIT's *Technology Review*.



**UNIVERSITY-BASED RESEARCH CONNECTION:**

Lehigh University helped launch Zhang's startup company, Lehigh Nanotech LLC. The company was formed with the help from Lehigh's Office of Technology Transfer and has its facilities on Lehigh's Mountaintop Campus.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Professor Zhang's work was supported by funding from the Environmental Protection Agency and the National Science Foundation.

FOUNDER(S): William Biggs

EMPLOYEES: 290

HEADQUARTERS: Lincoln, NE

FOUNDED: 1971

REVENUE: N/A

TSC MEMBER INSTITUTION: University of Nebraska

FUNDING AGENCY(S): US Department of Agriculture

# LI-COR Biosciences

## *Environmental and Biotechnology Research Systems*

CONTACT: LI-COR Biosciences  
4647 Superior Street  
Lincoln, NE 68504  
[www.licor.com](http://www.licor.com)

### ABOUT THE COMPANY:

From the extremes of the rainforests in South America to the harsh conditions of the Antarctic, and to cutting-edge research laboratories around the globe, scientists rely on products from LI-COR Biosciences to provide answers to their questions. LI-COR first introduced scientific instruments for plant science research and quickly grew to provide scientists tools for such diverse disciplines as atmospheric research and the study of how proteins interact at the cellular level. Today LI-COR is a global leader in the design, manufacture, and marketing of scientific instruments for plant biology, biotechnology, drug discovery, and environmental research. More than 30,000 customers in more than 100 countries use LI-COR instruments. In addition to its Lincoln, Nebraska headquarters, LI-COR has offices in Germany and the United Kingdom. The company also sells products through a global network of distributors.

### UNIVERSITY-BASED RESEARCH CONNECTION:

In the late 1960s, the University of Nebraska at Lincoln started a large project to develop sorghum as a food product. William Biggs was hired as a graduate student to develop research instruments for the project. One of the instruments Biggs helped design — an accurate, inexpensive sensor and meter for measuring photosynthetically active radiation — was described in an article in the

journal *Ecology*. Soon after, scientists from laboratories around the world began requesting similar instruments. In 1971, Biggs co-founded the Lambda Instruments Corporation to manufacture these sensors and other products. The name was formally changed to LI-COR in 1978.

#### **ROLE OF FEDERAL RESEARCH FUNDING:**

Initial funding for the research project on light transmission in sorghum fields which led to development of the research instruments was provided by the Rockefeller Foundation. The US Department of Agriculture, particularly Hatch Act funding for Agricultural Experiment Station research, played a significant role in funding the university professors, their graduate students, their laboratories, and their research projects.

**FOUNDER(S):** Raphael C. Lee, MD, ScD, PhD

**EMPLOYEES:** 7

**HEADQUARTERS:** Chicago, IL

**FOUNDED:** 2002

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** University of Chicago

**FUNDING AGENCY(S):** National Institutes of Health

# Maroon Biotech

**CONTACT:** Maroon Biotech  
2255 W. Harrison Street, Suite C  
Chicago, IL 60612  
[www.maroonbiotech.com](http://www.maroonbiotech.com)

## **ABOUT THE COMPANY:**

Maroon Biotech has developed a new category of pharmaceuticals called surfactant chaperones. This technology has the capability to restore structure and viability to cells disrupted by physical and chemical trauma. By reversing post-traumatic molecular alterations, Maroon Biotech's technology promises to improve recovery from vehicular, military and other types of severe traumatic injuries, electrical shock and reperfusion injury. The technology has already demonstrated effectiveness at treating experimental spinal cord injury, myocardial infarction (heart attack) and brain injury.

Fundamentally, surfactant chaperones mimic behaviors exhibited by naturally occurring stress proteins that protect living systems after injury. The safety of certain synthetic surfactants that act as molecular chaperones has been proven over time. In particular, polymeric surfactant chaperones that are symmetric block copolymers of polyethylene oxide-polypropylene oxide-polyethylene oxide (PEO-PPO-PEO) have been used to reduce blood viscosity for more than 50 years.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

The capability of this surfactant to repair damaged cell membranes was unknown until the late 1980's when Raphael C. Lee, MD, ScD, PhD, Professor of

Molecular Medicine and Surgery at the University of Chicago Pritzker School of Medicine, discovered its unique cell membrane healing properties.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Funding for Dr. Lee's research has come primarily through grants from the National Institutes of Health.

**FOUNDER(S):** Christopher Jaynes, PhD, Randall Stevens and Stephen Webb

**EMPLOYEES:** N/A

**HEADQUARTERS:** Lexington, KY

**FOUNDED:** 2004

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** University of Kentucky

**FUNDING AGENCY(S):** National Science Foundation

# Mersive Technologies

**CONTACT:** Mersive Technologies  
163 East Main Street, Suite 300  
Lexington, KY 40507  
[www.mersive.com](http://www.mersive.com)

## ABOUT THE COMPANY:

Mersive Technologies, founded in 2004, is a company that develops and uses software to create high-resolution video displays. The company's most recent display includes an image 25-and-a-half-feet wide and 11-feet tall and so clear you might expect to walk right into it.

The company has its roots in the University of Kentucky College of Engineering Center for Visualization and Virtual Environments. Mersive co-founder and chief technical officer Christopher Jaynes helped establish the UK center and it was there that he mentored student Stephen Webb, another Mersive co-founder.

Mersive™ software simplifies the way high-resolution displays are designed, configured, and maintained to merge multiple projectors into a seamless display of almost any size, shape and resolution. The company has a background rooted in military simulation applications; it has created technology that can sync well over a dozen projection screens. Mersive minimizes the complexities associated with building multi-projector displays while eliminating the need for cumbersome hardware.

Mersive's military simulation clientele includes the four branches of the US armed forces and a number of homeland security agencies. The company also counts a number of Fortune 500 corporations, museums and academic labs as clients.

#### **UNIVERSITY-BASED RESEARCH CONNECTION:**

Mersive's technology is based on research from the University of Kentucky College of Engineering's Center for Visualization and Virtual Environments. Mersive co-founder and chief technical officer Christopher Jaynes helped establish the Center for Visualization and Virtual Environments at the University of Kentucky where he secured more than \$5 million in funding to study issues related to virtual reality and novel display systems. Mersive co-founder Stephen Webb worked closely with Jaynes as an undergraduate, conducting research in multi-projector systems. As a graduate student Webb continued his work in large-scale displays, focusing on camera-based calibration methods, and developed a method for calibrating multiple projectors on curved display surfaces.

#### **ROLE OF FEDERAL RESEARCH FUNDING:**

Jaynes' work at University of Kentucky was supported by grants from the National Science Foundation. Mersive Technologies is a partner with NSF to define a new standard for how media can be transmitted, manipulated, and displayed on Ultra Definition (UD) devices.

FOUNDER(S): Onne Ganel and Felix Wehri

EMPLOYEES: 9

HEADQUARTERS: Philadelphia, PA

FOUNDED: 2003

REVENUE: NA

TSC MEMBER INSTITUTION: University of Pennsylvania

FUNDING AGENCY(S): National Institutes of Health, National Science Foundation

# MicroMRI, Inc.

## *Bone Micro-Architecture*

CONTACT: MicroMRI, Inc.  
1429 Walnut Street, Suite 1102  
Philadelphia, PA 19102  
[www.micromri.com](http://www.micromri.com)

### ABOUT THE COMPANY:

MicroMRI, Inc. is a medical device company focused on developing and commercializing novel and innovative products that perform high resolution Magnetic Resonance Imaging (MRI) of bone micro-architecture with subsequent detailed visualization of bone structural elements. The Company intends to develop a commercial product for routine clinical use that can be deployed as an add-on to currently available clinical MRI scanners.

### UNIVERSITY-BASED RESEARCH CONNECTION:

MicroMRI was founded in 2003 to commercialize core technology developed by Felix Wehri, a senior investigator at the Department of Radiology at the University of Pennsylvania, and licensed to MicroMRI.

Until recently, MRI as a modality had not been used for bone imaging because of technical limitations regarding signal and resolution. The technology originally developed at University of Pennsylvania has overcome these limitations and allowed for the first time the visualization of bone micro-architecture using high-signal, high resolution MRI. Since its founding in 2003, MicroMRI has been steadily developing its proprietary post-processing software.



#### **ROLE OF FEDERAL RESEARCH FUNDING:**

The basic research at the University of Pennsylvania that led to the development of this technology was supported by research grants from the National Institutes of Health and the National Science Foundation.

FOUNDER(S): Tiawei Jing and Stuart Lindsay

EMPLOYEES: 16,000 (Agilent)

HEADQUARTERS: Santa Clara, CA (Agilent)

FOUNDED: 1993

ACQUIRED: 2005

REVENUE: N/A

TSC MEMBER INSTITUTION: Arizona State University

FUNDING AGENCY(S): National Science Foundation

# Molecular Imaging, Inc.

*(Acquired by Agilent Technologies, Inc.)*

CONTACT: Agilent Technologies, Inc.  
5301 Stevens Creek Boulevard  
Santa Clara, CA 95051  
[www.agilent.com](http://www.agilent.com)

## ABOUT THE COMPANY:

Molecular Imaging was founded in 1993 by Arizona State University (ASU) Professor Stuart Lindsay and engineer Tianwei Jing. The Atomic Force Microscopes designed by Lindsay and Jing are key tools in the field of nanotechnology, where work is done on the scale of nanometers, which are one-billionth of a meter. The diameter of the average human hair, by comparison, is 70,000 nanometers. With atomic microscopes, scientists can develop new and better materials, such as thin coating on eyeglasses, paint for cars and houses, and the new soft-touch coating used on some toothbrushes, razors and car CD players.

Many everyday products have been improved by researchers using atomic microscopes, which allow the user to see extremely tiny objects such as cells, chromosomes, DNA and even atoms.

Lindsay and Jing hold nearly 40 patents for their Atomic Force Microscope design and technology. Their company became a premier developer and supplier of Atomic Force Microscope and Scanning Probe Microscope systems. These products are designed for nanotechnology research applications in life science, biotechnology, electrochemistry and material and polymer science for high-resolution imaging in fluids or ambient air under controlled temperatures and environmental conditions. In November 2005, Molecular Imaging was acquired by Agilent Technologies, Inc.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Molecular Imaging was founded by Arizona State University Professor Stuart Lindsay who continues to be a professor at the ASU Biodesign Institute. While the Molecular Imaging name has been retired, Agilent continues to have a very close working relationship with ASU and the Lindsay Lab at the Biodesign Institute.

**ROLE OF FEDERAL RESEARCH FUNDING:**

ASU Professor Stuart Lindsay received National Science Foundation (NSF) funding for his work to develop the first commercial prototype of the atomic force microscope, which became the foundational product for Molecular Imaging, Inc.

FOUNDER(S): Dr. S. V. Sreenivasan and Dr. Grant Willson

EMPLOYEES: 125

HEADQUARTERS: Austin, TX

FOUNDED: 2001

REVENUE: \$25 million FY08

TSC MEMBER INSTITUTION: University of Texas at Austin

FUNDING AGENCY(S): Department of Defense

# Molecular Imprints, Inc.

## *Enabling Nano-Scale Technology in Manufacturing*

CONTACT: Molecular Imprints, Inc.  
1807 West Braker Lane, Building C-100  
Austin, TX 78758  
[www.molecularimprints.com](http://www.molecularimprints.com)

### ABOUT THE COMPANY:

Molecular Imprints is a startup company spun out of the University of Texas at Austin in 2001. The company was created to commercialize a newly invented technology called “Step and Flash Imprint Lithography,” which has demonstrated the ability to pattern features as small as 3 nanometers (nm), or about the diameter of a DNA molecule.

Nano-lithography is the method of creating very small patterns on a substrate. The technology is critically important, especially to the production of electronic devices such as computer chips. Today, the technology used to do this is an optical technique, much like making photographic prints, where the patterns are projected onto a light sensitive resist on the substrate using a very sophisticated and expensive camera. However, as demand grows for smaller and faster chips, this technology is limited by the wavelength of light — it is difficult to make a 50nm feature with a 200nm light source. Step and flash technology requires neither a light source nor a complicated lens assembly. Instead, it allows for the production of a very accurate “master” using an electron beam tool of almost unlimited resolution. The master is then used to simply print, using a special ink, the features onto the substrate. The technology holds the prospect of denser storage at a lower cost.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

The technology used by Molecular Imprints is based on the pioneering research of University of Texas at Austin professors Dr. S. V. Sreenivasan and Dr. Grant Willson. Sreenivasan is chief technology officer of the company, while continuing to teach at UT Austin. Willson, who holds the Rashid Engineering Regents Chair at the Cockrell School of Engineering, received the National Medal for Technology and Innovation for his work on lithographic imaging materials and techniques.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Some of the funding for the research conducted at UT Austin that led to the creation of Molecular Imprints was provided by the Defense Advanced Research Projects Agency (DARPA), part of the Department of Defense.

FOUNDER(S): Ram Sasisekharan, PhD and Ganesh Venkataraman, PhD  
EMPLOYEES: 175  
HEADQUARTERS: Cambridge, MA  
FOUNDED: 2001  
REVENUE: \$14.6 million FY08  
TSC MEMBER INSTITUTION: Massachusetts Institute of Technology  
FUNDING AGENCY(S): National Institutes of Health

# Momenta Pharmaceuticals, Inc.

CONTACT: Momenta Pharmaceuticals, Inc.  
675 West Kendall Street  
Cambridge, MA 02142  
[www.momentapharma.com](http://www.momentapharma.com)

## ABOUT THE COMPANY:

Momenta Pharmaceuticals, Inc. was founded in 2001 based on technology developed at the Massachusetts Institute of Technology (MIT) for the precise sequencing of complex sugar molecules. This original technology platform and the resulting improvements made over the past five years have enabled Momenta to grow from a small, development-stage startup to a public company with more than 175 employees.

Momenta's technology platform enables the thorough characterization of sugar sequences that are found on human cells and proteins, as well as in complex drugs. Since the configuration and structure of sugars are instrumental to mechanisms of diseases and drug action, the company is able to gain valuable insight into complex biological processes by leveraging its understanding of sugar structure and relating it to activity. Momenta is using its in-depth knowledge of sugars to:

- Develop technology-enabled generic versions of complex drugs that historically have been difficult to duplicate.
- Engineer improved versions of currently marketed drugs that contain sugars.
- Create new sugar-based drugs based on the novel biology of sugars.

#### **UNIVERSITY-BASED RESEARCH CONNECTION:**

The initial research into the characterization of sugar molecules was performed by company founders, Ram Sasisekharan, PhD, Professor of Biological Engineering, Massachusetts Institute of Technology, and Ganesh Venkataraman, PhD, now Momenta Chief Scientific Officer. Sasisekharan, a molecular biologist, collaborated initially with Dr. Robert Langer, an established professor at MIT, to overcome many technical obstacles to create the first heparinase, an enzyme that cuts sugar sequences into smaller components. Dr. Venkataraman then started collaborating with Dr. Sasisekharan, looking at quantitative approaches for capturing the diversity of complex sugars. Ram Sasisekharan serves on the Board of Directors of the company.

#### **ROLE OF FEDERAL RESEARCH FUNDING:**

The MIT research received support from the National Institutes of Health.

