

# **Technology Transfer: Bringing University Research into the Economy**

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# Many forms of “Technology Transfer” from Academia to Industry

- The graduating student
- Publication
- The consulting professor
- Collaborative/sponsored research with industry
- Intellectual Property licensing to:
  - Existing companies
  - Spin-Outs

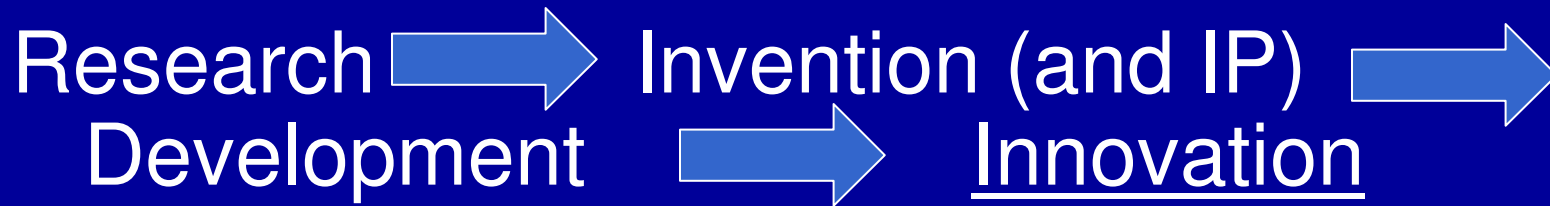
# Formal Definition of “technology transfer”

- Purposeful transfer of the results of fundamental research from universities and research institutions into the economy via protection and transfer of intellectual property into the commercial sphere

# Three major routes for IP transfer

- Collaborative Research followed by transfer of IP (licensing?) to industrial sponsor
- Licensing of IP to existing companies
- Spin-out of new companies formed to exploit IP

# Purposes of University Technology Transfer



- New products and medicines
- Bring new technology into industry for economic competitiveness
- Encourage entrepreneurship for local and national economic development

# The university/IP equation

- University technology is embryonic—neither its feasibility nor market is known
- Development will require high risk investment by industry
- Intellectual property protection can be used as an incentive to make the high risk investment
  - motivating the “first mover” by protecting against later competitors

## Patent protection is particularly critical for development of pharmaceuticals

- Development of a new therapeutic or vaccine product is a particularly high risk activity
  - Time frames are long
  - Financial investment is very high
  - Clinical trials are very difficult
  - Probability of failure is high
- Patent protection of the final product is necessary before companies (or biotech investors) will take the risk and make the investment

Other breakthrough technologies are in a similar situation:  
requiring substantial investments at high risk

Examples:

- Alternative Energy technologies
  - Solar, batteries, etc.
- “Clean water” technologies
  - low energy desalination, nano-sorption, etc.
- New Materials
  - Superconductors, nanomaterials, etc.



- But does technology transfer make money for the university?

# Financial Benefits of Tech Transfer

- Industry support of research the university
- Economic development, locally and nationally
- Revenues from licensing and spin-outs

# Financial expectations from royalties and spinouts

- Based on the US experience, universities should not plan for large returns from royalties and spinouts, even from very successful technology transfer programs

## 25 years after Bayh-Dole, US Tech Transfer has matured: Fiscal Year 2007 results

- New Issued US Patents: > 9800
- New License Agreements: >4200
- Total Licenses yielding income: >11,000
- New Startup Companies: >480

But direct financial income from technology transfer itself is usually not very large

- Licensing revenue from >200 research institutions in FY 2007: \$2.0 Billion (U.S.)
- **BUT...**this is on a research base of:  
\$ 41 Billion
- Thus, Licensing revenue, after 25 years of experience averages:  
only 5 % of research expenditures

## And even the total revenue is very unevenly distributed

- Dominated by a few very large royalties from fewer than 1% of total patents from research institutions in the U.S.
  - Pharmaceutical royalties are high—but very rare
  - Equity cash-ins from spin-outs are only occasionally large, and are one-time events
- Most universities eventually break even or make a small amount—but very few get rich!

# The Societal Impact is much Larger!

- More than 4000 new companies formed from US university intellectual property
- Spinouts are a significant contribution to “technology clusters” in some regions
- Estimate over 500,000 jobs in development and production of new products based on university licenses in the US
- Significant tax returns to the government
- Many new medicines developed based on patents from university research

- Significant number of new startups have developed into large, successful companies (e.g. Google! from Stanford)
- Biotech and Information Technology (IT) clusters in a number of cities with large research universities (Boston, San Francisco, San Diego, North Carolina, etc.)
  - Majority of new biotech companies spin directly out of university research



# Key elements in developing a successful university technology transfer system

I. Strong, world-quality research consistently supported over decades

II. A Well-thought-out Mission

- Why is the university doing it?
  - If it's "about the money", they will likely fail
  - And if there is not a consensus on a clearly defined mission, tech transfer may languish or grow contentious

### III. Program which wins the hearts and minds of the scientific investigators

- Clear policies that put the academic mission (and publishing) first
- Responsive tech transfer office
- Clear policies

# The researcher's questions?

- Will my institution's emphasis on technology transfer mean I won't be able to concentrate on fundamental, exploratory research?
- Will patenting interfere with my ability to publish?
- How do I separate my academic responsibilities from my involvement with companies?

