

# Economic Impact – what is it?

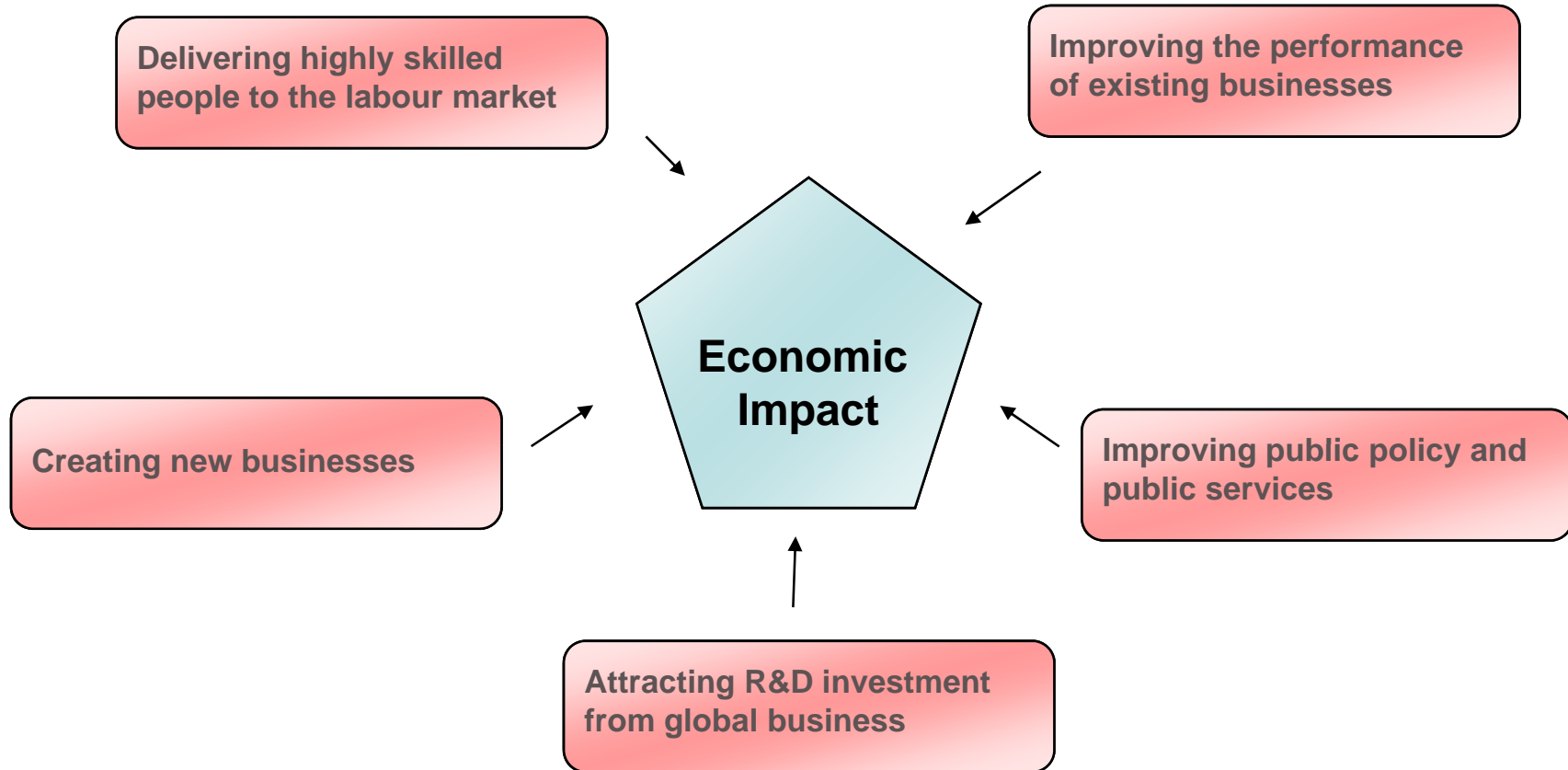
Liz Towns-Andrews  
Particle Physics Town Meeting  
7 Apr 2009

## Treasury 'Green Book' Definition

*'An action or activity has an economic impact when it affects the welfare of consumers, the profits of firms and/or the revenue of government. Economic impacts range from those that are readily quantifiable, in terms of greater wealth, cheaper prices and more revenue, to those less easily quantifiable, such as effects on the environment, public health and quality of life'*