FOUNDER(S): Howard Wang, Zhihao Yang and Tom Xu

EMPLOYEES: 6

HEADQUARTERS: Binghamton, NY

FOUNDED: 2006

REVENUE: \$200,000 FY08

TSC MEMBER INSTITUTION: Binghamton University

FUNDING AGENCY(S): National Science Foundation

# NanoMas Technologies, Inc.

*The art of functional nanomaterials*

CONTACT: NanoMas Technologies, Inc.  
Innovative Technologies Complex  
85 Murray Hill Road  
PO Box 6000  
Binghamton, NY 13902-6000  
[www.nanomastech.com](http://www.nanomastech.com)

## ABOUT THE COMPANY:

Founded by three seasoned nanotechnologists at Binghamton University, NanoMas Technologies, Inc., creates nanotechnology innovations in the emerging areas of printable electronics, renewable energy and high-performance chip packaging. NanoMas's proprietary technologies have integrated the art of precision nano-scale engineering with mass production of nano-scaled materials, enabling high value additions to a wide range of commercial applications with little extra cost.

The conductor and semiconductor nanocrystal inks developed at NanoMas will enable the new printable electronics industry to make products that are more mechanically flexible and manufactured in a fashion similar to that in the printing industry.

In late 2008, NanoMas Technologies, Inc. closed on \$3.2 million in venture financing, allowing the company to further its development of nanotechnology products. NanoMas intends to use its venture capital to further the commercialization of metallic nanoparticles for use in printed electronics, conductive pastes, solar cells and IC chip packaging. "We're hoping in the next year...to promote our products for industrial use around the world," said company President and Chief Technical Officer Zhihao Yang. "We're very excited."



**UNIVERSITY-BASED RESEARCH CONNECTION:**

Howard Wang, an associate professor of mechanical engineering at Binghamton University, founded the company in 2006 with fellow researchers Zhihao Yang, now president and chief technology officer, and Tom Xu.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Company founder Howard Wang has received research funding from the National Science Foundation.

FOUNDER(S): Dr. Seyoung Jang and Dr. Edward Turos

EMPLOYEES: 8

HEADQUARTERS: Tampa, FL

FOUNDED: 2004

REVENUE: N/A

TSC MEMBER INSTITUTION: University of South Florida

FUNDING AGENCY(S): National Institutes of Health, National Science Foundation

# Nanopharma Technologies, Inc.

CONTACT: Nanopharma Technologies, Inc.  
3802 Spectrum Boulevard, Suite 151  
Tampa, FL 33612  
[www.nanopharmatechnologies.com](http://www.nanopharmatechnologies.com)

## ABOUT THE COMPANY:

Nanopharma Technologies, Inc., a “spin-out” company at the University of South Florida (USF), got its start in 2004 when it won two federal Small Business Technology Transfer (STTR) grants for development of anti-anthrax antibiotics and drug-delivery platforms. The platforms were discovered by USF Chemistry professor Edward Turos, founder and scientific director of the company.

In 2004, the Turos research group announced that it had active scientific collaborations around the world., including at the USF Center for Biological Defense, the USF Medical School, and the H. Lee Moffitt Cancer Center. “USF is a perfect place for us to do this kind of work,” said co-founder Dr. Seyoung Jang. “We are grateful for the university’s commitment to provide a nourishing atmosphere for new businesses like ours.”

Nanopharma is currently researching and developing new antibiotics and biomaterials to treat and prevent drug-resistant hospital infections. In addition, the company is developing anti-bioterrorism agents against anthrax and is seeking new anticancer therapies. The cancer therapies include designing nano-sized vehicles — one billion times smaller than the head of a pin — to provide improved antibiotics passage to infection sites.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Dr. Edward Turos is co-founder and Chief Scientific Advisor to the company. He is a Full Professor at the Department of Chemistry at the University of South Florida.

**ROLE OF FEDERAL RESEARCH FUNDING:**

“Antibacterially-Active Nanoparticles” was funded by the National Science Foundation. “A Mechanically Novel Antibiotic for Anthrax” was funded by the National Institutes of Health.

**FOUNDER(S):** Rick Claus, Linda Duncan and Yanjing Liu

**EMPLOYEES:** 70

**HEADQUARTERS:** Blacksburg, VA

**FOUNDED:** 1998

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** Virginia Polytechnic Institute and State University (Virginia Tech)

**FUNDING AGENCY(S):** Department of Defense

# NanoSonic, Inc.

**CONTACT:** NanoSonic, Inc.  
1485 South Main Street  
Blacksburg, VA 24060  
[www.nanosonic.com](http://www.nanosonic.com)

## **ABOUT THE COMPANY:**

NanoSonic got its start in a kitchen with two part-time employees. Today, it has more than 70 employees and has as its customers NASA, defense contractors such as Lockheed Martin, Boeing and Northrop Grumman, major chemical suppliers, rubber industries and electronic companies.

Metal Rubber™ one of NanoSonic's nanotechnology products, can twist, stretch, cook to 200 degrees Celsius; it is wrinkle free and scar free. However, it holds its electrical conductivity as well as metal, and can easily return to its original shape after being twisted or bent.

The company has licensed several patents from Virginia Tech, including two that use a process known as electrostatic self-assembly (ESA). That patent has been the key to the development of NanoSonic's films and products because of its ability to create nanocomposites at room temperature and in an environmentally safe (and low-cost) manner.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

NanoSonic was established in 1998 as a result of a spinoff of federally-funded research at Virginia Tech. The company was founded by Rick Claus, then a

professor at Virginia Tech's College of Engineering, Linda Duncan, and Yanjing Liu, then a chemistry graduate student.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Funding from the Department of Defense — an Army Research Office equipment grant awarded at Virginia Tech — led to the establishment of NanoSonic.

NanoSonic has since received Department of Defense funding through the Defense Advanced Research Projects Agency (DARPA), the Air Force, and the Ballistic Missile Defense Organization. Other funding has come from NASA, the National Science Foundation, the Department of Energy and the National Institute of Standards and Technology.

FOUNDER(S): Dr. Paula Bickford and Dr. Paul Sanberg

EMPLOYEES: 6

HEADQUARTERS: Tampa, FL

FOUNDED: 2004

REVENUE: N/A

TSC MEMBER INSTITUTION: University of South Florida

FUNDING AGENCY(S): National Institutes of Health

# Natura Therapeutics, Inc.

*Nature's Care for Self Repair*

CONTACT: Natura Therapeutics, Inc.  
3802 Spectrum Boulevard, Suite 142  
Tampa, FL 33612  
[www.naturatherapeutics.com](http://www.naturatherapeutics.com)

## ABOUT THE COMPANY:

Natura Therapeutics was founded by scientists from the University of South Florida (USF) in Tampa with the mission to become a leading provider of cell-targeted nutrition for the health supplement and vitamin industry.

In 2008, USF and Natura Therapeutics received a patent for a dietary supplement designed to boost stem cells – the supplement is called NutraStem, a blend of active botanicals and antioxidants aimed at adult stem cell regeneration. The patent demonstrates that the combination of ingredients found in NutraStem helps to significantly promote stem cell nutrition and the natural growth of adult stem cell populations commonly found within the body.

Adult stem cells have the potential to develop into most tissues in the body and have the capacity to migrate toward damaged areas. According to the National Institutes of Health, the primary role of adult stem cells is to maintain and repair tissues. “Many people are unaware that adults possess stem cells and that keeping those cells functioning normally can greatly benefit our health, especially as we age,” said Cyndy D. Sanberg, PhD, president of Natura Therapeutics, Inc. “Our research focuses on natural elements of our diet that may protect those cells.”

The company’s products are researched and developed by a team of leading experts in the fields of nutritional science and adult stem cell research. Because

the company takes a science-based approach to product development, Natura Therapeutics donates a portion of profits to adult stem cell research.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Natura Therapeutics was founded by scientists from the University of South Florida Center of Excellence for Aging and Brain Repair. Its founders are USF professors Dr. Paula C. Bickford, Professor of Neurosurgery, and Paul R. Sanberg, Distinguished University Professor and Senior Associate Vice President for Research and Innovation.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Some Natura Therapeutics pivotal studies were funded by the National Institutes of Health (NIH) with the University of South Florida. Natura has received two Small Business Innovation Reserach grants from the NIH with the University of South Florida.

FOUNDER(S): Dr. Edmund Egan and Dr. Bruce Holm

EMPLOYEES: 26

HEADQUARTERS: Amherst, NY

FOUNDED: 1985

REVENUE: N/A

TSC MEMBER INSTITUTION: University at Buffalo

FUNDING AGENCY(S): National Institutes of Health

# ONY, Inc.

## *Makers of InfaSurf®*

CONTACT: ONY, Inc.  
1576 Sweet Home Road, Suite 112  
Amherst, NY 14228  
[www.onyinc.com](http://www.onyinc.com)

### ABOUT THE COMPANY:

ONY, Inc. was formed to commercialize InfaSurf, a lung surfactant developed by two professors of pediatrics at the University at Buffalo (UB).

InfaSurf was approved by the US Food and Drug Administration in 1999 for the prevention and treatment of respiratory distress syndrome (RDS) in premature and newborn infants. Since then the surfactant has been administered to more than 250,000 premature babies in the United States to assist with their breathing in the first critical hours after birth.

### UNIVERSITY-BASED RESEARCH CONNECTION:

Dr. Edmund Egan and Dr. Bruce Holm developed the lung surfactant technology based on research conducted by University at Buffalo, University of Rochester and University of Western Ontario.

Edmund Egan is the president and chief executive officer of ONY, Inc., and UB professor of pediatrics, physiology and biophysics. Co-inventor Bruce Holm is the executive director of UB's New York State Center of Excellence in Bioinformatics and Life Sciences and UB professor of pediatrics, gynecology-obstetrics and pharmacology. Both are faculty members in the School of Medicine and Biomedical Sciences.



**ROLE OF FEDERAL RESEARCH FUNDING:**

The original research conducted at University at Buffalo was supported with funding from the National Institutes of Health.

**FOUNDER(S):** Bruce Ferguson, David Thompson and Scott Webster  
**EMPLOYEES:** 3,400  
**HEADQUARTERS:** Dulles, VA  
**FOUNDED:** 1982  
**REVENUE:** \$1.16 billion FY08  
**TSC MEMBER INSTITUTION:** Harvard University  
**FUNDING AGENCY(S):** NASA

# Orbital Sciences Corporation

*Innovation you can count on<sup>®</sup>*

**CONTACT:** Orbital Sciences Corporation  
21839 Atlantic Boulevard  
Dulles, VA 20166  
[www.orbital.com](http://www.orbital.com)

## **ABOUT THE COMPANY:**

Orbital Sciences Corporation is one of the world's leading developers and manufacturers of smaller, more affordable space and launch systems. Founded in 1982, the company has pioneered new classes of rockets, satellites and other space-based technologies that help make the benefits of space more affordable, accessible and useful to millions of people on Earth.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

The foundation for Orbital Sciences Corporation was laid in 1980, when David Thompson, Bruce Ferguson, and Scott Webster met at Harvard Business School and worked together on a NASA-sponsored study of commercial space applications. They submitted their study to NASA in 1981 and subsequently won the Space Foundation Prize for Space Business Research. On April 2, 1982, Space Systems Corporation (SSC) — the predecessor to Orbital Sciences Corporation — was incorporated in Delaware to develop, manufacture, test, and market commercial space transportation systems.

## **ROLE OF FEDERAL RESEARCH FUNDING:**

The research project that was the genesis of Orbital was funded by NASA.

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**FOUNDER(S):** Harold Craighead and Watt Webb  
**EMPLOYEES:** more than 10  
**HEADQUARTERS:** Menlo Park, CA  
**FOUNDED:** 2004  
**REVENUE:** N/A  
**TSC MEMBER INSTITUTION:** Cornell University  
**FUNDING AGENCY(S):** Department of Energy, National Institutes of Health,  
National Science Foundation

# Pacific Biosciences

**CONTACT:** Pacific Biosciences  
1505 Adams Drive  
Menlo Park, CA 94025  
[www.pacificbiosciences.com](http://www.pacificbiosciences.com)

## **ABOUT THE COMPANY:**

Pacific Biosciences (PacBio) is a biotechnology company developing a transformative Single Molecule Real Time (SMRT™) DNA sequencing platform. PacBio's goal is to commercialize SMRT™ DNA sequencing technology, eventually enabling sequencing of individual genomes as part of routine medical care.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

PacBio, formerly Nanofluidics, Inc., is a spin-off from the Cornell Nanobiotechnology Center.

The Single Molecule Real Time (SMRT™) approach for nucleic acid sequencing concept was initially developed at Cornell University in the Laboratories of Watt Webb and Harold Craighead. Cornell has been a preeminent world leader in nanotechnology research for more than 25 years, and leads the National Nanotechnology Infrastructure Network (NNIN) — an integrated partnership of 13 facilities.

## **ROLE OF FEDERAL RESEARCH FUNDING:**

Initial research that led to PacBio was done at Cornell in part with funding from National Institutes of Health, the National Science Foundation and the Department of Energy.

In 2005, the National Human Genome Research Institute (NHGRI) of the National Institute of Health established two major grant programs to facilitate the development of technologies that would enable the sequencing of a human genome at significantly less cost than is possible today. Two categories of grants were established: one for the development of technology that promised to enable sequencing of the human genome at a cost of \$100,000, and a second category for the \$1,000 genome. The NHGRI awarded PacBio an Advanced Sequencing Technology Award grant of \$6.6 million for development of technology leading to the \$1,000 genome, the largest grant of any company applying at any level.

FOUNDER(S): Dr. Dennis Liotta and Dr. Raymond Schinazi

EMPLOYEES: 68

HEADQUARTERS: Princeton, NJ

FOUNDED: 1998

REVENUE: \$1.9 million FY08

TSC MEMBER INSTITUTION: Emory University

FUNDING AGENCY(S): National Institutes of Health

# Pharmasset, Inc.

*Where Innovation is Viral*

CONTACT: Pharmasset, Inc.  
303-A College Road East  
Princeton, NJ 08540  
[www.pharmasset.com](http://www.pharmasset.com)

## ABOUT THE COMPANY:

Pharmasset, Inc. is a clinical-stage pharmaceutical company that develops and commercializes novel antiviral therapeutic drugs. Pharmasset was founded by Dr. Raymond Schinazi and Dr. Dennis Liotta, faculty members at Emory University. Emory has multiple license agreements with Pharmasset.

Pharmasset's current focus is on the development of oral therapeutics for the treatment of hepatitis C virus (HCV). HCV is a leading cause of chronic liver disease and liver transplants. The World Health Organization estimates that nearly 180 million people worldwide, or approximately 3% of the world's population, are infected with HCV.

As a result of the limited benefits and serious side effects of existing therapies, the leadership at Pharmasset believes there are significant opportunities for new antiviral therapies to fight HCV. Pharmasset currently has three products that are in various phases of clinical trials. The company has established strategic partnerships with Roche, one of the world's leading research-focused healthcare groups in the field of pharmaceuticals and diagnostics, and Bukwang Pharmaceutical Company, a publicly-traded Korean pharmaceutical, oral hygiene, and cosmetics company.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Pharmasset was founded by Dr. Raymond Schinazi and Dr. Dennis Liotta, world-renowned scientists and drug discovery experts at Emory University. Emory has multiple license agreements with Pharmasset.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The technology development was supported by grants from the National Institutes of Health.