## Academic values, basic research, publication are not incompatible with technology transfer

Doing both well relies on:

- Core institutional values and policies that give academic mission (basic research, publication) clear priority over technology transfer
- Clear definition of who owns the intellectual property (the researcher, the institution, the government, the company? )
- Well defined policies on researchers' involvement with companies (allowed time, consulting privileges, other "boundaries")
- (?) Clear separation of startup companies from the institution

## The Tech Transfer office must be responsive to academics' needs

- The TTO must have “rapid response”
  - In evaluating invention reports for patenting
  - In getting patent agents to write the patents and filed them
- Educate researchers to get their cooperation: Patents need to be filed before publication—but publication may follow immediately thereafter
- Educate researchers to report inventions (several months) in advance of planned publication—when possible

## IV. Policies

- Clear university policies on
  - Ownership of IP
  - Sharing of Royalties
  - Publication, confidentiality
  - Use of university resources by industry and particularly spin-outs
  - Right of faculty to participate in spin-out companies, consulting to industry, etc.

## V. Investment

- It takes money to build a patent portfolio and to support a technology transfer office
  - **where will the funds come from?**
  - **Is the time frame realistic?**

## VI. Realistic Financial Expectations

- The university cannot expect that financial returns will ever be a major source of income
  - **Unless you get lucky**

# Technology Transfer is a talent-based endeavor!

## VII. TLO staff

- Technically trained
- “Bilingual” in Academia and Industry
  - Industrial experience very, very helpful
- Can command respect of faculty and business
- Can handle complexity
- Good communicators and negotiators
- Motivated by “Getting it done”
- And Dedicated to the mission



# VIII. Contact with Industry and Investors

Technology Transfer is done with people you know!

# Sponsored Research:MIT Statistics

- About \$80 million in industrial sponsored research
  - (ca. 15% of on-campus research)
- 150-200 industrial agreements negotiated/year
- 8-10 “Umbrella agreements” in place
  - multi-year (5-10 yr), multi-\$million
  - all “project-by-project” (competitive proposals from faculty chosen jointly by steering committee)
  - No “department-wide” or “field-wide” agreements

## Where do these sponsorships originate?

- No office formally in charge of “marketing” industrial sponsorship
- Many relationships start with a faculty member knowing someone from the company
  - Consulting
  - Scientific meetings
  - Former grad students/postdocs now at company
- Some come from senior faculty (deans, etc.) board memberships and other relationships
- Larger companies approach MIT to establish closer relationships (“Brand”)

# Technology Licensing Office Statistics

- 500 new invention disclosures/year
- 100 new technology licenses/year
- 15-30 new spin-out companies/year
- Over 650 active licenses
- About 350 spinout companies total

# Dependent on our “Entrepreneurial Eco-System”

- Activities on Campus involving continuous interaction with the business and investment community

# MIT components of the “entrepreneurial eco-system”

- Deshpande Center: sponsors research “with startup potential”—with business “catalysts”
- \$100 K Student Business Plan Contest
- Venture Mentoring Service
- MIT Enterprise Forum
- Entrepreneurship Center at Sloan School of Mgmt.
- Student Venture Capital and Entrepreneurship Clubs
- The Technology Licensing Office

# Deshpande Center

- Funded by a philanthropic endowment from successful IT entrepreneur
- Investigators submit competitive proposals for research with spinout potential

# Deshpande...continued

- **Volunteers from business community** (VC's, entrepreneurs, etc) on Judging Advisory committee
- Each funded project mentored by a **"Catalyst" from business community** for 1-2 years during research



# 100K Student Business Plan Contest

- Over 100 entries/year
- **Volunteers from business community** serve as mentors and judges
- Over 500 people (**mostly from business community**) attend the final awards ceremony

# Venture Mentoring Service

- Over 100 volunteers from the entrepreneurial, angel investing, venture capital and other businesses provide mentoring to entrepreneurs (including alums) associated with MIT.

# MIT Enterprise Forum

- Founded and run by volunteers from the business community
- Run separate monthly clinics for
  - “concept companies”
  - Startup companies
  - Early growth-stage companies
- Annual instructional and networking conference
- Several hundred audience attendees per month

# Role Models!

- Students and faculty are continuously exposed to people who have started companies—and to people who fund them
- Students graduate with a sense that “I can do it too”.  
Changes life-time expectations
- And faculty develop a sense (watching their colleagues succeed) that “I ought to try that too!”

**Entrepreneurship is in the air!**

# And our “incubator”—the City of Cambridge (and Boston)

A community experienced in forming, funding and growing new companies

- Early stage venture capitalists
- Lawyers, accountants, consultants
- Real estate managers

AND, the scarcest resource anywhere:

- Experienced managers who can run and raise money for new companies

# IX: TIME: the Final Requirement for building a successful TT operation

- It takes time (and investment) to build an IP portfolio
- It takes time to educate faculty and win their trust
- It takes time and experience to develop technology transfer skills
- Developing contacts with industry and investors—and developing trust—takes time
- It will likely take a decade to become financially self supporting

# Building a tech transfer system is a long-term societal investment

- To bring the results of basic research to the public in the form of new products, new cures
- To solve major societal problems (e.g. energy, clean water) through new scientific findings
- To enhance economic competitiveness of industry by incorporating new technology
- To build new industries based on new science and technology
- To build an entrepreneurial culture, bringing new companies, new jobs and new opportunities for the public

Thank you!