Why Consider Universities for new Business Opportunities

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About Me

Ph.D. Mechanical Engineering – Yale University
Academics – State University of New York, Stony Brook
Industrial Scientist – Automotive and Consumer Products
>20 inventions
15 issued US and International patents
6 Products: Invention to commercialization
Entrepreneur: Started Advanced Fluidics (Small Company) in 2001

Training: ET³ International (Non-Profit Organization)
About ET$^3$ International and Advanced Fluidics

**ET$^3$ International**
Entrepreneurship and Research Commercialization
Training and Consulting ~ 20 countries

**Advanced Fluidics LLC**
Research and Product Development in
1. Aerospace Sciences – Aerodynamics, combustion
2. Micro/Nanofluidics/nanotech-based biosensors
3. Medical Instrumentation
4. Technology Roadmap Development and Training

Work with many Universities…
Motivation

Universities are a good source for front-end research capabilities, unique and expensive laboratory facilities, talented faculty and students.

University researchers come up with many good ideas and inventions that may be useful for competitive position in markets.
OUTLINE

University contributions to products

My experiences with University-Industry interactions

Conclusions
Impact of Research beyond Academia

Impact is the effect research has beyond academia and consists of “........benefits to one or more areas of the economy, society, culture, public policy and services, health, production, environment, international development or quality of life, whether locally, regionally, nationally or internationally”

and as “....manifested in a wide variety of ways including, but not limited to: the many types of beneficiary (individuals, organizations, communities, regions and other entities); impacts on products, processes, behaviors, policies, practices; and avoidance of harm or the waste of resources.”

(UK 2014 Research Excellence Framework)
Great Contributions from Universities

Saccharin – Johns Hopkins 1879

Insulin – U. of Toronto 1922

Plexiglass – McGill U. 1930

Penicillin – Oxford U. 1939

Computer – U. Pennsylvania. 1946

Polio Vaccine – U. Pittsburgh 1955

Pacemaker – U. Minnesota 1958

LCD Screen – Kent State 1967

Recombinant DNA – Stanford, UCSF 1974

Internet Search (Google) – Stanford 1998
Great Contributions from Universities

11 Important Innovations That Came From University Research

**Seat Belt**
The first modern version was developed at Cornell University.

**Gatorade**
Researchers at the University of Florida developed this drink for their athletes.

**CAT Scan**
The CAT scan was patented by a researcher at Georgetown in the 1970s.

**The Internet**
Numerous research innovations at universities have helped make the Internet what it is today.

**Solar Power**
Some of the earliest applications of solar power in housing were pioneered at MIT.

**Flu Shots**
The vaccine comes from research done at the University of Rochester.

**Chemotherapy Drugs**
A number of these drugs were developed at various universities.

**Ultrasound**
The pioneering work for the ultrasound was done at the University of Vienna.

**Periodic Table**
The first version of the periodic table was created by a professor at Saint Petersburg University.

**Rocket Fuel**
Robert Goddard created the first liquid-fueled rocket while at Clark University.

Sources: en.wikipedia.org | wou.edu | history.com | boston.com | genesis-ultrasound.com | nytimes.com | gatorade.com | inventors.about.com
My Personal Experience in University-Industry Work


Course – project work – industrial visits – co-op student – small grant – larger grant + student support – full-scale spray system for the power plant

Industry-University Interaction (being on the other side now)

1. University of Maryland – Maryland Industrial Partnership (MIPS) Program – Automotive aerodynamics Company funded University for a research project of interest to automotive industry.

Fig. 1. Test Buck in Wind Tunnel

Fig. 3. Oil Flow Pattern

(Raghu et al, SAE Paper)
Industry-University Interaction

University of Maryland – Droplet impact studies on hard and soft targets - Faculty research funding from company for basic research to address a consumer product application

Industry-University Interaction

Advanced Fluidics + University of Arizona + NASA

Idea: 2006:

Started working in 2008 (Invention)
Provisional Patent application – July 2009
Full US Patent Application in July 2010
Patents Issued February 2013 – Owned by Surya Raghu

2 more patents are assigned to Boeing in a separate program
NASA Tail Technology Could Someday Reduce Airplane Fuel Use

RELEASE 13-340
NASA, Boeing Finish Tests of 757 Vertical Tail With Advanced Technology

“The flow control on the 757 vertical tail model comes from sweeping jet actuators, which are devices that essentially blow air in a sweeping motion along the span of the tail”

“NASA’s goal for the AFC project is to increase sideforce 20% on demand, and shrink the vertical tail by 17% to reduce aircraft fuel burn by 1-2%.”

Aerodynamic Flow Control Devices for Future Airplanes

http://wingsovermars.arc.nasa.gov/surfaces.html

Rathay et al, AIAA 2012-0071
Industry-University Interaction

Other Projects

1. JHU/AF – micropumps for fuel cells
2. Illinois Institute of Technology/Boeing/AF
3. MIT/JHU/AF – Haptic actuators
4. Georgia Tech/Air Force/AF – Helicopter Aerodynamics
5. University of Iowa, RPI, Northrop Grumman/AF
6. UMBC/AF – Biosensor; UMMC/AF – Biosensor
Some challenges..

IP

Time scales

Publications and impact on IP

Authorships
University-Industry Interaction

University and Public Research Institutions

Inventive Output
- Invention Disclosures
- Patents
- Publications
- Research Collaboration with Industry

Commercialization Output
- No. of Licenses
- Royalty Income
- Spin-Offs

Knowledge Transfer

Innovation in Industry/Start-ups

Innovative Inputs

Innovative Products

Regional Economic Development

Jobs
Income
Exports

Society
Thank You

Questions?
National Metrics: USA

Academic research advances the economy and improves lives
3.8 million jobs have been supported through university and nonprofit patent licensing. At least 153 new drugs and vaccines are on the market due to university and industry partnerships facilitated by the Bayh-Dole Act.

Revenues received from licensees are reinvested in additional research and development
$2.5 billion licensing income received, up 24.8% over 2014
$135.2 million licensing income attributed to equity, up 24.8%

Consumers and businesses benefit from the creation of new products
$28.7 billion net sales from new products, up 2.5% from 2014
879 new products created

Strong intellectual property rights help protect discoveries and ensure continued investment in research
15,953 new U.S. patent applications filed, up 14.7% over 2014
6,680 U.S. patents issued, up 4.9%

Creating new, sustainable businesses
1,012 startups formed, up 11.3% over 2014
735 of those startups reside in institution’s home state, up 4.7%
5,057 startups still operational at end of fiscal year 2015, up 7.8%
National Research Priorities

Different Priorities Among Research Leaders

- **U.S.**
  - Basic Research: 40%
  - Applied Research: 30%
  - Development: 30%

- **China**
  - Basic Research: 20%
  - Applied Research: 40%
  - Development: 40%

- **EU30**
  - Basic Research: 30%
  - Applied Research: 30%
  - Development: 40%

China places more emphasis on development, less on basic research

(December 2013 R&D Magazine)