



# Technology Transfer at Caltech

**Monash University**  
**In honor of Nick Birrell**  
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Special thanks to Fred Farina  
Asst. Vice President

*Office of Technology Transfer*  
*California Institute of Technology*



# What is Caltech?

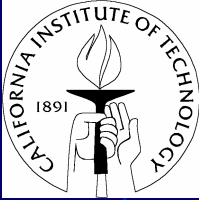
- Caltech is small
- Caltech is focused on excellence in Science and Engineering
- Caltech runs JPL for NASA



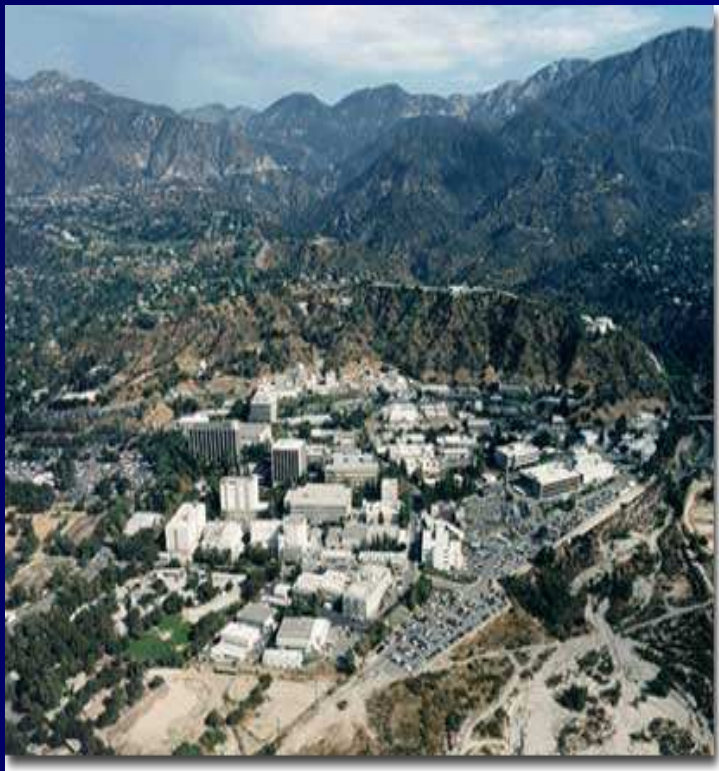
# California Institute of Technology



- Founded in 1891
- ~2,000 students  
(900 undergraduate + 1100 graduate)
- 280 professors and 130 research faculty
- 5,300 engineers/scientist at JPL
- 32 Nobel Prize Recipients among faculty and alumni
- 72 members of the NAS
- 35 members of the NAE
- \$240M in Research Funding



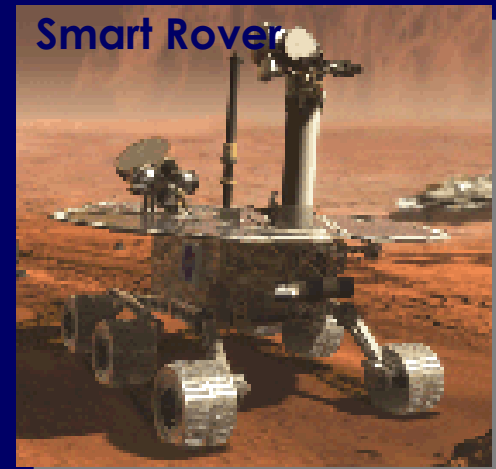
# The Jet Propulsion Laboratory



- **Founded in the 1930's when Caltech Professor Theodore von Karman conducted pioneering work on rocket propulsion.**
- **Chartered to Conduct Unmanned Robotic Exploration of the Solar System**
- **Federally Funded R&D NASA Facility operated by the Caltech**
- **Annual Budget - Over \$1 Billion**
- **5200 Employees**
  - **1/3 PhDs, 1/3 MS, 1/3 BS & Other**



