

Research in a global context: past and present



Professor Ian Walmsley
Pro-Vice-Chancellor Research



1. The international character of research isn't new

- It's always been essential to test ideas outside the local context
- Examples from Franco-British history confirm this: start of English universities, gravity, wave-particle duality
- It's all about people

2. 21st century research is more international than ever

- International collaboration
- International funding
- Research abroad
- Problems tackled
- International people

3. The challenge: the global value of ideas

- the value of an international university
- how to best to support collaborative research

Oxford's international origins

It's 1167 and King Henry II is
in dispute with France



He forbids English
students from
studying at the
Université de Paris

So they flock to Oxford,
accelerating its development



The schoolmen in England



Robert Grossteste
(1185 - 1240)

Bishop of Lincoln
First Chancellor of the University of Oxford

Light as a fundamental
constituent of the cosmos



De Luce (1224)



THE first corporeal form... is in my opinion light. For light of its very nature diffuses itself in every direction in such a way that a point of light will produce instantaneously a sphere of light of any size whatsoever, unless some opaque object stands in the way.

Gravity: local views

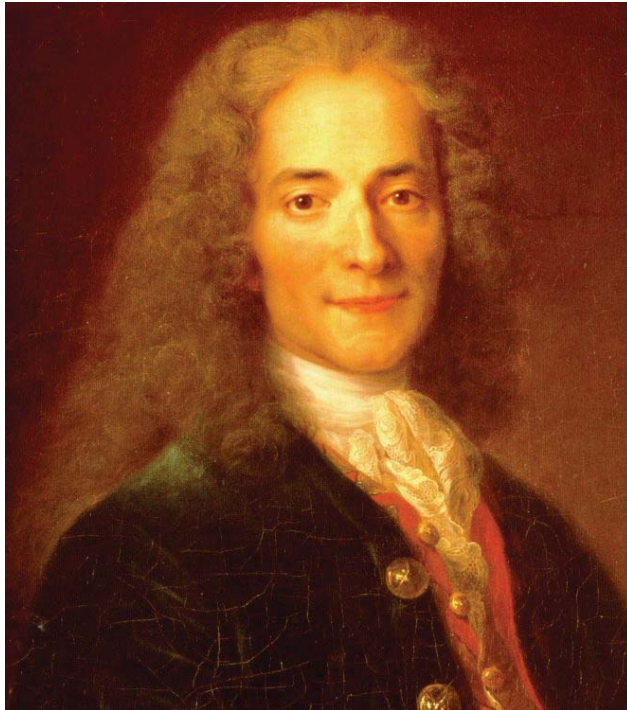
Isaac Newton



René Descartes



Gravity: tenable metaphors



“A Frenchman who arrives in London, will find philosophy, like everything else, very much changed there. He had left the world a plenum, and he now finds it a vacuum.”

Voltaire

What is light?

Early ideas: particles and waves



Isaac Newton
(1643 - 1727)



Robert Hooke
(1635 - 1703)



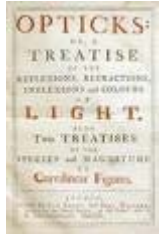
Christian Huygens
(1629 - 1695)

Pragmatic ideas: how to make a photon?



Otto Frisch
(1904 - 1979)

Wave-particle duality: the debate lasts centuries



Newton's *Opticks* expounds his particle theory of light

Double slit experiments of Thomas Young (in London) provide evidence for wave theory



Quantum mechanics provides resolution

1678

1704

Early 1800s

Early 1900s

Christiaan Huygens (in Paris) publishes *Traité de la Lumière*, proposing a wave theory of light



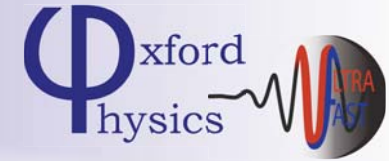
Augustin-Jean Fresnel (in Paris) confirms and extends Young's findings



Work of Einstein, Dirac, Planck, de Broglie and others confirms wave-particle duality



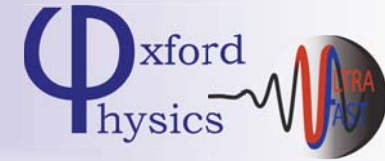
What is a light? A pragmatic view.



