

**Economic Development for Physicists from
Developing Countries**

27 November 2006 - 1 December 2006
Trieste - ITALY

GENERAL ASPECTS OF COMMERCIALISATION

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General Aspects of Commercialisation

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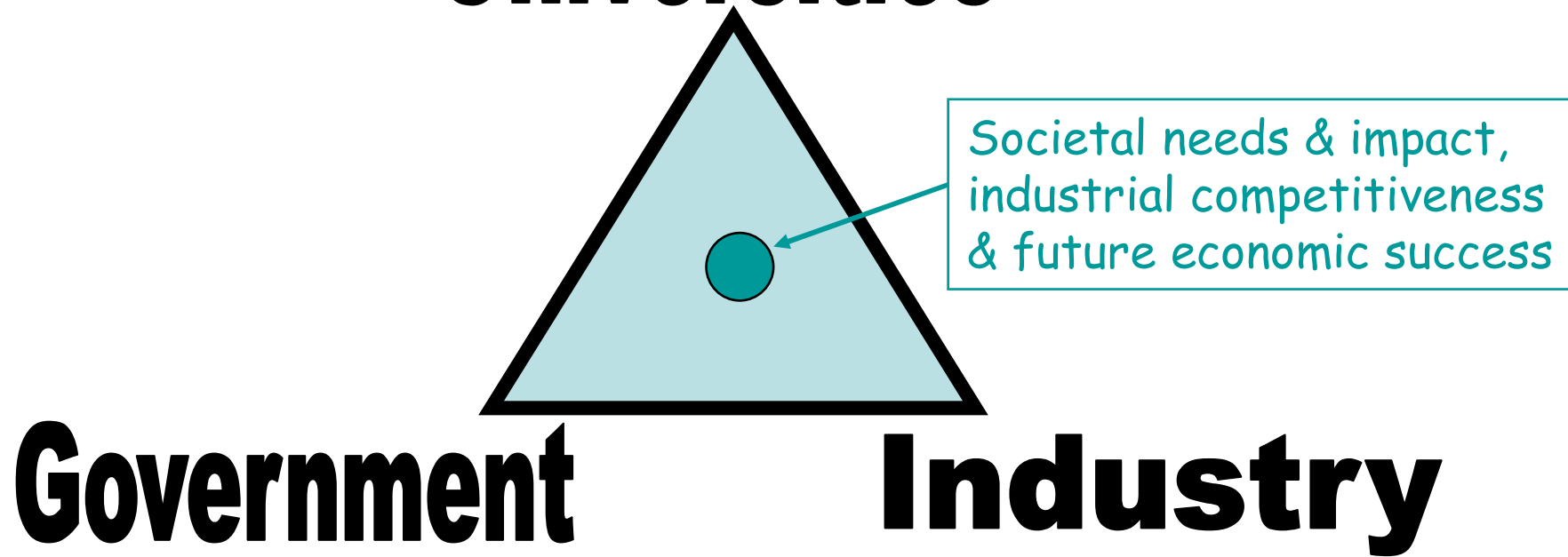
Trieste 27 November 2006

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This talk

- R&D trends in developed countries
- Why commercialise?
- Models of working with industry
- The people
- The rewards
- Where to go to learn more

Universities



Government

Industry

My background

- Academic bio-medical research
- More than 25 years in technology transfer
- R&D and product development in a small UK biotechnology company and big US pharmaceutical company
- Clinical trials in a biomedical research foundation
- University and PSRE technology transfer offices
- University research in regional economic development

Global R&D

Country	Annual R&D (\$bn) (%GDP)
USA	285 (2.6%)
Japan	114 (3.2%)
China	85
Germany	57
France	38 (2.2%)
UK	34* (1.9%)

Source OECD

* 60% private, 40% public

Global R&D

- Ford \$8bn per year (Pfizer, Toyota)
- Sweden (4% GDP) then Finland, Japan, Iceland
- Government R&D growing by 3.5% per year (in US mainly defence)
- In Ireland more than 70% firms are foreign owned (Japan less than 5%)

Economic Trends

- From manufacturing to services
- From low-tech to high-tech
- Driven by ICT
- From skills to intellectual property
- To “The Knowledge Economy”
- Outsourcing and globalisation

Economic Trends (cont'd)

- Patenting doubled 1992-2002
- 84% US Japan UK France Germany
- Growth mainly in ICT and biotechnology
- Internet sales / mobile phones

So:

- Is there a new role for universities?

