Drawing Room, 09.15-11.00

Plenary Opening:
Policy framework for Impact of Science

Rush Holt
David Sweeney
Mona Nemer
Burton Lee
Yuko Harayama

Plenary opening:
Policy framework for Impact of Science

Rush Holt

CEO of the American Association for the Advancement of Science, USA

AESIS

Plenary opening:
Policy framework for Impact of Science

David Sweeney

Executive Chair, Research England,
United Kingdom

AESIS

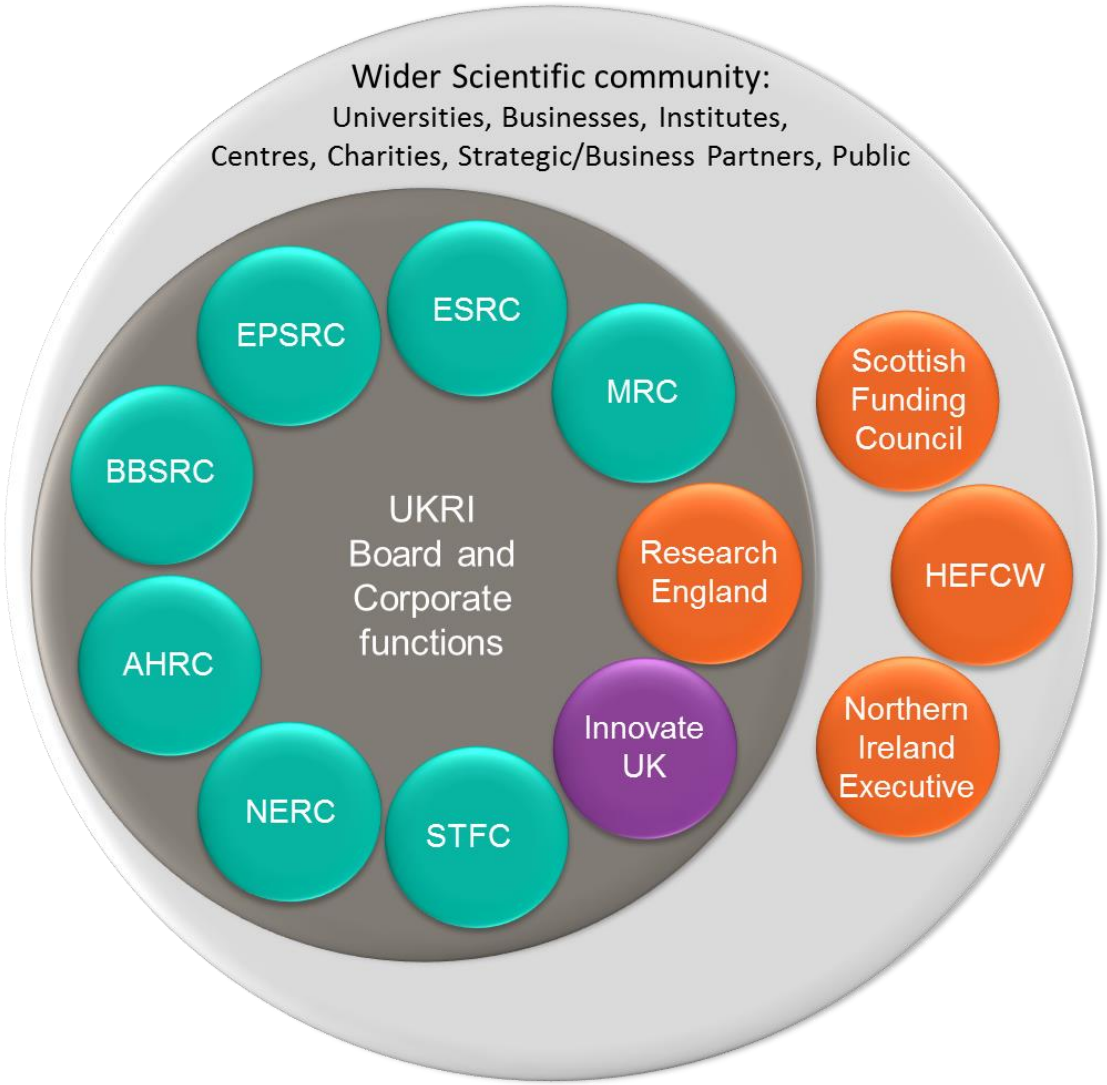
Research England

Do We Want to Drop the Concept of the Impact Agenda?