Frisch's single photon generator:

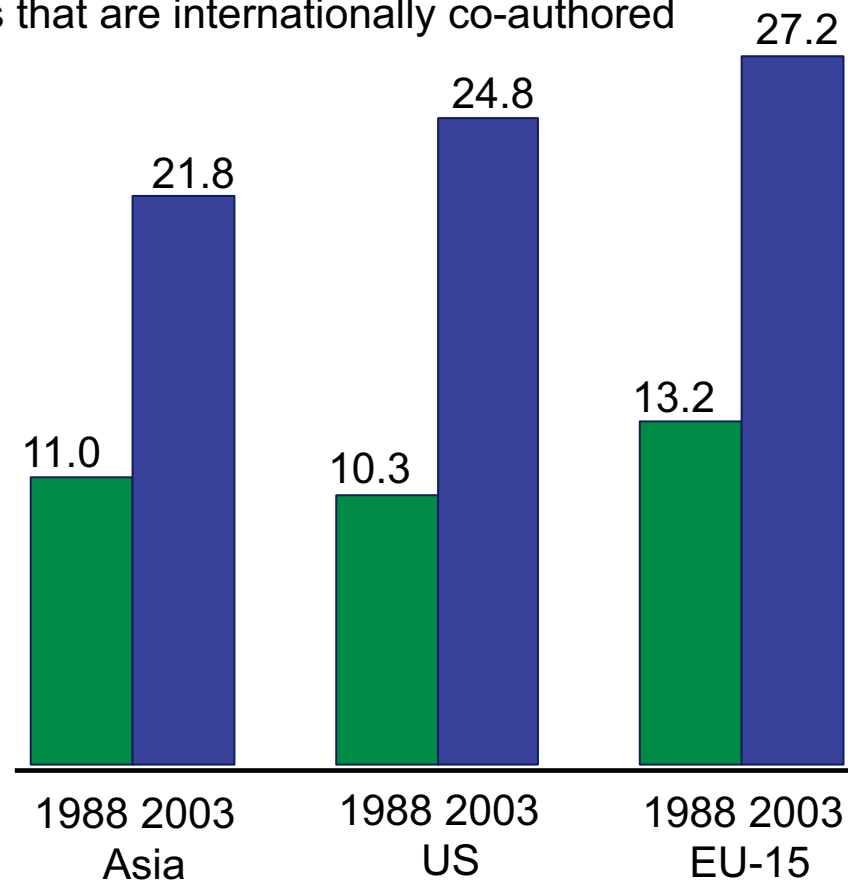
O. Frisch, Contemp. Phys, 7, 45 (1965)

Research in the 21st Century



International collaboration on science and engineering articles by region/country