# Five Key Ways of Generating Economic Impact from Research



DIUS 'Economic Impact Framework' – May 2007

# Stakeholders who receive these benefits

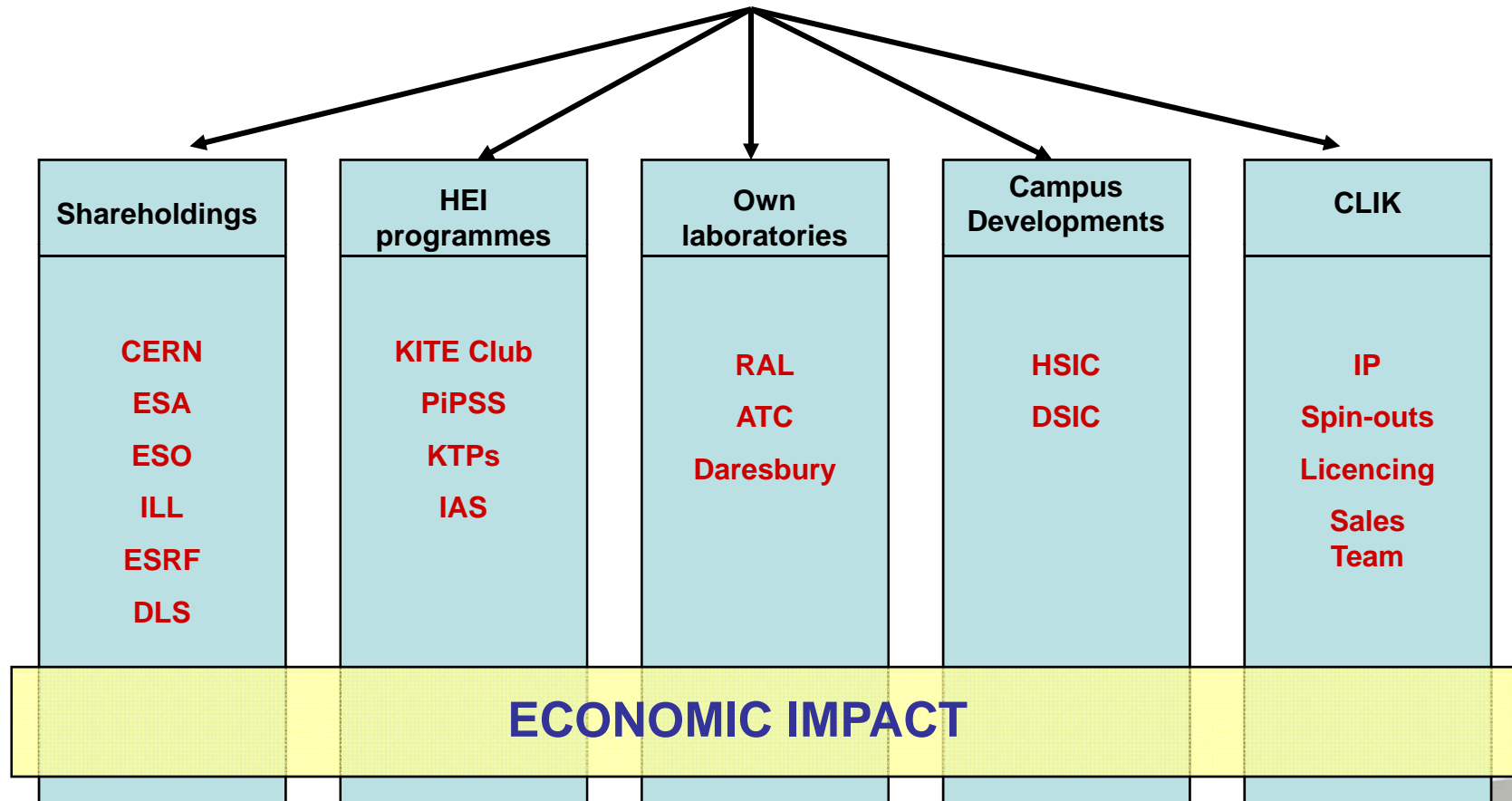
- **Consumers**
  - Greater choice and cheaper products, other effects on welfare
- **Firms**
  - Increased profits, efficiency in production
- **Government**
  - Revenue, social policy aims
- *Warry group's definition of economic impact focussed on the benefits to these parties*

