Further Activities

Further teaching activities including films, guides and online resources relating to Astro Academy: Principia topics

UK Space Agency

The UK Space Agency is at the heart of UK efforts to explore and benefit from space. It is responsible for all strategic decisions on the UK civil space programme and provides a clear, single voice for UK space ambitions.

The Agency is responsible for ensuring that the UK retains and grows a strategic capability in the space-based systems, technologies, science and applications. It leads the UK's civil space programme in order to win sustainable economic growth, secure new scientific knowledge and provide benefits to all citizens.

ESA

From the beginnings of the 'space age', Europe has been actively involved in spaceflight. Today it launches satellites for Earth observation, navigation, telecommunications and astronomy, sends probes to the far reaches of the Solar System, and cooperates in the human exploration of space.

Space is a key asset for Europe, providing essential information needed by decision-makers to respond to global challenges. Space provides indispensable technologies and services, and increases our understanding of our planet and the Universe. Since 1975, the European Space Agency (ESA) has been shaping the development of this space capability.

By pooling the resources of 22 Member States, ESA undertakes programmes and activities far beyond the scope of any single European country, developing the launchers, spacecraft and ground facilities needed to keep Europe at the forefront of global space activities.

National Space Academy

Established in 2011 and led by the National Space Centre, the National Space Academy is now the UK's largest space education and skills development programme for secondary and further education. Its team includes some of the country's best science teachers, project scientists and engineers who deliver masterclasses and intensive teacher training for thousands of students and teachers across the UK every year. Internationally the Academy works extensively with the European Space Agency, the UAE Space Agency, and it also leads the UK's ongoing space education and skills development work with China.

Astro Academy Principia

A unique education programme developed by the UK's National Space Academy for the UK Space Agency and ESA (European Space Agency), Astro Academy: Principia uses a suite of demonstrations filmed by ESA astronaut Tim Peake aboard the ISS during his six month Principia mission to explore topics from secondary physics and chemistry curricula. The programme is made up of stand-alone teaching films, downloadable video clips, downloadable files that can be used with the free-to-use dynamical analysis software programme "Tracker", written teacher guides and links to more than 30 further teaching activities.

Principia

Tim's mission to the International Space Station, called 'Principia', used the unique environment of space to run experiments as well as try out new technologies for future human exploration missions. Tim was the first British ESA astronaut to visit the Space Station where he spent six months as part of the international crew.

Further Astro Academy: Principia teaching activities, teaching films/ guides and other online resources

The National, Space Academy has previously produced the following resources in association with the European Space Agency (ESA):

ESA teaching film – gravity wells

http://www.esa.int/spaceinvideos/Videos/2014/07/Gravity_wells_-_classroom_demonstration_video_VP04

ESA teaching film – marble ellipse boards

http://www.esa.int/Education/Teach_with_Rosetta/Marble-ous_ellipses_-_speed_and_time_of_orbiting_bodies_Teach_with_space_P02

http://esamultimedia.esa.int/docs/edu/P02_Marble-ous_ellipses_teacher_guide.pdf

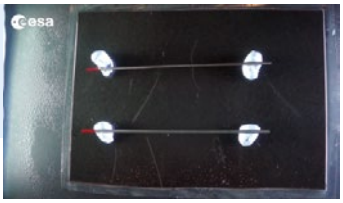
ESA teaching films – centres of mass and orbits

http://www.esa.int/Education/Teachers_Corner/Barycentric_balls_-_orbits_and_the_centre_of_mass_Teach_with_space_P07

This unit contains student activities to model the effects of centres of mass on orbits and also includes space demonstrations devised by the National Space Academy that were conducted by Italian ESA astronaut Samantha Cristoforetti during her six month mission.