David Sweeney
Executive Chair
Research England

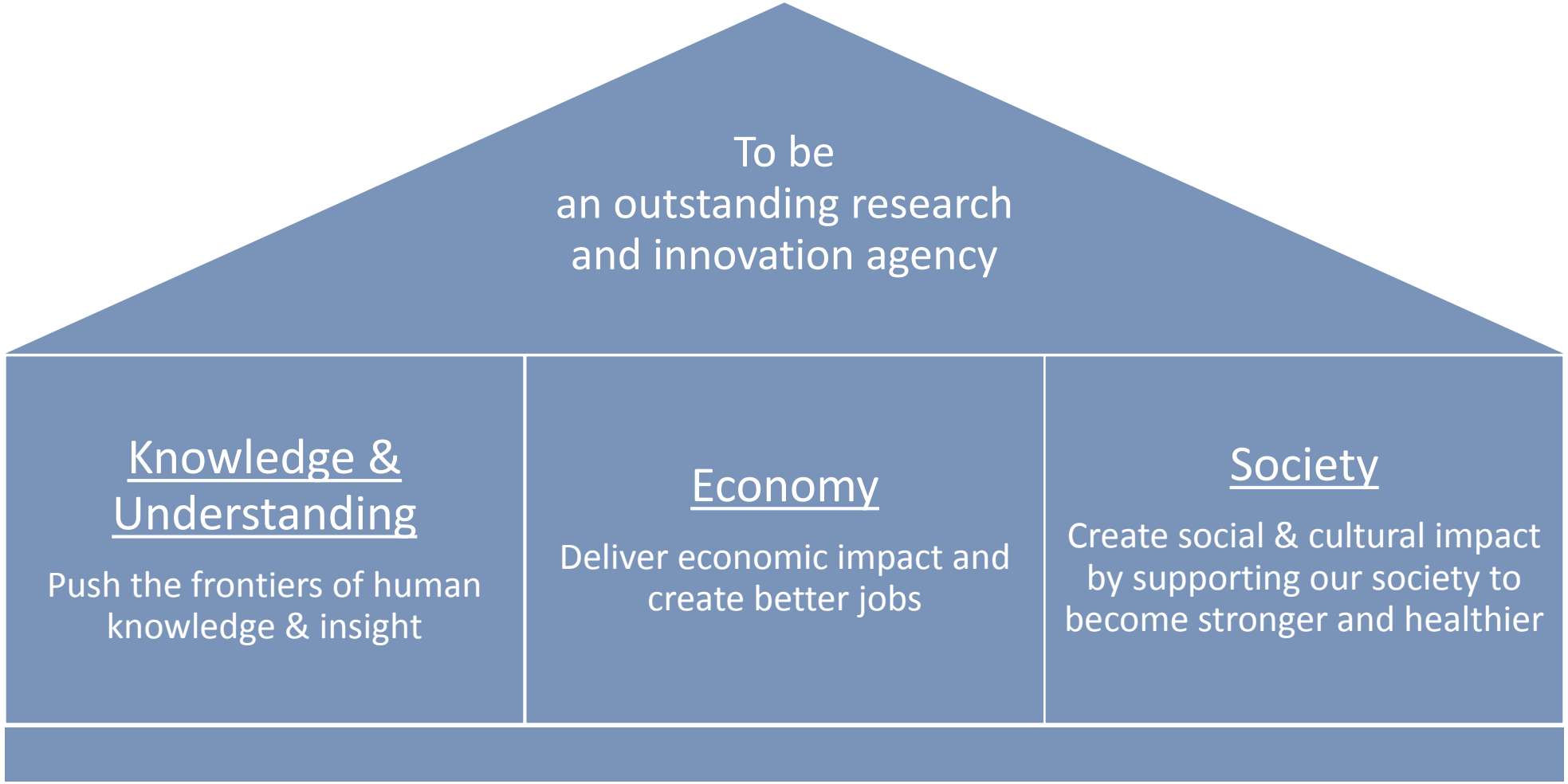
14th June 2018
AESIS Ottawa

UK Research and Innovation

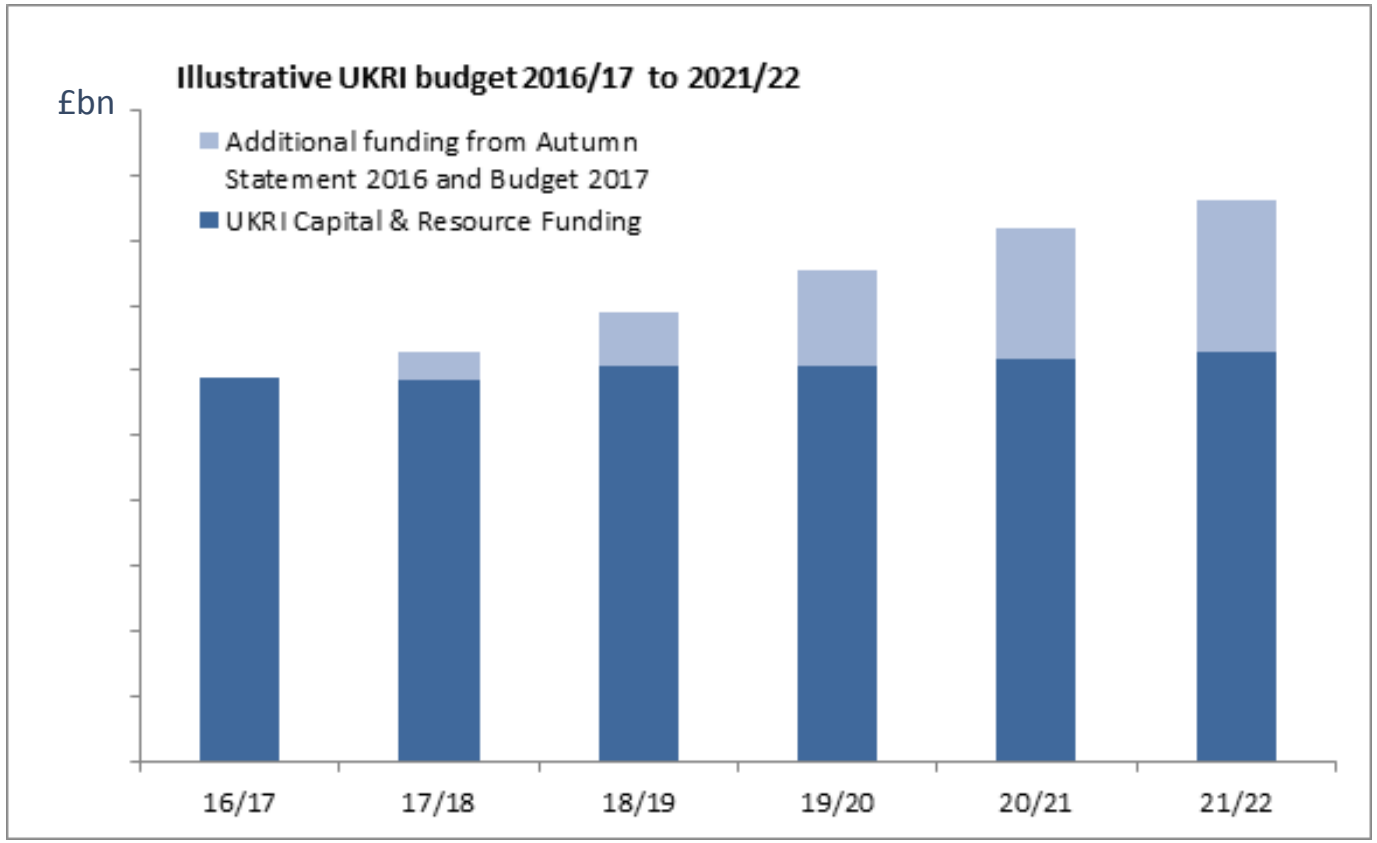


- More that **£6.5 billion** per year
- **3900** research and business grants each year
- **151** universities funded
- **38** research and innovation performing organisations

