



NATIONAL SPACE ACADEMY

Growing the skills pool for the UK space sector

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Science & Technology
Facilities Council



CATAPULT
Satellite Applications



Lloyd's Register
Foundation

UK Space Sector – economics and workforce 2013-14

- 7800 upstream, 27 800 downstream
- £1.2 b upstream, £10.4 b downstream
- Average annual growth rate of 7.5%
- Target –10% of projected £400 billion per annum global market by 2030

Drivers for recruitment strategies for the space sector

- Sector expansion – X thousands!
- Ageing workforce

Space- the Skills Need (Chas Bishop, BNSC 2008)

- Graduate engineers
- Reduction in time for new graduates to become effective in companies – business and communication skills
- Potential limitations on overseas recruitment

Gatsby Report (Paul Lewis, KCL 2012)

- As above but also an increasing demand for high-level technicians especially amongst SMEs

The UK Space Industry and the National Space Academy



Education
and Skills

Strategic advice for Government in skills for the space sector

International education skills work for ESA, with China and other countries

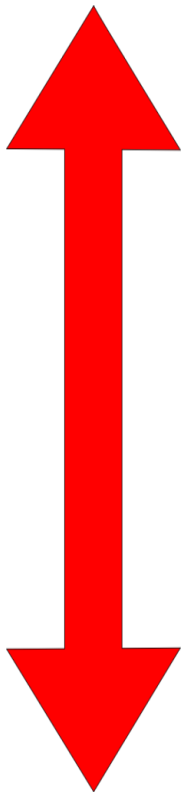
Undergraduate programmes for space industry employees –
HIGHER APPRENTICESHIPS IN SPACE SECTOR

Secondary school GCSE and A Level programmes (full-time) –
Space Engineering, Space Studio Schools

Secondary school support programmes (ages 11-19) – Science,
Technology, Engineering, Mathematics - students and teachers

Primary school support programmes

Inspiration



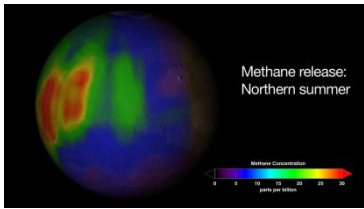
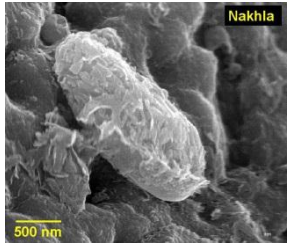
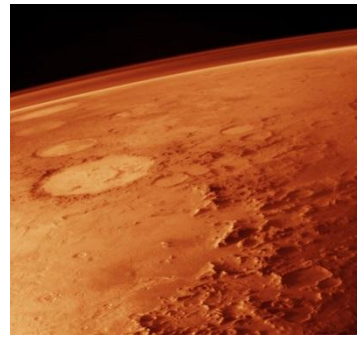
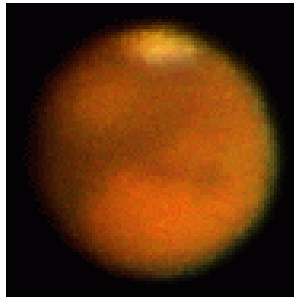
National Space Academy – “space for education”

Delivered by a network of 30+ core personnel, outstanding teachers and space scientists that uses space as a context within which to teach student and teacher curriculum programmes, careers conferences and provide a bridge to space sector companies