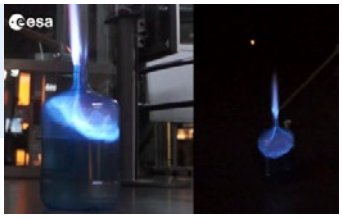
http://esamultimedia.esa.int/docs/edu/P07_Barycentric_balls_classroom_activity_and_student_worksheet.pdf

ESA teaching film - building your own cloud chamber to detect cosmic rays



http://www.esa.int/spaceinvideos/Videos/2014/07/Cloud_chamber_-_classroom_demonstration_video_VP03

ESA teaching films - Rocketry and whoosh bottles - demonstrations and student experiments



http://www.esa.int/spaceinvideos/Videos/2014/07/Whoosh_bottle_-_classroom_demonstration_video_VP01

http://www.esa.int/spaceinvideos/Videos/2014/07/Mini_whoosh_bottle_-_classroom_demonstration_video_VC01

ESA teaching film – cooking a comet

http://www.esa.int/Education/Teach_with_Rosetta/Cooking_a_comet_-_ingredients_for_life_Teach_with_space_P06

http://esamultimedia.esa.int/docs/edu/P06_Cooking_a_comet_teacher_guide.pdf

ESA ATV films – gravity, ballistics and orbits

This series of teaching films was written by the National Space Academy for ESA to help with student understanding of several topics in fundamental physics as well as to explain the role of ESA's ATV programme of cargo flights to the ISS. The videos feature the 5 scientists and visionaries after whom the Automated Transfer Vehicles (ATV) were named: Jules Verne, Johannes Kepler, Edoardo Amaldi, Albert Einstein, and Georges Lemaître. With their brilliant intuition, these historical figures proposed concepts that revolutionised science and our understanding of the world.

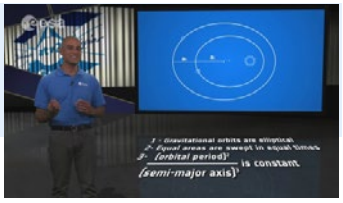
The films and physics topics are:

ATV1 Jules Verne – the science of leaving the Earth (gravity, ballistics, conservation of momentum)

http://www.esa.int/spaceinvideos/Videos/2014/07/ATV_Jules_Verne_-_The_science_of_leaving_the_Earth

https://www.youtube.com/watch?v=hEooqDeHJd4&feature=youtu.be

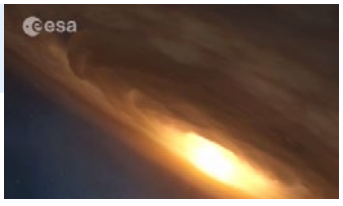
ATV2 Johannes Kepler – orbits and body motion in space (orbits, Kepler's Laws and gravity)



http://www.esa.int/spaceinvideos/Videos/2014/07/ATV_Johannes_Kepler_-_Orbits_and_body_motion_in_space

https://www.youtube.com/watch?v=5n7CmU4NXhA&feature=youtu.be

ATV3 Edoardo Amaldi – cosmic rays and space travel



http://www.esa.int/spaceinvideos/Videos/2014/07/ATV_Edoardo_Amaldi_-_Cosmic_rays_and_space_travel

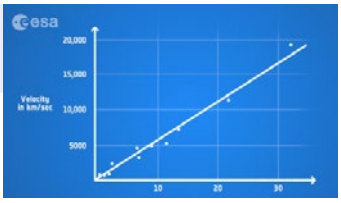
https://www.youtube.com/watch?v=Py8pqvZDrtE