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Universities are for ..

- Training priests (13th century)
 - Later: lawyers, doctors, teachers
- Teaching and research (and scholarship)
- Vocational training
- Helping industry / farmers
- Boosting economic development (21st Century)???

Why commercialise?

- Money?
- Prestige?
- Government encouragement?
- University policy?
- Social good?
- Economic impact?
- Law (Bayh-Dole, USA)

Why Stanford does it

“Why We Do It”

The mission of Stanford University's Office of Technology Licensing (OTL) is to promote the transfer of Stanford technology for society's use and benefit while generating unrestricted income to support research and education

Why license?

In 1980, the U.S. Congress passed Public Law 96-517, the Bayh-Dole Act, which provides that rights to inventions resulting from government-sponsored research at universities would be assigned to the universities.

Why Stanford does it (2)

Everyone Wins

While it is relatively easy to measure OTL's performance in direct financial terms, it is more difficult to characterize the less tangible benefits of technology licensing. Nonetheless, technology licensing has provided such valuable benefits.

Who benefits from licensing?

- * Stanford
- * Stanford inventors
- * Industry
- * Silicon Valley/Biotech Bay
- * The U.S. Government
- * The Public

Technology Transfer in Universities

- US 1980 Bayh-Dole Act
- UK Higher Education Innovation Fund

- Reaction to
 - Penicillin
 - Monoclonal antibodies
 - Knowledge economy
 - Global competition

