Foundation Debate on UK – China Research Partnerships

11 June 2014

Research Drivers

Urbanisation
Population
Climate change
Food security
Alleviating poverty

Energy demand
Biodiversity
Water demand
Human disease
Animal disease

Counter-terrorism
Nuclear proliferation
Ageing population
International migration
Non-infectious diseases
R&D spending, selected countries 2000-2015

The dotted lines indicate projections, based on announced targets.

Proportion of Global Publication Authorship: Top Ten Countries

Key
- United States
- Japan
- United Kingdom
- Germany
- France
- China
- Italy
- Canada
- Russian Federation
- India
- Spain
- Other

1999-2003
- 30%
- 26%
- 8%
- 7%
- 6%
- 5%
- 4%
- 4%
- 3%
- 2%
- 1%

2004-2008
- 34%
- 21%
- 10%
- 7%
- 6%
- 6%
- 6%
- 5%
- 4%
- 4%
- 4%
Risks – If we don’t

- China will become the largest science nation for:
  - Output & investment
- ∴ loss of opportunity in:
  - commercial, intellectual (top table), influence.
- Risks to UK if China does not engage in our agenda on:
  - Environmental challenges (climate, air, ozone, rivers etc)
  - Healthcare (AMR, dementia, food safety)
**Technology Capability ‘Valley of Death’**

**MCRL 4 - 6**
- Universities have less experience
- Industry finds this time consuming and expensive (especially SME’s)
- Going it alone limits derived benefits
- Research therefore often fails to reach the market

**Product Challenges**
- New materials
- Novel geometry
- Tighter specifications
- Safety & environmental needs

**Business Challenges**
- Lower Operational & material costs
- Improved process capability
- Reducing PI Lead times
- Delivery adherence

Develop new capability to remain competitive

**Top 11 Overseas Patent Registrations at the US Patent Office**

<table>
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<tr>
<th>1989</th>
<th>1999</th>
<th>2009</th>
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<tr>
<td>Japan</td>
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<tr>
<td>Global total</td>
<td>96,537</td>
<td>Global total</td>
</tr>
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</table>

Source: US Trademark and Patent Office
Risks – Commercial & Security

• Theft and exploitation of intellectual property
  • Patent, trade mark and copyright laws are being revised, driven by domestic Chinese stakeholders.

• Infringement of trade marks
  • Loss of market share and damage to reputation.

• Trade secret misappropriation
  • ‘Know-how’ - loss of competitive advantage.

• Cyber espionage attacks – from a variety of sources

• Selective enforcement of regulations

• Security – duel use (legislate), harder if aggregate risk, especially if gained from more than one country.

Many Very Different Areas

• Space
  • Satellites (duel use, but China already sophisticated)
  • If not upstream why not downstream

• Aerospace
  • China rapidly catching-up though joint ventures (required) & product development.
  • Will Chinese companies move to the UK?

• Life sciences
  • Huge market, opportunity for rapid commercialisation, requires an especially long term perspective, hard to duplicate?
Different Research Paradigms

The university research group: Can be well interconnected and work in consortia but transfer of ideas further up the TRL is the challenge.

Research driven by the entrepreneur: But dependent on a charismatic leader. Groups of entrepreneurs have worked well e.g. Silicon Valley → Intel.

The corporate laboratory: Very significant 1930-1980 but many have had difficulties more recently in the west.

National Laboratories: Again very important from the 1930s but many have closed (other than military related). Some are shared (e.g. EU).

Catapult Centres

Government is investing £200m in developing business-focused centres with a world-leading capability to solve technical challenges.

Catapults will provide business with
- access to world-leading technology & expertise
- reach into the UK’s world-class research base
- capability to undertake collaborative R&D
- capability to undertake contract research
- a critical mass of activity
- skills development at all levels
Catapult Locations

People to People Links

- **Students**
  - 135,000 Chinese students studying in the UK
  - 75% in higher education
  - 27% STEM, 46% business

- **Academics**
  - 2,895 Chinese academic staff, 40% Engineering & Technology, 19% Physical sciences, 14% Medical

- **Industry**

- **Commerce**

- **How many UK students are there in China?**
  4,500 (but most on short term courses)
A wild guess at the future

• A shift in where research is carried out.
• Different paradigms to enable more effective transition of science (from bench to bedside).
• More diverse teams of researchers – an even more itinerant population.
• The means of communicating will change but conferences will remain, despite skype.
• Markets will have emerged and transformed, aspirations will be greater.
• The main drivers will remain from: environmental concerns, population changes, health provision, energy, resource management….but things can change quickly.

Getting Smarter

• Smarter strategic collaboration.
• Best with best?
• More UK students spending time in China & Chinese students considering internships in the UK.
• Joint degree opportunities with Chinese universities.
• Possible German Humbolt Foundation type model of a long-standing relationship.
• Long-term, joined-up approach to ensure the UK is the research partner of choice not just now but in 30 years time.
End