ATV4 Albert Einstein – relativity of space and time

http://www.esa.int/spaceinvideos/Videos/2014/07/ATV_Albert_Einstein_-_Relativity_of_space_and_time

https://www.youtube.com/watch?v=q1iqSRRtmmE

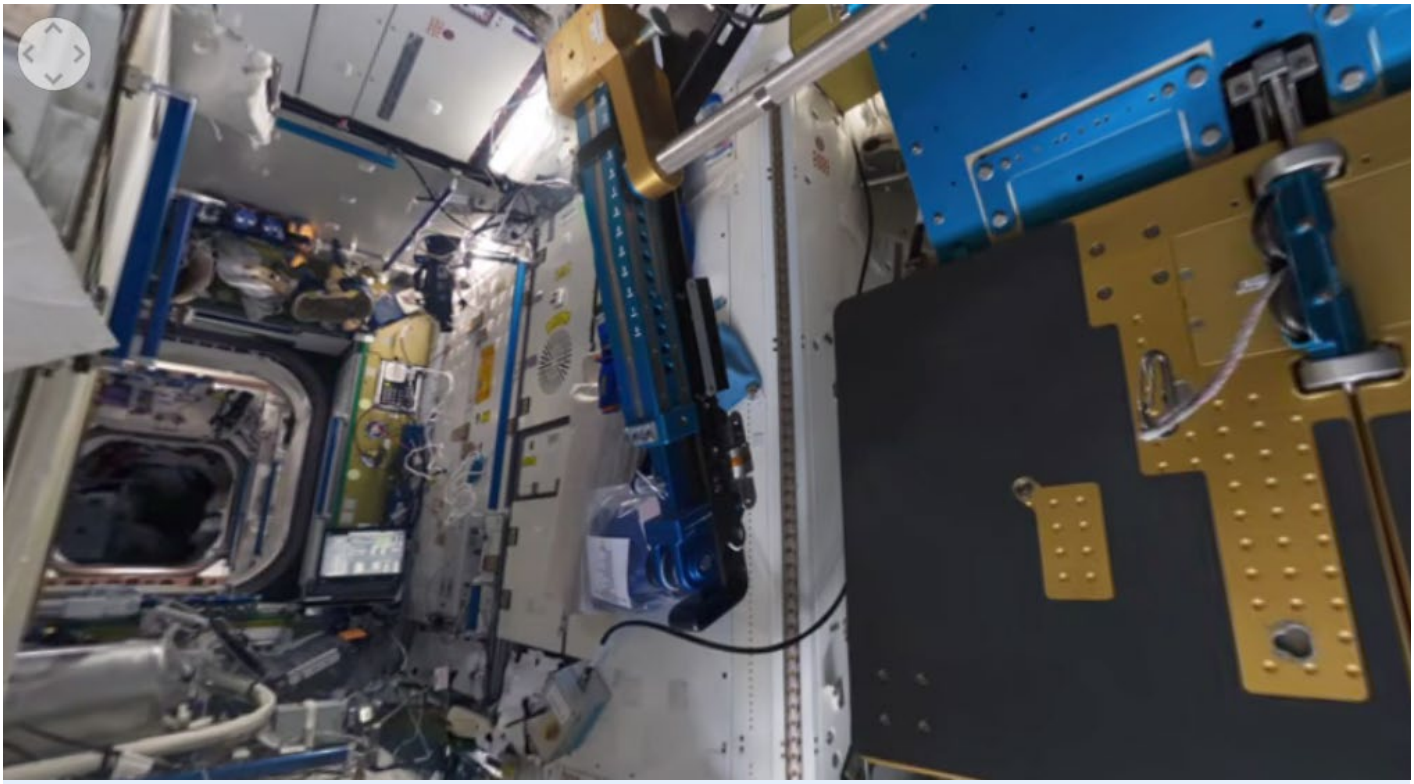
ATV5 George Lemaitre – the evolving Universe



http://www.esa.int/spaceinvideos/Videos/2014/07/ATV_Georges_Lemaitre_-_The_evolving_Universe

https://www.youtube.com/watch?v=II3Rw_1Zmww

Additional ESA resources



ESA tour of the International Space Station (image courtesy of ESA)

ESA has developed an interactive film 360 tour of the ISS which can be accessed using a standard web browser:

http://www.esa.int/Our_Activities/Human_Spaceflight/International_Space_Station/Highlights/International_Space_Station_panoramic_tour

Additional National Space Academy resources

Other downloadable space contexts for teaching - astrobiology

In partnership with the Science and Technology Facilities Council (STFC) the National Space Academy and NSC Creative (the National Space Centre's planetarium production company) have developed a number of teaching films and teacher/student guides which include curriculum-focused activities for high school physics, chemistry and biology curricula and which use various contexts from ASTROBIOLOGY – the search for life and environments which could sustain life beyond Earth.