**FOUNDER(S):** Frank Slattery, Jr. and Nicolas Landekic  
**EMPLOYEES:** 16  
**HEADQUARTERS:** Radnor, PA  
**FOUNDED:** 2002  
**REVENUE:** \$1.06 million FY08  
**TSC MEMBER INSTITUTION:** University of Pennsylvania  
**FUNDING AGENCY(S):** National Institutes of Health, National Science Foundation

# PolyMedix, Inc.

**CONTACT:** Polymedix, Inc.  
170 N. Radnor Chester Road, Suite 300  
Radnor, PA 19087  
[www.polymedix.com](http://www.polymedix.com)

## **ABOUT THE COMPANY:**

PolyMedix focuses on developing novel high-value therapeutic drug products for serious, life-threatening acute disorders. The company specializes in biomimetics — novel small molecule compounds and polymers that mimic the activity of proteins. These compounds are designed with a proprietary computational technology platform which focuses on a specific field of biology with many potential product opportunities.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

PolyMedix was founded in 2002, based on proprietary computational drug design technology exclusively licensed from the University of Pennsylvania. This technology is based on the work of Dr. William DeGrado and Dr. Michael Klein. Dr. DeGrado is Raizus Professor of Biochemistry and Biophysics at the Medical School of the University of Pennsylvania and Dr. Klein is the former Director of the Laboratory for Research on the Structure of Matter at the University of Pennsylvania.



#### **ROLE OF FEDERAL RESEARCH FUNDING:**

The basic research at the University of Pennsylvania that led to the development of this technology was supported by research grants from the National Institutes of Health and the National Science Foundation.

FOUNDER(S): Dr. Porter Anderson, Dr. David Insel and Dr. David Smith

EMPLOYEES: 81,800 (Pfizer)

HEADQUARTERS: New York, NY (Pfizer)

FOUNDED: 1983

ACQUIRED: 1988

REVENUE: N/A

TSC MEMBER INSTITUTION: University of Rochester

FUNDING AGENCY(S): National Institutes of Health

# Praxis Biologics

*(Acquired by Pfizer)*

CONTACT: Pfizer  
235 E. 42nd Street  
New York, NY 10017  
[www.pfizer.com](http://www.pfizer.com)

## ABOUT THE COMPANY:

Praxis Biologics was founded in 1983 to develop and market a new vaccine manufacturing process that was discovered by scientists at the University of Rochester Medical Center.

The Praxis Biologics process, called conjugate vaccine technology, causes vaccines to provoke a more aggressive immune system response to infection. Praxis Biologics pioneered pediatric vaccines to fight haemophilus influenza type b (marketed under the brand name HibTITER) and pneumococcal bacteria (Prevnar). The two vaccines target bacteria that are collectively the leading causes of pneumonia, spinal meningitis, blood, and middle ear infections in children in the United States. The bacteria and the diseases it causes are also a major contributor to infant mortality globally.

In 1988, Praxis was sold to American Cyanimid, which, in turn, was acquired by Wyeth Pharmaceuticals in 1994. In 2009, Wyeth Pharmaceuticals was acquired by Pfizer.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Praxis Biologics was founded in 1983 by University of Rochester Medical Center (URMC) researchers David Smith, MD, Porter Anderson, PhD and David Insel, MD.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The original research behind Praxis Biologics founding was funded by National Institutes of Health.

FOUNDER(S): Stephen Turner  
EMPLOYEES: 21  
HEADQUARTERS: Morgantown, WV  
FOUNDED: 2001  
REVENUE: N/A  
TSC MEMBER INSTITUTION: West Virginia University  
FUNDING AGENCY(S): National Institutes of Health

# Protea Bioscience, Inc.

## *Chemistry for Biology*

CONTACT: Protea Biosciences, Inc.  
955 Hartman Run Road  
Morgantown, WV 26507  
[www.proteabio.com](http://www.proteabio.com)

### ABOUT THE COMPANY:

Protea Biosciences, founded in 2001, is a biotechnology manufacturing and marketing company whose products are used to improve the discovery and analysis of proteins found in biological samples and to aid the development of new protein-based pharmaceuticals.

Protein research is necessary for new pharmaceutical development. Most drugs are either proteins or substances that can interact with proteins. Current pharmaceuticals are based on only about 500 of the 300,000 proteins estimated to be present in the human body.

Protea has successfully adapted a novel method to control the flow of biological samples, or biofluids, through micro-channels embedded in plastic protein “microchips.” As a result of that process, a single, enclosed fluid path accommodates a range of processing in a protected environment.

Protea Biosciences provides identification products and services to more than 150 customers worldwide, including 11 pharmaceutical research laboratories. The proprietary technology that founder Stephen Turner and his company adapted in the laboratories of West Virginia University (WVU) is helping Protea Biosciences accomplish its mission by improving the quality, reproducibility and speed of processing protein samples.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Protea Bioscience, Inc. was founded based on West Virginia University-developed technology and with the support of the WVU Research Corporation. It was founded to advance microfluidics and cell signaling technology developed at WVU and apply it to the discovery of novel protein targets to be used in the development of new pharmaceuticals and improved ways to manage disease.

Protea has 12 patents pending based on WVU-generated technology and has also branched out to sponsor research for post doctorate personnel at the University.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Initial funding for the WVU protein research that led to the technologies upon which Protea was founded came from the National Institute of Health.

FOUNDER(S): Dr. Darren Link and Dr. David Weitz

EMPLOYEES: 64

HEADQUARTERS: Lexington, MA

FOUNDED: 2004

REVENUE: N/A

TSC MEMBER INSTITUTION: Harvard University

FUNDING AGENCY(S): National Science Foundation

# RainDance Technologies, Inc.

*Simplicity. Speed. Science.*

CONTACT: RainDance Technologies, Inc.  
44 Hartwell Avenue  
Lexington, MA 02421  
[www.raindancetech.com](http://www.raindancetech.com)

## ABOUT THE COMPANY:

RainDance Technologies manufactures instruments for genomic selection, a method to make current genetic sequencing machines much more efficient. This is important to basic biomedical research as well as to ushering in the new generation of personalized medicine.

RainDance Technologies uses microdroplet-based technology that can be extended across basic and applied research, translational research, and diagnostics. Each droplet is the functional equivalent of a test tube and can contain a single molecule, reaction, or cell. The droplets are processed on a disposable chip that has no moving parts or valves — a true breakthrough for accelerating the targeted sequencing of the human genome. The speed and simplicity of the company's technology platform enable researchers to design experiments in ways that were previously unaffordable or unimaginable.

RainDance's initial application focuses on the targeted resequencing of the human genome — one of the fastest-growing segments of the \$1 billion DNA sequencing market. This application will enable the high-resolution analysis of genetic variation between individuals and populations at a level unmatched by current methodology.

#### **UNIVERSITY-BASED RESEARCH CONNECTION:**

RainDance Technologies was founded by Dr. David Weitz of Harvard University along with two collaborators from Europe and a postdoctoral scientist, Darren Link, from Dr. Weitz's lab. The droplet-based microfluidics technology developed by Dr. Weitz's Harvard-based research group is the essential technology behind RainDance's current product line, as well as those in development. In addition to RainDance, four other companies have spun-out of Dr. Weitz's lab. Each is based on droplet-based microfluidics technology, and all employ individuals who have worked under Dr. Weitz. "All of the companies employ students or post docs who have worked with me, as well as many other people, and this is one thing I am most proud of," Weitz commented.

#### **ROLE OF FEDERAL RESEARCH FUNDING:**

Development of droplet-based microfluidics was supported by grants from the National Science Foundation.

FOUNDER(S): Dr. Omar Knio and Dr. Timothy Weihs

EMPLOYEES: 25

HEADQUARTERS: Hunt Valley, MD

FOUNDED: 2001

REVENUE: N/A

TSC MEMBER INSTITUTION: Johns Hopkins University

FUNDING AGENCY(S): National Science Foundation

# Reactive NanoTechnologies, Inc.

CONTACT: Reactive NanoTechnologies, Inc.  
180 Lake Front Drive  
Hunt Valley, MD 21030  
[www.rntfoil.com](http://www.rntfoil.com)

## ABOUT THE COMPANY:

Headquartered in Hunt Valley, Maryland, Reactive NanoTechnologies, Inc. (RNT) was founded in 2001 by two Johns Hopkins University (JHU) professors to develop and manufacture the company's patented technology, NanoFoil®.

NanoFoil® is useful for bonding components when exposure to high process temperatures must be considered, and is compatible with all solders. NanoFoil® is designed to improve the process of bonding heavy materials, using localized heat bursts to bond electronics on the nanoscale. The company has also developed its patented NanoBond® joining process to simplify manufacturing and ensure the benefits of NanoFoil® are maximized. NanoBond® localized heat is used in many bonding applications, ranging from the bonding of sputter targets to backing plates, to the attaching of a component such as an LED to a circuit board.

RNT's breakthrough technology has earned several prestigious awards, including the 2005 "R&D 100" from *R&D Magazine*, the 2005 Nano 50™ from NASA Nanotech Briefs magazine and recognition in The National Nanotechnology Initiative Strategic Plan in December 2004.

RNT has entered into licensing agreements with a number of Fortune 500 companies.



**UNIVERSITY-BASED RESEARCH CONNECTION:**

The founders of RNT were both professors at Johns Hopkins University. Dr. Timothy Weihs was a Professor of Materials Science and Engineering and Dr. Omar Knio was a Professor of Mechanical Engineering.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Funding from the National Science Foundation helped support the original research conducted at JHU.

FOUNDER(S): David Smith  
EMPLOYEES: 40  
HEADQUARTERS: Los Angeles, CA  
FOUNDED: 1999  
REVENUE: \$7.1 million FY08  
TSC MEMBER INSTITUTION: University of Southern California  
FUNDING AGENCY(S): National Institutes of Health

# Response Genetics, Inc.

CONTACT: Response Genetics, Inc.  
1640 Marengo Street, 6th Floor  
Los Angeles, CA 90033  
[www.responsegenetics.com](http://www.responsegenetics.com)

## ABOUT THE COMPANY:

Response Genetics (RGI) is focused on the development and sale of molecular diagnostic tests for cancer. RGI's technologies enable extraction and analysis of genetic information from tumor samples stored as formalin-fixed and paraffin-embedded specimens. Until this technique was invented at the University of Southern California, RNA was only available from fresh frozen specimens; it was not possible to extract meaningful genetic information from diagnostic specimens fixed and stored in paraffin.

In addition to diagnostic testing services, RGI generates revenue from the sales of its proprietary analytical pharmacogenomic testing services of clinical trial specimens for the pharmaceutical industry.

This exclusively licensed technology allows Response Genetics to deliver tangible results to pharmaceutical companies and to create new platforms to support the industry with more efficient, cost-effective analysis of clinical trial samples. That should lead to the development of more "personalized" patient therapies. Response Genetics has client relationships with some of the largest pharmaceutical companies in the world, including Roche, Roche Diagnostics, Taiho Pharmaceuticals and GlaxoSmithKline.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

This technique was invented at the University of Southern California.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The Response Genetics technologies were invented with the help of federal research funding from the National Cancer Institute, part of the National Institutes of Health.

FOUNDER(S): Dr. Don Cameron, Daniel Richard and Dr. Paul Sanberg

EMPLOYEES: 4

HEADQUARTERS: Tampa, FL

FOUNDED: 2001

REVENUE: N/A

TSC MEMBER INSTITUTION: University of South Florida

FUNDING AGENCY(S): National Institutes of Health

# Saneron-CCEL Therapeutics, Inc.

## *Bio • Innovations*

CONTACT: Saneron-CCEL Therapeutics, Inc.  
3802 Spectrum Boulevard, Suite 145  
Tampa, FL 33612  
[www.saneron-ccel.com](http://www.saneron-ccel.com)

### ABOUT THE COMPANY:

Saneron-CCEL Therapeutics is focused on neurological and cardiac cell therapy for the early intervention and treatment of several devastating or deadly diseases which currently lack adequate treatment options, such as Alzheimer's disease.

Saneron-CCEL Therapeutics provides readily available, non-controversial, ethically acceptable cells, both stem cells and other cell types, for cellular therapies.

Saneron-CCEL was co-founded by University of South Florida (USF) professors Dr. Paul Sanberg and Dr. Don Cameron. Sanberg has extensive experience in bringing neural transplantation therapies from the laboratory to the clinic and Cameron is well-known for his fundamental research in Sertoli cells.

### UNIVERSITY-BASED RESEARCH CONNECTION:

Saneron is a University of South Florida spin-out company and is located at the Tampa Bay Technology Incubator. Its founders are USF professors. Dr. Don Cameron is a Professor of Anatomy and has a joint appointment as a Professor of Neurosurgery at USF. Dr. Paul Sanberg is Distinguished University Professor and Director of the Center of Excellence for Aging and Brain Repair and Senior Associate Vice President for Research & Innovation at the University of South Florida.

#### **ROLE OF FEDERAL RESEARCH FUNDING:**

Pivotal studies upon which Saneron is based were funded through USF from the National Institutes of Health (NIH). Saneron has also received 10 Small Business Technology Transfer Programs (STTR) grants and one Small Business Innovation Research (SBIR) grant from the NIH in collaboration with US universities. Further, throughout their careers, Dr. Cameron and Dr. Sanberg have received numerous federal research grants from agencies including NIH and NASA.

**FOUNDER(S):** Anthony Barr, Jim Goodnight, Jane Helwig and John Sall  
**EMPLOYEES:** 11,080  
**HEADQUARTERS:** Cary, NC  
**FOUNDED:** 1976  
**REVENUE:** \$2.26 billion FY08  
**TSC MEMBER INSTITUTION:** North Carolina State University  
**FUNDING AGENCY(S):** US Department of Agriculture

# SAS

*The power to know®*

**CONTACT:** SAS  
100 SAS Campus Drive  
Cary, NC 27513  
[www.sas.com](http://www.sas.com)

## **ABOUT THE COMPANY:**

Born from the Statistical Analysis System developed by company founder Jim Goodnight at North Carolina State University to analyze agricultural data, SAS is today the world's largest privately held software company and the leader in business analytics software and services. It counts 91 of the Fortune 100 companies as its customers and its products are installed at more than 45,000 business, government and university sites around the world. SAS software is used today to sift through massive amounts of data. Insurance companies use SAS to flag fraudulent claims. Retailers use SAS to find profitable places to put stores and products within those stores. Financial institutions use SAS to detect money laundering, as mandated by the USA PATRIOT Act and Basel II. They also use it to sniff out fraud and to score credit applications.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

On completion of his doctorate in statistics, Goodnight became employed as a member of the NC State faculty. During his doctoral research, he joined forces with Anthony Barr, a fellow North Carolina State University graduate. By this time, the department of statistics had become a focal point for incoming agricultural data from universities all over the Southeast. Rather than writing a new program each time analysis was required, Goodnight and Barr thought it

would make sense to write one program that could be applied again and again. From this, Statistical Analysis System (SAS) was developed.

By 1972, with federal funding for the project running out, Barr and Goodnight persuaded the schools using SAS to fund their salaries so that they could continue to develop the software. The partners then were approached by pharmaceutical and insurance companies who recognized the applications of the software for their industries. By 1976 Goodnight and Barr had 120 clients and a growing group of SAS fans. It became apparent that SAS had out-grown its initial status as a research project and needed to move out of the confines of the university. With business partners John Sall and Jane Helwig, Goodnight and Barr established the SAS Institute.

#### **ROLE OF FEDERAL RESEARCH FUNDING:**

A research grant from the US Department of Agriculture supported the development of Statistical Analysis System.