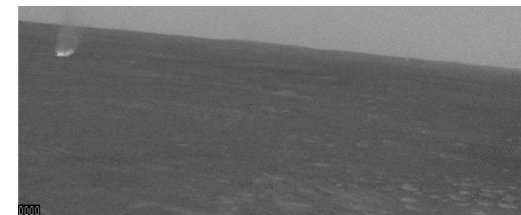
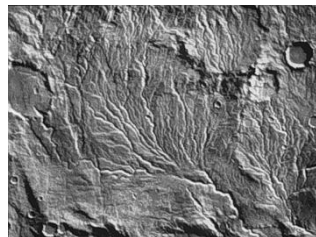
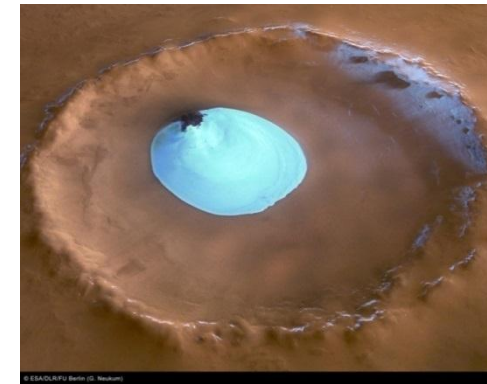
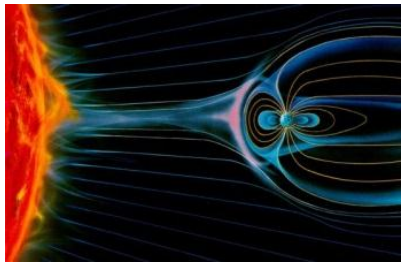
Delivered on behalf of ESA, STFC, UK Space Agency, industry sponsors and further supported by Lloyds Register Foundation and the Satellite Applications Catapult

Originally focused on supporting 14-19 age range and their teachers, programmes have expanded to include full-time school programmes, higher education and current space workforce training

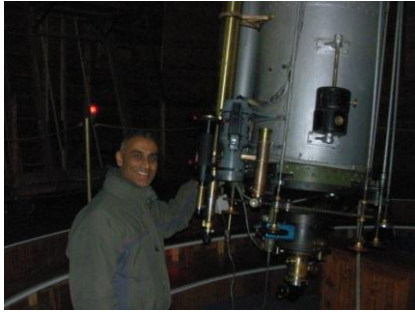




- Newton's Laws and Rocketry
- Gravitational field theory
- Atmospheric physics and ideal/non-ideal gases ($pV=NkT$, $P = P_0 e^{-(mgh/kt)}$)
- EM fields and radiation
- Interaction of charged particles with magnetic fields
- Radioactive decay and cosmic rays
- Origins of magnetic fields