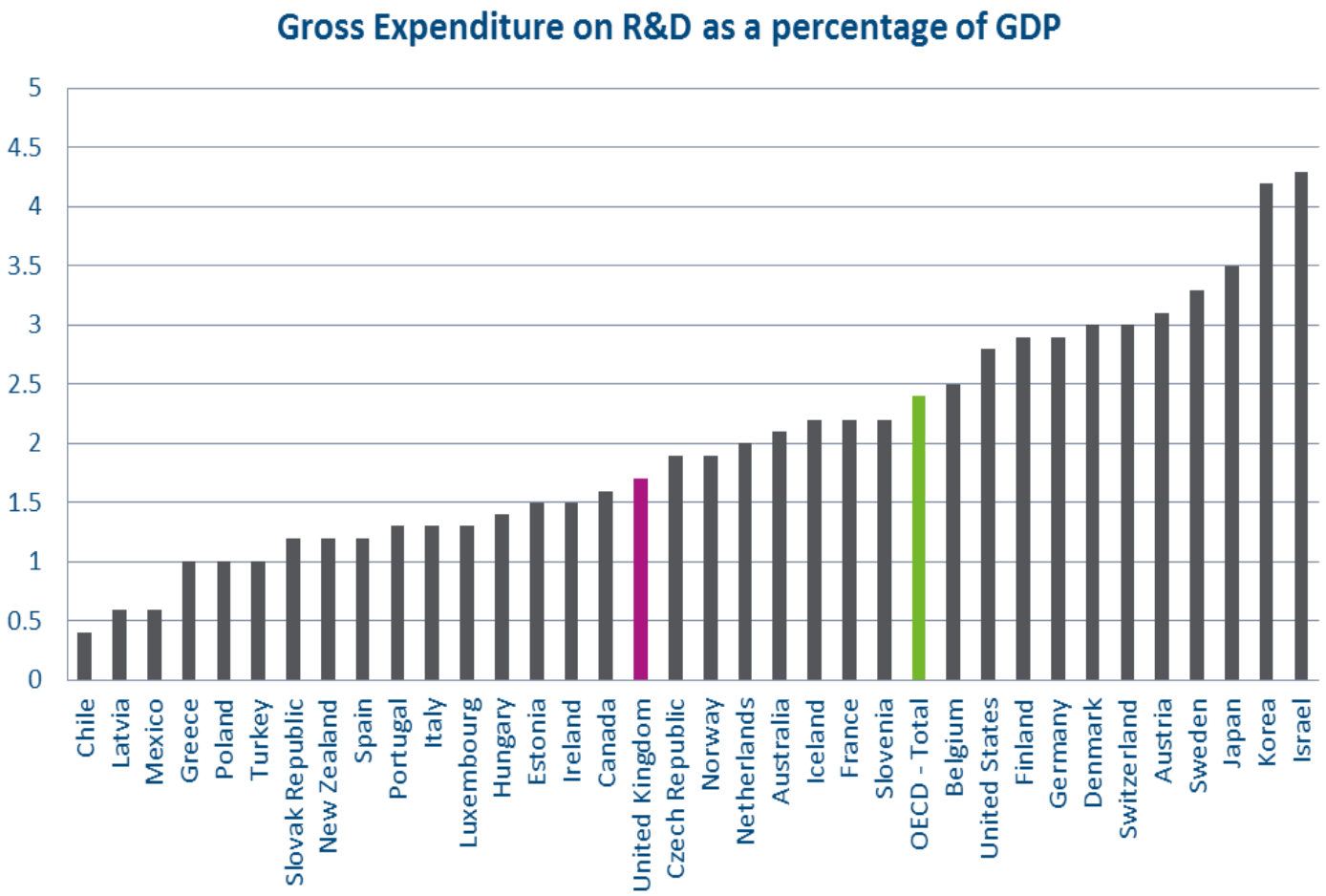
UKRI vision


To be
an outstanding research
and innovation agency
Knowledge &
Understanding
Push the frontiers of human knowledge & insight
Economy
Deliver economic impact and create better jobs
Society
Create social & cultural impact by supporting our society to become stronger and healthier

Context: rising funding



Context: the 2.4% target



Source: OECD STI. Data is the latest available for each country.

The Government has committed to reaching 2.4% of GDP investment in R&D by 2027, and to reaching 3% in the longer term.

As a first step it will invest an additional £2.3bn over what was previously planned in 2021/22.

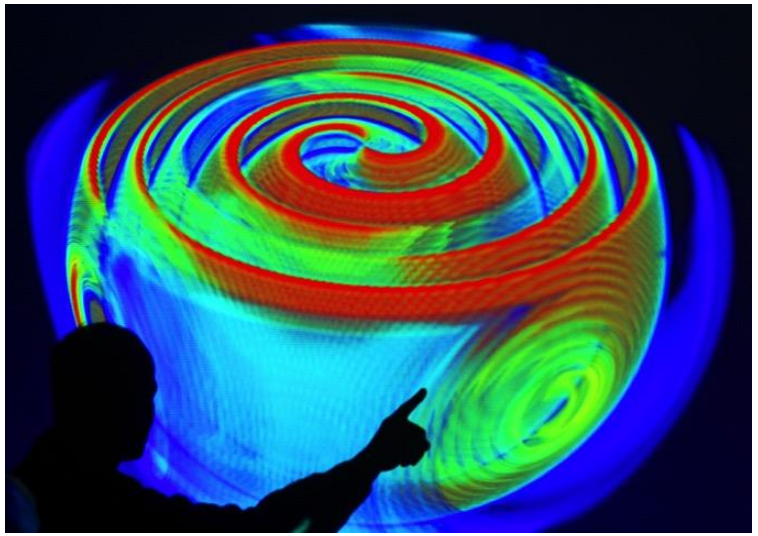
UKRI will work with the Government to develop a roadmap for meeting this target.

Tackling important problems

- Fundamental questions
- Needs of society – working with government
- Advancing the UK economy
- Research and innovation as a key element of UK’s place in the world

Asking fundamental questions

- Host defence mechanisms
- Structure of the cell
- Gravitational waves
- Materials science
- Poverty measurement
- Hokusai



Needs of society

- Hydrology and meteorology
- Air quality
- Infectious diseases
- Ageing
- Security
- Economy

The Context

‘And we are not fulfilling our potential if, despite having scientists and universities renowned the world over, we cannot turn their ideas into the products and services on which the industries of the future will be built.’

