

EURO-CARES: THE EDUCATION AND OUTREACH OPPORTUNITIES OFFERED BY A EUROPEAN SAMPLE CURATION FACILITY. M. M. Grady^{1,2}, B. Dryer¹, S. Russell², J. Aléon³, L. Berthoud⁴, J.R. Brucato⁵, L. Ferrière⁶, M. Gounelle³, A. Hutzler⁶, A. Meneghin⁵, C. L. Smith², F. Westall⁷, and the EURO-CARES Consortium, ¹The Open University, Milton Keynes, MK7 6AA, UK, ²The Natural History Museum, Cromwell Road, London, SW7 5BD, UK, ³Museum National d'Histoire Naturelle, 57 rue Cuvier, 75005 Paris, France, ⁴TAS UK, Coldharbour Lane, Bristol, BS16 1EJ, UK, ⁵INAF, Astrophysical Observatory of Arcetri, Firenze, Italy, ⁶Natural History Museum, Burgring 7, A-1010 Vienna, Austria, ⁷CNRS- CBM, rue C. Sadron, 45071 Orléans, France. (monica.grady@open.ac.uk).

Introduction: EURO-CARES (Figure 1) is an EU-funded project with the goal of preparing a roadmap of the stages required to establish a European facility for the curation of extraterrestrial materials, particularly materials collected by sample return missions. The project is part of the European Commission's Horizon 2020 programme, and runs for three years from January 2015. It is led by the Natural History Museum in London, and has partners in thirteen institutions from six EU countries. A complementary abstract [1] outlines the main scientific and technical aspects of the project, and the teams that have been established to undertake the work; here, we consider the educational and outreach opportunities that the project offers.



Figure 1: EURO-CARES logo.

Progress to date: The first year of EURO-CARES has offered relatively little opportunity for major educational and outreach initiatives, mainly because the different teams are laying the groundwork for the specific tasks that have to be accomplished. Basic communication outlets, such as a website (www.euro-cares.eu), facebook page, and twitter account (@EuroCares) are in place, and these will be employed to build a 'presence' for EURO-CARES on social media that will ensure international awareness of the project. We have different goals for the short term (whilst the project is in progress) and the long term (once (if) the facility is agreed and the build phase commences).

Short Term (2015-2017): One of the most important aspects of the education and outreach programme is its commitment to training. Curation of ex-

traterrestrial materials is a very specialized field, and requires a breadth of skills beyond academic knowledge of the material being curated. Practical skills, such as techniques of sample manipulation (both manual and semi-autonomous), must be taught, along with understanding of planetary protection, documentation, and data management requirements. Working with all the EURO-CARES teams, we will be designing a course which covers the different aspects of sample curation – bearing in mind the different requirements for samples from Mars, Moon, and asteroids and cometary dust, and eventually, ices, organic samples, and gases. The course will be aimed at postgraduates and final year undergraduates. In order to draw on the best possible information, we will be inviting international participation in building the course.

Any course in sample curation is dependent on having a cohort of students to teach – and those students have to have the correct scientific and technical background. So the EURO-CARES education programme will start at a much earlier stage than university level, by producing teaching resources for different levels. One of the complications of a pan-European project is that national curricula and learning expectations vary in different countries (and even within countries – the nation states that comprise the UK have separate curricula). We will focus our efforts at three age-groups: below 10 yr, 10 – 16 yr, over 16 yr. We hope to produce material in English, French, German, Spanish, and Italian; team members will assist in translation of resources. The resources will be web-based, and will include the ability to undertake remote experiments (use of microscopes, simple chemical tests, micro-manipulation of samples, etc.) through the OU's Open-Science Lab (www.open.ac.uk/researchprojects/open-science/).

Although the outcome of the EURO-CARES project is not a detailed business plan for development of a European Sample Curation Facility (ESCF), the production of such a plan will eventually be required. One of the aims of the EURO-CARES education and outreach programme is also to keep the need for an ESCF on the political agenda within Europe. This entails maintaining a high profile for EURO-CARES, both with politicians, and within the general public. The

start of Year 2 sees this part of the project being put into effect, with a series (at least monthly) of curation-related stories being promoted through EURO-CARES social media tags.

Along with frequent communication, an education resource for the general public will be developed, in the form of a MOOC (Massive Open On-line Course), to be deployed, at least in the first instance, on the FutureLearn Platform (<https://www.futurelearn.com/>). It is anticipated that, eventually, the material will be translated for publication in other languages on additional platforms such as iVersity (<https://iversity.org/>). Because it is unlikely that a course on basic sample curation would attract much interest amongst the general public, the MOOC will centre around planetary exploration, and the search for life beyond Earth, enabling issues of planetary protection, etc., to be considered in a wider context. To encourage people to follow the short course, they would be offered the opportunity to gain a ‘badge’, which could be displayed on a LinkedIn profile, etc., to show that they had completed the course and had some proficiency in the subject (Figure 2).



Figure 2: Example of ‘badge’ awarded for completion of a MOOC in Planetary Exploration. The ‘badge’ contains embedded information about course content (Background deliberately pixelated).

As part of the awareness-raising programme, the EURO-CARES education and outreach team is preparing to take part in a series of European Science Festivals (potentially at Edinburgh, Orléans and Vienna, as well as at other locations throughout Europe), where the idea of a Curation Facility will be presented to the general public. EURO-CARES also aims to participate in the Summer Science Exhibition organized by the Royal Society in summer of 2017.

The last idea that the education and outreach programme hope to pursue is to produce an animated cartoon, showing the adventures of a pair of tweezers. The adventures will be based around Tizzy, a semi-autonomous set of tweezers (for example, see <http://i.imgur.com/IxvnQ1F.gif>), who will be seen out

in the field (in space!) collecting samples (e.g., rocks) and in the lab. The inspiration for the idea comes from the very successful Rosetta cartoons produced by ESA (<http://sci.esa.int/rosetta/53593-outreach-resources/#once-upon-a-time>), and will be aimed at children, but suitable for all ages.

Longer Term: The ESCF will be a restricted site, but will still be expected to host visitors. One possible model for this is a ‘Discovery Centre’, analogous to that which runs alongside the Astrophysics Dept. at Manchester University (<http://www.jodrellbank.net/>). Such a Centre would welcome visitors of all ages, especially groups of school students for directed learning activities and would hold Open Days for the general public. It would not be sufficient merely to have cameras focused on staff inside the facility, watching them at work. There must be a museum-style exhibition within the Centre, with ‘hands-on’ activities.

The aim of one of the main EURO-CARES project teams is to outline the instrumentation required within an ESCF to conduct preliminary examination of returned extraterrestrial materials for research. The presence of such equipment will allow staff to carry out their own research on the material. Visiting researchers would also be welcomed at the ESCF, both to work with staff in selection of materials, or to undertake individual short-term research projects using the available instrumentation.

The ESCF will also become an international training facility for students, giving them direct experience of working with planetary materials, beyond that which would be provided by the original web-based course.

References: [1] Hutzler A. et al. (2016) *LPS XLVII* #1937.