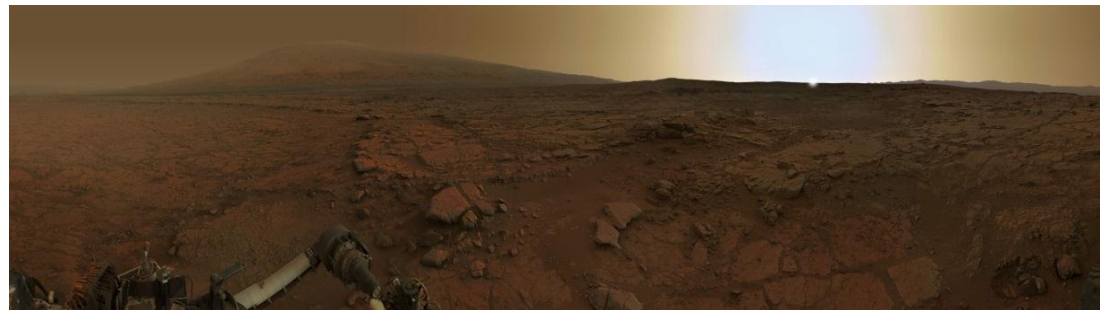
- Looking out there



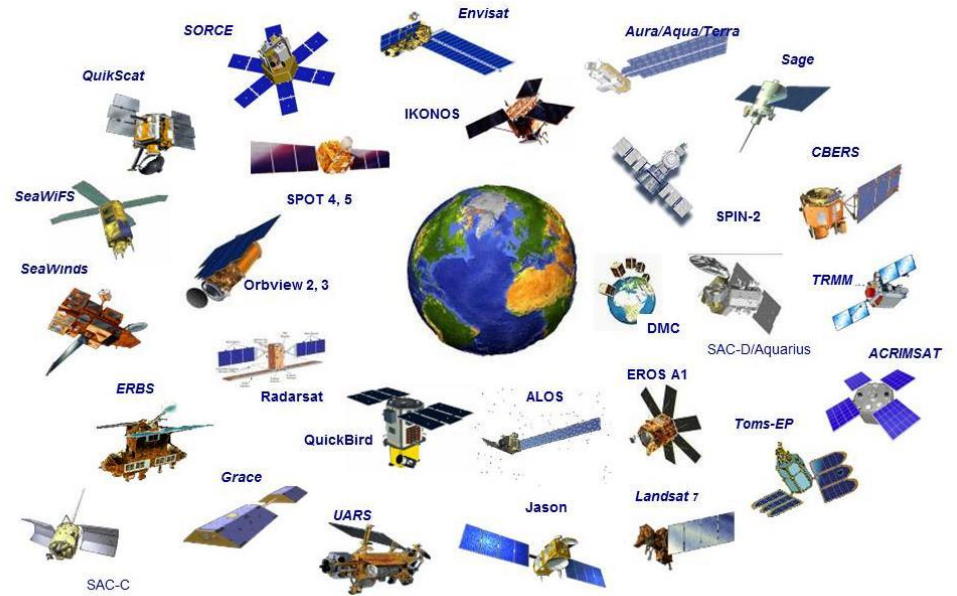
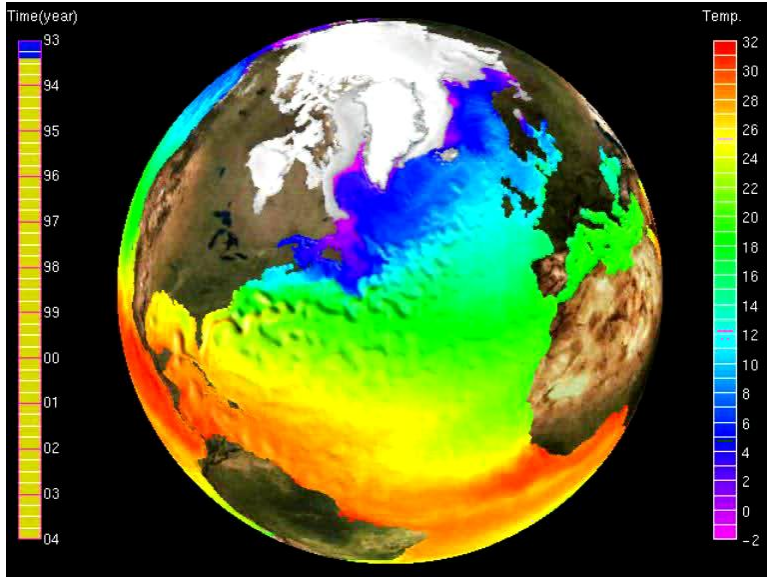
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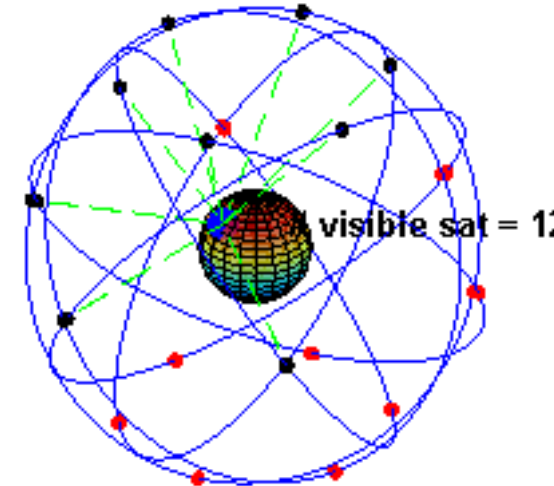
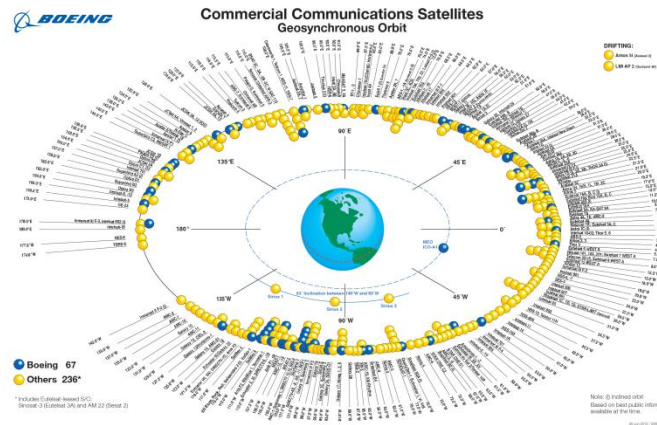
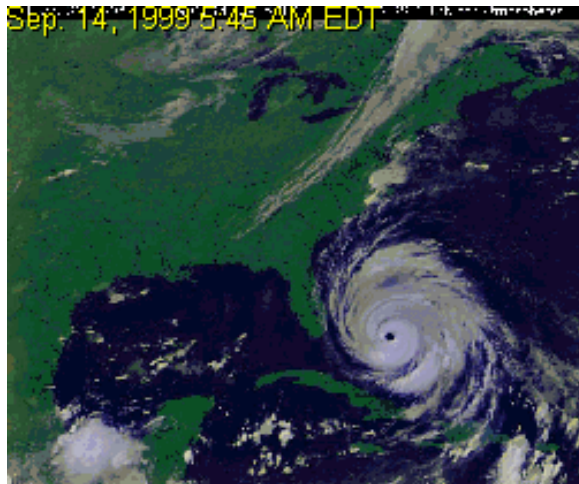
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- Looking back here