‘We must invest more in turning brilliant discoveries into practical products’

The Context

‘Research is about discovery, but it also needs to be about directly tackling some of the issues we face’

‘Taxpayers expect to see how their investment in research is paying dividends’

‘We want to keep universities focused on research that has wider economic and social benefits’

Encouraging Impact

- Measuring Impact from Research as a justification of investment for specific investments, and that building towards a budget case.
  - Much focus on appropriate metrics
  - Almost impossible to make fair comparisons
  - threatening
- Providing Incentives for Researchers to deliver on those important questions
  - Alignment between reputation and reward for all kinds of research, some of which delivers impact
  - Using reputation and reward in a relative way which emphasizes fair comparisons, allowing universities and academics to make choices.

The Defence of Basic Research

HIGHER EDUCATION FUNDING COUNCIL FOR ENGLAND

@DSweeneyUK

David Sweeney
Executive Chair, Research England

Global Research-Intensive Universities Networks
27th November 2017

The Defence of Basic Research?

HIGHER EDUCATION FUNDING COUNCIL FOR ENGLAND

@DSweeneyHEFCE

David Sweeney
Executive Chair Designate, Research England

Global Research-Intensive Universities Networks
27th November 2017

Basic Research Definition - OECD

‘Basic research is experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view’

‘Applied research is… directed primarily towards a specific practical aim or objective