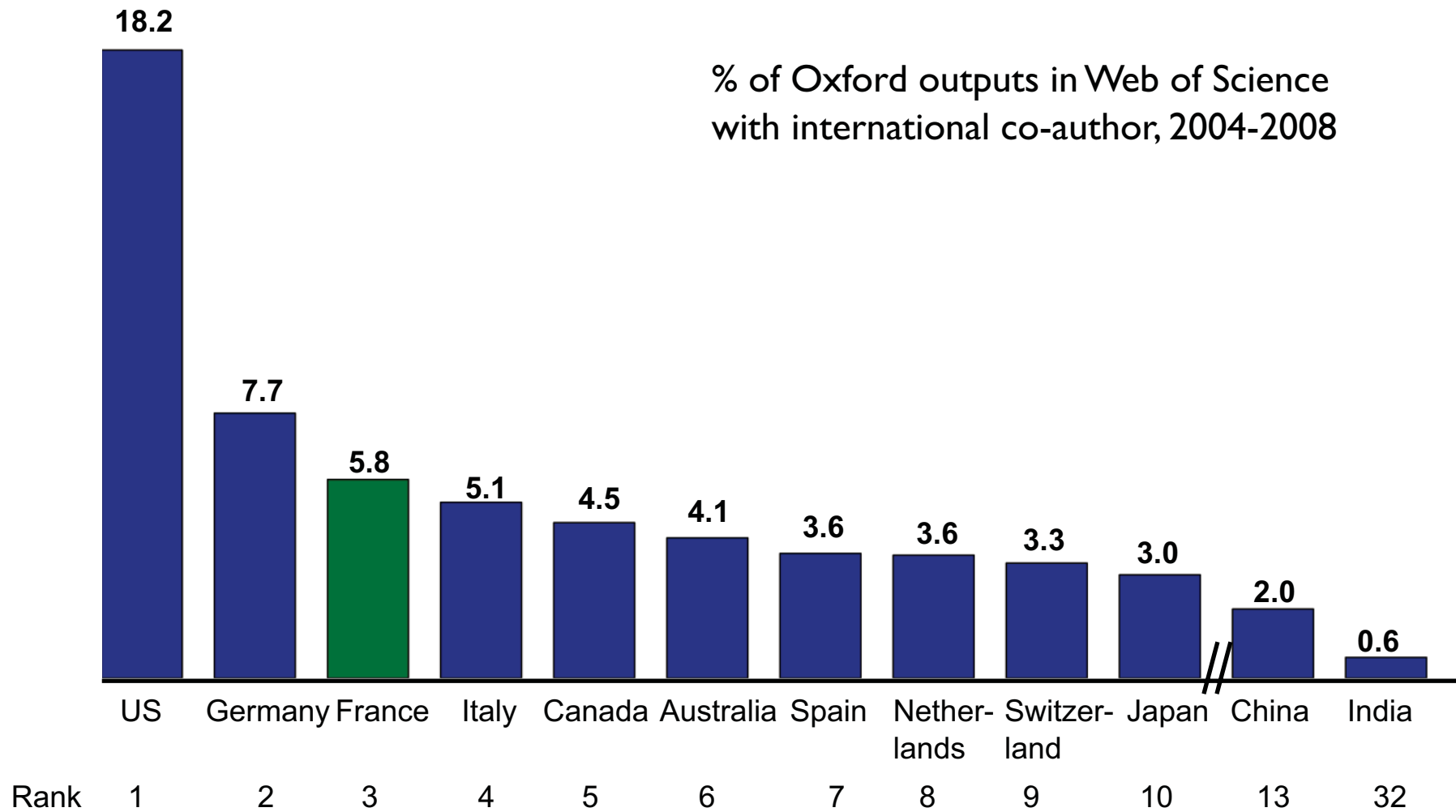
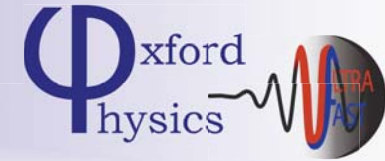
Percent total articles that are internationally co-authored



Note: Asia includes China, India, Indonesia, Japan, Malaysia, Philippines, Singapore, South Korea, Taiwan, and Thailand; EU-15 includes the members of the EU before enlargement