# Measuring economic impact

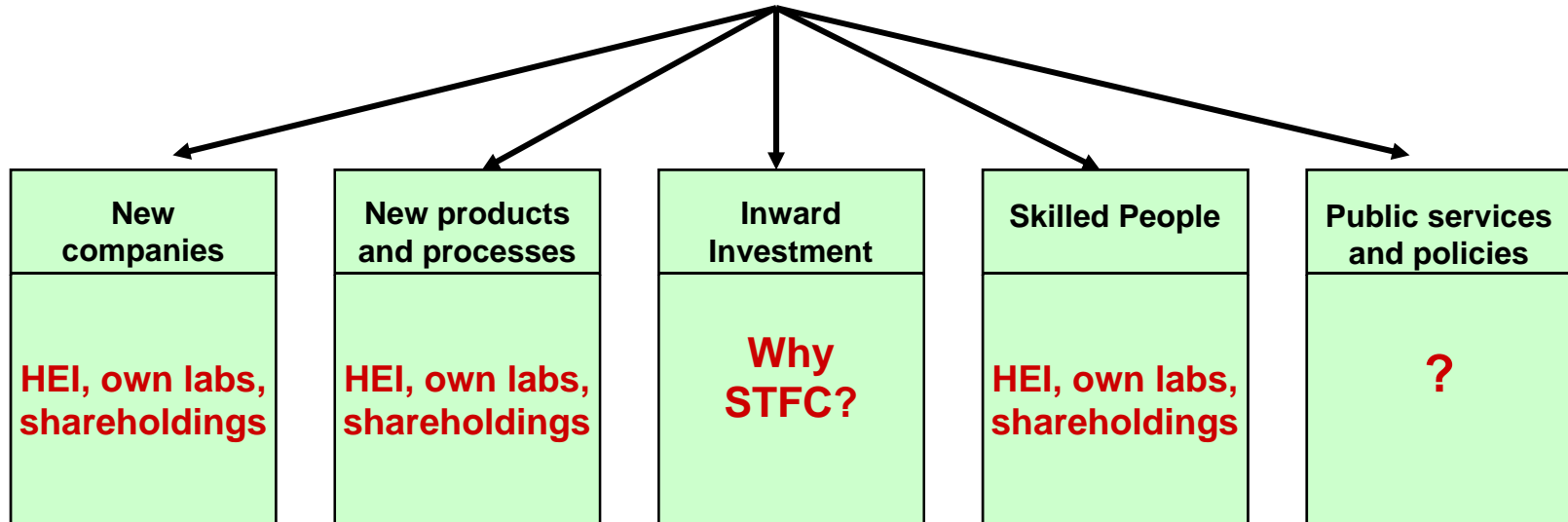
- Involves capturing the benefits of investment in research and innovation in a systematic way, using quantitative evidence where possible.
- **Distinction between:**
  - Benefits to the aggregate economy (macro effects)
  - Contribution of a particular organisation (micro effects)