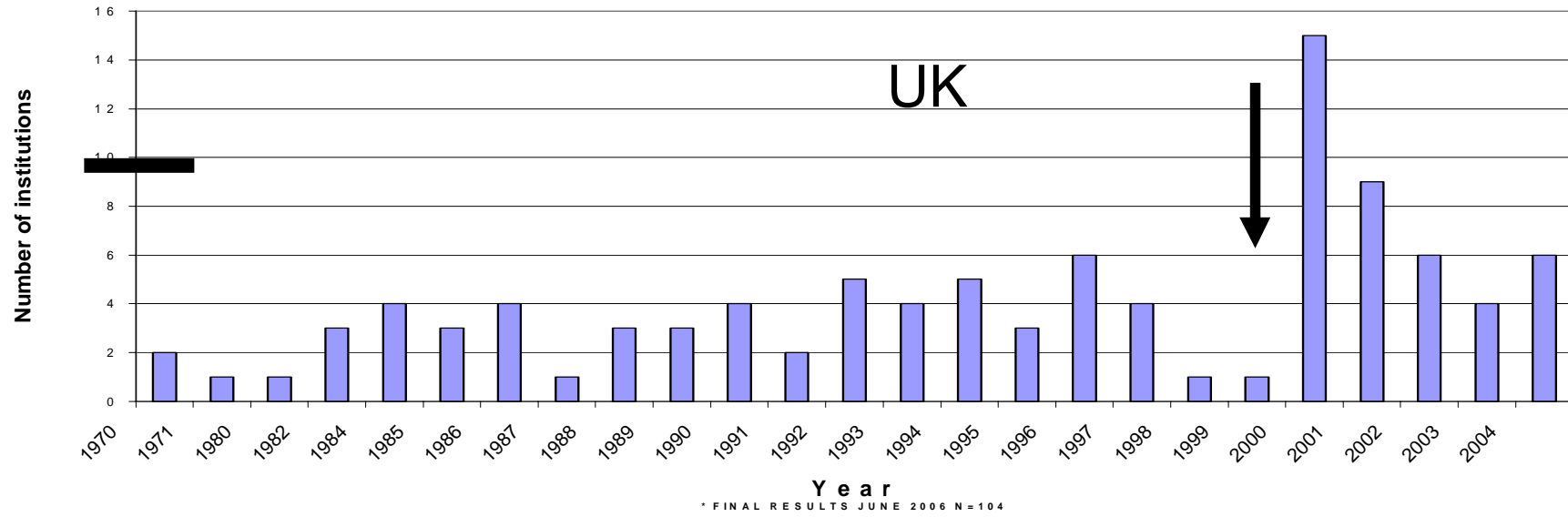
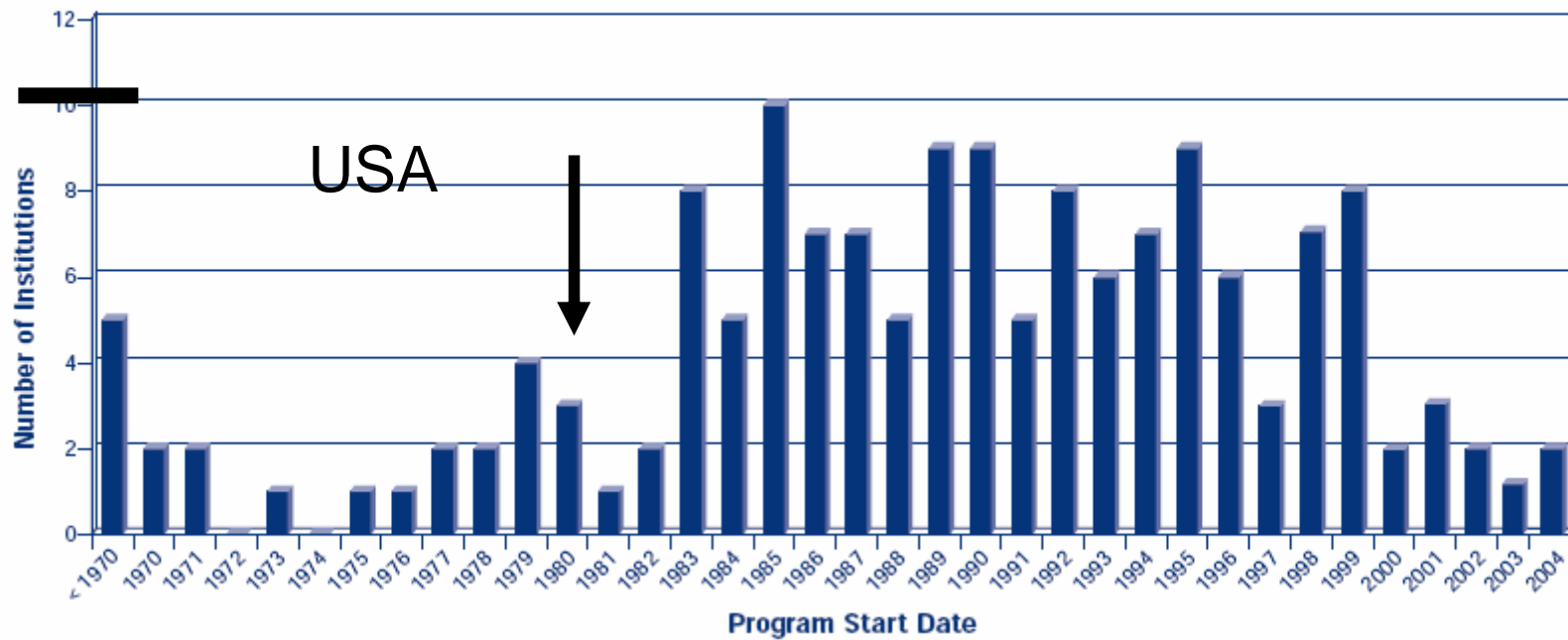


Figure US-1: Technology Transfer Program Start Date of U.S. Universities



Source AUTM, UNICO

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Technology Transfer via ...