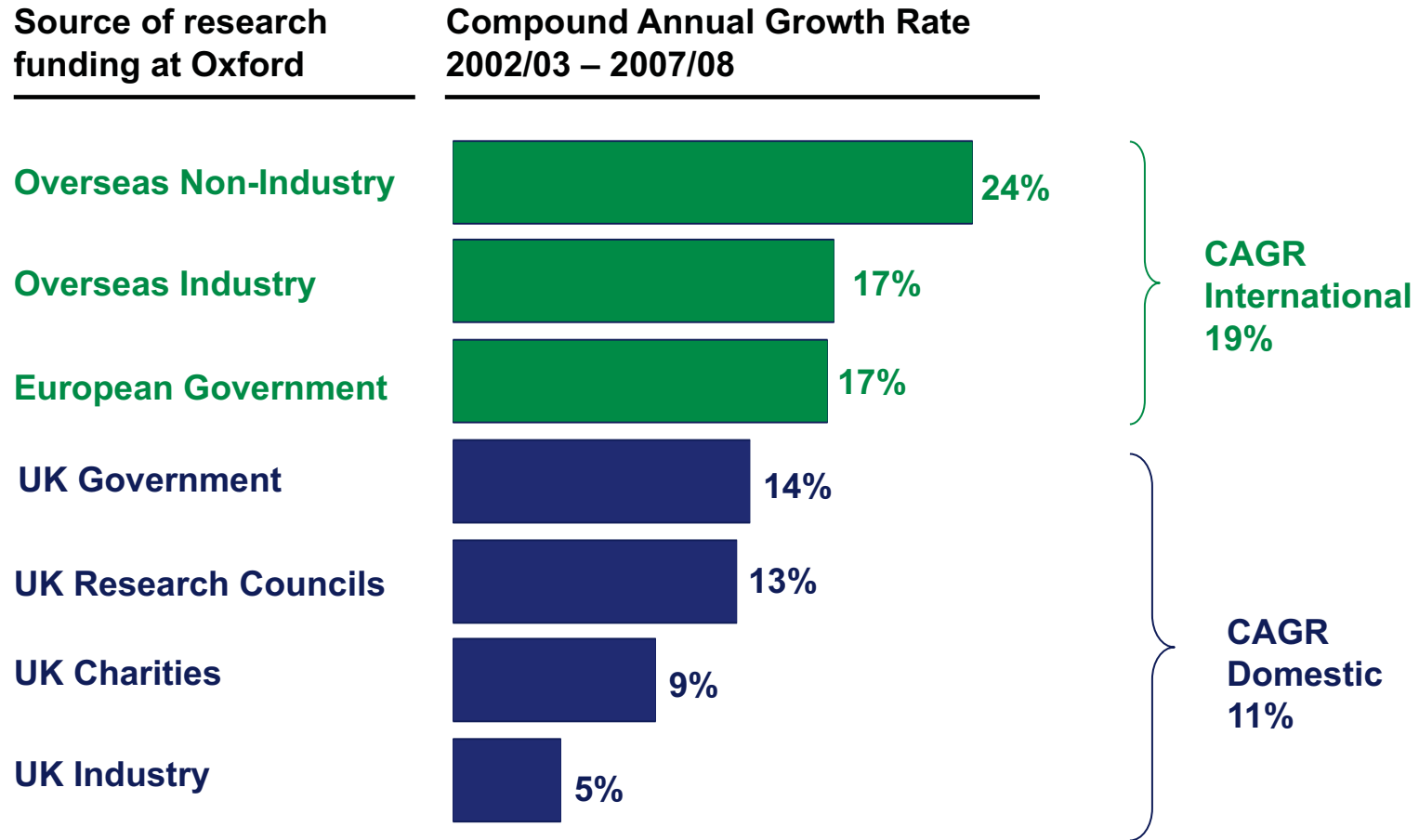
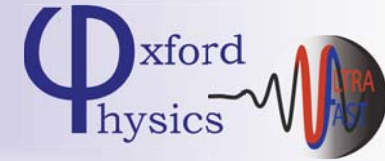
Source: National Science Foundation, *Asia's Rising Science and Technology Strength*, May 2007, pp. 25-26

At Oxford: international collaboration



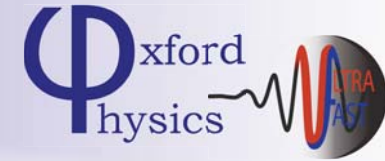
Source: ISI Web of Science (all databases)