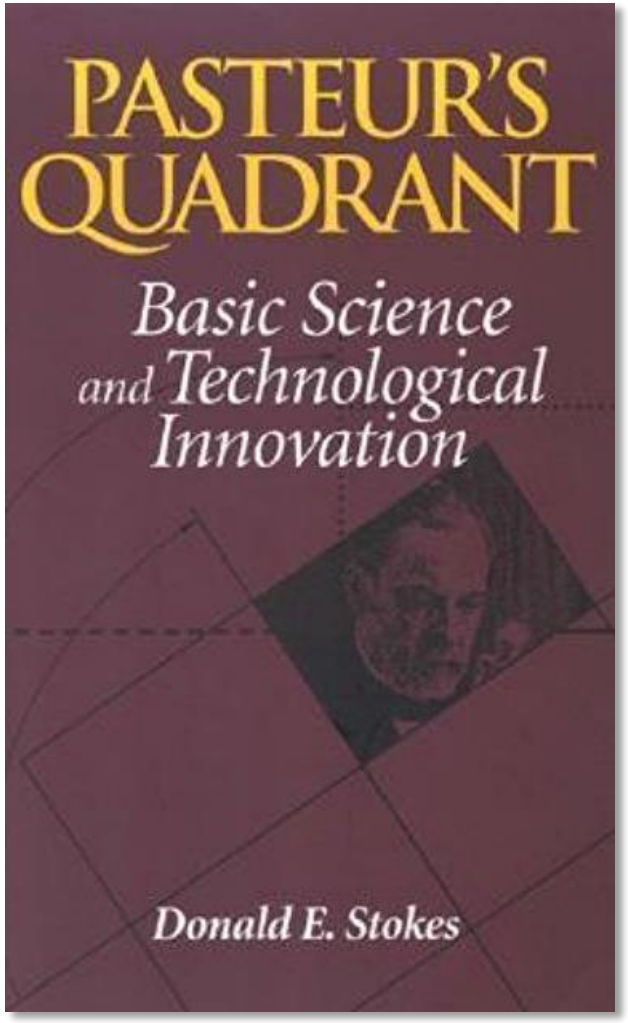
‘

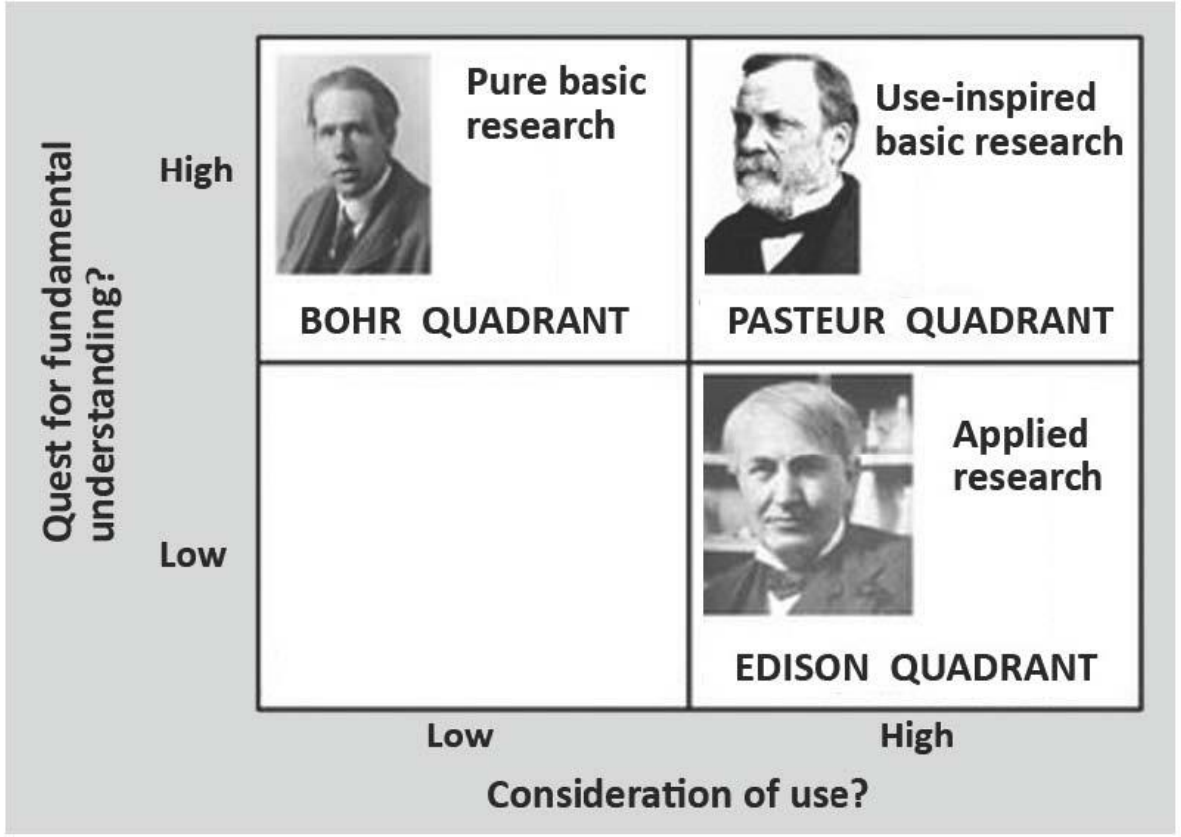
Examples of Basic Research Outcomes

- Seismology, Vulcanology and Meteorology
- Health Research
- History, Languages and Comparative Theology
- Philosophy

- ‘Without any particular application or use in view?’

Pasteur's Quadrant





Evidence-based case for RESEARCH as an enterprise

- Impact is not an agenda, it stands alongside our human drive for understanding & insight as a natural outcome of what we do
- Demonstrate this by better tying specific outcomes back to essential underpinning work
- Demonstrate the many unplanned outcomes and cross-fertilization of ideas to demonstrate that ‘predicted impact’ is only part of the answer
- Engage our eminent colleagues as advocates rather than opponents

Research and Engagement?

- Universities represent a major UK industry, contributing £95bn each year to the economy
- They are key influencers in their local and regional contexts and well as major players on the national and world stage
- Universities build and maintain the environments that allow research and innovation to flourish:
  - Facilities and infrastructure
  - Staffing – research, teaching, knowledge exchange, support/administrative staff
  - Partnerships with businesses, charities, local government, other institutions, international partners
- Universities are autonomous institutions with their own strategic priorities. They make significant investments (from their own funds) to meet these.
- Move to a discussion about engaged and responsible research where the academics see themselves as partners with society, and society respects academics for the key partnership role they play

David Sweeney
Executive Chair

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Research England

Plenary opening:
Policy framework for Impact of Science

Mona Nemer

Chief Science Advisor
of Canada

AESIS

Diversifying Metrics for Modern Science Advice

Mona Nemer

AESIS Impact of Science Conference

June 14, 2018

Government of Canada
Office of the Chief Science Advisor

Gouvernement du Canada
Bureau de la Conseillère scientifique en chef

Current Situation in Canadian Science

The government has signaled its respect for science:

- ❑ Appointment of first government chief science advisor in over a decade
- ❑ Historic science budget of 2018
- ❑ Response to Review of Fundamental Science (Naylor Report)
- ❑ Values evidence-informed policy-making
  - ► requires more metrics and data

Mandate of Canada's Chief Science Advisor

My mandate involves providing advice on:

- Ensuring the government considers science in its decisions.
- Improving the way science advice is provided in government.
- Ensuring government better supports Canadian science.
- Raising public awareness of science.
- Ensuring full public access to government science.

