

**MOON VILLAGE WORLDWIDE ACTIVITIES: UPDATE FOR LPSC2018 & APOLLO16/17 TRIBUTE.**

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**Summary:** With special tribute to Apollo 16 & 17 astronauts J. Young, E. Cernan & J. Schmitt, we give an update of Moon Village (MV) activities, with emphasis on events that took place in 2017. The Moon Village is an open concept proposed with the goal of a sustainable human and robotic presence on the lunar surface as an ensemble where multiple users can carry out multiple activities. [1-3].

**Why a Moon Village?** Multiple goals of the Moon Village include planetary science, life sciences, astronomy, fundamental research, resources utilisation, human spaceflight, peaceful cooperation, economical development, inspiration, training & capacity building.



Fig 1: a possible step towards the MoonVillage using robotic with 3D printing to consolidate inflatable domes against radiation and meteorites before the arrival of astronauts

**How did the Moon Village start?** ESA director general has revitalized and enhanced the original concept of MoonVillage discussed in the last decade. Space exploration builds on international collaboration. COSPAR and its ILEWG International Lunar Exploration Working Group (created in 1994) have fostered collaboration between lunar missions [4-8]. A flotilla of lunar orbiters has flown in the last international lunar decade (SMART-1, Kaguya, Chang'E1 & 2, Chandrayaan-1, LCROSS, LRO, GRAIL, LADEE). Chinese Chang'E 3 lander and Yutu rover. Upcoming other landers from 2018 (GLXP, Chang'E 4 & 5,

SLIM, Luna, LRP) will constitute a Robotic Village on the Moon.

**Moon Village Workshops/activities at ESA Centres:**

Moon Village Workshops held at ESA centres in 2015-2016 at ESTEC or EAC/DLR were reported [45, 28-36]. In 2017 MoonVillage ESA interdirector group meetings and seminars, *EuroMoonMars workshop* were held with senior experts as well as Young ESA professionals to discuss general topics and specific issues (habitat design, technology, science and precursor missions; public and stakeholder engagement). Dedicated ESA studies were started on mission scenarios (GO et al), building blocks (DB,ML), 3D Manufacturing & ISRU (LP, NA, MG).

**Moon Village workshops with community in 2017**

A number of MoonVillage talks and/or interactive jam sessions conducted at International workshops and symposia in 2016 have been reported at LPSC 2017 [45, 16-27]. In 2017, Moon Village Workshops MVWS or sessions were also conducted at international symposia or in collaboration with specific universities or institutes (we give here events, and initials of main co-organisers listed in acknowledgements\*):

- WdeKooning Acad. Arts Rotterdam: King of Moon (NV)
- ISU Strasbourg MVWS & design projects 6 March 2017
- ISAE Supaero Toulouse MVWS & design 7 March (SDM)
- ESTEC PMAS simulation workshop 16-18 March (SH)
- Paris SGAC European meeting 24-25 March (HG)
- London Ontario SW Uni Exploration day 4-5 April(JC)
- McGill Montreal Moon Village workshop 6-7 April (VF)
- Stuttgart Architecture Moon Village Projects April-August
- Cannes Innov. Centre/O'Sol MVWS 5-6 May (PS, EGB)
- Stuttgart Architecture MVWS & projects ESTEC 8-9 May
- Munich Airbus/ESA MVWS 31 May (P-A J, LF)
- Stuttgart Architecture MVWS & projects mid review 30 May
- Seoul KICT MVWS 1-2 June (TSL, BF)
- Paris Obs. Astronomy from Moon WS 21 June (JS, BF,AD)
- Salon du Bourget Air & Space 22-23 June MVWS (
- Torino SGAC MVWS 29 -30 June (HG)
- Etna ROBEX DLR campaign 29 Jun- 2 July (AW, MW)
- LunAres Base installation expeditions (AK, AL)
- LunAres Base PMAS campaign (SH, AK)
- LunAres Base LunEx1 campaign (AK, MH)
- LunAres Base IcAres campaign (AK, CH)
- Budapest MVWS 31 Oct (TP)
- VU Amsterdam/ESTEC Planetary design 9 Nov-11 Dec

**Moon Village talks at 2017 international events**

- Global Space Congress Abu Dhabi UAE 30 Jan-1 Feb

- UN COPUOS Action team on Exploration 5-7 Feb 2017  
 - UN COSPAR explo workshop Vienna 25 April, 22 May  
 - European Lunar Symposium & New Views of Moon , Muenster 2-4 May (HH, CN)  
 - ISDC ST Louis (with ESA DG J. Woerner) 1-2 June  
 - GLEX Global Exploration Conf Beijing 6-8 June  
 - Concordia U Montreal MVWS 11-12 Aug (M-P B.)  
 - Global Hands on Universe , Bowling Green 16-17 Aug  
 - Nashville Adventure Sci Center, Eclipse 19-21 Aug (JI)  
 - EPSC European Planetary Science Congress Riga, Moon Village Science, Explo. Technology Foresight 18-21 Sep  
 - Adelaide Australia IAC Intl Astronautical Congress A3 exploration symposium & plenaries 25-29 Sept  
 - Hawaii International Moon Base Alliance 1-4 Oct (HR)  
 - Columbia, LEAG Lunar Expl. Analysis Group 10-11 oct  
 - Bremen Space Tech 24-26 Oct  
 - ISU MVA MVWS 19-21 Nov (GR, CW, JM, AK)  
 - ESLAB ESTEC Extreme Habitable Worlds 4-8 Dec (ESN)  
 - MoonVillage Global Science Opera (performance over 15 countries including ESTEC event) 13 Dec (O. B.-O.)

**Perspectives for MoonVillage:** A number of MoonVillage activities are planned. “The Moon Village will rely both on automatic, robotic and human-tendered structures to achieve sustainable moon surface operations serving multiple purposes on an open-architecture basis.”

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