Industrial Physics Leadership Summit III

Fueling Future Innovation: Coupling Industry and Universities for Physics Research

Frederick E. Pinkerton

Friday, June 11, 2010

American Center for Physics

College Park, MD

AIP | American Institute of Physics

APS physics

In association with:

AAPT PHYSICS EDUCATION

American Association of **Physics Teachers**

Enhancing the understanding and appreciation of physics through teaching

Outcomes:
Industrial Physics Leadership Summit I

16 March 2006, APS March Meeting, Baltimore

- Human resources
  - Physicists' value in industrial research
    - Broad-based knowledge
    - Adaptable
    - Rigorously analytical
    - Creative
    - Strategic thinkers
- Industrial Physicists interfacing with academia should:
  - Communicate workforce needs
  - Stress competitiveness
  - Promote intellectual property policies
- Interfacing with government
- Enhancing the R&D enterprise

"Physics is an attitude, and a way of thinking."
Steven Koonin, Undersecretary for Science, DOE
June 10, 2010

Outcomes:
Industrial Physics Leadership Summit II
12 March 2008, APS March Meeting, New Orleans

- Consortia
- Culture gap between industry and university physics departments
  - Industry often has strong working relationships with engineering departments, less so with physics departments
    - This limits interaction between researchers and industry
    - This limits career opportunities for students
    - This limits richer dissemination of physics into industry and society
  - ***Industrial physicists want to meet with academic department leadership***
- Connection to federal and state governments
  - Intellectual property in collaborations
  - Lobbying by industry
- Networking
- Industrial participation in physics journals

Goals for
Industrial Physics Leadership Summit III:

- Previous Summits laid a consistent groundwork for Summit III
- Arrive at a set of best practices that strengthen industry-university physics research relationships
- Build cooperation at the leading edge of science to advance corporate research
  - fuel the front end of the innovation pipeline
  - assure future competitive success of industry
  - prepare physics students to work in industry
  - prepare physicists to work with industry
- Identify action items
  - how can AIP, APS, and AAPT help?

Agenda

1:15 pm **Fueling Future Innovation – framing the discussion**
Fred Pinkerton, General Motors

1:30 pm **Statistics of physicists' employment – where are physics PhDs working?**
Rachel Ivie, Statistical Research Center, AIP

1:50 pm **Academic Forum**
Moderator: *Kate Kirby, APS*
Nicholas J. Giordano, Purdue University
Edward Van Keuren, Georgetown University
Moderated discussion

2:45 pm Break

3:05 pm **Government Lab and Industry Forum**
Moderator: *Robert Doering, Texas Instruments*
Jason Boehm, NIST
David Bishop, LGS, Bell Labs Innovations
Richard Sears, Shell and MIT (retired)
Moderated discussion

4:15 pm **Round Table discussion**
Moderator: *Fred Pinkerton*

5:20 pm Wrap-up and summary

5:30 pm Adjourn

6:30 pm **Reception and Dinner**
Keynote address: *Broadening Physics Career Paths: Industry, Education and Policy*
Steven Koonin, Undersecretary for Science at DOE

THEMES

- Exposing undergraduate and graduate students to broader career possibilities
- Broaden physics curriculum to include “soft skills”
- Cultural divergence between academia and industry, especially timing
- Networking for research
- Intellectual property

Exposing students to broader career possibilities

- Make students aware of available opportunities at the start of their graduate career.
  - Mention and encourage minors in other areas
  - Projects working with industry
  - Count non-traditional courses toward physics degree
- Graduate advisors should have an ongoing conversation (1-2 times yearly) with their students about career goals and options.
- Encourage seminars by industry researchers, especially alumni.
- Improve faculty advising of undergraduates for non-academic careers.
- Departments track where their students (grad or undergrad) go, especially those who go on to non-academic careers. And then engage them personally.

Broad physics curriculum including “soft skills”

- Develop “T-shaped” students: deeply skilled in one specialty, with broad knowledge of other areas
- Broaden curricula in graduate programs to include industry knowledge and “soft skills” (seminars could be an option)
  - Entrepreneurship
  - Teamwork
  - Communication to diverse audiences
  - Project management
  - Nature of IP and origin of IP issues
- Internships are integral components of training for industry-bound students.
- Interdisciplinary education.
- Consider both results- and behavior-based performance measures at universities (industry does both already).
- Modify promotion & tenure of professors to encourage industrial collaborations and interdisciplinary research – models exist (Stanford, Purdue).