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Programme development and delivery – per annum

- Student masterclasses (secondary) - 6000
- Continuing Professional Development for Teachers -1000
- Careers conferences for GCSE/A Level students- 1000
- International contract work for ESA Education
- Developing in-flight experiments for ESA astronauts
- Space Engineering course (full-time 2 years – pre University)
- Curriculum development and delivery for Space/Aerospace Studio Schools
- Development and delivery of the National Higher Apprenticeship framework for UK space sector (includes 2 years of University engineering course)
- Development of new MSc course in space science and education



Space Engineering programme (Sept 2012+)

- Two year full-time programme
- A Levels in Maths and Physics
- BTEC Level 3 in Engineering (2 A level equivalent)
- Extensive use of space contexts in teaching
- Space work experiences and industry involvement



Destination	Programme
University of South Florida	B.S. in Physics and Aerospace (full scholarship)
University of Plymouth	BSc Business management
Airbus	Higher Apprenticeship
University of Leicester	MPhys Physics
University of Leeds	MPhys, Physics and Astrophysics
Brunel University	BEng Aerospace Engineering
Nottingham Trent University	BSc Physics with Forensics
University of Nottingham	BSc Electrical Engineering
N/A	Applying for Rolls Royce apprenticeship (2015 entry)
University of Plymouth	Foundation degree – Engineering (2015 entry secured)
University of Loughborough	BSc Physics and astrophysics

Space Studio Schools (Sept 2014+)

- Full-time schools for GCSE and A Level students
- Space contexts embedded throughout curriculum
- Extensive work experience and project-based learning using space contexts/industry linkage
- Banbury opened Sept 2014, West London Sept 2015



National Space Academy “affiliate” students; full-time with ongoing extensive Academy engagement



Affiliate growth (minima!)

- Sept 2012 – 11 students
(Loughborough)
- Sept 2013 – 24 students
(Loughborough)
- Sept 2014 – 112 students
(Loughborough, Salford, Banbury)
- Sept 2015 – 350 students
(Loughborough, Salford, Birmingham, Banbury, West London)
- Sept 2016 – 500 students
(Loughborough, Salford, Birmingham, Banbury, West London)



Higher Apprenticeship in Space Engineering

Loughborough
COLLEGE est. 1909



**University of
Leicester**

- Foundation degree training programme covering mandatory requirements for engineering professional recognition (Levels 4 and 5 , *i.e. 1st and 2nd year undergraduate standard*) – validated by the University of Leicester
- Entry standard A Level or equivalent
- Developed with active involvement of space sector companies



QinetiQ



First cohort of employees from Magnaparva on two-year programme commencing in January 2015

Space Intern Network (SpIN)



University of
Reading

CATAPULT
Satellite Applications

The Space Internship Network provides project placements within companies and research organisations for undergraduates in the summer of their 2nd/3rd year or 3rd/4th year from a range of disciplines of interest to employers within the space sector (eight week placements)

Through SpIN, the sector intends that the brightest and best graduates are encouraged to focus their attention on space for their career planning