FOUNDER(S): Dr. Mark F. Bear and Randall L. Carpenter

EMPLOYEES: 21

HEADQUARTERS: Cambridge, MA

FOUNDED: 2005

REVENUE: N/A

TSC MEMBER INSTITUTION: Brown University

FUNDING AGENCY(S): National Science Foundation

# Seaside Therapeutics

CONTACT: Seaside Therapeutics  
840 Memorial Drive  
Cambridge, MA 02139  
[www.seasidetherapeutics.com](http://www.seasidetherapeutics.com)

## ABOUT THE COMPANY:

Seaside Therapeutics founders understand the toll that brain development disorders, including autism and mental retardation, take on families and share the sense of frustration that effective therapeutics are still not available despite recent scientific advances. Historically, drug discovery in disorders of brain development has been unproductive largely due to the lack of a mechanistic understanding of these disorders, as well as the absence of predictive animal models. Seaside is changing this paradigm through scientific exploration that focuses on identifying the fundamental pathophysiology of brain development disorders and application of this knowledge to develop targeted therapeutics. A key advance for understanding Fragile X syndrome was the discovery of the specific genetic cause and subsequent engineering of a relevant mouse disease model. Through study of these genetically engineered mice, Seaside founder Dr. Mark Bear and his colleagues discovered a molecular pathway, an mGluR signaling cascade, that is disrupted in a specific disorder of brain development — Fragile X Syndrome. Further research has provided insights for developing novel medications to normalize the function of this pathway, which Seaside believes may extend beyond Fragile X Syndrome into a number of other developmental disorders, including autism.

Seaside Therapeutics was founded to develop potential treatments for these underserved populations by translating breakthrough discoveries in neurobiology



into therapeutics that improve the lives of patients and their families. Its lead drug development programs are currently focused on creating new treatments to correct or improve the course of Fragile X Syndrome and autism. It also continues to evaluate discoveries and explore opportunities to develop novel therapeutics for patients with other disorders of brain development.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Seaside Therapeutics, a successor company to Brown University spin-off Sention, Inc., was founded in 2005 to commercialize new drug treatments to correct or improve the course of Fragile X Syndrome, autism and other disorders of brain development. In his work, first at Brown University and now at MIT, founder, Mark Bear, found that people with Fragile X cannot process metabotropic glutamate receptors, or mGluRs, which act as a conduit between incoming information and memory in the brain. Strengthen that chemical link, the theory goes, and you may be able to stop or even reverse developmental disorders.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The National Science Foundation supported the research conducted at Brown University that formed the basis of Brown spin-off, Sention, Inc. This was subsequently rolled into Seaside Therapeutics.

**FOUNDER(S):** Ralph Nuzzo, John Rogers and George Whitesides

**EMPLOYEES:** 30

**HEADQUARTERS:** Durham, NC

**FOUNDED:** 2005

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** University of Illinois at Urbana-Champaign

**FUNDING AGENCY(S):** Department of Defense, Department of Energy, National Science Foundation

# Semprius

**CONTACT:** Semprius  
4915 Prospectus Drive, Suite C  
Durham, NC 27713  
[www.semprius.com](http://www.semprius.com)

## **ABOUT THE COMPANY:**

Semprius is developing low cost, high performance concentrator photovoltaic (CPV) modules to make solar power generation economically viable in sunny, dry climates. The company's unique micro-transfer printing technology enables CPV modules with high performance, high reliability and low cost with scalability to high-volume production.

Semprius is also licensing its micro-transfer printing technology for non-solar applications to enable a wide variety of new products requiring large-area, thin, lightweight form factors, unprecedented performance, high reliability and low cost. Applications include flat-panel displays, flexible electronics, large-area sensors, RF devices and other applications requiring heterogeneous integration of high-performance semiconductors. The company won the coveted Spin-out of the Year Award from the Council for Entrepreneurial Development in 2007, the Wall Street Journal Technology Innovation Award in 2006, and was a recipient of a National Science Foundation Small Business Innovation Research Phase I Grant in 2007. Semprius closed a \$6.4 million Series B round of venture funding in June 2009.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

While solar energy is not new, the challenge today is to make solar energy more affordable, streamlined and powerful. Semprius has an advantage in this area because of a micro-transfer printing technology invented by company founder John Rogers. Rogers is a professor of Engineering and Chemistry at the University of Illinois in the Nanoelectronics and Biophotonics group. His technology allows transfer printing of high performance semiconductors onto virtually any surface, including, glass, flexible or rigid plastic, metal or other semiconductors.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The work of Professor Rogers has been supported by the Department of Energy, National Science Foundation and the Defense Advanced Research Projects Agency (DARPA), part of the Department of Defense.

FOUNDER(S): Gary Kendra, Sergio Mazza and Dr. Sean Wu

EMPLOYEES: 8

HEADQUARTERS: Detroit, MI

FOUNDED: 2003

REVENUE: N/A

TSC MEMBER INSTITUTION: Wayne State University

FUNDING AGENCY(S): National Science Foundation

# SenSound, LLC

*Sound, as we see it.*

CONTACT: SenSound, LLC  
440 Burroughs Street, Suite 170  
Detroit, MI 48202  
[www.sensound.com](http://www.sensound.com)

## ABOUT THE COMPANY:

SenSound offers software, systems and services for noise source identification and noise related quality control testing.

Dr. Sean F. Wu, distinguished professor of mechanical engineering at Wayne State University's College of Engineering, developed this tool to help quiet the noise that surrounds our daily lives. He says that seeing sound through science is the perfect solution to noise problems such as squeaky brakes, noisy dish-washers and more.

Dr. Wu and a team of Wayne State graduate students developed, patented and licensed a technology that allows users to actually see where unwanted sound originates and how it travels through space and time.

SenSound's technology creates a 3-D image of sound in space and time that can pinpoint the exact source of noise in a large number of products with a high degree of resolution and accuracy. It will provide manufacturers of automobiles, airplanes, ships, consumer appliances and industrial machinery with an invaluable tool to quickly and accurately isolate and resolve problems of unwanted sound. It will also serve architectural firms that want to reduce the intrusions of external environmental noise or internally generated noise from HVAC equipment and other sources.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

SenSound's technology was initially developed in the College of Engineering at Wayne State University in Detroit, Michigan.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Development of the SenSound technology was initially supported by grants from the National Science Foundation and was further supported by Small Business Innovation Research (SBIR) grants from the Department of Defense through the US Air Force and the National Science Foundation.

FOUNDER(S): Dr. Anthony Brennan

EMPLOYEES: 5

HEADQUARTERS: Alachua, FL

FOUNDED: 2007

REVENUE: N/A

TSC MEMBER INSTITUTION: University of Florida

FUNDING AGENCY(S): Department of Defense

# Sharklet Technologies, Inc.

*From Evolution to Medical Solution*

CONTACT: Sharklet Technologies, Inc.  
PO Box 1799  
Alachua, FL 32616  
[www.sharklet.com](http://www.sharklet.com)

## ABOUT THE COMPANY:

Sharklet Technologies, named one of the top biotech startups in the Southeast, has developed an innovative surface technology (mimicking the antimicrobial properties of shark skin) that can prevent hospital-acquired infections. The technology controls the growth of microorganisms and bacteria such as staph and E. coli. The company has also begun testing the product for use against more virulent strains of bacteria, including MRSA.

University of Florida Materials Science and Engineering Professor Anthony Brennan conducted research for the US Navy; he was looking to develop an environmentally friendly coating for hulls of ocean-going ships. Brennan's idea was to mimic sharks' unique scales in a ship hull coating that would prevent the growth of marine algae and barnacles.

Brennan invented a microscopic surface pattern technology comprised of billions of tiny raised bars arranged in a specific diamond pattern. The shape and pattern alone disrupts bacterial growth and the formation of bacterial biofilms. There is no chemistry, toxicity or leaching of any chemicals. The pattern itself may be manufactured onto the surfaces of medical devices such as catheters, or manufactured as a durable film that may be applied to existing objects such as bed rails or tray tables in a healthcare setting. Sharklet's founders want to reduce the reproduction, migration and transference of bacteria everywhere in

the hospital setting, so that patients have a reduced risk of getting a hospital-acquired infection.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Sharklet grew out of research at the University of Florida. The company is headquartered at the university's Sid Martin Biotechnology Center.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The original research was supported by the Department of Defense through the US Navy.

FOUNDER(S): Dr. Deepika Singh and Rajiv Singh

EMPLOYEES: 15

HEADQUARTERS: Gainesville, FL

FOUNDED: 2002

REVENUE: N/A

TSC MEMBER INSTITUTION: University of Florida

FUNDING AGENCY(S): Department of Energy, NIST, National Science Foundation

# Sinmat

*The Clear Choice*

CONTACT: Sinmat  
2153 SE Hawthorne Road, Suite 124  
Gainesville, FL 32641  
[www.sinmat.com](http://www.sinmat.com)

## ABOUT THE COMPANY:

Sinmat is an emerging materials nanotechnology company developing new processes for polishing semiconductor wafers. Sinmat produces slurry that makes it cheaper to produce silicon wafers. The company designed new polishing techniques to enable the introduction of copper in integrated circuits. It also is developing new manufacturing processes as the industry moves to larger wafers.

The high hardness and chemically inert quality of gallium nitride and silicon carbide make them good materials for many applications in both the semiconductor and materials processing industries. But surface preparation is often costly, because even the best chemical mechanical planarization (CMP) finishing methods have slow removal rates (up to 100 hours per wafer) and can cause defects.

The solution from Sinmat is the Ultra-Rapid Polishing Slurry for Wide Band-Gap Semiconductors. The technology uses a combination of reactive nanoparticles and chemistry to convert hard wide band-gap material into a softer layer for rapid removal.

Sinmat is also developing new ways to manufacture microchips that can help power smarter energy systems — from more fuel-efficient hybrid cars to more responsive, efficient lighting for homes and businesses. Rajiv Singh, the company's co-founder and inventor of the new polishing technologies, is a



world leader in the field of materials science. He has 15 patents and software copyrights, and has authored over 400 papers and more than 10 books.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Rajiv Singh, the company's co-founder and inventor of the new polishing technologies, is a professor at the University of Florida.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Singh's research at the University of Florida on semiconductor polishing techniques has been supported by grants from the National Science Foundation, Department of Defense, Department of Energy, and the National Institute of Standards and Technology.

**FOUNDER(S):** Edward Chen, Woolas Hsieh and Jennifer Yu

**EMPLOYEES:** 26

**HEADQUARTERS:** El Monte, CA

**FOUNDED:** 2006

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** University of California, Los Angeles

**FUNDING AGENCY(S):** Department of Defense, National Science Foundation

# Solarmer Energy, Inc.

**CONTACT:** Solarmer Energy, Inc.  
3445 Fletcher Avenue  
El Monte, CA 91731  
[www.solarmer.com](http://www.solarmer.com)

## **ABOUT THE COMPANY:**

Using technology developed at the University of California, Los Angeles (UCLA), Solarmer Energy seeks to overcome one of the significant barriers to broader use of solar technology — its cost. According to Solarmer, their solar panels have the potential to bring down the cost of solar energy to be on par with conventional fuel costs.

The company's flexible plastic solar cells are made using inexpensive organic materials, rendering them lightweight, transparent, aesthetically pleasing, and environmentally friendly. These attributes further open the door to using renewable solar energy in many applications where conventional silicon solar cell technology would not currently be a fit. Portable electronics — cell phones, laptops, digital music players, portable video games, etc. — are one example. Plastic solar cells have the potential to extend the portable power of these devices. In addition to consumer and portable electronics, Solarmer is targeting building-integrated photovoltaics, smart fabrics, and sensor networks for its organic photovoltaic technology.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

Solarmer Energy, Inc. was founded in 2006 to commercialize a portfolio of solar cell technologies developed by UCLA Materials Science Professor

Yang, PhD. Solarmer has licensed seven polymer solar cell patents registered by Yang's lab at the Henry Samueli School of Engineering and Applied Science at UCLA and is in the process of licensing several other key patents based on his research from the University of California.

Former UCLA doctoral students Gang Li and Vishal Shrotriya, who both worked on polymer solar cell technology as part of Professor Yang's research group, now lead product development at Solarmer Energy. Solarmer continues to collaborate with UCLA scientists in the development of next generation solar technologies and provides partial financial support for continuing research on the UCLA campus.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The National Science Foundation and the US Department of Defense Office of Naval Research (ONR) and the Air Force Office of Scientific Research (AFOSR) have supported Professor Yang's research.

FOUNDER(S): Andrew Kent  
EMPLOYEES: 10  
HEADQUARTERS: Quincy, MA  
FOUNDED: 2007  
REVENUE: N/A  
TSC MEMBER INSTITUTION: New York University  
FUNDING AGENCY(S): National Science Foundation

# Spin Transfer Technologies

CONTACT: Spin Transfer Technologies  
One Adams Place  
859 Willard Street, Suite 400  
Quincy, MA 02169  
[www.alliedminds.com/Portfolio/Spin\\_Transfer\\_Tech](http://www.alliedminds.com/Portfolio/Spin_Transfer_Tech)

## ABOUT THE COMPANY:

Spin Transfer Technologies (STT) has developed novel magnetoresistive random access memory (MRAM) devices for non-volatile computer memory. This class of memory devices — USB flash drives, memory sticks, and smart cards are examples — utilizes a quantum mechanical effect known as spin transfer to manipulate magnetic orientations over small distances.

However, a problem with flash drives and flash memory is the limited life of each memory cell write and its slow write speed, making them unsuitable for tasks requiring frequent read/write cycles. Additional disadvantages include high voltage requirements and limited scalability to smaller dimensions. STT's patented technology provides a significant improvement over current spin transfer MRAM designs, which involve thermodynamic processes in the initiation of magnetic switching.

## UNIVERSITY-BASED RESEARCH CONNECTION:

STT was established by New York University (NYU) and Allied Minds. The technology was originally developed from the mesoscopic magnetism research conducted in the laboratory of Andrew Kent, professor of physics at NYU and a Fellow of the American Physical Society.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The National Science Foundation funded the work on MRAM computer memory technology.

**FOUNDER(S):** Andreas Bechtolsheim, Bill Joy, Vinod Khosla and Scott McNealy

**EMPLOYEES:** 33,556

**HEADQUARTERS:** Santa Clara, CA

**FOUNDED:** 1982

**ACQUIRED:** 2009

**REVENUE:** \$13.88 billion FY08

**TSC MEMBER INSTITUTION:** University of California, Berkeley and Stanford University

**FUNDING AGENCY(S):** Department of Defense

# Sun Microsystems, Inc.

*The Network is the Computer*

**CONTACT:** Sun Microsystems, Inc.  
4150 Network Circle  
Santa Clara, CA 95054  
[www.sun.com](http://www.sun.com)

## **ABOUT THE COMPANY:**

Sun Microsystems, Inc. is one of Silicon Valley's most famous startups. Sun was born in 1982 when four Bay Area tech gurus created a new class of inexpensive workstations to perform tasks that previously required costly mainframes or minicomputers. Sun Microsystems was founded in 1982 by Bill Joy, a doctoral student at University of California, Berkeley, Andreas Bechtolsheim, a doctoral student at Stanford University, and two graduates of the Stanford business school, Vinod Khosla and Scott McNealy. Their goal was to commercialize hardware and software technologies developed at UC Berkeley and Stanford University.

The design of Sun Microsystems' first workstations was based on the Stanford University Network (SUN) workstation engineered by Bechtolsheim. The company also used the Berkeley version of the Unix operating system developed by Joy.

Sun Microsystems, Inc. is a major supplier of software, microchips, and computer workstations. Its core brands include Java, the Solaris operating system, and the UltraSPARC microprocessor. Sun sells a wide array of high-end computer servers used in the construction of data centers and IT networks. It also created the Java programming language that developers can use to create

software once, so that it can then be used on any computer (Windows, Apple, Linux, etc.) and devices such as cell phones.