Bulldozer



Smart Rover



Reconnaissance Orbiter



Smart Lander



Sample Return



Mars Express



# The University-Industry Culture Clash

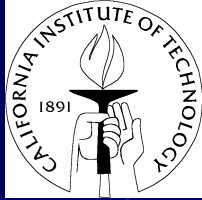
## Universities

Open  
Publication  
Conservative  
Long Term

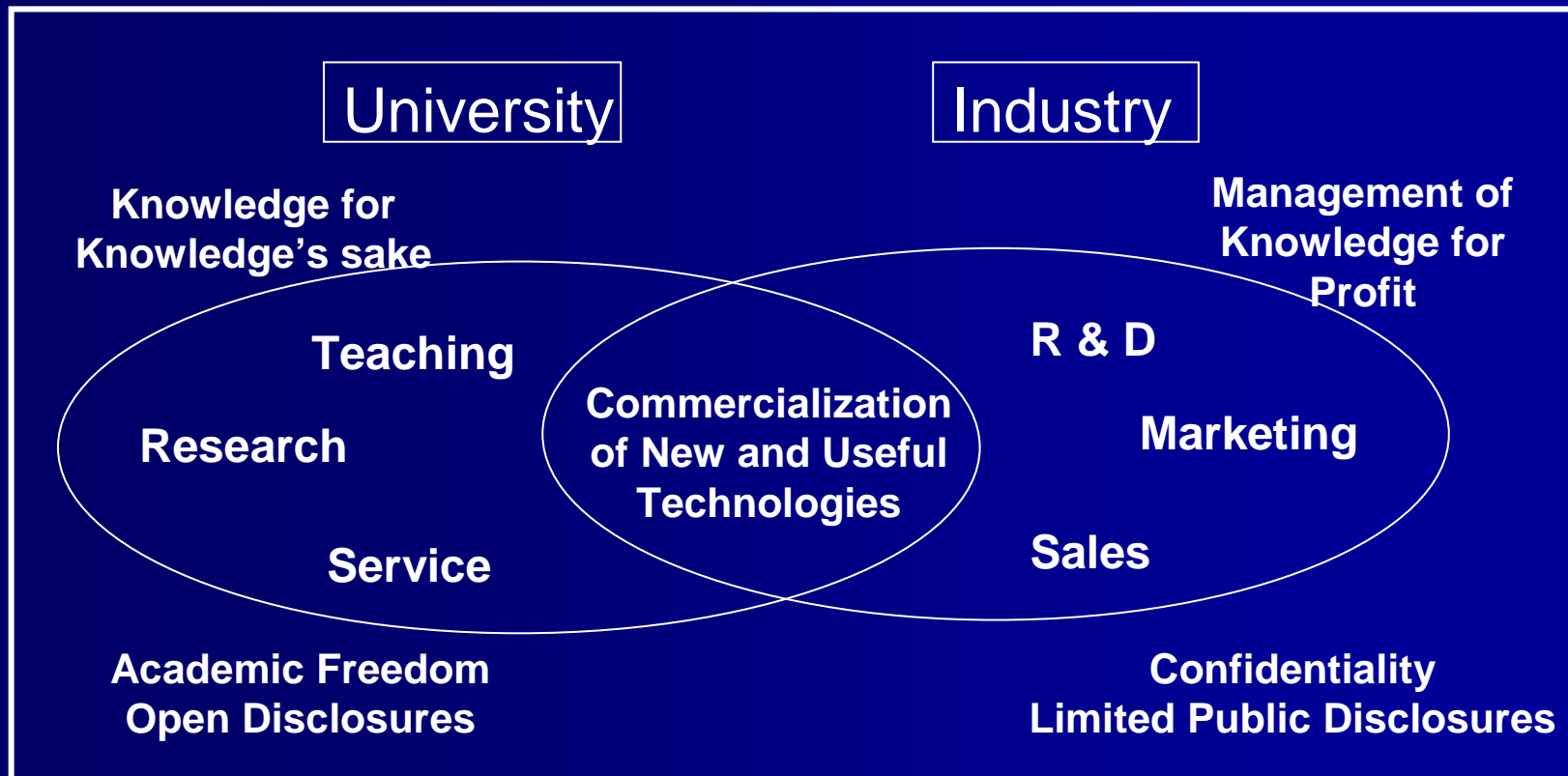
## Industry

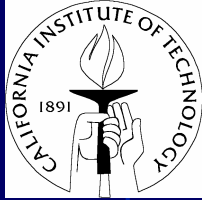
Closed  
Secrecy  
Aggressive  
Short Term