Issue → Metrics → Advice

Results of Research Investments

Measured outputs:

- ✓ # of trainees
- ✓ # of publications
- ✓ # of patents
- ✓ # of awards

Broader effect:

- ❑ International reputation (university ranking)
- ❑ # of international students attracted
- ❑ Skills development
- ❑ Spending associated with international students

Limitations of Indicators

Near term

- Research income
- Research expenditures
- Publishing profile
- Citations
- Total research outputs
- Commercialization income

Longer term

- Reputation
- Attraction and retention of talent
- International students
- Foreign investment
- Diplomatic relations
- Long-term results and benefits

Science indicators measure past performance. They do not necessarily provide insight into future prospects.

Are we getting the full picture?

It is difficult to capture the intangible benefits of research investments

The universality challenge

Different countries, fields and organizations have various methods of assessing their research enterprise.

National: Research assessment varies in accordance with national context (funding, etc.)

Disciplinary: Researchers produce a variety of outputs across disciplines (books, articles, patents, datasets, designs, software, etc.)

How do we reconcile these variances in order to build a framework for addressing global challenges?

Science is International

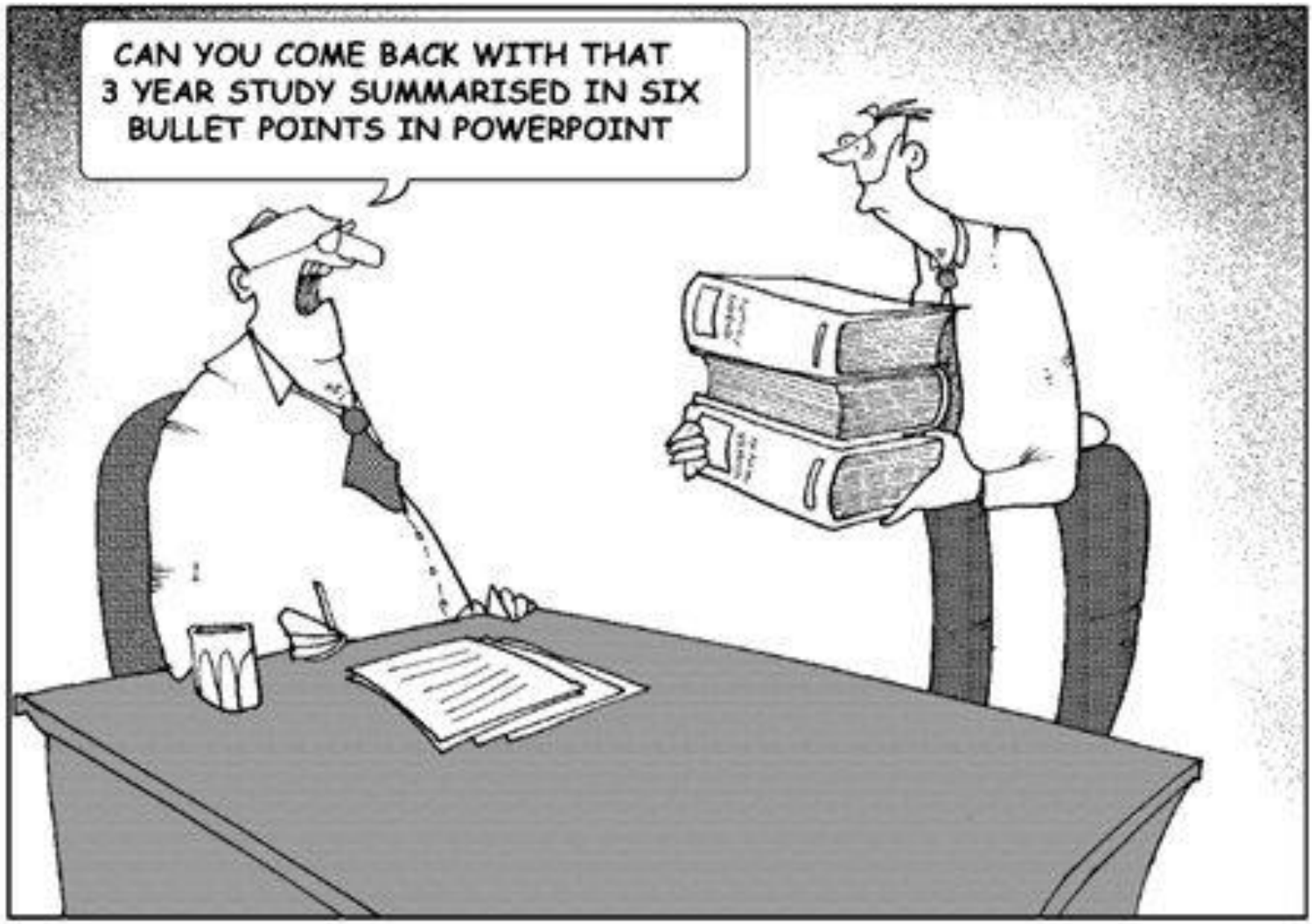
Impact of science is measured differently in different countries.