In April 2009, it was announced that Sun would be acquired by Oracle Corp. for \$7.4 billion.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Sun Microsystems was founded in 1982 by Bill Joy, a doctoral student at University of California, Berkeley, Andreas Bechtolsheim, a doctoral student at Stanford University, and two graduates of the Stanford business school, Vinod Khosla and Scott McNealy.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Work on the Stanford University Network (SUN) workstation at Stanford was funded by the Defense Department's Defense Advanced Research Projects Agency (DARPA). DARPA also supported the development of the Berkeley version of Unix.

FOUNDER(S): Dr. Richard Swanson  
EMPLOYEES: 5,000  
HEADQUARTERS: San Jose, CA  
FOUNDED: 1985  
REVENUE: \$1.43 billion FY08  
TSC MEMBER INSTITUTION: Stanford University  
FUNDING AGENCY(S): Department of Energy

# SunPower Corporation

## *The Planet's Most Powerful Solar*

CONTACT: SunPower Corporation  
3939 N. 1st Street  
San Jose, CA 95134  
[us.sunpowercorp.com](http://us.sunpowercorp.com)

### ABOUT THE COMPANY:

SunPower is the global leader in developing high-efficiency solar solutions for homes, businesses, commercial buildings and utilities.

### UNIVERSITY-BASED RESEARCH CONNECTION:

In the early 1970s, SunPower co-founder Dr. Richard Swanson was pondering ways to deal with the oil crisis. At the time, he was working on his doctorate in engineering at Stanford University. While he (and the rest of the world) waited in long gas station lines, Dr. Swanson began to consider alternative energy sources. Solar cells were being used on satellites, a concept that he found extremely intriguing. His engineering challenge was to figure out how to make the cells — which were extremely expensive to produce — more cost-effective.

By 1985, Dr. Swanson (who by then was a professor of electrical engineering at Stanford) had been awarded grants from the Electric Power Research Institute and the Department of Energy to support his solar power explorations. With the help of these funds — as well as financial support from two venture capital firms — SunPower was officially incorporated.

Today, Dr. Swanson's original vision — that solar energy generated from massive installations in the desert might power the electrical grid — is about to



become reality. In 2008, SunPower signed an agreement with PG&E to build the world's largest — 250 MW — photovoltaic (PV) power plant, set to begin energy delivery in 2010.

**ROLE OF FEDERAL RESEARCH FUNDING:**

SunPower solar technology was developed by founder, Dr. Richard Swanson and his students while he was professor of electrical engineering at Stanford University. Financial support for Dr. Swanson's early research was provided in part by the US Department of Energy and the Electric Power Research Institute (EPRI).

FOUNDER(S): Dr. Ernest Garcia  
EMPLOYEES: 5  
HEADQUARTERS: Atlanta, GA  
FOUNDED: 1999  
REVENUE: \$3 million FY08  
TSC MEMBER INSTITUTION: Emory University  
FUNDING AGENCY(S): National Institutes of Health

# Syntermed, Inc.

## *Software Solutions from Medical Imaging*

CONTACT: Syntermed, Inc.  
Tower Place Center  
3340 Peachtree Road, Suite 1800  
Atlanta, GA 30326  
[www.syntermed.com](http://www.syntermed.com)

### ABOUT THE COMPANY:

Syntermed, Inc. is an Atlanta-based nuclear medicine imaging and informatics software company. The company's lead product is a software package called Emory Cardiac Toolbox™ (ECTb™). Today, the Emory Cardiac Toolbox is in nearly half of all nuclear medicine labs nationwide.

Syntermed's software products were developed by Emory University scientist Ernest Garcia, PhD and his colleagues, in collaboration with scientists at the Georgia Institute of Technology. The Emory Cardiac Toolbox provides physicians with the ability to process, display, interpret, and analyze cardiac positron emission tomography (PET) and single-photon computed tomography (SPECT) images. By displaying three-dimensional images of the patient's heart, the Toolbox allows physicians to see whether or not blood is flowing to all areas of the myocardium and determine the heart's efficiency.

### UNIVERSITY-BASED RESEARCH CONNECTION:

Emory University initially licensed these software packages directly to equipment manufacturers and diagnostic imaging centers. In 1999, Syntermed was co-founded by the Emory University Office of Technology Transfer in order to streamline the commercialization of the university-developed software products, and Syntermed now does direct licensing.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The research and product development was supported by grants from the National Institutes of Health and the Georgia Research Alliance, a state agency.

FOUNDER(S): John Gill and Yigong Shi  
EMPLOYEES: 17  
HEADQUARTERS: Malvern, PA  
FOUNDED: 2004  
REVENUE: \$1.4 million FY08  
TSC MEMBER INSTITUTION: Princeton University  
FUNDING AGENCY(S): National Institutes of Health

# TetraLogic Pharmaceuticals

CONTACT: TetraLogic Pharmaceuticals  
343 Phoenixville Pike  
Malvern, PA 19355  
[www.tetralogicpharma.com](http://www.tetralogicpharma.com)

## ABOUT THE COMPANY:

TetraLogic Pharmaceuticals is a privately held biopharmaceutical company that discovers and develops small molecule drugs that modulate programmed cell death pathways to treat debilitating diseases and conditions.

Professor Yigong Shi, formerly of Princeton University's Department of Molecular Biology, developed TetraLogic's core technology, called Inhibitor of Apoptosis Proteins (IAP), which enables drugs to be developed that unblock the cell death or apoptosis pathway, resulting in the death of tumor cells.

The company's Smac Mimetics neutralize critical blocks in the apoptosis pathway to selectively destroy cancer cells. Its Necrostatin drugs block critical steps in the process leading to necrosis, enabling cell survival in a wide range of diseases and injuries where necrosis is a critical component of pathology.

TetraLogic recently announced that it has completed a \$36 million Series B private equity financing process. Proceeds from the financing will be invested to advance its Inhibitor of Apoptosis Proteins antagonist oncology program through initial clinical trials. TetraLogic has made substantial progress in its research and development efforts on the IAP antagonist.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

One of TetraLogics's founding scientists is Yigong Shi, formerly of Princeton University's Department of Molecular Biology.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Professor Shi's work was supported in part with funding from the National Institutes of Health.

**FOUNDER(S):** Dr. Hans Blaschek

**EMPLOYEES:** 10

**HEADQUARTERS:** Chicago, IL

**FOUNDED:** 2006

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** University of Illinois at Urbana-Champaign

**FUNDING AGENCY(S):** Department of Energy, US Department of Agriculture

# TetraVitae Bioscience

**CONTACT:** TetraVitae Bioscience  
20 N. Wacker Drive, Suite 3410  
Chicago, IL 60606  
[www.tetravitae.com](http://www.tetravitae.com)

## **ABOUT THE COMPANY:**

TetraVitae Bioscience is developing bio-based chemical, plastics and fuels. Their focus is the production of biobutanol using a proprietary fermentation process and enhanced microorganism platform. Their biobutanol technology has demonstrated significant improvements over conventional approaches in key performance metrics.

TetraVitae has patented a mutant strain of *Clostridium beijerinicki* that produces higher levels of butanol than wild-type strains and that is known for its stability, robustness, and responsiveness to genetic modification and improvement.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

Dr. Hans Blaschek is a professor at the University of Illinois in Urbana-Champaign and a leader in the realm of genetic manipulation of the (ABE) fermentation microorganism, *Clostridium beijerinicki*, for biotechnology applications.

## **ROLE OF FEDERAL RESEARCH FUNDING:**

Dr. Blaschek's work has funding from the Department of Energy and the US Department of Agriculture Value Added Non-Foods program.

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**FOUNDER(S):** Dr. Mostafa Analoui and Dr. Mark Saxen

**EMPLOYEES:** 15

**HEADQUARTERS:** Indianapolis, IN

**FOUNDED:** 1996

**REVENUE:** \$2.7 million FY08

**TSC MEMBER INSTITUTION:** Indiana University

**FUNDING AGENCY(S):** National Institutes of Health

# Therametric Technologies, Inc.

**CONTACT:** Therametric Technologies, Inc.  
351 West Tenth Street, Suite 222  
Indianapolis, IN 46202-4119  
[www.therametric.com](http://www.therametric.com)

## ABOUT THE COMPANY:

The roots of Therametric Technologies, Inc. (TTI) date back to the mid-1990s, when Dr. George Stookey and his Indiana University School of Dentistry colleagues, Dr. Mostafa Analoui and Dr. Mark Saxen learned about a promising laser light-scattering technology under development at an Amsterdam-based firm. It had the potential to identify dental cavities two years earlier than current X-ray-based techniques. TTI was formed in 1996 by Dr. Analoui and Dr. Saxen. Dr. Stookey bought out the company in 2002 following his retirement from Indiana University (IU) the year earlier.

TTI develops devices that use light waves to spot weaknesses in tooth enamel. The latest hand-held version is markedly improved so that dentists can perform oral exams and have the results immediately fed back into computers that record and analyze each reading. The main advantage will be helping patients avoid cavities or reverse the cavity growing process through professional treatments such as fluoride varnishes. Since tooth enamel decays slowly because acids from bacteria eat away at enamel faster than the body can rebuild, early detection of weak spots is critical. TTI has discovered an unusual niche: it is already marketing a line of patented dental health products for pets. The products include extruded rawhide products, dog biscuits, cat treats, and an additive to dissolve in pets' water dishes that helps to prevent plaque, tartar, gingivitis, and bad breath in dogs and cats. These products are being marketed



only to veterinarians for resale to their clients and are presently available in veterinary offices in 32 states.

#### **UNIVERSITY-BASED RESEARCH CONNECTION:**

Stookey's work in the field actually began in 1957, when he performed some of the original fluoride sampling for Indiana University's Crest Toothpaste project. He spent the next four decades at Indiana University, mostly as the School of Dentistry's associate dean for research. In that time, he earned more than 20 US and foreign patents.

Original research was conducted at Indiana University, at the School of Dentistry. TTI is housed within the Indiana University Emerging Technologies Center.

#### **ROLE OF FEDERAL RESEARCH FUNDING:**

Dr. Stookey received significant federal and state research funding for his work at IU to test and validate the scientific principles behind TTI's technologies. Federal funding was provided by the National Institute for Dental and Cranio-facial Research, a part of the National Institutes of Health.

FOUNDER(S): Allan Curran and Keith Johnson  
EMPLOYEES: 30  
HEADQUARTERS: Calumet, MI  
FOUNDED: 1994  
REVENUE: \$2 million FY08  
TSC MEMBER INSTITUTION: Michigan Technological University  
FUNDING AGENCY(S): Department of Defense

# ThermoAnalytics, Inc.

## *Total Thermal Solutions*

CONTACT: ThermoAnalytics, Inc.  
23440 Airpark Boulevard  
PO Box 66  
Calumet, MI 49913  
[www.thermoanalytics.com](http://www.thermoanalytics.com)

### **ABOUT THE COMPANY:**

ThermoAnalytics, Inc. provides software and engineering services in the area of thermal modeling and analysis for civilian and military applications — including infrared signature modeling, climate control design and optimization, and component design and optimization. The company has been awarded contracts to develop software engineering design tools to assist in the design of Army tactical vehicles.

### **UNIVERSITY-BASED RESEARCH CONNECTION:**

ThermoAnalytics was founded to make use of software and technical capabilities developed under military and civilian sponsored research at Michigan Technological University's Keweenaw Research Center (KRC). Both organizations continue to collaborate on research, leveraging each others' core technical strengths and business relationships.

### **ROLE OF FEDERAL RESEARCH FUNDING:**

The original ThermoAnalytics software product offering was developed in part through the US Army, part of the Department of Defense.

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FOUNDER(S): Thomas Rockwell Mackie, PhD and Paul Reckwerdt  
EMPLOYEES: 665  
HEADQUARTERS: Madison, WI  
FOUNDED: 1997  
REVENUE: \$232.8 million FY 2008  
TSC MEMBER INSTITUTION: University of Wisconsin-Madison  
FUNDING AGENCY(S): National Institutes of Health

# TomoTherapy Incorporated

CONTACT: TomoTherapy Incorporated  
1240 Deming Way  
Madison, WI 53717-1954  
[www.tomotherapy.com](http://www.tomotherapy.com)

## ABOUT THE COMPANY:

TomoTherapy Incorporated has developed, manufactures and sells the TomoTherapy® Hi-Art® treatment system, one of the most advanced and versatile radiation therapy systems available for the treatment of a wide variety of cancers.

University of Wisconsin-Madison professors Thomas Mackie and Paul Reckwerdt wanted to solve a major problem in cancer treatment therapy — the serious damage to normal tissues and organs created by standard radiation therapy. They were intrigued with the idea of building a machine that could deliver radiation in a fashion that more accurately targeted cancerous tumors, while minimizing radiation exposure to surrounding tissue. The result is the Hi-Art® system, unique among linear accelerators in its CT platform-based design. With integrated CT imaging and helical delivery capabilities, it is the only device developed from the ground up for image-guided, intensity-modulated radiation therapy.

Today, physicians in more than 20 countries use this remarkable technology to customize a treatment plan that delivers a precisely configured field of radiation to the tumor that is essentially the same shape and volume as the tumor itself.

In use at hospitals and cancer centers in North America, Europe, Asia and the Middle East, the Hi-Art® treatment system delivers advanced radiation to kill cancer cells while reducing radiation exposure to surrounding healthy tissue.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

University of Wisconsin-Madison professors Thomas Mackie and Paul Reckwerdt developed the TomoTherapy system.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The initial research and development was undertaken at the University of Wisconsin-Madison with a \$250,000 grant from the National Cancer Institute, part of the National Institutes of Health.

**FOUNDER(S):** Dr. Shyam Mohapatra

**EMPLOYEES:** 6

**HEADQUARTERS:** Tampa, FL

**FOUNDED:** 2002

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** University of South Florida

**FUNDING AGENCY(S):** Department of Energy, National Institutes of Health

# Transgenex Nanobiotech, Inc.

**CONTACT:** Transgenex Nanobiotech, Inc.  
3802 Spectrum Boulevard, Suite 123  
Tampa, FL 33612  
[www.transgenex.com](http://www.transgenex.com)

## **ABOUT THE COMPANY:**

Transgenex uses nanoparticle technology to create diagnostic and disease-treatment products. More specifically, Transgenex uses a unique gene expression and delivery technology to discover and develop nanoparticle formations to diagnose and treat acute and chronic pulmonary inflammatory diseases, such as asthma, and cancer.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

Founder Dr. Shyam Mohapatra is a molecular biologist with more than 20 years experience in drug discovery for the treatment of allergic diseases. He is currently a Professor of Medicine and Director of Research at the Airway Disease Center at the University of South Florida (USF).

## **ROLE OF FEDERAL RESEARCH FUNDING:**

Transgenex has received awards from the Department of Defense and the National Institutes of Health (NIH). Throughout his career, Dr. Mohapatra at USF was funded from the NIH which helped lead to the work being done at Transgenex.

