

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 3 (2C)

Author: Dr. Christiane Heinicke
ZARM, University of Bremen, Germany, christiane.heinicke@zarm.uni-bremen.de

Dr. Steven Jaret
Stony Brook University, United States, steven.jaret@stonybrook.edu
Dr. Jens Ormö
Centro de Astrobiologia (INTA-CSIC), Spain, ormoj@cab.inta-csic.es
Ms. Miranda Fateri
DLR, German Aerospace Center, Germany, miranda.fateri@dlr.de
Ms. Nina Kopacz
Utrecht University, The Netherlands, k.a.kopacz@uu.nl
Dr. Mickael Baqué
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR), Institute for Planetary Research, Germany,
mickael.baque@dlr.de
Dr. Cyprien Verseux
Institute for the Dynamics of Environmental Processes (IDPA), CNR, Antarctica,
cyprien.verseux@gmail.com
Dr. Alberto Razeto
Ospedale Civile di Imperia (A.S.L. 01 Imperiese), Italy, alberto.razeto@concordiastation.aq
Prof. Bernard Foing
ESA/ESTEC, ILEWG & VU Amsterdam, The Netherlands, Bernard.Foing@esa.int

HOW A LABORATORY ON THE MOON SHOULD BE EQUIPPED

Abstract

The Moon is at the center of attention in many current plans for spaceflight activities, particularly manned missions. Significant progress has recently been made in the transportation to the Moon, and several institutes work on systems and system components to support human life on the surface of the Moon. One of these activities is project MaMBA (short for Moon and Mars Base Analog) which is located at the ZARM in Bremen and that is dedicated to creating a full-scale, technologically functioning habitat.

Unlike MaMBA, most of these projects focus on habitability alone – neglecting scientists’ desire to perform meaningful analyses, using the advantages of human presence at the location of interest. This approach is concurrent with how most spaceflight missions have been implemented in the past, adding scientific instruments after most of the engineering work is already finished. This often limited scientific studies to relatively scattered, insular topics.

One of the main goals of project MaMBA is therefore to create a base that allows scientists to comprehensively study the most relevant areas of interest. Our focus is the in-base laboratory, and any equipment that should be available inside the habitat, but we also take into consideration instrumentation that may more efficiently be placed outside the habitat and/or on-board of rovers. The purpose of the habitat laboratory is to perform some basic investigations; in-depth analyses of selected samples are supposed to remain within the responsibility of Earth-based laboratories. However, the base may help chose which samples should be sent to Earth for further analysis.

The authors of this paper represent different disciplines with a particular interest in scientific exploitation of the Moon. These represented disciplines are: astrobiology and astrochemistry, geology, materials science, medicine, and astronomy. We will present what we deem some of the most important questions that could be addressed on the Moon, and how these may be addressed efficiently instrument-wise. We will consider synergies between the different disciplines, saving weight and space wherever possible, and make recommendations for a to-be-built lunar base. While the direct addressee of our recommendations is the MaMBA laboratory, most of them are also applicable to general non-terrestrial surface laboratories.