# What are the challenges for STFC?

# STFC KE Programme Areas

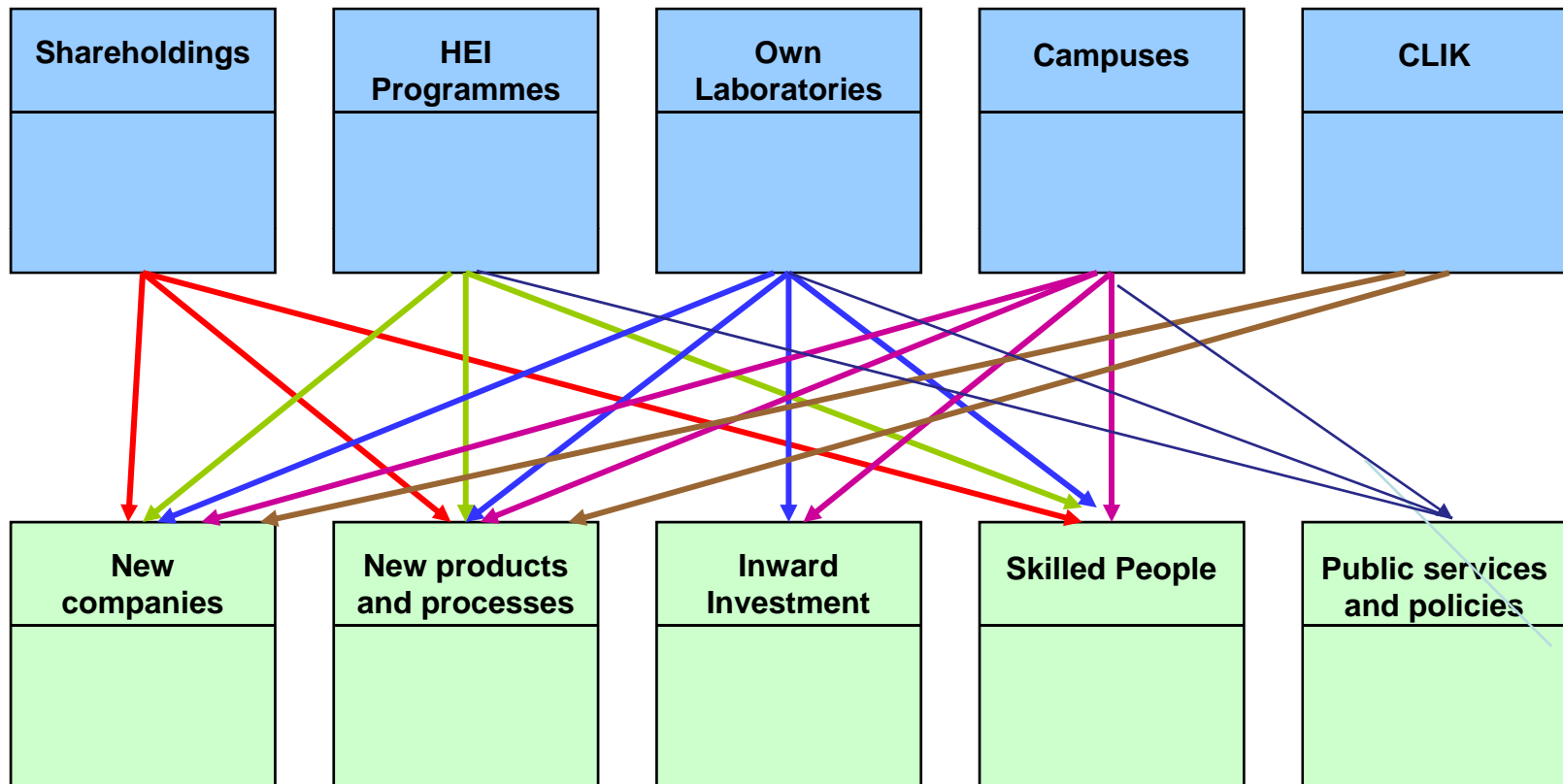


## DIUS EI Framework Themes



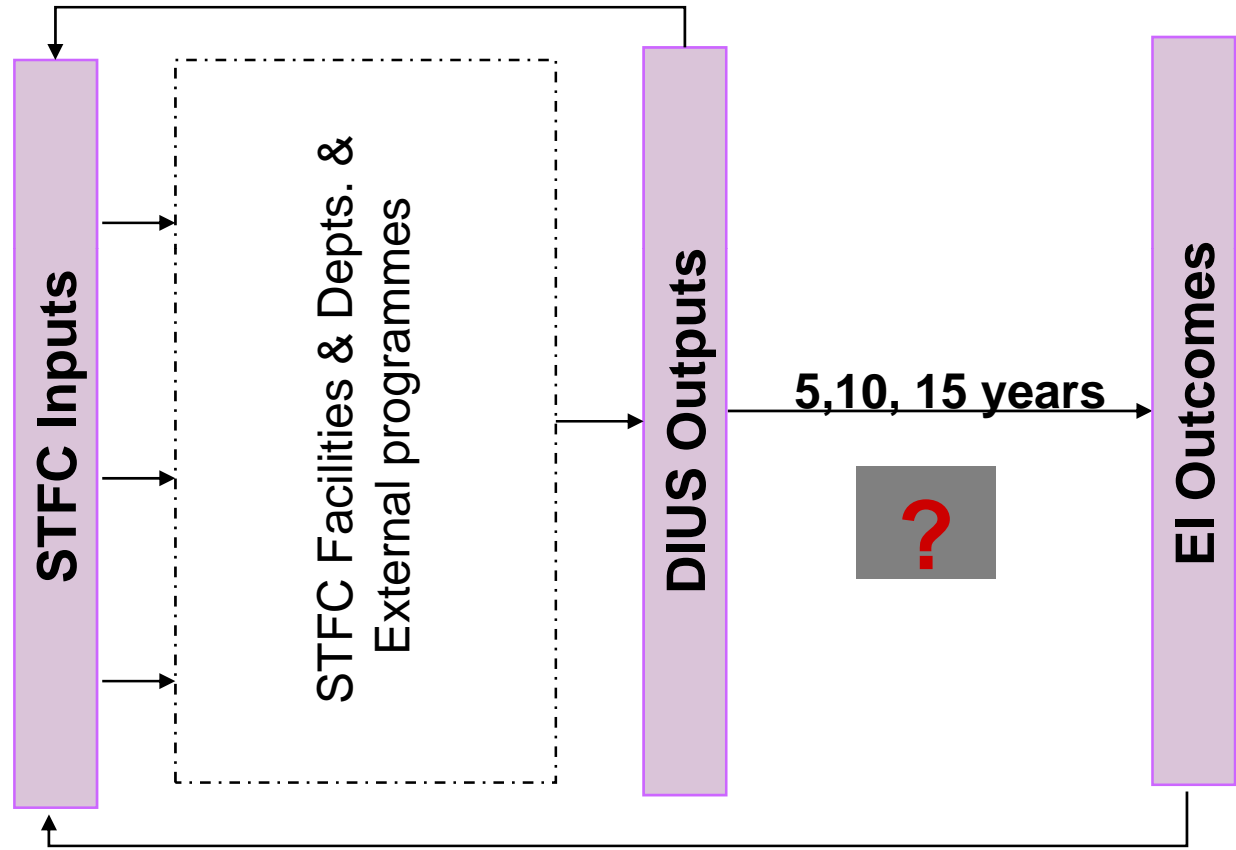


## STFC Programmes



## DIUS EI Themes

# Inputs – Outputs - Outcomes



Inputs – Outputs – Outcomes

Examples

# SRS Lifetime Study:

## Research Excellence

- 2,000,000 hours of science
- > 5000 papers, 10 high impact factor/yr
- >1200 protein structures solved
- > 70 synchrotrons operational worldwide in 2008 – international business