2013

217 applicants from 25 university departments: 46 interns in 12 organisations

2014

480 applicants from 80 departments: 47 interns in 16 organisations

- Mainly 2nd and 3rd years
- Not just physicists!
- Projects include Agricultural Image Segmentation, robotics, Solar Physics
- 40% take part in “programming bootcamp”
- Organisations including Rockwell Collins, Geocento, Rezatec, RAL Space, Astrosat – targets for this year include greater SME involvement
- ***Many companies successfully using this as first-line identification for recruitment***



With Magna Parva, having worked on numerous ESA projects, I completed a full inspection of a lens carrier for the BepiColombo mission which required immense attention to detail. I had to disassemble all of the parts and make sure each one matched the design drawing. Using the coordinate measuring machine has helped to develop specific skills such as precision..... ***Aerospace is one of the most exciting areas of engineering and I would love to work this dynamic industry which brings new challenges and enables me to work in a continually developing field, learning new skills and expanding my knowledge.***

Alongside my studies, I had the opportunity to spend one week at the Space Research Centre at the University of Leicester. This experience was absolutely enlightening. I worked alongside researchers and engineers. I was assigned to carry out several experiments and record results in a logbook. ***These results were going to be used for projects like SPLIT (Small Planetary Linear Impulse Tool);*** the key was to be precise.***I have been further motivated to try harder and achieve my best after spending time in a professional environment.***

Being a remarkably challenging career, Aerospace Engineering will encourage me to achieve my potential. The skills and knowledge I have gained throughout my education will thoroughly assist me at university. As an enthusiastic, highly motivated and extremely diligent person, I am eager to pursue a career in this highly rewarding field and achieve the status of a chartered engineer.



When I was looking at my options for an A level course I was put forward for the Space Engineering Course at Loughborough College, as I was always interested in Space and Technology I followed my gut instinct and applied, the best thing I have ever done.

The Course gave me a practical side, hands on with the BTEC aspect of the course as well as the theory side in A Level Maths and Physics.

This helped me decide whether I wanted to follow the University Path or Apprenticeship path, as it happened the course gave me the opportunity to go onto a higher apprenticeship with a major company, which is giving me the chance again to combine an hands on approach of working for a company while also studying for a degree in engineering.

**Nigel Grainger
Airbus Higher Apprenticeship trainee**

When Nigel first came home from senior school and said he wanted to apply for a brand new course for his A Levels at Loughborough College, and explained it was Space Engineering, as parents we were interested in finding out more but also nervous as we didn't know whether it would work being a new course and also was it putting to many boundaries on Nigel's options in the future.

How wrong could we have been, the course was so well organised, the teaching staff were absolutely brilliant and so dedicated not only in college time but in their own time. As parents we where kept informed of Nigel's progress and any concerns either we had or the teachers had where dealt with quickly.

With the course being in two sections, the BTEC in Engineering and the 'A' Levels it meant that it opened up several options for our son's future. The college organised several meetings with Engineering Companies and not just those in the Space Industries but in other engineering sectors as well which led to long evening discussions about which path to take, space or not space, university, higher apprenticeship or standard apprenticeship.

The course has surpassed our expectations by far, and the best result we have the from the course is that Nigel had the opportunity to apply for an higher apprenticeship at Airbus UK, which with the qualifications he achieved at Loughborough he was successful in achieving.

The one thing that really shocked us as parents is how wrong we were to think of the image of engineering being one of "blue overalls and greasy machinery", when in fact it can be an excellent opportunity to work with the latest technology in an almost sterile environment.

It would be good to see the large engineering companies, and the Government promote this new image, as it is all well and good people in engineering knowing this but to get youngsters interested, people need to see the this new image, and not everybody is lucky enough to have the Space Engineering Course at Loughborough available to them.

