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LEARNING AND LEGACY THE ROLE OF EDUCATION IN CREATING HEALTHIER, HAPPIER CITIES
EAUC 20th Annual Conference 25th - 26th May 2016

Lab Sustainability – Modernising research for tomorrow's challenges

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Learning, Teaching and Research

Lab Sustainability – Modernising research for tomorrow's challenges

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Session Agenda:

- Intro into why we're discussing science and labs
- Quiz!
- A look into some of the projects around the field from Bristol, King's College London, and the wider community
- A discussion of incentives – through regulation, financial and finally ethical
- Questions and comments

Introductions

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Speakers

•Anna Lewis: Sustainable Labs Officer at the University of Bristol

•Martin Farley: Research efficiency officer at King's College London, (formerly 'Labs facilitator' at University of Edinburgh)

How is Science doing?

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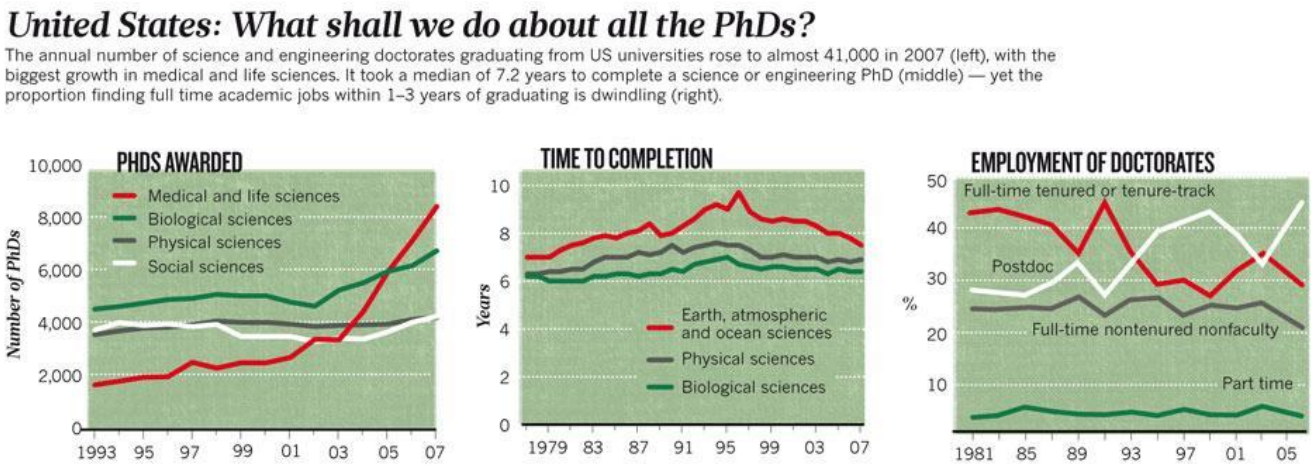
- To start, we have a lot of PhDs! Good right?

- "The academic job market has become more and more competitive… nowadays, less than 17% of new PhDs in science, engineering and health-related fields find tenure-track positions within 3 years after graduation."
-R. Larson et. al.



Current Research Environment

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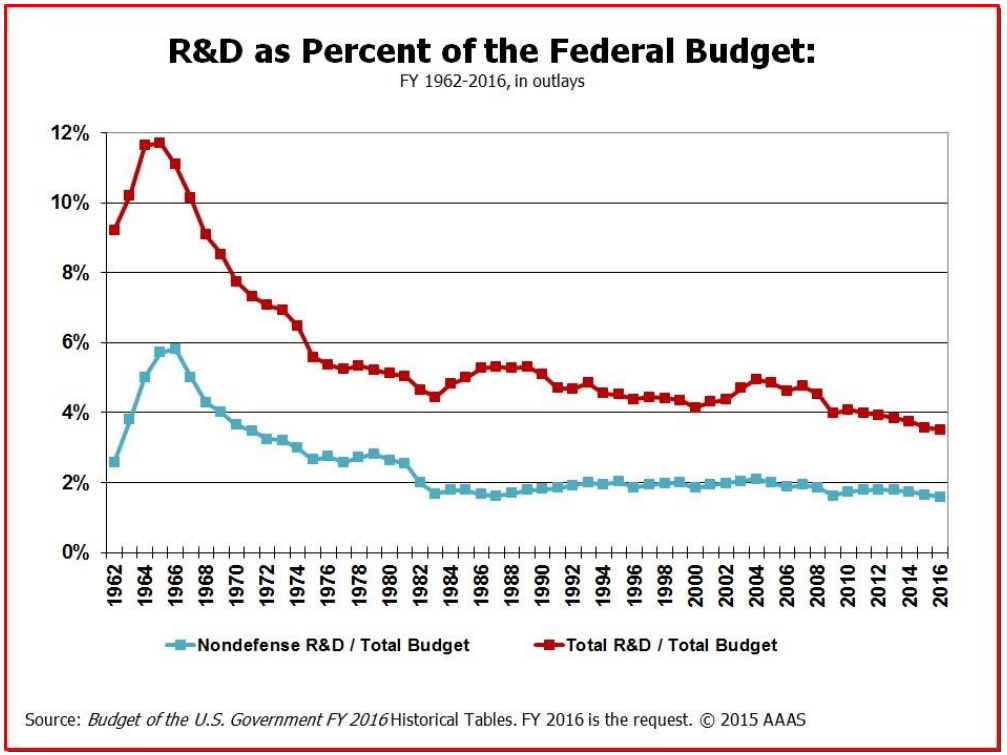
- Still plenty to research though!
- UK rises in funding were frozen . . .
- Worse in the US