Cultural divergence between academia and industry

- Industrial Human Resources (HR) departments
  - Industrial physicists should work with HR to make physics-accessible jobs recognizable to job searchers ("physics" in job title or qualifications?)
  - Cast HR in minor role if possible – networking is essential to find a job, establish collaborations, etc.
  - Often necessary to work with HR for adherence to legal hiring practices
- Industry should be careful in making long term (PhD thesis research) commitments: don't promise support if you can't keep the promise.

Notable quotes

- "Universities turn money into knowledge; industry turns knowledge into money."
  - Bahram Roughani, Kettering University

- "It is not evil to want to make money; it is not stupid to want to advance human knowledge."
  - David Bishop, CTO, LSG Innovations

Networking for research

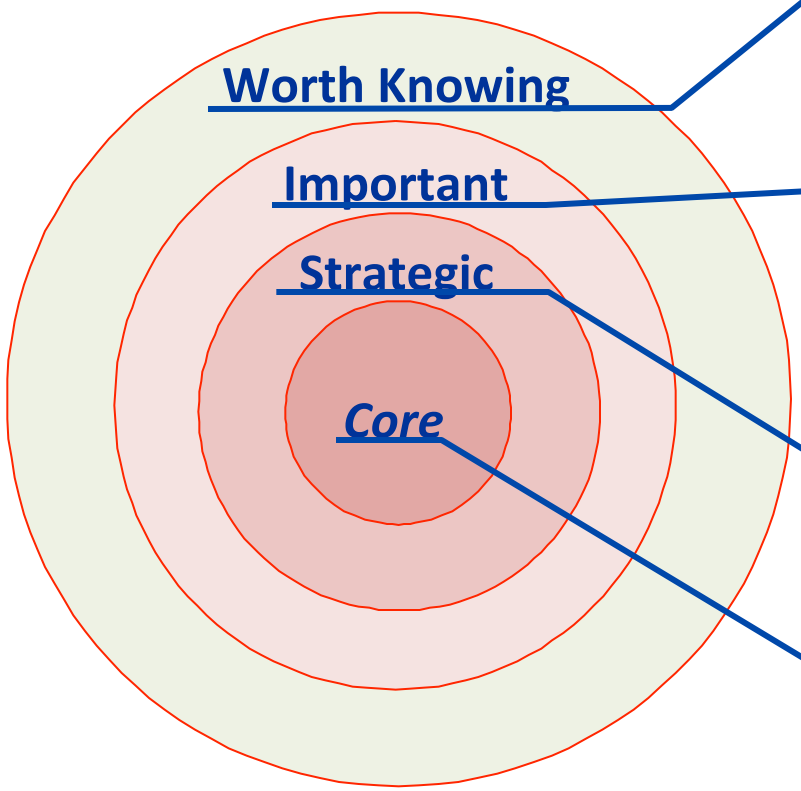
- Develop personal relationships as a key to starting and sustaining collaborations.
- Nurture long-term relationships to build a body of knowledge over time.
- Use web-based social media to foster networks between academia and industry
- Consortium-sponsored research

Intellectual property

- Establish IP agreements prior to entering into research collaborations – let scientists from both sides focus on the science.
- Use common, university-wide IP agreements when multiple working relationships are anticipated – avoid the need to negotiate every contract individually
- Chop “core” industrial research problems into (1) non-proprietary pieces that can be tackled by universities/ students, and (2) competitive differentiators that must be kept in-house
- Use professors as consultants for core problems that need to remain internal and proprietary.

Industrial Open Innovation Model

- What -



Relevant Fields, Scout Options

Academics, Scout IP, Background Knowledge, University Sponsored Research and Research Consortia

Evolving Technologies, Game-changers, Don't Know What You Don't Know, Generate IP, University Sponsored Research and Consortia

Exclusive IP and Access to Unique Skills, Often joint venture or B2B Partners

Differentiating, Critical Technologies, Highly Guarded, Usually Internal

Richard A. Sears, 6/10

Suggestions for Future Progress

- **Disseminate Summit III results**
  - **University physics and astronomy chairs**
  - **AIP Corporate Associates members**
  - **FIAP members**
  - **SPS chapter advisors**
  - **Social networking via LinkedIn "Industrial Physics" group**
- Establish a plan for continuing the dialog
- Distribute IP language from standard Semiconductor Research Corp (SRC) contract
- Produce a list of departments that have well-established industrial physics degree programs, with industrial partnerships/collaborations, and strong alumni networks, etc.
- Form an industrial physics network of universities that demonstrate adherence to best practices.
- Establish a network of industrial physicists who would visit departments as seminar speakers.
- Educate industry HR professionals about the value of physics degree holders.