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FOUNDER(S): Dr. Dennis Liotta and Dr. Raymond Schinazi

EMPLOYEES: 3,400 (Gilead)

HEADQUARTERS: Foster City, CA (Gilead)

FOUNDED: 1995

ACQUIRED: 2003

REVENUE: N/A

TSC MEMBER INSTITUTION: Emory University

FUNDING AGENCY(S): National Institutes of Health

# Triangle Pharmaceuticals

*(Acquired by Gilead Sciences, Inc.)*

CONTACT: Gilead Sciences, Inc.  
333 Lakeside Drive  
Foster City, CA 94404  
[www.gilead.com](http://www.gilead.com)

## ABOUT THE COMPANY:

Since the emergence of the HIV/AIDS epidemic in the 1980s, two Emory scientists, Dennis Liotta, PhD and Raymond Schinazi, PhD, have led the fight to develop life-saving drugs to treat its victims. Their HIV laboratory was the first of its kind, and their research was supported by grants from the National Institutes of Health. In 1995, Schinazi and Liotta co-founded Triangle Pharmaceuticals, Inc., a faculty startup located in Research Triangle Park, NC. Triangle was a specialty pharmaceutical company developing new antiviral drugs for HIV and the hepatitis B virus. In early 2003, Triangle was acquired by Gilead Sciences, Inc.

Gilead Sciences, Inc. is one of the world's largest biopharmaceutical companies. Gilead discovers, develops and commercializes innovative medicines in areas of unmet need. Gilead's primary areas of focus include HIV/AIDS, liver disease, and serious cardiovascular and respiratory conditions. The company currently has a portfolio of 10 products, including a number of category firsts and market leaders. Gilead is a \$42 billion public company and has operations on four continents.



**UNIVERSITY-BASED RESEARCH CONNECTION:**

Three of the 10 products marketed by Gilead (Emtriva<sup>®</sup>, Truvada<sup>®</sup> and Atripla<sup>®</sup>) were invented by Emory scientists. Currently, over 94 percent of HIV patients in the United States on lifesaving antiviral therapy take a drug developed at Emory University.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The technology development of the three Emory-invented drugs was supported by grants from the National Institutes of Health.

FOUNDER(S): Sherwin Seligsohn  
EMPLOYEES: 80  
HEADQUARTERS: Ewing, NJ  
FOUNDED: 1994  
REVENUE: \$19.1 million FY08  
TSC MEMBER INSTITUTION: Princeton University  
FUNDING AGENCY(S): Department of Defense, Department of Energy

# Universal Display Corporation

*From molecules to color monitors*

CONTACT: Universal Display Corporation  
375 Phillips Boulevard  
Ewing, NJ 08618  
[www.universaldisplay.com](http://www.universaldisplay.com)

## ABOUT THE COMPANY:

Universal Display Corporation (UDC) is a world leader in the development of innovative Organic Light Emitting Device (OLED) technology for flat panel displays, lasers and other light generating devices. Its innovations are based on technologies developed at Princeton University.

The company is developing an important portfolio of worldwide patents in the area of OLEDs and is, therefore, poised to be a force as the industry develops and a new generation of flat panel display products is sold. Universal Display has one of the largest patent portfolios in the OLED field with licensing rights to over 940 issued and pending patents worldwide in a broad array of OLED technologies, materials and processes.

“Our licensees and partners remain focused on manufacturing and selling OLED displays on a global scale,” said Sidney D. Rosenblatt, Executive Vice President and Chief Financial Officer of Universal Display, in May 2009. “Our technology continues to be a key differentiator for the next generation of consumer electronics. Right now, these products are primarily personal electronic devices like MP3 players and cell phones. However, the industry has larger area displays, including TVs and computer monitors, in its sights for 2010.”

UDC has entered into more than 30 business agreements with leading manufacturers in Japan, Korea, Taiwan, China, Europe and the United States including with companies such as Chi Mei EL, DuPont Displays, Konica Minolta, LG Display, Samsung SMD, Seiko Epson, Sony, Tohoku Pioneer and Toyota Industries.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

UDC's innovations are based on technologies developed at Princeton University. A founder, Dr. Steven Forrest, now at the University of Michigan, continues to serve on UDC's Scientific Advisory Board. Universal Display has university partners at Princeton University, the University of Southern California and the University of Michigan.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The work by Dr. Forrest and others in the Princeton University Departments of Electrical Engineering was supported in part by grants from the Department of Energy and the Department of Defense, including the Defense Advanced Research Projects Agency (DARPA), Office of Naval Research, and the US Army.

FOUNDER(S): Deepak Sahasrabudhe, MD and Maurice Zauderer, PhD

EMPLOYEES: 50

HEADQUARTERS: Rochester, NY

FOUNDED: 1997

REVENUE: N/A

TSC MEMBER INSTITUTION: University of Rochester

FUNDING AGENCY(S): National Institutes of Health

# Vaccinex, Inc.

*Discovering the next generation  
of therapeutic antibodies*

CONTACT: Vaccinex, Inc.  
1895 Mt. Hope Avenue  
Rochester, NY 14620  
[www.vaccinex.com](http://www.vaccinex.com)

## ABOUT THE COMPANY:

Vaccinex is a biotechnology company that develops human monoclonal antibody technology to treat a variety of serious diseases. While the technology has many applications, one promising use is for the identification of certain proteins called monoclonal antibodies that are capable of seeking out and destroying harmful cells.

The firm's pipeline of antibody products target disease indications such as rheumatoid arthritis, non-Hodgkin's lymphoma, multiple sclerosis, breast cancer and inflammatory diseases. From this group, two will enter clinical development in 2009, followed by the remainder in the second half of 2010, officials said.

Vaccinex was founded in 1997 by Maurice Zauderer, PhD and Deepak Sahasrabudhe, MD based on antibody platform technology developed at the University of Rochester Medical Center. It employs some 50 research and drug development scientists and staff.

"Vaccinex is well positioned to advance the development of several innovative therapies in the areas of cancer, autoimmune disease, and inflammation," said Dr. John E. Leonard, a member of the Vaccinex Scientific Advisory Board. The antibody market is predicted to reach \$34 billion by the end of the decade.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Vaccinex was based on research developed at the University of Rochester Medical Center.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The work of Dr. Zauderer at University of Rochester was supported with grants from the National Institutes of Health.

FOUNDER(S): Lonnie Ingram  
EMPLOYEES: 500  
HEADQUARTERS: Cambridge, MA  
FOUNDED: 1992  
REVENUE: \$69 million FY08  
TSC MEMBER INSTITUTION: University of Florida  
FUNDING AGENCY(S): US Department of Agriculture, Department of Energy

# Verenium Corporation

CONTACT: Verenium Corporation  
55 Cambridge Parkway, 8th Floor  
Cambridge, MA 02142  
[www.verenium.com](http://www.verenium.com)

## ABOUT THE COMPANY:

Verenium Corporation is a leader in the development and commercialization of cellulosic ethanol, an environmentally-friendly and renewable transportation fuel, as well as higher performance specialty enzymes for applications within the biofuels, industrial, and animal nutrition and health markets. Verenium operates one of the nation's first cellulosic ethanol pilot plants, in Jennings, Louisiana. The company also has a strategic partnership with BP to accelerate the development and commercialization of cellulosic ethanol in the United States and around the world.

In 2008, Verenium was awarded a grant from the US Department of Energy to enhance the development of small-scale cellulosic ethanol biorefinery plants. Verenium started the construction of the cellulosic ethanol demonstration-scale plant that same year.

Verenium holds exclusive licenses to cellulosic ethanol conversion processes developed by University of Florida microbiologist Lonnie Ingram. Ingram and his colleagues genetically engineered the best traits of two common bacteria — *E. coli* and *Zymomonas* — to create a new organism that could perform a two-step process to convert those complex sugars to acids and then convert the acids to ethanol. In 1991, that accomplishment earned Ingram's team the landmark 5 millionth patent granted in the United States.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Verenium holds exclusive licenses to processes developed by University of Florida microbiologist Lonnie Ingram.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The original research on the cellulosic ethanol conversion process was supported by grants from the US Departments of Energy and Agriculture.

**FOUNDER(S):** Dr. J. Joseph Kim and Dr. David Weiner

**EMPLOYEES:** 27 (Inovio)

**HEADQUARTERS:** Blue Bell, PA (Inovio)

**FOUNDED:** 2000

**MERGED:** 2009

**REVENUE:** \$2.1 million FY08 (Inovio)

**TSC MEMBER INSTITUTION:** University of Pennsylvania

**FUNDING AGENCY(S):** National Institutes of Health

# VGX Pharmaceuticals

*(Acquired by Inovio Biomedical Corporation)*

**CONTACT:** Inovio Biomedical Corporation  
450 Sentry Parkway E  
Blue Bell, PA 19422  
[www.inovio.com](http://www.inovio.com)

## **ABOUT THE COMPANY:**

VGX Pharmaceuticals was formed in 2000 to focus on the discovery and development of novel vaccines and therapies for infectious diseases, including HIV, and cancer. In June 2009, the company completed a merger with Inovio Biomedical Corporation. Inovio focuses on the discovery, development, and delivery of a new generation of vaccines — DNA vaccines — to prevent or treat cancers and chronic infectious diseases.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

VGX was founded based on several novel DNA vaccine technologies developed in the laboratory of Dr. David B. Weiner, Professor of Pathology and Laboratory Medicine, at the University of Pennsylvania. Professor Weiner is a pioneer in the field of DNA vaccines and a VGX co-founder. Dr. Weiner continues to serve as Chairman of the Inovio Scientific Advisory Board.

## **ROLE OF FEDERAL RESEARCH FUNDING:**

The basic research at the University of Pennsylvania that led to the development of this technology was supported by research grants from the National Institutes of Health.



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**FOUNDER(S):** Dr. Shane Farritor and Dr. Dmitry Oleynikov

**EMPLOYEES:** 2

**HEADQUARTERS:** Lincoln, NE

**FOUNDED:** 2006

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** University of Nebraska

**FUNDING AGENCY(S):** Department of Defense, NASA, National Institutes of Health

# Virtual Incision Corporation

**CONTACT:** Virtual Incision Corporation  
6137 Blackstone Road  
Lincoln, NE 68526  
[www.virtualincision.com](http://www.virtualincision.com)

## **ABOUT THE COMPANY:**

Virtual Incision Corporation will develop, build, and commercialize the first inexpensive, remotely operated, in vivo, miniature robotic surgical tools and camera systems to operate within the abdominal cavity. These remotely controlled robots can be inserted through a single tiny incision to perform minimally invasive surgeries, significantly reducing pain and recovery times for patients. Each camera-carrying robot would be remotely controlled by the surgeon and would be capable of performing complex surgeries such as gall bladder removal and colon resection.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

Virtual Incision Corporation grew from collaboration between a University of Nebraska Medical Center surgeon interested in improving surgery practices and a University of Nebraska-Lincoln mechanical engineer with expertise in designing robots. After learning of their mutual interests, they began developing mini-robots and testing them in animal models. Their exciting research led to development of a spin-off company, Virtual Incision Corporation, to commercialize and produce these novel devices.

#### **ROLE OF FEDERAL RESEARCH FUNDING:**

The US Army, part of the Department of Defense, has significantly funded the basic research and development of prototype surgical robots. The National Institutes of Health and NASA have also been key funding sources for these researchers.

FOUNDER(S): Ilhan Aksay, John Lettow and Robert Prud'homme

EMPLOYEES: N/A

HEADQUARTERS: Jessup, MD

FOUNDED: 2006

REVENUE: N/A

TSC MEMBER INSTITUTION: Princeton University

FUNDING AGENCY(S): NASA, National Science Foundation

# Vorbeck Materials Corporation

*Custom materials for the industry's toughest challenges*

CONTACT: Vorbeck Materials Corporation  
8306 Patuxent Range Road, Unit 112  
Jessup, MD 20794  
[www.vorbeck.com](http://www.vorbeck.com)

## ABOUT THE COMPANY:

Vorbeck Materials is a privately held specialty materials company established to manufacture and develop applications around Vor-x™, a novel graphene (carbon) nanomaterial developed by Professors Ilhan Aksay and Robert Prud'homme in the Princeton University Department of Chemical Engineering.

Described as the “strongest, most conductive material known,” graphene is an emerging force in high performance materials.

Until now, the manufacture of single-sheet graphene on a ton scale has not been commercially feasible. In response to this industry need, Vorbeck has licensed core technology from Princeton University to develop a unique, scalable process for manufacturing graphene in ton quantities.

NASA has used functionalized graphene sheets from Vorbeck Materials — describing the company as “the only known source, based on their exclusive license from Princeton University, able to use proprietary processes to manufacture functionalized graphene materials.”

Recently, BASF and Vorbeck Materials Corporation established a joint research program to develop graphene-based formulations and composite materials. As part of the collaboration, Vorbeck and BASF are developing dispersions of

highly conductive graphene for producing electrically conductive coating and compounds for the electronics industry.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Vorbeck Materials Corporation is based on technologies developed in the Princeton University Department of Chemical Engineering.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The research to develop the technologies behind Vorbeck was supported in part through federal funding from NASA and the National Science Foundation.

**FOUNDER(S):** Weiyi Meng, Vijay Raghavan, Zonghuan Wu and Clement Yu

**EMPLOYEES:** 7

**HEADQUARTERS:** Binghamton, NY

**FOUNDED:** 2002

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** Binghamton University

**FUNDING AGENCY(S):** National Science Foundation

# Webscalers

**CONTACT:** Webscalers  
ITC Startup Suite 2113  
Binghamton University  
Binghamton, NY 13902-6000  
[www.webscalers.com](http://www.webscalers.com)

## ABOUT THE COMPANY:

Webscalers aims to develop search systems that can produce more accurate, current and complete search results than mainstream search engines such as Google. Its large-scale metasearch engine technology makes it possible to connect to numerous specialized search engines, allowing the potential to probe the deep web, where some 900 billion pages reside but where it is difficult for traditional search engines to reach. Current mainstream search engines, due to their reliance on a “crawler” to collect pages and index them for future searches, can search fewer than 30 billion pages.

Binghamton University Professor Weiyi Meng, along with colleagues at the University of Illinois at Chicago and the University of Louisiana at Lafayette, has helped pioneer large-scale metasearch-engine technology that can potentially harness the power of numerous specialized search engines to achieve more accurate and more complete retrieval.

Webscalers says that its metasearch engines can be adapted for marketing, manufacturing, accounting, legal and other services. See its technology at work by visiting [www.allinonenews.com](http://www.allinonenews.com), the largest metasearch engine in the world, and [www.mysearchview.com](http://www.mysearchview.com), an automatic metasearch engine generator.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

The research that led to the creation of Webscalers was conducted by Binghamton University professor Weiyi Meng and his collaborators, including Clement Yu, a professor of computer science at the University of Illinois at Chicago, and Vijay V. Raghavan, a distinguished professor of computer science at the University of Louisiana at Lafayette.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Webscalers and affiliated researchers have received five grants from the National Science Foundation.

**FOUNDER(S):** Dr. Pamela Contag, Dr. David Benaron and Dr. Christopher Contag

**EMPLOYEES:** 489 (Caliper)

**HEADQUARTERS:** Hopkinton, MA (Caliper)

**FOUNDED:** 1994

**ACQUIRED:** 2006

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** Stanford University

**FUNDING AGENCY(S):** Department of Defense, National Institutes of Health

# Xenogen

*(Acquired by Caliper Life Sciences)*

**CONTACT:** Caliper Life Sciences  
68 Elm Street  
Hopkinton, MA 01748  
[www.caliperls.com](http://www.caliperls.com)

## **ABOUT THE COMPANY:**

With a goal to detect and quantify cell growth and migration in living animals, Stanford University investigators Pamela Contag, David Benaron, and Christopher Contag, co-founded Xenogen in 1994. The company became the world leader in “in vivo” optical imaging and was sold to Caliper Life Sciences in 2006.