Growing international research funding

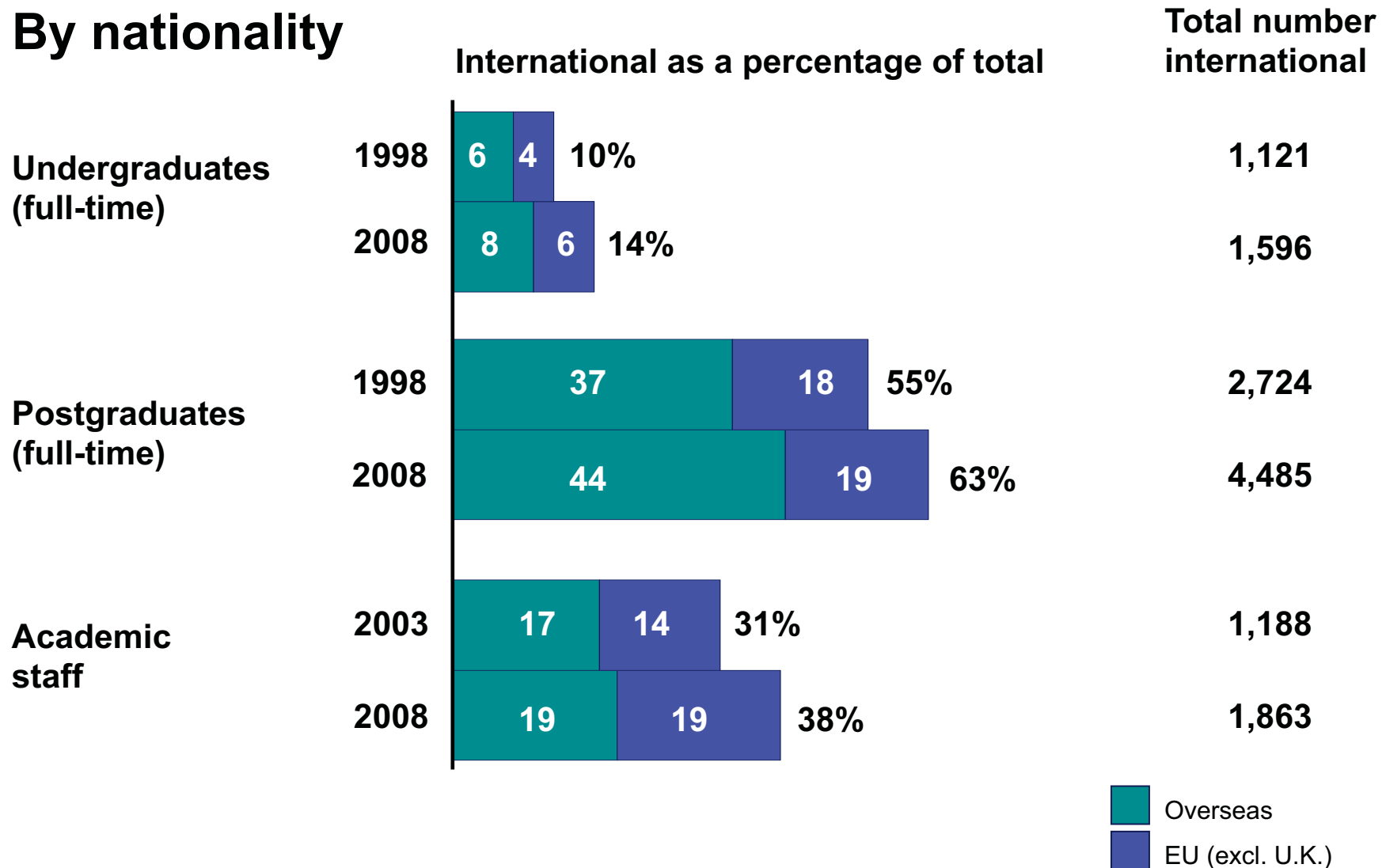


Note: total research income grew at a CAGR of 12% in this period.
Source: Oracle Financials

People at Oxford: increasingly international

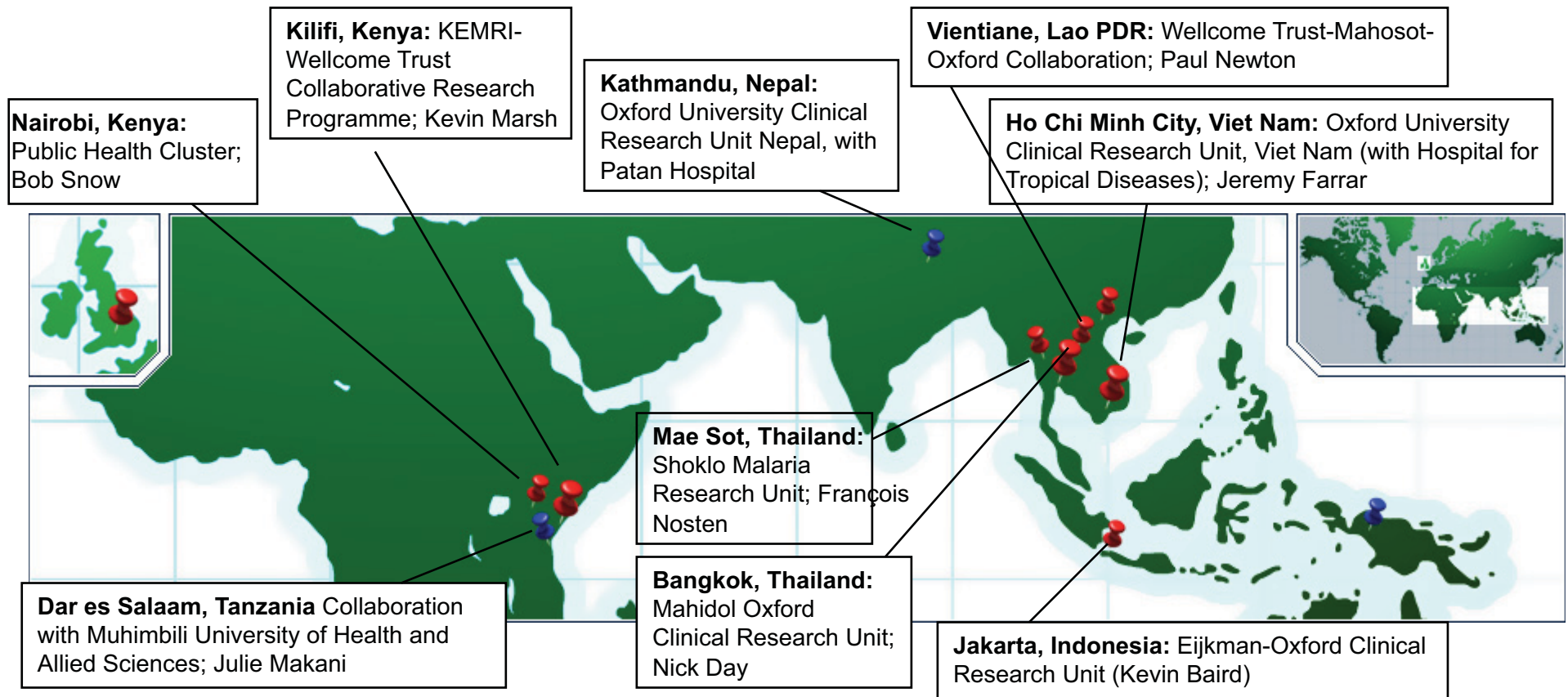
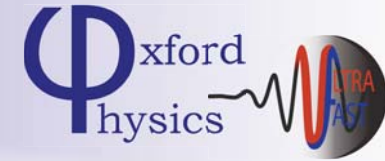