## Skilled people

- 11,000 users from over 25 countries
- 4,000 PhD students
- 2,000 post-docs
- ~500 work experience students

# SRS Lifetime Study:

## Local economy

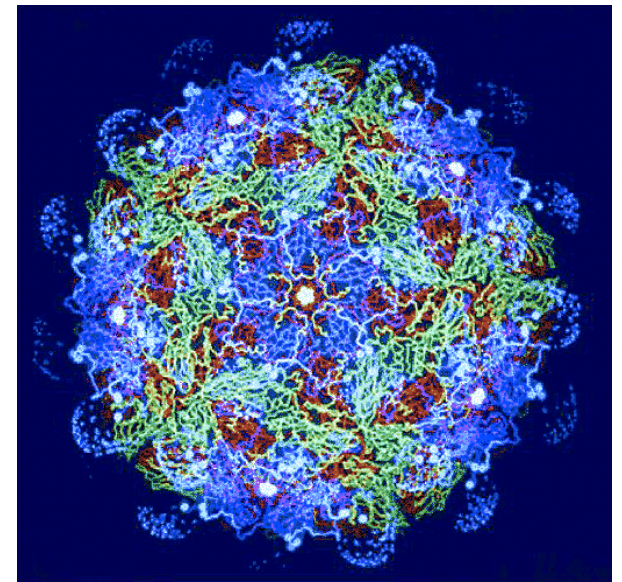
- £468M total spend, 40% on salaries
- Av 200 staff/yr employed over lifetime
- 300 local businesses engaged in operations
- Induced EI ~£357M (using ONS I/O multiplier for R&D sector of 1.84)

## New companies, products and processes

- 4 spin-outs, 4 potential spin-outs, 3 indirect spin-outs
- 2 commercial service providers
- 25 patents created
- 11 licenses, revenue ~£1million – **UK sales?**
- Joint R&D- e2v £250 million sales post dev of antimultipactor coating

# Foot and Mouth Disease Virus – I/O perspective

- X - shifts of beamtime
  - Y - PhD students, postdocs etc
  - Z - £ research council and govt. dept funding
- 
- Academic publications
  - Citations
  - Theses
  - Patents/licensing
  - Contracts with industry
  - Collaborative opportunities
  - Subsequent grant funding income
  - Recognition

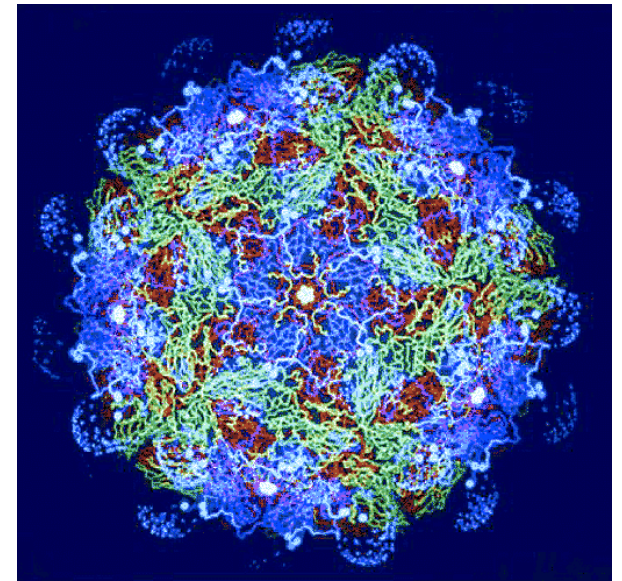


# Foot and Mouth Disease Virus - Impact

- FMDV structure has led to development of vaccines - would not have been possible without SRS facility during the 1980s
- 2001 outbreak has estimated direct costs of FMDV at £3.1bn. If animals had been vaccinated then the savings would have been:
  - Agricultural producers (£355 M)
  - Food industry (£170 M)
  - Public sector (£2585 M)
  - Consumers (£15 M)

## In addition:

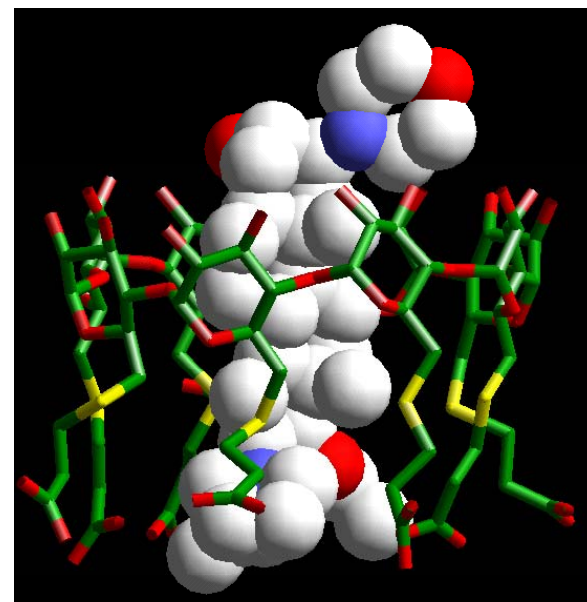
- Tourism direct costs estimated ~£3.2 bn
- Indirect costs to industries supplying agriculture, food, tourist industries related estimated at ~£2.3 bn