- Movement of people (students)
- Publication and conferences
- Consultancy
- Contract Research
- Licensing
- Spinouts

Commercial

MIT

Number of Invention Disclosures	523
Number of patent applications filed	321
Licences	121
Spinouts	23
Licence income	\$48.2 million
Patent costs	\$11.2m
Research income	\$1bn

Cambridge

Number of Disclosures	127
Number of UK priority patent applications filed	41
Licences	40
Spinouts	3
New start-ups assisted	30
Consultancy contracts	70
Licence income	£2.71 million
Patent costs	£689k
Consultancy income	£1.58 m
Research income	£250m

How measure success?

- Size of office?
- Number of engagements?
- Number of patents filed?
- Number of patents granted?
- Number of spinouts?
- Leveraged investment?
- Valuations in market?
 - £1.5bn in 3 years for UK universities

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Who do you need for commercialisation?

Scientist?



or Businessman?



Scientist or Businessman??



Why important?

- Speak the “language”
- Credibility with business and entrepreneurs
- “Interpret” between two communities
- Add value to academic offering
- Catalyse cultural change
- NOT “get in the way”
- “Technology push” or “market pull”?

Bridging the Gap



What else do you need?

- Money for:
 - Networks
 - Travel
 - Patents
- Support of your organisation
- Clear mission
- Realistic expectations
- Time!!

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The Rewards

- For inventor?
- For colleagues?
- For institution?
- For TTO

So common model is:

1/3 - inventor

1/3 - department

1/3 – university

Problems in USA

- Does not cover costs (125 / 21 000 make >\$1m)
- Companies still say universities difficult to deal with – (*and vice versa!*)
- High expectations based on few large successes
- Political backlash
- Over-emphasis on money
- Conflicts of interest

November 5, 2006

ARMCHAIR M.B.A.

Putting Bright Ideas to Work Off Campus

By WILLIAM J. HOLSTEIN

AMERICAN universities should do a better job of channeling scientific breakthroughs into the marketplace, says William R. Brody, president of Johns Hopkins University. Here are excerpts from a conversation:

FORTUNE

By CLIFTON LEAF September 19, 2005

The Law of Unintended Consequences

Twenty-five years ago a law known as Bayh-Dole spawned the biotech industry. It made lots of university scientists fabulously rich. It was also supposed to usher in a new era of innovation. So why are medical miracles in such short supply?

Sources of information

- OECD www.oecd.org
- EC europa.eu
- AUTM www.autm.org
- UNICO www.unico.org.uk
- Praxis www.praxiscourses.org.uk
- Lambert www.lambertreview.org.uk
- MIHR www.mihr.org
- PIPRA www.pipra.org
- WIPO www.wipo.int

Group Discussion

1. What do you consider the barriers to commercialisation in your place of work?
2. As a group, rank them in order of importance
3. Talk about possible solutions
4. Choose rapporteur to feedback top two barriers

Barriers

- Group A
- Lack of Awareness/Confidence
- Lack of Structure Tech Tr. Office
- Group B
- Lack of tradition experience and
- Lack of core funding
- Industry not aware

Solutions

- Group C
- Funds
- Braindrain – no critical mass of researchers
- Labor based economy
- Group D
- Physics community has to change
- Lack of tech transfer office
- Industry not tuned/small markets

- Group E
- No Tech transfer offices
- No money

- Solutions
- Group E
- Courses /industry-academics conferences
- Case studies, examples, role models
- Political willingness

Group D

Establish tech centers

Academic culture –

introduce new courses/new disciplines

- Group C
- Need increased funding from govts and industry
- Research Centers of excellence
- Increase training and provide motivation
- Pro-active govt policy

- Group B
- Forum between researchers and industry
- Recognition
- Core funding for applied research
- Group A
- Courses/management
courses/workshops/seminars, etc