Two Views on University/Industry Collaboration

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Outline

1. Introduction and Vision
2. Current Organization and Skills
3. Strategic Thrusts
4. 1999 CC&C Plan

• 2 years consulting
• 2 years full time (post tenure!)
• 80 engineers @ UTRC
Mechanisms for Interaction with Universities (I)

Consulting contracts (A)
- Leading faculty acting as consultants in areas of importance
- Protects IP and competitive info

Summer Interns (B)
- PhD students from leading schools
- Good record hiring at graduation
- Need early advisor involvement

Joint Projects (C)
- University as subcontractor
- Mainly for relationship building

Consortium membership (B)
- Choose areas where we have interest, but lack of internal R&D
- Look for project/consulting support

Hiring students from school (A+)
- Hire technically excellent people
- Very effective transition of ideas and establishing relationship

Sponsoring student projects (C)
- Sponsor course project; typically low level of impact
- Requires overhead $$ expense

Grading key:
- A = absolutely outstanding
- B = good, solid, no problems
- C = satisfactory, but not exciting
- D = weak, terrible
Engineering and Applied Science
Research at Caltech

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http://www.eas.caltech.edu/
Research Thrusts

Information Science & Technology (BIO/CCE/EAS/HSS/PMA)
- Hardware, architectures and “software” for novel substrates
- Analysis and design of complex, interconnected systems

Biological Engineering (BIO/CCE/EAS)
- Analysis and design of neural and molecular biosystems

Nanoscale Systems (BIO/CCE/EAS/PMA)
- Photonics, biophysics, and large-scale integration

Global Environmental Science (CCE/EAS/GPS)
- Micro to macro, natural to engineered

Computational Science and Engineering (Institute-wide)
- Petabyte scale computing applied to science and engineering
- Integrative multi-scale modeling and simulation

Pursue UNIQUE APPROACH in each area

CDC, 8 Dec 03
**EAS Research Centers**

*Centers provide important mechanism for long-term, multi-disciplinary research*

- **Center for the Simulation of Dynamic Response of Materials**
  - DOE/ASCI Center; $4M/year
  - 10 faculty, 3 divisions, 4 EAS options

- **Center for the Science and Engineering of Materials (CSEM)**
  - NSF MRSEC; $2M/year (two IRGs)
  - 10 faculty, 2 divisions, 4 EAS options

- **Lee Center for Advanced Networking**
  - Privately funded; $10M over 10 years
  - 11 faculty, 2 divisions, 4 EAS options

- **Center for Advanced Computing Research (CACR)**
  - Institute-wide center for computational science and engineering (CSE)
  - Maintains large scale computation and storage facilities for research

- **Center for Neuromorphic Systems Engineering (CNSE)**
  - NSF ERC; $3M/year; 9 faculty, 2 divisions, 3 EAS options

- **Institute for Quantum Information**
  - NSF ITR; $1M/year; 5 faculty, 2 divisions, 4 EAS options
Materials and Devices in EAS
Commercial and Scientific Applications

- Aleph
- Mycometrix
- Liquid Metal
- On Chip
- Holoplex
- Simulant
- Arroyo Optics

- All VC funded
- All started by students, postdocs, faculty
Mechanisms for Impact through Applications (A)

New Companies (A+)
- Former students and postdocs working with faculty to start new companies
- Requires Institutional support and oversight to be successful

Strategic partnerships (B)
- Establish long term, substantial funding ($1M/year)
- IP master agreements
- Target research centers to own relationship

Sponsored research (C)
- Funding for specific project
- Often includes IP/review rights

Students working at company (A+)
- Graduates hired by industry
- Provides advocates for Caltech within industry
- Successful students = future donors

Joint educational projects (B)
- Large project with participation by students and industry engineers

Challenges
- IP agreements, publication review
- Conflict of interest
Conclusions and Recommendations

Students are *critical* mechanism for collaboration
- Establishes conduit between research groups and applications
- Must provide education required for students to be successful
- For control, research must be relevant to system needs
- Look at new companies as superior mechanism for transition (SBIR, STTR, VCs, etc)

Centers provide stable mechanism for industry interaction
- Provides access to multiple research groups, many students
- Can often tie into corporate dollars set aside for this purpose
- Controls community needs to make sure to establish these

Joint projects require support for universities *and* industry
- DARPA is a model, but difficult for universities to participate
- Line up projects with strategic areas of interest at company
- Relationship must be built up ahead of time