# Sugamadex – I/O perspective

Cyclodextrin chelator used to reverse the effects of neuromuscular relaxants without side effects

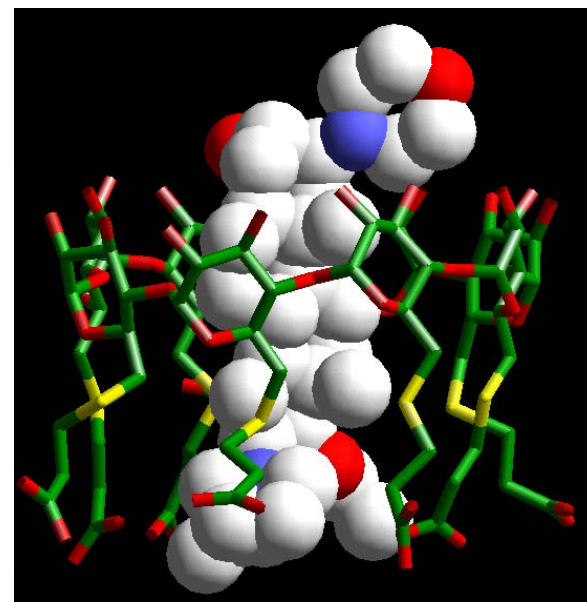
- X - beamtime and STFC effort for service work
- Y - £ direct from Organon for proprietary work
  
- Crystal structure
- Joint academic publication
- Marketing opportunity for DARTS and Organon



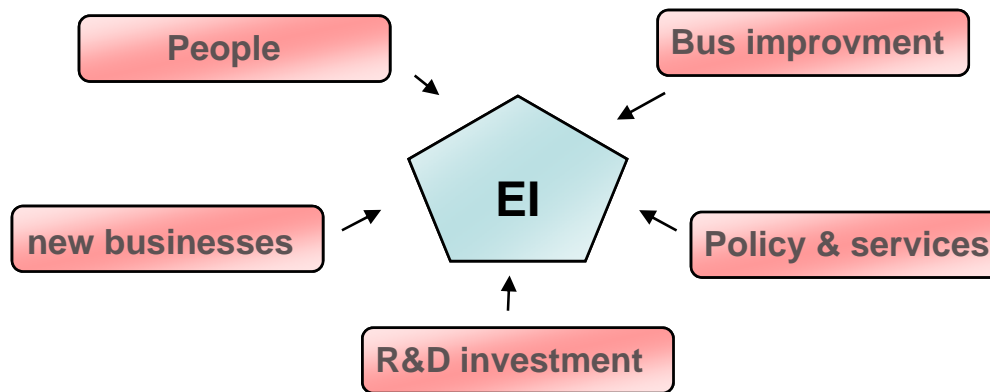


# Sugamadex – Impacts

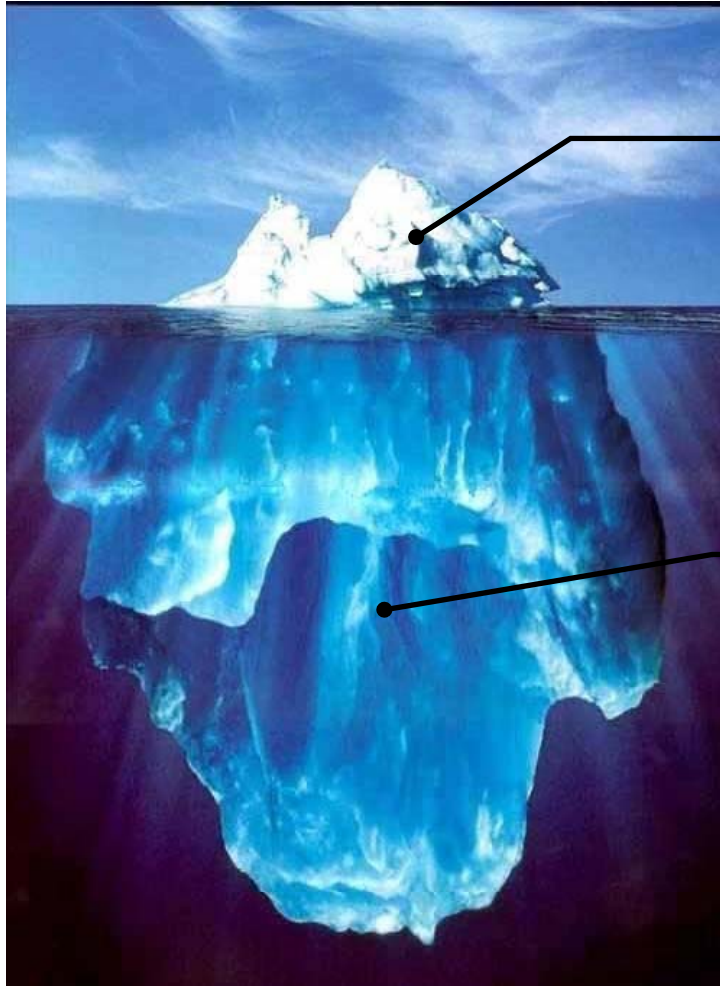
- Clinical trials now complete
- Shering-Plough now own rights to Sugamadex
- Cost to NHS of ICT beds £2K/day vs £200/day on wards
- Number of lives saves
- Public service/policy impact in longer term