By nationality



Source: OSS for students; OpenDoor database for academic staff. Student data as of December 1; staff data as of July 31.

Tropical Medicine at Oxford



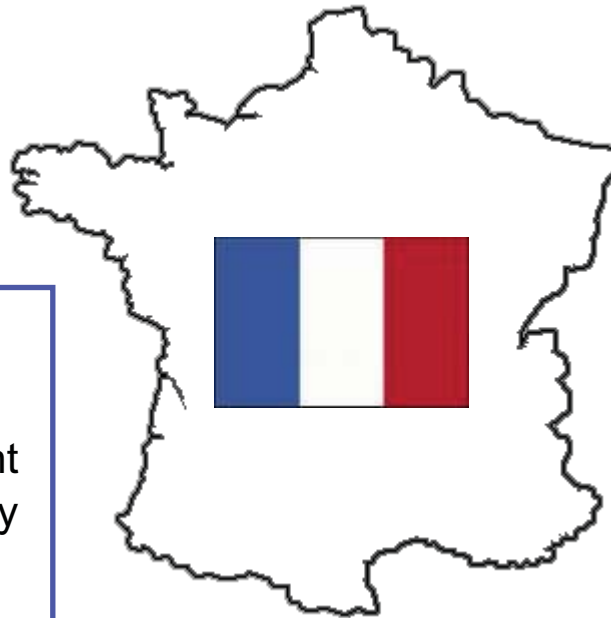
Consider how this all weaves together: Oxford's engagement with France

A source of talented students and staff

- 8th largest source of students: 198
- 6th largest source of academic staff: 113

A leading centre for the study of France

- Largest French department in UK; specialists in History and Politics
- Voltaire Foundation
- Institute for European and Comparative Law
- British Centre for Durkheimian Studies
- Major projects include comparative study of 1968



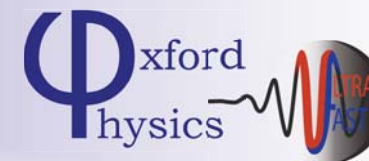
A focus of fruitful collaborations

- Scientific collaborations with Paris 6, CNRS, Paris 7 and Paris 11
- OXPO: Oxford-Sciences Po Research Group in the Social Sciences
- Maison Française d'Oxford
- College/departmental exchanges: e.g., Ecole Normale Supérieure

