



# The non-science benefits of the Square Kilometre Array

Philip Diamond  
(PrepSKA Co-ordinator; University of Manchester)

COST Strategic Workshop  
Palazzo Rospigliosi, Rome, 30-31 March 2010

Quantum physics  
– what was it good for?

- 'I think there is a world market for maybe 5 computers'
- Thomas J Watson, founder of IBM.

- When laser was invented,
- there was no conceivable application

- Explaining electromagnetism to then Chancellor
- of the Exchequer William Gladstone, Michael Faraday was asked, 'But after all, what use is it?'
- He famously, but perhaps apocryphally, replied,
- 'Why sir, there is every probability you will be able to tax it'.



# Impact of Radio Astronomy

- Development of cheap low-noise-amplifiers of benefit for telecommunications industry.
- Radio imaging algorithms had strong influence on medical tomography, NMR imaging, finger-print detection, speed cameras!
- Development of intensity interferometry by Hanbury-Brown and Twiss at Jodrell Bank in 1950s led to quantum cryptography
- Very Long Baseline Interferometry measures rotational parameters of Earth, directly useful to GPS and navigation: civil and military applications.
- Need to locate mobile antennas in France led to founding of Cambridge Positioning Systems Ltd, techniques used by GPS and Galileo
- Wifi (802.11): huge impact on society and the way we work and socialise.

# LOFAR as a recent example

- 75% of contracts spent in North-NL - did not happen by magic:
  - KT transfer via small R&D projects built up expertise in local companies → bid on LOFAR tenders
  - expertise level of companies increased dramatically in decade, now able to compete for other "high tech" projects
- LOFAR multidisciplinary - not just astronomy but also geophysics, meteorology, agriculture, passive radar etc but the astronomy application pushes computing networking, archiving etc.
- LOFAR started the concept of generic sensor networks. In north Netherlands there is something called Sensor Universe in which ASTRON is a founding member
- There is now much more investment by government in Sensor Universe - generic sensors - than was ever provided for LOFAR and this trend is set to continue over the next few years.

# Science



Increase in the stock of useful knowledge



Creation of new firms



Supply of skilled graduates and researchers



Creation of new scientific instrumentation and methodologies



Development of networks and stimulation of social interaction



Enhancement of problem-solving capacity

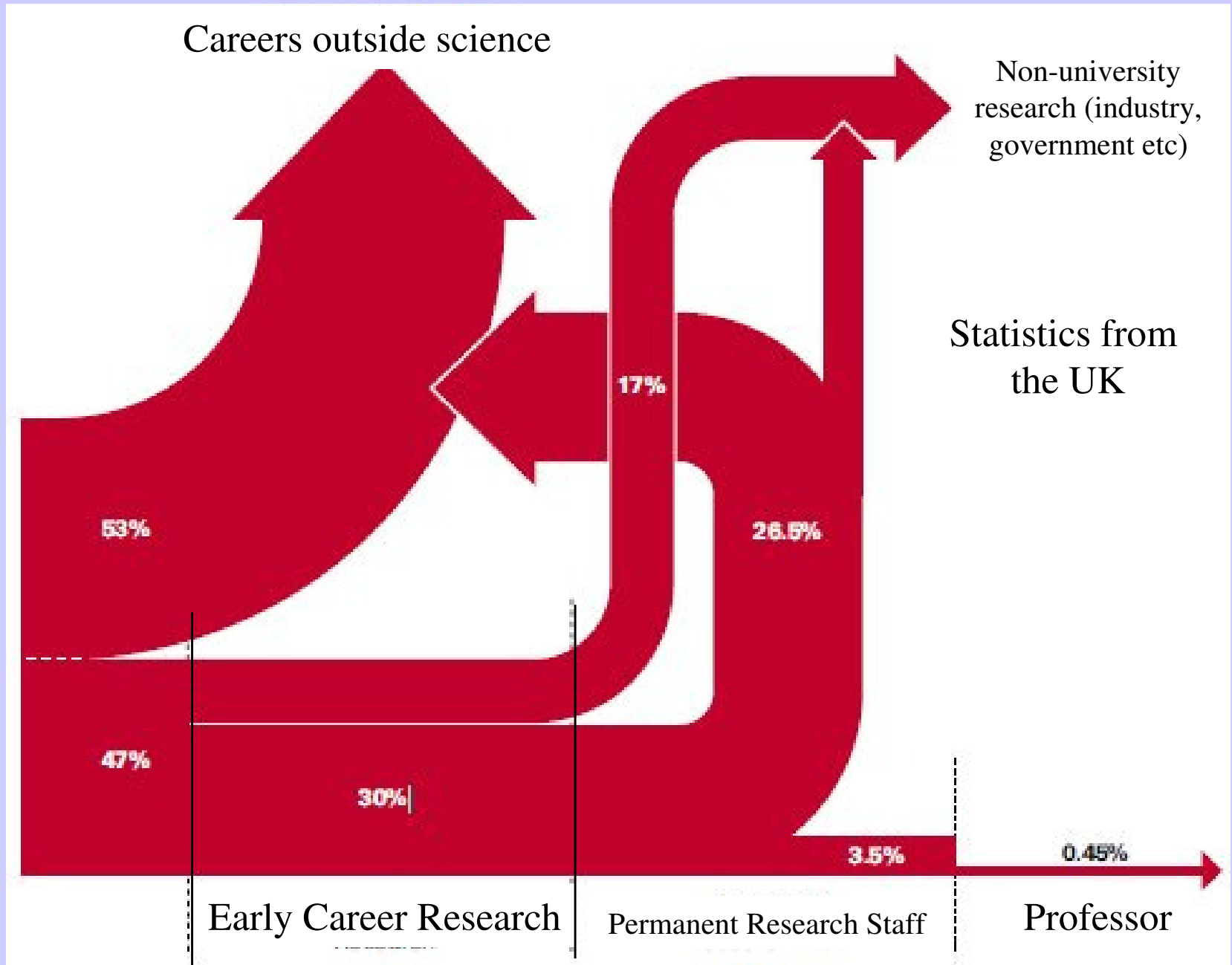


Provision of social knowledge



## People: astronomy attracts the best

- Science requires investment, infrastructure and an enabling policy environment, but its most important resource is people.
- Of equal importance is the excitement that such science (astronomy, particle physics etc) can engender in the public.
- To be explored in Human Capital Development theme