# How do we compare with the DIUS view of EI?



# STFC EI evidence



What we think we have

What we actually have



# Creating new businesses

- In the period 2003-2007, thirty one university spin outs were launched with an IPO value of £1.5 billion.
- Ten spin out companies were acquired for a total value of £1.9 billion in the same period.

*[Source UNICO]*



# STFC commercialisation activity

- Strong record of spin-outs via CLIK including
  - L3 technology Ltd
  - ThruVision Ltd
  - Microvisk Ltd
  - Oxsensis Ltd
  - Petra Ltd
  - LiteThru Ltd
  - Quantum Detectors Ltd
  - Bi-Au Ltd

# Commercialisation from HEI community

- Symetrica Ltd a spin-out company from the Department of Physics and Astronomy at the University of Southampton.

In 2006 a partnership between **Symetrica and Smiths Detection**, a world leading provider of explosives trace and X-ray detection systems, led to award of a contract with a potential total value, including options, of **\$222 million** by the U.S. Department of Homeland Security's **(DHS) Domestic Nuclear Detection Office (DNDO)** to provide next-generation radiation detection and identification systems.



# Improving Existing Businesses - Drug Discovery

- **Reduced Development Time**

- Development cost for new drug is >£550 million & takes 10-12yrs with no guarantee of commercial success.
- SRS has played a key role in drug discovery programmes through structural studies which have lead to more effective drug development.
- High throughput techniques and computational methods for drug design contribute to reducing development time.
- Difficult to estimate value of SRS contribution but even if it is a small fraction then the impact is still many £millions per drug

- **Earlier Market Exploitation**

- A new drug will generate revenues close to \$1,000 million/yr for 10 or 12 years.
- SRS provided results inaccessible via other techniques - if time to market can be reduced by just six months then potentially \$500 million additional revenue.
- This assumes that the new drug does not displace an existing product. Of this a small but significant proportion would be expected to be attributed to the PX insights.



# Delivering highly skilled people to the labour market

Proportion of STEM Graduates in workforce is increasing:

## First degree

- 1997 3.9%
- 2005 6.2%

## Doctorate

- 1997 0.37%
- 2005 0.5%



Source : UK Labour Force Survey

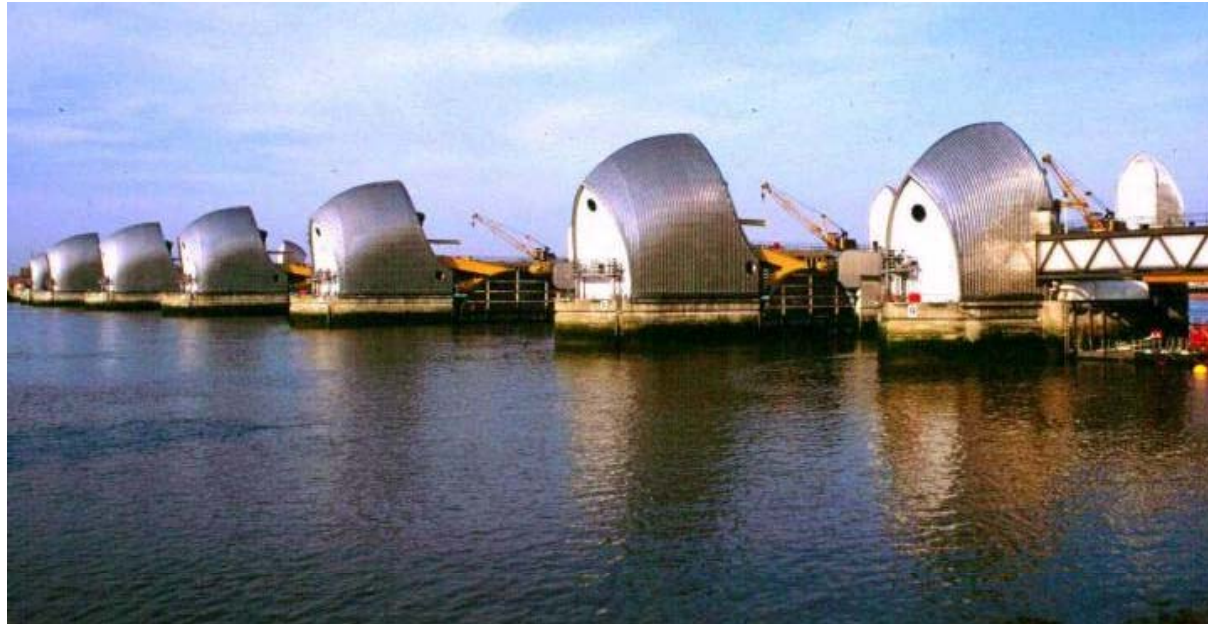


# Highly trained people

- STFC directly funds over 260 PhD students per year (steady state 800);
- STFC provides training for over 900 PhD students from a range of disciplines;
- 39 joint appointments with HEIs (21 in 2006/07);
- 63 visiting fellows (from and to) large facilities (56 in 2006/07).

**But what is the value of a studentship to the UK economy? – we are working on this!**

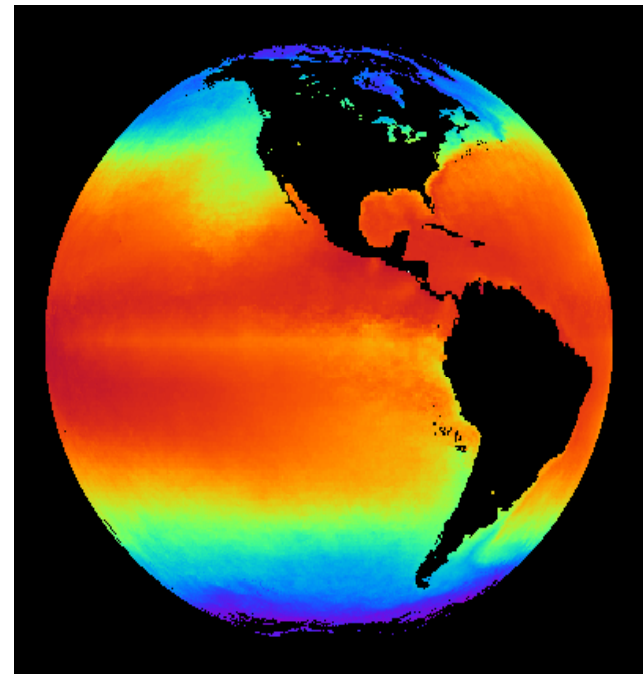
# Improving public policy and public services



NERC informs decisions to raise or lower the Thames Barrier. The cost of getting this wrong would be £30 billion, not counting the cost of human lives.

# Enabling data collection for public services

- Global surface temperature map taken by Along Track Scanning Radiometer (ATSR) instrument
- Built at RAL and used by NERC scientists and others to monitor global sea surface temperatures for climate monitoring purposes
- Developed by STFC with increasing industrial involvement
- Allowed last in series to be procured by DEFRA directly from industry



ATSR



# Space Industry – UK GDP, Inward Investment

- Turnover of ~£5.2 billion, UK space industry directly contributed around £2.4 billion to UK GDP in 2004/05. This results in an induced total of nearly £7 billion GDP.
- Direct employment in UK space industry 17,560 in 2004/05.
- Space industry one of UK's highly productive sectors, GDP/worker ~£135,000 in 2004/05 - ~x4 times higher than the average.
- In part, reflects the high levels of capital investment undertaken by firms in the sector. The industry's labour force is also highly skilled, with nearly 60% of workers being qualified to at least graduate level - compared to 30% for the economy as a whole.

# Economic Impact – next steps:

- Establish STFC Impact Unit

(Case studies, programmatic studies, methodology development, forward planning, reporting, initiatives, econometrics)

- Cross STFC EI Group Established

- SR Evidence Base Exercise

# SR09 Evidence Base:

- We need inputs and case studies from PP community
- Think back as far as possible
- Think laterally and from a beneficiary's perspective
- Give us your thoughts, ideas and suggestions!

# Particle Physics Impact – next steps:

- We want to undertake an impact study of the STFC Particle Physics programme which:
- Addresses the DIUS impact areas
- Considers other key impact considerations:

International reputation

Inspiring next generation of scientist

Treasury ‘Grand Challenge Areas’

# Ideas and Suggestions to:

[liz.towns-andrews@stfc.ac.uk](mailto:liz.towns-andrews@stfc.ac.uk)

[claire.dougan@stfc.ac.uk](mailto:claire.dougan@stfc.ac.uk)