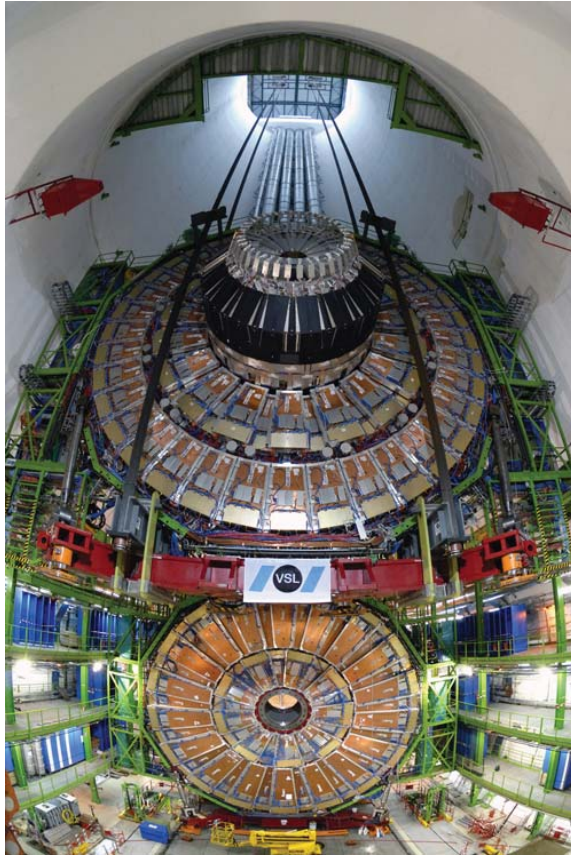
Home to talented alumni

- 6th largest concentration of alumni in the world: at least 2,035

Measuring the value of a global university?



The power of collaboration

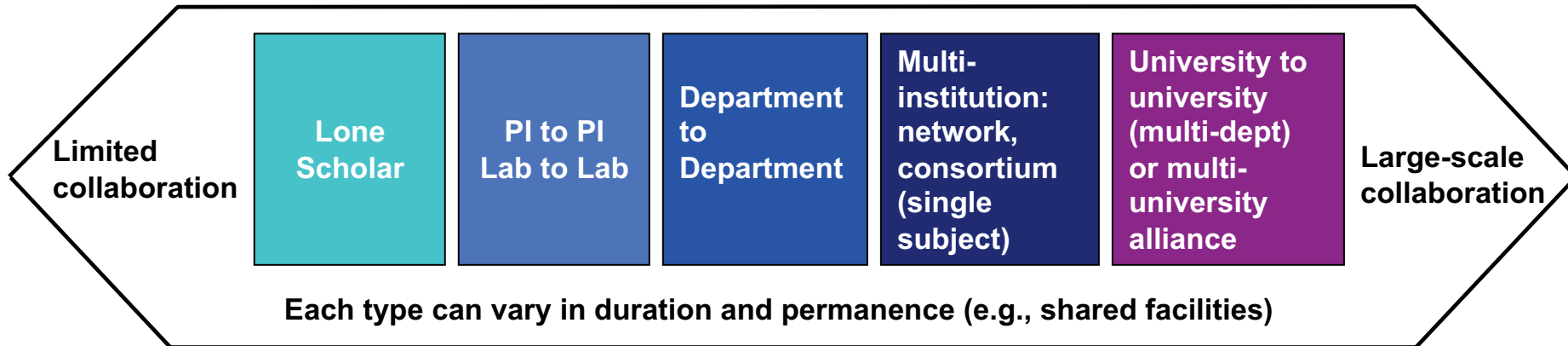
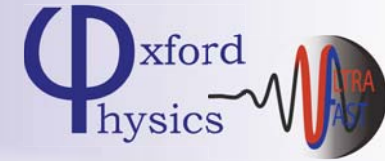


CERN: Large Hadron Collider



Bodleian Library: Roman de la Rose digitisation collaboration

Diverse collaboration

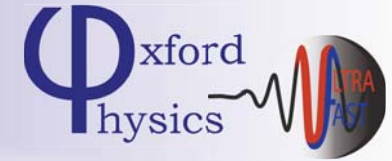


Examples

- Archival research
- Textual analysis
- Environmental engineering projects with Peking
- Econometrics projects with Arhus and Copenhagen
- Tropical medical laboratories
- Oxford-Fuwai Cardiovascular Centre
- Bodleian book digitisation with University of Michigan
- Large facilities experiments: CERN, Subaru telescope
- Multi-centre medical studies: autism, cancer
- Social science surveys: Institute of Ageing
- Oxford-Princeton
- Privileged partnership with ULB
- IARU

All disciplines collaborate through conferences, workshops, journal editing, travel, hosting visitors, etc.

The final word: are photons real?



Ascribing particle or wave properties to photons is contextual:

it depends on what questions we ask.