Rod and Chris Grainger – Nigel's parents

Space: Research/exploration vs exploitation

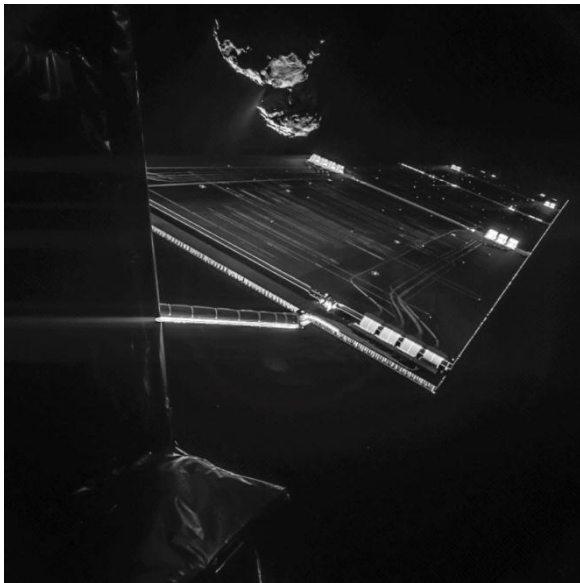


Figure 0.9: Upstream sector turnover by sub-sector, 2012/13

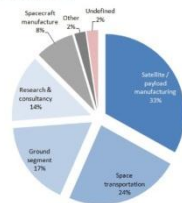


Figure 0.10: Upstream sector employment by sub-sector, 2012/13

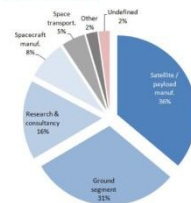


Figure 0.11: Downstream sector turnover by business category, 2012/13

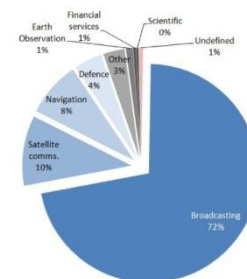
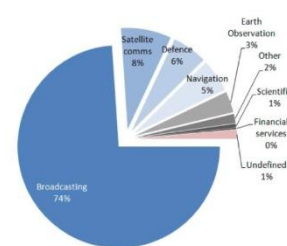
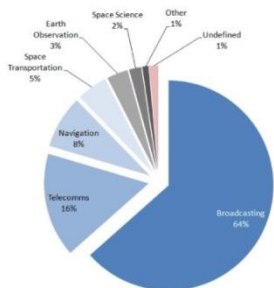


Figure 0.12: Downstream sector employment by business category, 2012/13



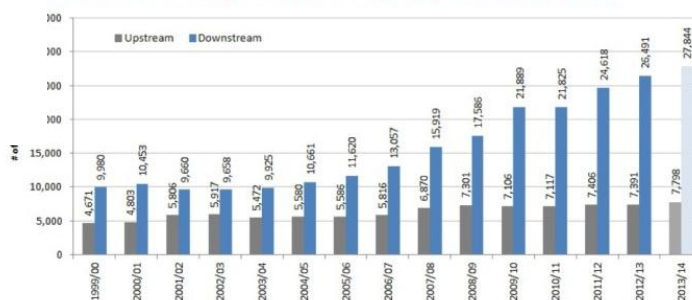
Note: Satellite communications include communications other than broadcasting, such as telecommunications and Internet.
Source: London Economics analysis