# Scientific Diplomacy

- *‘Many of the challenges we face today are international and—whether it’s tackling climate change or fighting disease—these global problems require global solutions . . . . That is why it is important that we create a new role for science in international policymaking and diplomacy . . . to place science at the heart of the progressive international agenda.’*

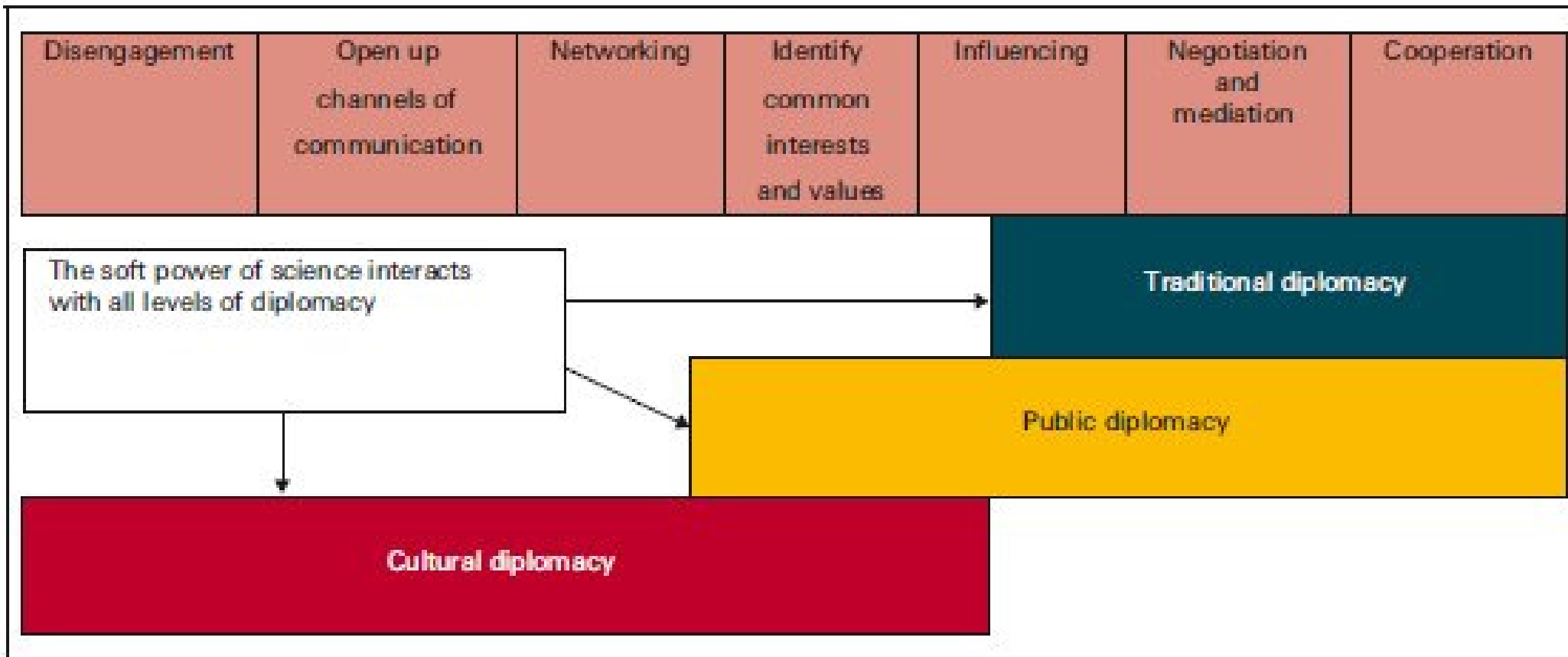
Rt Hon Gordon Brown MP, Prime Minister



# Three dimensions of scientific diplomacy

1. informing foreign policy objectives with scientific advice (*science in diplomacy*)
2. facilitating international science cooperation (*diplomacy for science*);
  - Projects like ITER, LHC and SKA are large, inherently risky and beyond capacity of any one country to build. Science can be a bridge to encourage stronger diplomatic ties between countries.
3. using science cooperation to improve international relations between countries (*science for diplomacy*):
  - *the soft power of science, e.g. CERN post-WWII, VLBI in the Cold War*

# The soft power of science





# PrepSKA: Preparatory Study for the SKA

- 4 year project, April 2008 → March 2012:
- €5.5M EC funds; ~€40M national funds.
- 24 Partners from 14 countries:
  - UK, NL, IT, FR, DE, PT, SE
  - USA
  - AU, CA, ZA, IN, CH, KR
- 7 work-packages:
  - WP1: Management
  - WP2: SKA design
  - WP3: Further SKA site characterisation
  - WP4: Governance
  - WP5: Industry & Procurement
  - WP6: Funding model
  - WP7: Implementation and socio-economic impact