Yet, science is international:

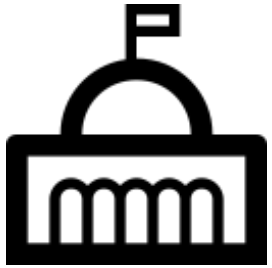
- International Space Station
- Human Genome Project
- SESAME synchotron
- Combatting pandemics (Zika, Ebola)
- International Cancer Genome Consortium

Global challenges require global solutions. Impact assessments and metrics should reflect this. **This requires scientists to engage more with policy makers.**

Engaging with Policy-Makers



Understanding the Two Cultures



Science	Policy
Long timelines (years)	Short timelines (hours or days)
Deep and narrow field of knowledge	Wide and shallow field of knowledge
Culture of experimentation	Culture of risk aversion
Horizontal accountability	Vertical accountability
Precise language	Flexible language
Culture of peer-review	Culture of approvals
Spread around the world	Concentrated in government capitals

Roadmapping objectives

- How do we ensure better co-creation of research indicators between academia and policy makers?

- How do we develop meaningful metrics with the right level of analysis which are tied to public goals? (From the local level, such as smart cities, to the international level, such as the UN Sustainable Development Goals)?

- Roadmapping can help us build frameworks to measure our progress in achieving these goals.

The Way Forward

We need to expand our metrics to reflect the modern, diverse, multidisciplinary characteristics of research.

- ❑ Adopt criteria for academic recruitment and appointments that reflect both research accomplishments and wider contributions to policy, culture and society.
- ❑ Redefine merit to reflect diversity of backgrounds/experience.
- ❑ Develop common data standards to support interoperability between organizations.

- ❑ Ensure greater openness and transparency of research data infrastructure.
- ❑ Develop new metrics to capture the benefits of high-risk research.

Thank you.
Merci.

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MonaNemerScience

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Plenary opening:
Policy framework for Impact of Science

Burton Lee

Managing Director, Innovarium Ventures, and
Lecturer at Stanford University School of Engineering, USA

AESIS

Plenary opening:
Policy framework for Impact of Science

Yuko Harayama

Former Executive Member, Council for Science, Technology and Innovation, Government of Japan, and NEDO-TSC Fellow, Japan

AESIS

Science & Society
Ever-evolving relationship

Yuko Harayama
Former Executive Member
Council for Science, Technology & Innovation
NEDO-TSC Fellow

Policy framework

- A time of accelerated change
  - Digital transformation, empowered by AI
  - Connected & networked society
  - Ever-increasing sphere of human influence
    - e.g. Genome editing technology, Neuroscience
- Mainstreaming of innovation
  - Economic growth, Wellbeing, Sustainability
    - e.g. Sustainable Development Goals (SDGs)
- New breed of Science, Technology & Innovation (STI) policy needed!
  - Far beyond the "Linear model of innovation"

Impact on the Nature & ourselves!

STI for SDGs!

"Society" at the heart

- From "Technology-driven"
  to "**Human-centered**"
- Society backed by **Science, Technology and Innovation**
  - Including AI, Big data, IoT, Robotics,…
- Values of **Sustainability**, **Inclusiveness** & **Openness**
- **Everybody** on board
  - In the context of aging society!

Revisiting our evolutionary path
➡ Society 5.0

Society 5.0 as a living concept

Hunting & gathering society
In symbiosis with Nature

1.0

2.0

Agrarian society
Beginning of human organization

Industrial society
Mastering of power & Mass production

3.0

Information society
Increased value of intangibles & networks

4.0

What's next?

5.0

Socially responsible STI

- STI and Society
  - Co-creation
    - Dialogue and Collaboration (e.g. Citizen Science)
    - Empowering stakeholders
    - Ethical, Legal and Social Implications (ELSI)
    - **Shared values and guiding principles** to advance STI
  - Research integrity
- Putting into practice
  - In Japan
    - Interim Report on **Genome Editing** (2016)
    - Report on **Artificial Intelligence** and Human Society (2017)
    - Strategic Vision on **Intellectual Property** (mid 2018)
    - Human-centered **AI guiding principles** (end of FY2018)

Global engagement!

Need for global action

- Global discussions are underway
  - Open Science
  - AI Principles, Digital Rights
  - Bioethics
  - …

- Policy challenges
  - Identifying a set of **shared** values, while respecting the **diversity** of views
  - To go beyond funding and regulating, that is to explore new ways of "**Governing** Science"!

Panel discussion

Led by Koenraad Debackere

Rush Holt
David Sweeney
Mona Nemer
Burton Lee
Yuko Harayama

AESIS