



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 640190



EURO-CARES

A PLAN FOR EUROPEAN CURATION OF RETURNED EXTRATERRESTRIAL SAMPLES

Work Package 8

Deliverable 8.8

MOOC: Space on Earth

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Space on Earth

Background: A MOOC (Massive, Open On-line Course) is a web-based, open access, stand-alone tailored package of material designed to enable guided study of a subject. Courses typically last between 4 and 8 weeks. A well-designed MOOC is often used by school teachers seeking enrichment activities for students, or to bring themselves up to speed on a specific subject area, although the main participants are usually the general public. The EURO-CARES consortium chose to produce a MOOC because it is a relatively easy way to reach many thousands of people globally, raising the profile of space science.

Description: The MOOC, **Space on Earth**, is designed to deliver 3 hours of study materials over a 6 week period. By the end of the course, students will have an understanding of the range of materials delivered to Earth (both natural and artificial), where it comes from and how it is collected. They will learn about current curation practices, and about the cutting edge analytical techniques applied to the materials. Finally, they will bring all this information together to gain a 'big picture' of why it is interesting and important to study extraterrestrial material. At the end of each week, there will be a quiz to test their understanding of the material, and then a final quiz that covers the whole course; we are still in debate about whether or not to award a Certificate of Completion to participants. There will be a forum for participants to ask questions or discuss issues, possibly through a twitter feed or facebook page. It will not be moderated by members, but will operate through peer pressure and be subject to the usual rules of netiquette. Consortium members will be encouraged to monitor the forum on a semi-regular basis to ensure that the discussions are sensible. The first presentation of the MOOC (now scheduled for April 2017) will be delivered in English; future presentations will be rolled out in French, Spanish, Italian and German.

Delivery Platform: The reason why the MOOC has not yet been launched is because of a delay in determining which platform would be most suitable to host the material. Originally, it was planned to use FutureLearn, *via* the Open University, but because that has not been possible (change in OU policy on funding of MOOCs), we have had to seek an alternative platform. The materials have been written in a format that is ready to be transferred to EdX (one of the largest MOOC platforms), but we are also considering the European SchoolNet Academy (<http://www.europeanschoolnetacademy.eu/>), which would then also link directly to our school education resources, and would also link in to the EuroPlanet network. There are pros and cons to both platforms: EdX has a higher and more varied audience of potential global participants, but the European SchoolNet Academy is closer to our target audience.

Target audiences: (i) secondary school and university students seeking additional challenges beyond their respective curricula; (ii) school teachers who wish to enhance their knowledge of space and planetary sciences, giving them additional material for their lessons and (iii) the section of the general public that maintain an interest in astronomy and planetary sciences.

Breakdown of Presentation:

- Week 1: What is extraterrestrial material?
Meteorites, Cosmic Dust, Space Debris, Remote Observation
- Week 2: Where does extraterrestrial material come from?
Asteroid Belt, Moon, Mars, Comets
- Week 3: How do we acquire extraterrestrial material?
Fall, Find, Atmosphere, Ice, Sample Return Missions
- Week 4: How do we look after extraterrestrial material?
Planetary Protection, Curation
- Week 5: How do we analyse extraterrestrial material?
Non-Invasive, Invasive, Destructive
- Week 6: Why is it important to study extraterrestrial material?
Solar System formation and Evolution, Impact possibilities



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Introductory page of the MOOC:



🌐 Free online course ⌚ Duration: 6 weeks ⌚ 3 hours pw 📄 Certificates available

FUNDING



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ABOUT THE COURSE

What is the chance of the Earth being hit by a meteorite? Might we all be wiped out, like the dinosaurs? What would cause such a catastrophe?

In this 6 week course, you will find out about the range of materials that falls to Earth, where it all comes from and how it is collected. You will learn how scientists look after this valuable material, and the sort of equipment they use to study it. You will think about why it is interesting and important to study extraterrestrial material – and find the answer to whether you might suffer the same fate as the unlucky dinosaurs

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Outline of the content material for week 1:

Segment	Section	Title	Image	Ref:	Video	Ref:	Other Assets	Time (min)
Week 1: What is Extraterrestrial Material ?								
Hour 1								
Segment 1	1.1	Introduction to the Course			MMG introduces course	N		5
		Introduction to ET Material	Montage of meteorites	N				5
		Observed to fall: forward look to W2			Chelyabinsk	Youtube		5
Segment 2	1.2	Found by chance: forward look to W3	Antarctic meteorite					5
		Meteorites: unsorted	Allende hand specimen	MMG				20
Segment 3	1.3	Meteorites: melted, stone	Eucrite hand specimen	MMG			Link to Virtual Microscope	10
			Eucrite thin section	MMG				
		Meteorites: melted, iron	Iron meteorite (Gibeon or Hensbury)	MMG				
		Meteorites: melted, stone-iron	Pallasite (Irnakt)	MMG				
Hour 2								
Segment 1	2.1	Cosmic Dust: Meteor		MMG				5
		Cometary dust forward look to W2	Comet tail	MMG				5
		Atmospheric and ice collection: forward look to W3	Melting ice, sieving water	Gounelle	Melting ice, sieving water	Gounelle		5
Segment 2	2.2	Fusion crust & micrometeorites		MMG				5
		Space Debris: what is it?						5
		Where does it come from?			Debris around Earth	NASA/Youtube		5
Segment 3	2.3	What can we learn from it?	Eurock foils	MMG				10
		Practical session: Find the meteorite					OpenScience Lab	20
Hour 3								
Segment 1	3.1	Remote Observations						5
		Ground-based telescopes						5
		Space-based telescopes						5
		Orbiters						5
Segment 2	3.2	Landers						5
		Quiz and Feedback						20
Segment 3	3.3	Summary						10
		Look Ahead						10