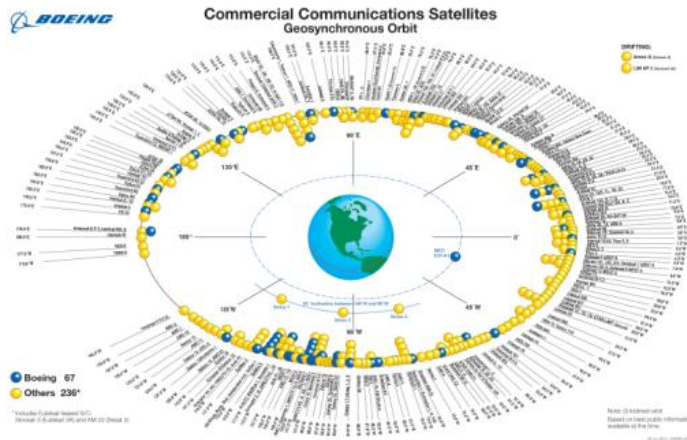
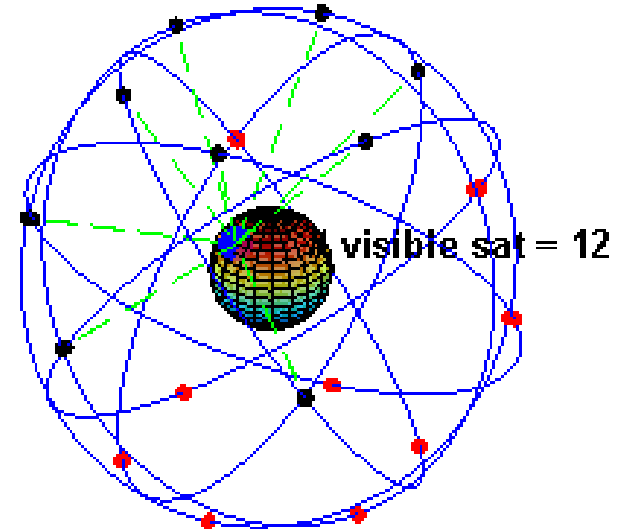
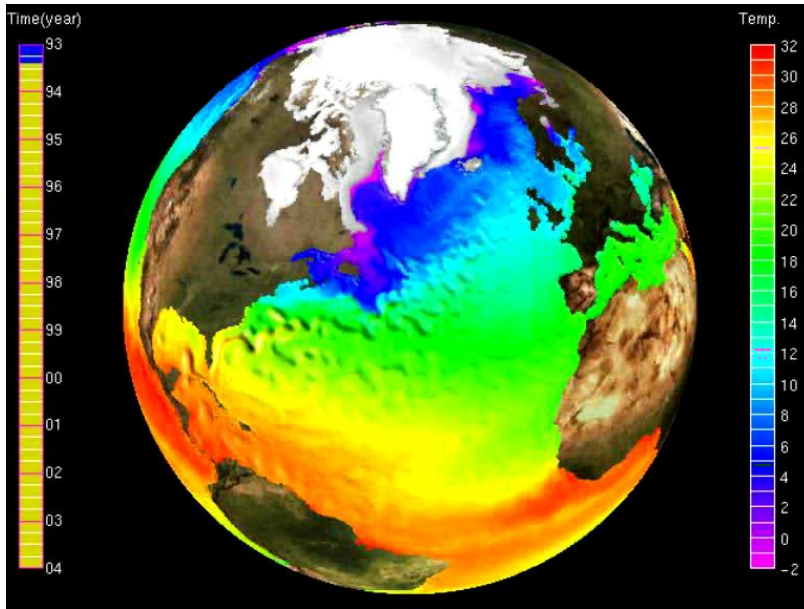
0.15: UK Space turnover by application, 2012/13



Source: London Economics analysis

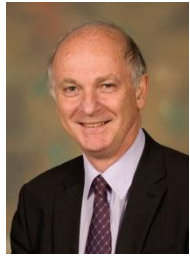
0.5: UK downstream and upstream space industry employment 1999/2000-2013/14



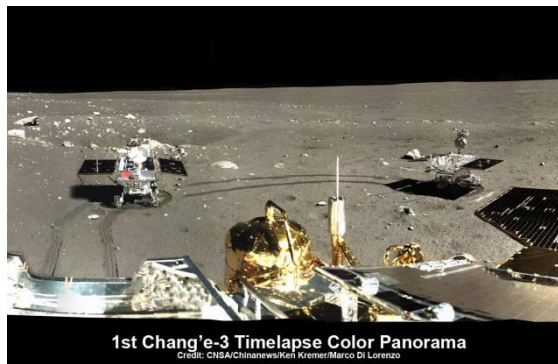
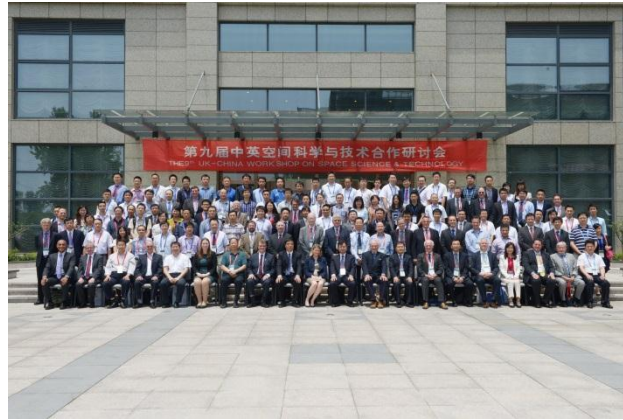