At the time Xenogen was conceived, there was a general view that optics lacked the sensitivity and reproducibility required for commercial drug discovery. Company founders credit federal funding from the Department of Defense – which came at a critical early phase of their work – for the fact that today nearly every medical center in the United States uses Xenogen’s methods of optical labeling, tracking, and imaging as part of its biomedical research program.

The Xenogen IVIS® systems are the most sensitive available—for both fluorescence and bioluminescence in vivo imaging. IVIS molecular imaging systems are designed to detect optical signals linked to cell growth and disease pathways in order to reveal mechanisms of action, and evaluate the efficacy of drugs by monitoring their effects on disease progression in living animals.

This technology uses optical tags, such as bioluminescence and fluorescence, to detect and track stem cells, cancer cells, pathogens and normal cellular functions in living hosts. The initial demonstration of the power of this technology



was shown by the Stanford investigators using engineered microorganisms with genes-encoding bioluminescent enzymes inside a living animal where the light they emitted was observable with a digital camera outside the body. These images demonstrated that the course of infection and the response to therapy could be assessed noninvasively. The new approach had broad applicability, including in the areas of oncology, physiology, stem cell biology, immunology, and of particular relevance to the Department of Defense, regenerative medicine and infectious disease.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

The technology behind Xenogen was developed by Pamela Contag in the Department of Microbiology and Immunology, David Benaron, Professor of Pediatrics, and Christopher Contag, currently professor of Pediatrics, Radiology and Microbiology and Immunology at Stanford University. The Stanford Office of Technology Licensing licensed the invention to Xenogen in 1996. Xenogen went public in 2004 and was acquired by Caliper Life Sciences in 2006. Caliper sells biophotonic real-time in vivo imaging technologies and has extensively sublicensed the Stanford University patents to pharmaceutical and biotech companies.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Development of the technology was initially supported by grants from the Department of Defense through the Office of Naval Research to Stanford University and Xenogen and grants from the National Institutes of Health to Stanford University.

FOUNDER(S): Dr. William Beschoner

EMPLOYEES: 3

HEADQUARTERS: Blair, NE

FOUNDED: 1993

REVENUE: N/A

TSC MEMBER INSTITUTION: University of Nebraska

FUNDING AGENCY(S): National Institutes of Health, NIST

# Ximerex, Inc.

CONTACT: Ximerex, Inc.  
439 East Grant Street  
Blair, NE 68008  
[www.ximerex.com](http://www.ximerex.com)

## ABOUT THE COMPANY:

Ximerex, Inc. is dedicated to the treatment of tissue and organ failure by transplanting cells, tissues, and organs from pigs with either no or minimal anti-rejection drugs. For example, patients with type 1 diabetes have lost the insulin producing cells found in pancreatic islets. Lost cells could be replaced by transplantation from human donors, but anti-rejection drugs would be needed to prevent rejection, making the patient more susceptible to infection. Islets and islet cell clusters isolated from the pancreas of pigs could potentially replace those cells, but pig tissues would be more vigorously rejected than human tissues. Ximerex is developing proprietary and patented technology for growing foreign cells, including human cells, within fetal pigs. Later, xenografts from humanized pigs are accepted without limiting the patient's ability to fight infections. Ximerex currently produces fresh and cryopreserved quality tissues, such as pancreatic islets and islet cell clusters, from high grade clean pigs (SPF and DPF, VitalPure). These tissues are provided to investigators studying diabetes and other diseases. Ximerex intends to pursue FDA-allowed clinical trials of its proprietary technology and, if successful, would explore corporate partnerships to market and distribute its technology.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Ximerex, Inc. grew from research that Dr. William Beschorner conducted at the University of Nebraska Medical Center. He has conducted transplantation of pig pancreatic islets in diabetic primate animal models with significant success eliminating or reducing the need for insulin. He is also investigating pig heart xenografts in preclinical animal models.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Dr. Beschorner received federal support from the National Institutes of Health through the Small Business Innovation Research program and the Advanced Technology Program at the Department of Commerce, National Institute of Standards and Technology. Ximerex, Inc. also received funding from foundations such as the Juvenile Diabetes Research Foundation, and from private investors.

**FOUNDER(S):** Dr. Steve Hutcheson  
**EMPLOYEES:** N/A  
**HEADQUARTERS:** College Park, MD  
**FOUNDED:** 2006  
**REVENUE:** N/A  
**TSC MEMBER INSTITUTION:** University of Maryland  
**FUNDING AGENCY(S):** Department of Energy, National Oceanic and Atmospheric Administration, National Science Foundation

# Zymetis, Inc.

**CONTACT:** Zymetis, Inc.  
387 Technology Drive  
College Park, MD 20742  
[www.zymetis.com](http://www.zymetis.com)

## ABOUT THE COMPANY:

Zymetis, Inc. is a biotechnology company that develops enzyme technologies for biofuel production. Derived from unique organisms, Zymetis products are designed to achieve lower costs, improved yields and higher manufacturing efficiencies in the conversion of cellulosic biomass to usable sugars. Currently, Zymetis is focused on the production of affordable next-generation transportation fuels. Zymetis was recently named to the 2009 “GoingGreen East” 50 Top Company List.

Zymetis was formed in 2006 to commercialize technologies discovered by Dr. Steve Hutcheson, professor of cell biology and molecular genetics, and Dr. Ron Weiner, Professor Emeritus, at the University of Maryland.

Dr. Hutcheson made the decision to lead the company through its early days and began by licensing several patents and patents-pending from the University. Zymetis participated in the University’s VentureAccelerator spin-out program located in the Technology Advancement Program (TAP) building on the University’s College Park campus. TAP is a leading venture incubator that partners with regional entrepreneurs to build early-stage companies.

At this location, Zymetis has access to dedicated lab facilities for all necessary technology development and a talented pool of recent graduates and student interns seeking to transition to the industrial world. Zymetis has a growing full

time staff of research scientists and bio-process engineers working to develop and refine the company's initial product offerings.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Zymetis technologies were discovered by Dr. Steve Hutcheson, professor of cell biology and molecular genetics, and Dr. Ron Weiner, Professor Emeritus, at the University of Maryland.

**ROLE OF FEDERAL RESEARCH FUNDING:**

The research and genome characterization that led to Hutcheson and Weiner discovering the enzyme's ability to breakdown biomass to biofuel was supported by two grants from the National Science Foundation, a National Oceanic and Atmospheric Administration (NOAA) Sea Grant, and support from the Department of Energy Joint Genome Institute. The company has received an additional phase-one Small Business Innovation Research (SBIR) grant from the Department of Energy. Zymetis also has received funding from the Maryland Department of Business and Economic Development and equity investment from the Maryland Department of Natural Resources.

# 100 Plus

Companies in this section have academic research at their core, but their inception is not traced directly to federally funded research.

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FOUNDER(S): Audra L. Stinchcomb, PhD

EMPLOYEES: 8

HEADQUARTERS: Lexington, KY

FOUNDED: 2004

REVENUE: N/A

TSC MEMBER INSTITUTION: University of Kentucky

# AllTranz, Inc.

CONTACT: AllTranz, Inc.  
2277 Thunderstick Drive  
Lexington, KY 40505  
[www.alltranz.com](http://www.alltranz.com)

## ABOUT THE COMPANY:

Osteoarthritis sufferers may soon find relief in an easy to apply gel that offers maximum pain relief with minimal side effects. AllTranz, Inc., a University of Kentucky startup company, will soon begin human clinical trials on their lead product: a next-generation synthetic cannabinoid pain management product that is delivered transdermally.

Founded in 2004 by Audra Stinchcomb, University of Kentucky associate pharmaceutical sciences professor and company chief scientific officer, AllTranz is poised to be an industry leader as a specialty pharmaceutical company.

AllTranz develops products delivered via unique dermal solutions to treat a variety of neuroscience disorders. These new products feature improved drug dosing and reduced side effects with greater patient compliance. Plans to develop a second generation of the osteoarthritis gel product to be delivered via a proprietary transdermal patch are currently underway.

In 2007, AllTranz received \$1.26 million in Series A financing, making a number of critical milestones in their research and development possible. The company is currently raising Series B funds. Local funding partners include the Kentucky Seed Capital Fund, Commonwealth Seed Capital, Bluegrass Angels, Kentucky Science & Technology Corporation, and the Kentucky Economic Development Finance Authority.



**UNIVERSITY-BASED RESEARCH CONNECTION:**

AllTranz was founded in 2004 by Audra Stinchcomb, University of Kentucky associate pharmaceutical sciences professor and company chief scientific officer. AllTranz was located in the ASTeCC campus incubator at UK until its expansion and relocation off campus in February of 2009.

**ROLE OF FEDERAL RESEARCH FUNDING:**

In 2000, Dr. Stinchcomb's initial research and the genesis of AllTranz was funded by a \$361,000 grant from the American Cancer Society and a \$720,000 renewal awarded to the University of Kentucky in 2004.

AllTranz has also received a National Institutes of Health Small Business Technology Transfer grant under the direction of faculty principal investigator Dr. Kim Nixon, as well as a Small Business Innovation Research grant awarded to Dr. Stinchcomb in 2009.

FOUNDER(S): Dr. John Herr

EMPLOYEES: 4

HEADQUARTERS: Charlottesville, VA

FOUNDED: 2002

REVENUE: N/A

TSC MEMBER INSTITUTION: University of Virginia

# ContraVac

*Advancing male reproductive health*

CONTACT: ContraVac  
PO Box 4608  
Charlottesville, VA 22905  
[www.contravac.com](http://www.contravac.com)

## ABOUT THE COMPANY:

ContraVac is a startup dedicated to leadership, education and innovation in male reproductive healthcare with revolutionary products that promise accuracy, efficiency and accessibility. ContraVac's family of SpermCheck products have been developed to meet the needs of millions of men who seek information about their fertility health but wish to test themselves at home. Similar in principle to kits currently used by women to monitor pregnancy and ovulation, the SpermCheck devices help men to monitor their fertility by detecting the presence or absence of sperm. SpermCheck devices will be marketed to vasectomized men, men who have male factor infertility and men taking contraceptives.

SpermCheck Vasectomy is FDA approved and became commercially available in April 2009. SpermCheck Fertility is in clinical trials with expected revenues to commence in August 2009.

## UNIVERSITY-BASED RESEARCH CONNECTION:

ContraVac develops products for male reproductive healthcare in cooperation with the Center for Research in Contraceptive and Reproductive Health at the University of Virginia directed by ContraVac's founder, Dr. John Herr, PhD. ContraVac develops and commercializes research discoveries into innovative

diagnostics for male reproductive health care. Through an in-license agreement with the University of Virginia Patent Foundation, ContraVac has obtained exclusive world-wide rights to certain University of Virginia patents related to sperm specific antigens, their complementary antibody reagents and their methods of use. The company has funded over \$800,000 in sponsored research at University of Virginia.

**ROLE OF FEDERAL RESEARCH FUNDING:**

While federal funding did not play a role, development of SpermCheck Vasectomy and SpermCheck Fertility has been supported by a grant from the Commonwealth Technology Research Fund of the Virginia Center for Innovative Technology.

FOUNDER(S): Dr. Bill Endres

EMPLOYEES: 3

HEADQUARTERS: Houghton, MI

FOUNDED: 2006

REVENUE: N/A

TSC MEMBER INSTITUTION: Michigan Technological University

# Endres Machining Innovations, LLC

*Technology at the cutting edge*

CONTACT: Endres Machining Innovations, LLC  
1402 E. Sharon Avenue  
Houghton, MI 49931  
[www.endresmachining.com](http://www.endresmachining.com)

## ABOUT THE COMPANY:

Endres Machining Innovations is an advanced metalworking technology company commercializing technologies for specialized applications, including high speed machining of hard materials.

## UNIVERSITY-BASED RESEARCH CONNECTION:

The founder of Endres Machining Innovations, Dr. Bill Endres maintains a faculty position at Michigan Technological University in the Department of Mechanical Engineering — Engineering Mechanics, and the company has licensed technology developed by Dr. Endres at the University. The company continues to sponsor undergraduate research projects and is a partner on many sponsored research activities in collaboration with researchers across the University.

## ROLE OF FEDERAL RESEARCH FUNDING:

Endres Machining Innovations has received Small Business Innovation Research (SBIR) funding from the National Science Foundation for development of its advanced technologies. These funds have been critical to successful establishment of the company and the development of its technology.

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**FOUNDER(S):** John Ruedy, Dr. Robley Williams and Joel Ufford

**EMPLOYEES:** 30

**HEADQUARTERS:** Ithaca, NY

**FOUNDED:** 1936

**REVENUE:** \$4 million FY08

**TSC MEMBER INSTITUTION:** Cornell University

# EMF Corporation

**CONTACT:** EMF Corporation  
239 Cherry Street  
Ithaca, NY 14850  
[www.emf-corp.com](http://www.emf-corp.com)

## **ABOUT THE COMPANY:**

While pursuing a graduate degree in physics at Cornell University, EMF (Evaporated Metal Films) founder Dr. Robley Williams investigated the possibility of making mirrors that are long-lasting and that reflect ultraviolet light effectively. It was this work that led EMF to become the first company in the United States to manufacture evaporated, metallic, thin film coatings. Nearly 20 years later, in 1954, Dr. Williams received the John Scott Award, one of the nation's highest scientific honors, in recognition of his invention of a thermal vacuum-evaporation method to coat mirrors with thin metal films.

Today, EMF provides thin-film coating for a broad range of application markets, including display systems, instrumentation, satellite communications and lighting. EMF's customers include companies from various industries: aerospace, automotive, instrumentation, lighting, military and vision.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

EMF was founded in 1936 to commercialize a doctoral thesis in vacuum-deposited aluminum coatings by Dr. Robley Williams at Cornell University. A partnership with fellow physicist John Ruedy and Joel Ufford, an electrical engineer, was formed and Evaporated Metal Films Corporation began operations.

#### **ROLE OF FEDERAL RESEARCH FUNDING:**

Founded in 1936, EMF predates the government-university research enterprise that fueled so much of America's economic growth following World War II. Nevertheless, university-based research played an integral role in the company's creation.

**FOUNDER(S):** William Hewlett and David Packard

**EMPLOYEES:** 304,000

**HEADQUARTERS:** Palo Alto, CA

**FOUNDED:** 1939

**REVENUE:** \$118.4 billion FY08

**TSC MEMBER INSTITUTION:** Stanford University

# Hewlett-Packard (HP)

**CONTACT:** Hewlett-Packard (HP)  
3000 Hanover Street  
Palo Alto, CA 94304  
[www.hp.com](http://www.hp.com)

## **ABOUT THE COMPANY:**

HP today is a global technology leader operating in more than 170 countries around the world.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

Founded in 1939, HP predates the government-university research enterprise that fueled so much of America's economic growth following World War II. Nevertheless, university-based research played an integral role in the company's creation.

William Hewlett and David Packard met during their undergraduate days at Stanford University and forged a friendship in the Stanford electronics laboratory where they talked about "someday" having their own company. Following graduation in 1934, Packard took a job at General Electric in New York and Hewlett pursued graduate studies at MIT and Stanford. It was while studying electrical engineering at Stanford under Fred Terman — the man often credited as "the father of Silicon Valley" — that the idea for HP was born.

Terman challenged Hewlett to figure out how to make the newly discovered "resistance-tuned oscillator" more functional and less expensive, and therefore more marketable. The problem with the resistance-tuned oscillator was that it



didn't maintain a constant level of output. Hewlett solved the problem by designing an audio oscillator that inserted a non-linear element — a simple 3 watt light bulb — into the feedback loop of the oscillator. The light bulb served to control the amount of feedback in accordance with the amplitude of the oscillation, thus maintaining constant output.

