THE EUROPEAN STUDENT MOON ORBITER AND ITS BIOLOGICAL LUNAR EXPERIMENT: A UNIQUE OUTREACH MISSION TO THE MOON. J. Davidson[1], S. Bartlett[1], A. Carter[1], M. A. Cornwall[1], B. J. Dryer[1], C. D. Fernandes[1], S. K. Harrison[1], I. H. S. Janmohamed[1], J. P. Mason[1], V. Masteika[1], A. K. R. Morris[1], S. Otter[1], T. Tomkinson[1], and P. T. Wilkinson[1], [1]PSSRI, The Open University, Milton Keynes MK7 6AA, UK, CEPSAR-ESMO@open.ac.uk.

Introduction: *ESMO.* The European Student Moon Orbiter (**ESMO**) is a mission to the Moon with a difference: it is being designed, built and operated solely by research students from ESA's member states [1].

ESMO will be the first European student mission to the Moon and is supported by the European Space Agency (**ESA**) through the Education Satellite Programme.

Despite carrying scientific payload, ESMO is primarily an outreach mission designed to inspire the future generations of space explorers and scientists.

A preliminary launch date is set for 2011/12.

BioLEx. Our team, based at the Open University, is currently developing ESMO's primary science payload: the Biological Lunar Experiment (**BioLEx**). BioLEx aims to further our understanding of the effects of spaceflight conditions on bacterial growth during Earth-Moon transfer.

Studying microbial growth in space may provide insight into the validity of the panspermia theory (seeding life on planets by the transfer of organisms through space) and whether microbial growth rates are rapidly increased in microgravity. Despite this, no such experiments have been performed beyond low earth orbit (LEO) since the Apollo program. This makes BioLEx a unique opportunity to study microbial growth in the different radiation environments within, and beyond, the Van Allen belt.

BioLEx will also illuminate the difficulties in transporting biological organisms to, and maintaining them on, the Moon. This is particularly important if humans are to return to the Moon and has relevance to Contained Ecological Life Support Systems (CELSS) for long duration manned space exploration. This will be vital if we ever hope to send manned missions to Mars.

The launch of ESMO will coincide with a period of solar maximum which is ideal for testing organic survival in extreme conditions owing to the associated increase in solar radiation.

Outreach: One of ESMO's key mission objectives is to acquire images of the Moon and transmit them back to Earth for education/outreach purposes. This will be achieved by the core payload, a Narrow Angle Camera, which will optically image specific locations on the lunar surface upon request from schools [1].

ESMO is therefore a crucial education/outreach endeavour for inspiring future generations of scientists, whilst training the current generation of research students.

BioLEx team members are very active in organising and implementing various outreach activities, including:

- Talks within schools,
- Participation in science festivals to bring ESMO and BioLEx to the general public (Fig. 1),
- Dissemination of information through our website (http://www.open.ac.uk/pssri/esmo: Fig. 2),
- Submission of literature to various publications to raise awareness of ESMO and BioLEx within the professional and amateur scientific communities.

A full list of outreach activities can be found on our website.

Figure 1. ESMO/BioLEx outreach display, including a microscope with microbial specimens, during the Milton Keynes Science Festival (October 2008).

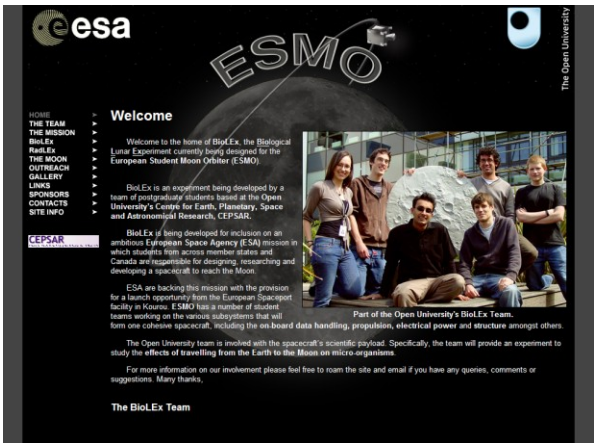

Figure 2. To find out more about BioLEx and our involvement in ESMO visit us online at: http://www.open.ac.uk/pssri/esmo

Experimental: The BioLEx experimental set-up (a microbial culture control and analysis instrument) is capable of producing repeatable growth curves in different environments. It uses an automated nutrient injection system to control the growth of spore-forming bacteria which are suspended in high purity nutrient-free water and held in a growth chamber. To initialize growth, nutrients are pumped into the chamber and this growth is monitored by measuring optical density through the chamber with an LED light source and an LDR detector. When the growth nutrients are depleted, and bacterial growth is complete, the cells form spores and lay dormant until another growth cycle is initiated. Testing of the BioLEx instrument has produced high quality repeatable growth curves.

Summary: The ESMO mission provides an ideal opportunity to increase public awareness of lunar missions and to train the current generation of space/planetary science students whilst also conducting novel science via the BioLEx scientific payload.

References: [1] Walker, R. and Cross, M. (2008) *NLSI* Lunar Science Conf. #2160.

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