Lesson starter clips (1min 30s each) - http://wearealiens.com/resources/lesson-starter-movies/

These include the following subject areas:

- It really is a small world
- A sample of one
- Are we alone?
- Life in the extremes
- Why are scientists interested in Mars?
- Robot pioneers
- What lies under the ice of Europa?
- Finding exoplanets
- Goldilocks Zone
- Alien atmospheres

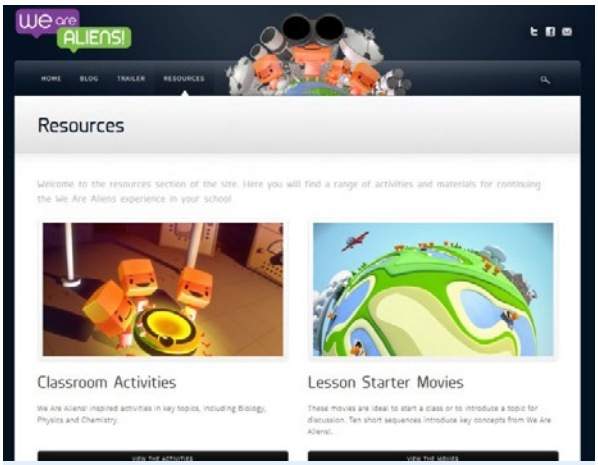


Image courtesy of NSC Creative

Classroom activities

- Physics: http://wearealiens.com/resources/classroom-activities/physics/
- Chemistry http://wearealiens.com/resources/classroom-activities/chemistry/
- Biology http://wearealiens.com/resources/classroom-activities/biology/

These sessions are presented by Lead Educators from the National Space Academy programme – outstanding current teachers of physics, chemistry and biology who showcase experiments and demonstrations which have been successfully used to boost student understanding and engagement in a range of subject areas.

Each video clip includes classroom activities, demonstrations, an overview of the specific space context and science area covered and is accompanied by a teacher guide.

Additional Resources

The UK Space Agency has worked with the Open University to produce a number of short cartoon-style films to explain the science of microgravity:

http://www.open.edu/openlearn/science-maths-technology/science/physics-and-astronomy/physics/60-second-adventures-microgravity

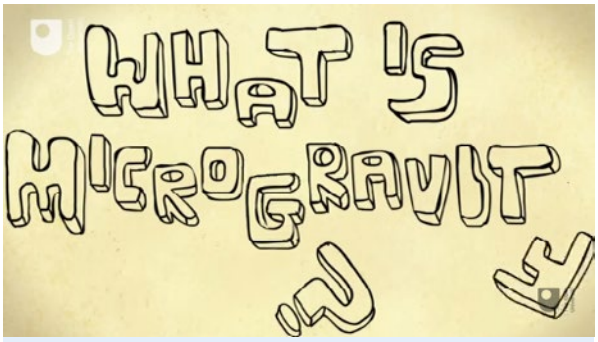


Image courtesy of The Open University and UK Space Agency

The links for each film individually are:

What is microgravity?

- https://www.youtube.com/watch?v=7IIQLRXCPhk

The Vomit Comet

- https://www.youtube.com/watch?v=aLgHKSQ7Oj4

Bed rest

- https://www.youtube.com/watch?v=XugqOLFlEm0

Space bugs

- https://www.youtube.com/watch?v=HEblUMz5NlY