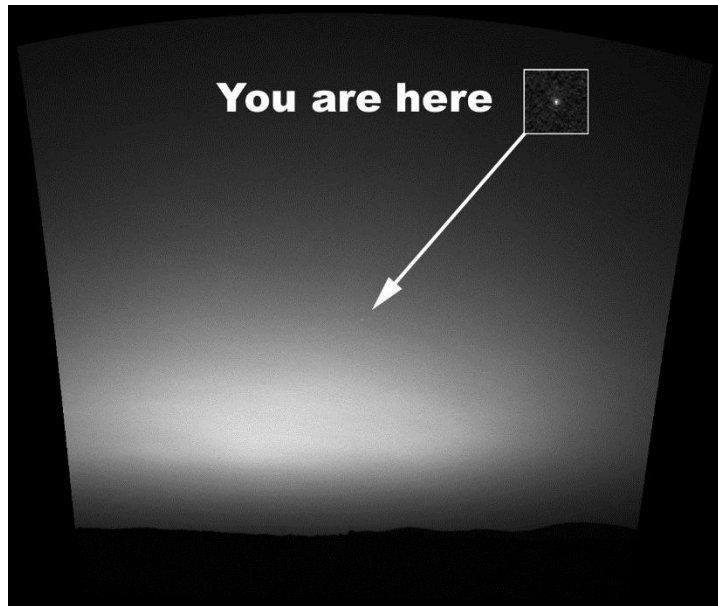
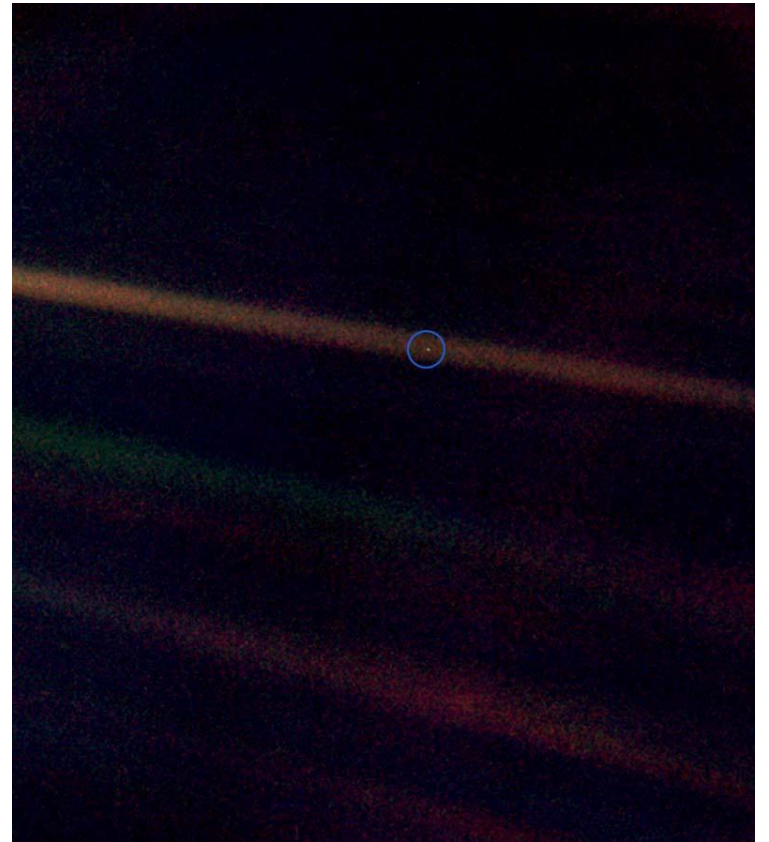
Professor George Fraser (1955-2014)

Perspectives from the new emerging space superpowers



Professor Richard Holdaway, RAL Space







NATIONAL SPACE ACADEMY

“We went all the way to the Moon but the most astonishing thing we discovered was Planet Earth”