*How do you bridge the gap?*



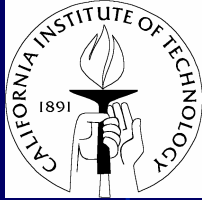
# University-Industry: a culture clash with some overlap





## Why Do it?

- Public Benefit
  - Innovation as a source of new jobs
  - And economic growth
- Faculty Recruitment
- Generation of Revenue



# Is Tech Transfer working ?

YES... 2006 figures:

- 5000 licenses
- 550 new start-ups (5,724 since 1980)
- 700 new products (4,350 since 1998)
- \$1.5B in royalties in 2004

2006 AUTM Survey

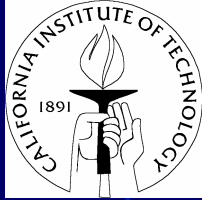


# Is Tech Transfer working ?

**But...**

- IBM's royalties (~\$1.5B)
- Great majority of Universities don't break even

*Plenty of opportunity for "new science" in Tech Transfer*



# Defining A Technology Transfer Model

## Given Restraints of Culture and Resources

- How to maximize the influx of invention disclosures from inventors into the Office of Technology Transfer (OTT)?
- How to strategically protect the IP?
- How to find licensees and select the best candidate?
- How much involvement with startups?



# The Caltech Model

- **Relationships with Faculty**
- **Aggressive patent filing**
- **No (traditional) marketing**
- **Favor Startup/Equity deals over Licensing**

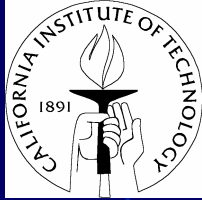


## Invention Disclosures to Technology Transfer Office

➤ **Develop relationships with faculty and other inventors and gain their respect and trust:**

- Routinely meet with faculty
- Discuss their research
- Solicit their input
- Attend group meetings
- Organize events and invite faculty

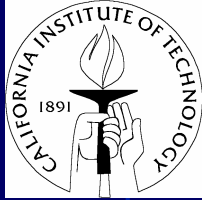
***The Faculty is the Customer***



## Evaluation of Inventions/ Patent Filing Decisions

### Some of the questions to ask:

- Applications of the invention, product?
- Problem solved by invention?
- Prior art solution to same problem?
- Advantages over the prior art?
- Status of development/reduction to practice, proof of concept, prototype?
- Publications? Dates?
- Continued funding?
- Industry interest/contacts?
- Sponsored Research?



## Evaluation of Inventions/ Patent Filing Decisions

- Made by individual members of OTT
- Decision presented to bi-weekly OTT meeting: open discussion → decision finalized
- If decide to file: Select outside patent counsel and instruct to prepare patent application
- If decide not to file: offer to sponsor if any (Bayh-Dole compliance)



## Evaluation of Inventions/ Patent Filing Decisions

- Trusting Relationships with Inventors: Use Their Expertise to Make Patent Filing Decisions
- Avoids Lengthy and Often Meaningless Invention Evaluation
- The “Yes” Factor - Aggressive Filing

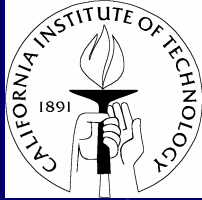


## Evaluation of Inventions/ Patent Filing Decisions

### **Patent Filing Strategy at Caltech: File Aggressively**

File provisional application on every new disclosure from Caltech faculty:

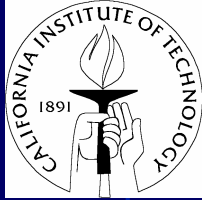
- Easy, quick and cheap filing: beat publications, establish early priority date
- Give one year to make non-provisional filing decision: allows monitoring of invention development



## Evaluation of Inventions/ Patent Filing Decisions

➤ **Before expiration of 1 year provisional filing, review status of invention and make nonprovisional filing decision:**

- Status of development?
- Proof of concept / prototype?
- Industry interest?
- Continuing funding?