As he closed in on a marketable product, Terman helped Hewlett further. He found the necessary seed money for materials (\$500) and to facilitate Packard's return to Stanford in the fall of 1938 as a paid research assistant (\$55 a month). In January 1939, Hewlett-Packard was formed. Their first product, the audio oscillator based on Hewlett's design, was built in a small garage in Palo Alto. One of HP's first customers was Walt Disney Studios, which purchased eight oscillators to develop and test an innovative sound system for the movie "Fantasia."

**FOUNDER(S):** Sonny Kirkley and Chris Borland

**EMPLOYEES:** 40

**HEADQUARTERS:** Bloomington, IN

**FOUNDED:** 1999

**REVENUE:** \$4 million FY08

**TSC MEMBER INSTITUTION:** Indiana University

## Information in Place, Inc.

**CONTACT:** Information in Place, Inc.  
501 North Morton Street, Suite 206  
Indiana University Research Park  
Bloomington, IN 47404  
[www.informationinplace.com](http://www.informationinplace.com)

### **ABOUT THE COMPANY:**

Information in Place, Inc. (IIPi) designs and builds virtual worlds as platforms for learning. IIPi combines the best technology available for rich immersive environments with leading edge instructional design processes. IIPi helps learners gain understanding through solving problems or undertaking missions. Clients for IIPi's offerings include military and hazmat personnel as well as middle and high school students.

The company has performed cutting-edge research for the federal government and various organizations in the Department of Defense using emerging learning technologies. It is now working with NASA on a multiplayer online learning game. IIPi also has developed training programs for large corporate organizations. Military Training Technology magazine has listed Information in Place as one of the global top 100 companies in the military training industry, based on the company's innovative work in augmented reality and serious games training. IIPi has partnered with Virtual Heroes Inc. to develop a blended learning environment for training personnel on hazmat incident response. IIPi has also partnered with Virtual Heroes Inc. to develop a multiplayer online environment where middle and high school students can explore and colonize space while learning key science, technology, engineering and mathematics concepts.

#### **UNIVERSITY-BASED RESEARCH CONNECTION:**

IPII was founded as a spinout of Indiana University's (IU) Center for Excellence in Education. President Sonny Kirkley was a faculty member in the Indiana University School of Education. To sustain IPII's technology edge, Kirkley and the company continue to work closely with Indiana University faculty. The company is located in the Indiana University Research Park.

#### **ROLE OF FEDERAL RESEARCH FUNDING:**

The work conducted at IU has directly enabled IPII to apply for and receive federal research funding. According to company founder Sonny Kirkley: "In the IU research lab, we were investigating how new technologies (Web, mobile, location-based) could be used for transforming learning as well as training instructors in using these technologies. This work has continually influenced all the federal grants we secured, especially in the early years of the company."

IPII has received grants from the National Science Foundation, the National Institutes of Health, and the Department of Defense through the US Army, US Air Force, and US Navy.

FOUNDER(S): Glen Barna and Dr. Carl Anderson

EMPLOYEES: 20

HEADQUARTERS: Houghton, MI

FOUNDED: 1994

REVENUE: \$1 million FY08

TSC MEMBER INSTITUTION: Michigan Technological University

# IR Telemetrics, Inc.

CONTACT: IR Telemetrics, Inc.  
PO Box 70  
Houghton, MI 49931  
[www.irtelemetrics.com](http://www.irtelemetrics.com)

## ABOUT THE COMPANY:

Engineers at IR Telemetrics figured out how to do what has previously been impossible — allow signals that monitor pressure, temperature and strain to be sent wirelessly from such hard-to-monitor places as piston heads, turbines, crankshafts, connecting rods, torque converters and other mechanical systems, including inside an internal combustion engine and inside an automotive transmission.

The company provides advanced mechanical and thermal sensing and analytical services and technology, which allows for recording and wireless transmission of data in extreme environments. IR Telemetrics' technology is crucial in testing prototype engines under high RPMs or extremely heavy loads to see what continues to work properly and what begins to break down or perform less efficiently under maximum loads. The company's customers have ranged from engine and automobile manufacturers to mineral processing and advanced energy companies. The list of customers includes some of the most well known names in engine and motor manufacturing, including GM, Ford, John Deere, Harley-Davidson, Cummins, Briggs & Stratton and Renault, to name a few.

The company's technology — an offshoot of patented research at Michigan Technological University — solves a problem that prohibited traditional telemetry systems from being used in testing engine components and mechanical

processes. Traditional systems have operated at FM frequencies, about 100 megahertz, which require antennas of 30 inches or more. IR Telemetric's newest system operates at the much higher microwave level, at frequencies of 2–3 gigahertz, which allows for a transmitter about one inch square and an antenna smaller than two inches.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

The company was founded by then-graduate student Glen Barna and his advisor Dr. Carl Anderson at Michigan Technological University. IRT's platform technology is based on research work originally conducted within the University. Dr. Anderson has remained on the faculty and continues to use the technology for corporate and federally sponsored research.

**ROLE OF FEDERAL RESEARCH FUNDING:**

IR Telemetrics has received Small Business Innovation Research (SBIR) funding for developing alternative applications for their technology and wireless data transmission expertise.

**FOUNDER(S):** Earl Bakken and Palmer Hermundslie

**EMPLOYEES:** 38,000

**HEADQUARTERS:** Minneapolis, MN

**FOUNDED:** 1949

**REVENUE:** \$13.5 billion FY08

**TSC MEMBER INSTITUTION:** University of Minnesota

# Medtronic

**CONTACT:** Medtronic  
710 Medtronic Parkway  
Minneapolis, MN 55432-5604  
[www.medtronic.com](http://www.medtronic.com)

## ABOUT THE COMPANY:

Medtronic is one of the world's largest medical device makers, with more than \$13 billion in sales in FY 2008.

Medtronic was founded in 1949 as a medical equipment repair shop by Earl Bakken and his brother-in-law, Palmer Hermundslie. Bakken was a graduate student in electrical engineering at the University of Minnesota and did part-time work repairing delicate lab equipment. As demand for their services grew, Earl left his graduate studies, Palmer quit his job, and together they formed a medical equipment repair company they named Medtronic. The two men set up shop in a garage in northeast Minneapolis.

As the servicing business grew and new employees were added, Medtronic expanded into a second garage and eventually occupied an apartment. It wasn't long before medical professionals asked Medtronic engineers to not only repair equipment, but also modify it, or design and produce new devices needed for research. The company's manufacturing business was born.

Medtronic co-founder Earl Bakken began working with legendary University of Minnesota heart surgeon C. Walton Lillehei in 1957. At Lillehei's request, Bakken created a transistorized, battery-powered pacemaker that led the way in short-term pacing of the heart. Soon, both Medtronic and the pacemaker technology started to take off, with the University of Minnesota Medical School a

key partner in the success of both. The company's first cardiac pacemaker — a wearable, battery-powered device — was the foundation for dozens more Medtronic therapies that use electrical stimulation technologies.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Medtronic co-founder Earl Bakken began working with legendary University of Minnesota heart surgeon C. Walton Lillehei in 1957.

**ROLE OF FEDERAL RESEARCH FUNDING:**

Dr. C.W. Lillehei's cardiac and pacemaker research was funded in part by the National Heart Institute, part of the National Institutes of Health and the precursor to what is today the National Heart, Lung and Blood Institute at NIH.

FOUNDER(S): Charles Larsen, Steven Waite and Thomas Weldon

EMPLOYEES: 50

HEADQUARTERS: Malvern, PA

FOUNDED: 2003

REVENUE: \$292,000 FY08

TSC MEMBER INSTITUTION: Emory University

# Neuronetics, Inc.

CONTACT: Neuronetics, Inc.  
One Great Valley Parkway, Suite 2  
Malvern, PA 19355  
[www.neuronetics.com](http://www.neuronetics.com)

## ABOUT THE COMPANY:

Neuronetics, Inc. is a medical device company that develops and commercializes non-invasive therapies for the treatment of severe, chronic psychiatric and neurological disorders. Neuronetics' lead product is based on repetitive transcranial magnetic stimulation (rTMS) technology invented by Emory University neurologist Dr. Charles M. Epstein.

The NeuroStar® TMS Therapy system is an electromagnetic medical device for the treatment of major depressive disorder. It operates by applying a focused, pulsed magnetic field that stimulates cortical neurons associated with depression. NeuroStar® TMS Therapy is the first and only TMS Therapy® device cleared by the FDA for the treatment of depression.

Data presented in June 2009 at the American Psychiatric Association's annual meeting demonstrated that NeuroStar® Transcranial Magnetic Stimulation (TMS) Therapy improved depression. NeuroStar TMS also produced significant improvements on both overall cognitive function and short-term verbal memory.



Neuronetics was founded in 2003 within The Innovation Factory, an Atlanta-based medical technology incubator. The company says the device provides new hope for patients with major depressive disorders.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Neuronetics' lead product is based on technology invented by Emory University neurologist Dr. Charles M. Epstein.

FOUNDER(S): Jeff Han  
EMPLOYEES: 10  
HEADQUARTERS: New York, NY  
FOUNDED: 2007  
REVENUE: N/A  
TSC MEMBER INSTITUTION: New York University

# Perceptive Pixel, Inc.

CONTACT: Perceptive Pixel, Inc.  
111 Eighth Avenue, 16th Floor  
New York, NY 10011  
[www.perceptivepixel.com](http://www.perceptivepixel.com)

## ABOUT THE COMPANY:

Perceptive Pixel is a multi-touch sensing screen technology company. This screen technology functions like a big and more elaborate iPhone, with users able to manipulate images and data to the size and location of their choosing. Founder Jeff Han was named one of Time Magazine's "100 Most Influential People in the World" in 2008.

Han calls his invention a "Multi-Touch Collaboration Wall." It has been sold to CNN and other television networks. CNN used the "Wall" in its coverage of the 2008 presidential primaries, with chief national correspondent John King manipulating maps of states and counties to show voter preferences and other demographic data. Although the broadcast application is the best known, much of Perceptive Pixel's business is in the business, industrial and government space.

Jeff Han told an audience at an industry event in 2009 that while the multi-touch business is young, its technology roots stretch back decades. Han said he was inspired by seeing a PBS documentary in the early 1980s that showed Microsoft researcher Bill Buxton, then at the University of Toronto, using multitouch to compose music on a computer. The computer itself was a green screen with an ancient processor and little memory, but the key underlying concept was already there.

“Sometimes it takes that long for these things to marinate and gestate,” Han said.

**UNIVERSITY-BASED RESEARCH CONNECTION:**

Jeff Han invented a multi-touch sensing screen while a research scientist at New York University’s Courant Institute of Mathematical Sciences.

**FOUNDER(S):** Jake Chen, Dr. David Clemmer and Dr. Stephen Naylor

**EMPLOYEES:** 9

**HEADQUARTERS:** Bloomington, IN

**FOUNDED:** 2005

**REVENUE:** \$936,152 FY08

**TSC MEMBER INSTITUTION:** Indiana University

# Predictive Physiology & Medicine, Inc.

*Empowering People*

**CONTACT:** Predictive Physiology & Medicine, Inc.  
409 W. Patterson Drive, Suite 205  
Bloomington, IN 47403  
[www.ppmwellness.com](http://www.ppmwellness.com)

## **ABOUT THE COMPANY:**

Founded by a group of Indiana business professionals and academic leaders from Purdue University, Indiana University School of Medicine and Indiana University (IU) in 2005, Predictive Physiology & Medicine, Inc. (PPM) is a Bloomington, Indiana-based health and life sciences company. Its next generation blood tests create a predictive summary of an individual's health that helps warn of future health problems.

PPM's assessments provide doctors and patients with an early warning of potential health problems such as heart disease, diabetes and stroke earlier than current clinical blood tests. The company uses bioinformatics and analytics to measure targeted lists of molecules to generate a summary of a patient's health. Known as a bioprofile, this summary provides in-depth information on an individual's health and identifies potential health conditions sooner than current clinical blood tests on the market.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

The company is an Indiana University research and development spinout and its founders include professors from IU and Purdue University.

#### **ROLE OF FEDERAL RESEARCH FUNDING:**

The National Institutes of Health has supplied grant funding to PPM. These grants were awarded to further develop the company's comprehensive molecular health assessments.

**FOUNDER(S):** Dr. Trevor Thornton

**EMPLOYEES:** 3

**HEADQUARTERS:** Fountain Hills, AZ

**FOUNDED:** 2000

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** Arizona State University

# SJT Micropower, Inc.

**CONTACT:** SJT Micropower, Inc.  
16411 North Skyridge Lane  
Fountain Hills, AZ 85268  
[www.sjtmicropower.com](http://www.sjtmicropower.com)

## **ABOUT THE COMPANY:**

SJT Micropower is developing silicon field effect transistor (SiFET) technologies for ultra-high efficiency low-power electronics. These transistors offer ultra-low dropout voltages and require fewer external components. The company's products provide power management solutions for portable electronics that result in reduced cost, increased reliability, and longer battery lifetimes.

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

SJT Micropower founder and Arizona State University (ASU) professor, Dr. Trevor J. Thornton, is the inventor of the silicon MESFET technology that launched the company and leads its technical team.

## **ROLE OF FEDERAL RESEARCH FUNDING:**

ASU professor Thornton received Small Business Innovation Research (SBIR) funding for research behind SJT Micropower.

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**FOUNDER(S):** Steven Evans-Freke, Joseph Schlessinger and Axel Ullrich

**EMPLOYEES:** 81,800 (Pfizer)

**HEADQUARTERS:** New York, NY (Pfizer)

**FOUNDED:** 1991

**AQUIRED:** 1999

**REVENUE:** N/A

**TSC MEMBER INSTITUTION:** New York University

# SUGEN

*(Acquired by Pfizer)*

**CONTACT:** SUGEN  
235 East 42nd Street  
New York, NY 10017  
[www.pfizer.com](http://www.pfizer.com)

## **ABOUT THE COMPANY:**

SUGEN was founded in 1991 in Redwood City, California, as a partnership between the laboratories of Joseph Schlessinger at New York University Medical School and Axel Ullrich at the Max Planck Institute of Biochemistry. Steven Evans-Freke was a third co-founder. The focus of their research was to develop drugs targeting intracellular signaling pathways that could treat cancer. Specifically, the company sought to discover competitive ATP small-molecule kinase inhibitors which block common cancer pathways.

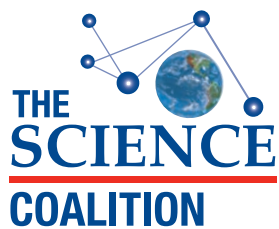
Considered one of the most innovative biotech startups of the mid-1990s, SUGEN pioneered a first-in-class drug for two cancers that are extremely hard to treat: renal cell carcinoma (RCC) and gastrointestinal stromal tumors (GIST). In January 2006, SU11248 was approved by the FDA for treatment of GIST and RCC, and it is now marketed as the drug Sutent (sunitinib). Sutent is currently the top seller in Pfizer's cancer-drug portfolio with \$847 million in 2008 sales. (SUGEN was acquired by Pharmacia in 1999 and as the result of subsequent acquisitions is today part of Pfizer.)

## **UNIVERSITY-BASED RESEARCH CONNECTION:**

SUGEN was founded as a partnership between the laboratories of Joseph Schlessinger at New York University Medical School and Axel Ullrich at the Max Planck Institute of Biochemistry.



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