Current Research Environment

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So what can we do?

Not less science

We can start with looking at methods and efficiency (and sustainability) – science is going to need to reduce cost

Students want more sustainable development content integrated in their course material (*NUS/HEA survey*)

So why Research Spaces?

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Research spaces consume 3-5 times more energy per square meter than academic spaces

Exeter used 267 tonnes of plastic in 2014 – there are ~20,500 research institutions worldwide ~ 1.8% total world's consumption!

Typical research institution can have 60-65% of its electricity consumed by research spaces. Construction costs of £2000+/m^2

Often unaddressed due to specified nature of research – though some processes are common

Quiz!

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1) Lab plastic are estimated to contribute ...?..... to the total global plastic waste.

a. 0.001%

b. 0.6%

✓ c. 1.8%

d. 5.3%

Quiz!

2) What piece of standard lab equipment consumes the most energy?

✓ a. Fume cupboards

b. Centrifuges

c. Ovens

d. Biological safety cabinets

Quiz!

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3) Inefficient ultralow temperature freezers DON'T use the same amount of CO_2e as:

a. An average UK household

b. 15,000 miles in average car

✓ c. An average US person

d. 2.5 tonnes of waste sent to landfill

Quiz!

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4) Efficient ultralow temperature freezers use the equivalent CO_2e as:

- ✓ a. 5,000 miles in an average car
- b. 8,500 mile in an average car
- c. 11,200 miles in an average car
- d. 15,000 miles in an average car

Quiz!

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5) What isn't the equivalent to running a fume cupboard?

a. 19 acres of forest

b. 3-4 average households

c. 12 tonnes of coal burned

✓ d. 3 average cars driven for a year

Quiz!

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6) Single pass (tap-to-drain) cooling systems can use ……..per year of water.

a. 10,000 L/year

b. 25,000 L/year

✓ c. 60,000 L/year

d. 85,000 L/year

Quiz!

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7) What percentage of health-care waste did the WHO estimate was hazardous?

a. 5%

✓ b. 15%

c. 30%

d. 50%

Quiz!

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8) KCL spent how much on electricity last year?

a. £5,000,000

b. £8,500,000

✓ c. £11,000,000

d. £15,000,000

Quiz!

Learning, Teaching and Research

9) Of that figure, what estimated percentage was on spent on running cold storage?

a. 2%

b. 3%

✓ c. 4%

d. 5%

Quiz!

Learning, Teaching and Research

10) While variable, what range typically represents ‘indirect costs’ of research?

a. 0-10%

b. 10-20%

✓ c. 20-30%

d. 30-40%

Projects in the field – Bristol

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Labs = 40% energy, water and waste, but only 6% space.

Energy for plug-load and heating, ventilation & cooling (HVAC).

Normally HVAC = 50-70%. UoB Chemistry = 65%

So is the first port of call fume cupboards?

£1 million funding for projects

Current project = 198 fume cupboards in Synthetic Chemistry and £56,000/yr savings.

Projects in the field – Bristol

Learning, Teaching and Research

All well and good but £££££ and disruptive.

Reducing plug load still worthwhile: non-invasive AND speedy…..relatively.

Lab equipment replacements: Drying cabinets and ultralow temperature freezers. There's already a lot of info out there!