## Evaluation of Inventions/ Patent Filing Decisions

- **Pay particular attention to new faculty:**
  - File on first disclosures to encourage additional invention disclosures and gain trust
  
- **File aggressively for all faculty:**
  - Encourage invention disclosures by faculty
  - Do not know which invention might be a hit
  - By not filing: faculty may stop disclosing and hit invention may be missed



## Evaluation of Inventions/ Patent Filing Decisions

### Conclusion:

Impossible to predict which inventions will be big hits → **File aggressively**



Technology Licensing

Established Company

Technology Push = active marketing of technology  
→ Requires to commit substantial resources  
→ Minimal benefit for level of effort

*Technology Push* → *Usually Ineffective*



Technology Licensing

Established Company

## The Caltech Strategy => Rely on Market Pull

- Market Pull = Process by which a company finds a technology using a technique known as **competitive technical intelligence**.
- Understand that **the faculty is a marketing resource** via publications, consulting, conferences, etc.



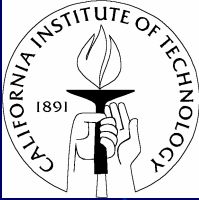
Technology Licensing

Established Company

**The Caltech Strategy => Rely on Market Pull**

**Exceptions:**

- Sometimes technology is an obvious match with company (e.g., only player in the field)
- Use faculty/inventors in identifying licensing candidates
- Contact company directly and/or use inventor contact in company



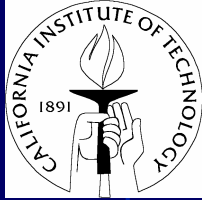
Technology Licensing

Startup Creation

Option Agreement: Contract giving the right to acquire a license

Elements of an option:

- Period within which option must be exercised (12 months)
- Right exercised upon raising funds (typically >\$500k)
- Addresses chicken and egg problem
- Term sheet (equity, royalty rates, etc.)
- Consummation (conversion to a license)

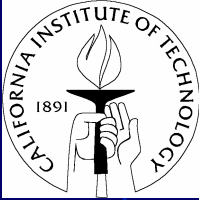


Technology Licensing

Startup Creation

## Why an Option?

- Quick and easy to do: 4-5 pages standard language with term sheet defining business terms (royalty rates, equity, etc.)
- Can be consummated in a short time
- Allows entrepreneur to raise funds
- Ties up technology only for duration of the option (typically one year)



Technology Licensing

Startup Creation

### Rationale for equity stake (in lieu of upfront fees):

- Does not financially burden the company early on
- Money raised is focused on product development
- Founder's stock is worth only pennies
- Equity means lower royalty rate: royalties affect the price to end-customers and the company's bottom line  
→ the lower the better



Technology Licensing

Startup Creation

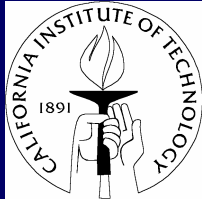
## Rationale for equity stake (continued):

- Equity provides an undivided interest in the company as a whole. Alignment of interests
- When IP fails or the company migrates away from original technology
- Equity may provide a quicker (and possibly greater) return if company goes public or is acquired (4-7 years)



## OTT's Rapid Growth

- Founded in 1995
- 80 start-ups created in first decade
- ~ 8 new companies each year
- 25% failed
- 25% had successful exit (IPO or acquisition)
- 50% plugging away
- Thousands of jobs created





# Caltech Grubstake Fund

- Gap fund
- for Proof of Concept / Prototype/Data
- up to 50k at a time

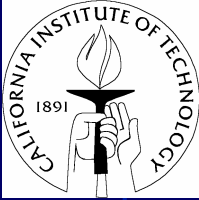


## Some Final Thoughts

- Caltech has been unusually successful in creating new start-ups
- No huge wins in IPOs etc
- Key to success has been
  - Faculty support
  - Caltech culture of entrepreneurship
  - Aggressive Filing



Questions?



# Addenda

## How does Caltech compare to Stanford and MIT?

TT Office	Research Budget	*Inv. Disc.	Research \$ for 1 Invention Disclosure	Patents Issued *	Start-ups*	Faculty	OTT Office Personnel
Stanford (1970)	\$1.1B	378	\$2.9M	58	12	1700	29
MIT (1950s)	\$1B	496	\$2.0M	140	20	1000	33
CIT (1995)	\$200M	168	\$1.2M	131	11	300	10

\* Numbers are per year, averaged FY 2002-2006 (Source: MIT and Stanford Annual Reports)