- Replaced 71 units
- ~£30,000/yr energy savings
- 155tCO2e
- Payback ~4.2yrs

Projects in the field – King's College London

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KCL Operates in a complex environment – partnerships with NHS (3 hospitals), Bouygues, soon the Crick, and all in central London

- Cold Storage – Surveys, policy, resilience, freezer room business case
- More Surveys – timers, savawatt, drying cabinets
- Awards! Year 2 – 15 teams submitted, 4 Gold

Projects in the field – King's College London

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- Waterless Condensers
- Ventilation – Policy, variety of projects underway. Setting affects outcome
- Procurement – KCL+UCL ULT freezer deal . . . More to come through combined economies
- Surveys for other London institutions, more to come!

KING'S College LONDON

UCL

Imperial College London

Incentives – Standards and Regulations

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- The standards and regulations in place have great effects on efficiency and sustainability
  - Organisational/national commitments
  - Carbon reduction commitment

- What areas of research are affected?

- Facilities construction and management
  e.g. air change rates, cold rooms, containment

- Research methods
  e.g. storage temperatures, green chemistry

- Financial management
  e.g. grant funding models and procurement systems

Incentives – Follow the money . . . .

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- Researchers don't pay the bills.

- Studies show users more likely to purchase efficient equipment with offer of incentives and rebates.

- Financial and safety benefits - inductions
  - e.g. long equipment life span, repair costs, streamlined and research security

- Solutions? Cap-and-trade e.g. Gurdon Institute

- Take advantage of competitive nature.

- Funding – organisational level – HEFCE
  - supported by other Grant Funding Bodies

Incentives – Follow the money . . . .

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- Who exactly benefits from cost effective/efficient research??

- Stakeholders: Researchers, Funding bodies (public vs private), Public, Estates departments

- Let's look at how research is funded
  - -It starts with an issue, or concern
  - -Funding bodies put money up, but not enough. HE bids for it based on varied tools
  - -HE bodies use their funds to compensate
  - -HE looks for continued funding/success, but efficiency only plays a small part in (REF)
- Confusing!

Incentives? Ethical research + education

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- Social responsibility in science research.
- organisational reputation
- European Commission responsibility

- Education for Sustainable Development

- reach students prior to research.

- Students (Generation Y) more environmentally aware.

Pew Research Study (2011)

- 'They are most likely to pay more for responsibly made products'
- 'Roughly 80 percent want to work for companies that care about their impacts'

So now what? - Solutions

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Standards and regulations – Question more (as with the mind of a child). Challenge, Experiment, and Improve.

Financial – Clarity and standardisation of funding methods. Eventual fair assessments and integration of efficiency.

Educational – Integration in inductions and teaching. Leaving lasting good practice for tomorrows researchers.

So now what?
Larger than the lab

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Benchmark laboratory equipment - lifecycle cost & environmental impact

e.g. Energy Star in US + My Green Labs

Collaboration

- standardised but flexible Sustainable Lab guides.
- improve methods of sharing data.

The dream….regulated Environmental Accreditation status for laboratories

- financial benefits from grant funding bodies such as the current Research Efficiency Framework (REF).

What's next?

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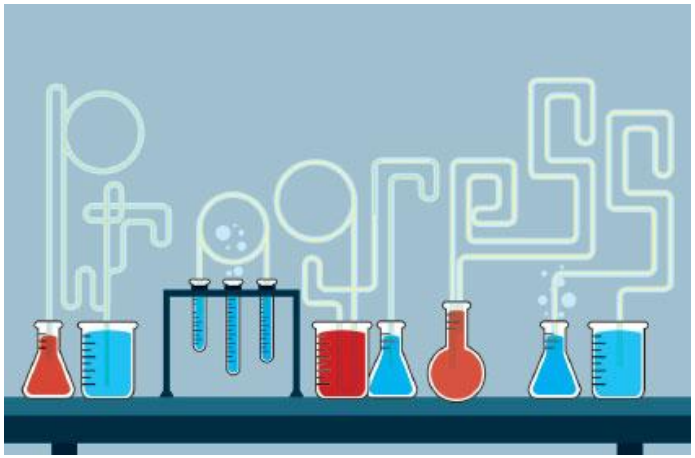
- Look to make a post
- Different solutions for every institution
- Get in touch
- Nothing can grow indefinitely – tomorrow's research will need to adapt and evolve. Help lead the way



Questions + Comments? Contact, + Thanks

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Big thanks to: Everyone at Edinburgh and the Roslin Institute, Scottish Funding Council, HEFCE, S-Lab, Eppendorf/VWR, KCL Estates/Sustainability, Martin Wiles and UoBrighton Sustainability, and all the many research and sustainability folk who have helped us along the way!