ILOA 5 Moon Missions, Galaxy Forum, First Women on the Moon Update Toward 2020

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International Lunar Observatory Association (ILOA) is making tangible progress on all 5 of its missions with the vision of advancing observation and communication from our Moon, and help catalyze Human Lunar build-out at the Moon South Pole. The ILO-1 flagship mission to the Moon South Pole, in collaboration with Canadensys Aerospace Corporation and Moon Express, is gathering potential contributions and investments. The precursor ILO-X is preparing for flight, with Canadensys completing final testing of the omni-directional imager instrument for lunar surface operation including potential lunar night survival. ILO-X may launch to the Moon on a commercial USA lander in 2021. ILOA Lunar-based Ultraviolet Telescope (LUT) collaboration with National Astronomical Observatories of China is making another major advance with co-sponsorship of a dedicated research fellow to analyse LUT data and publish scientific results. Finally, the ILOA Human Moon Mission is poised to approach realization through a major international conference Galaxy Forum Hainan in China on 25-28 February 2020 with the theme "International Human Moon Landings" and secondary theme "Astronomy from the Moon". The ILOA Galaxy Forum program has already hosted nearly 100 events in over 16 countries. The First Women on the Moon initiative is another important component of the Human Moon Mission effort, now working with Moon Village Association, World Space Week, and others. Through collaboration with international space agencies, commercial enterprises, and potential participation in NASA's Artemis program, ILOA is prepared to be a major contributor to the exploration of the Galaxy, Moon, and everything in-between. First women on the Moon in 2024 is a vital step toward establishing a sustainable Human Multi World Civilization.

Life at the "Moon Village": how imagination and environment entangle to bring new 'worlds'

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The idea of 'conquering' a 'new (and exotic) world' to have a brighter future is not uncommon. The Moon, located in outer space, is an 'alien' place for the general public, gathering a lot of fantasies and imagination on what it entails. Additionally, life on such an 'extreme' environment for a long period has significant physical impacts on the human body. Yet, it can also be considered 'familiar': Moon being the closest extra-terrestrial object to earth, and this year marking fifty years since the success of the Apollo mission. Now, scientists are actively working on technologies allowing the human body to stay in outer space, marking the next step of "life on Moon" a plausible reality. This paper explores the socio-cultural way we envision life at the "Moon Village", from an anthropological perspective. Drawing upon the key notion of the "extreme"[1] for contemporary understandings of outer space, I explore how current (cultural) considerations on life on the Moon are envisioned and made 'acceptable'. It is by bringing together the familiar and the alien, the past, present and imagined future experiences that it becomes an organisational tool for 'worldbuilding'. Thus, the "Moon Village" we aspire to create is currently inhabited in our minds: this means that we cannot think of 'the Moon' as a sterile space where culture is inexistent.

[1] Valentine, D., Olson, V. and Battaglia, D. (2012). Extreme: Limits and Horizons in the Once and Future Cosmos. *Anthropological Quarterly*, 85(4), pp.1007-1026.

Deep Space Gateway is Our Laboratory of Radiation Research for Living in Space

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Beyond the International Space Station (ISS), NASA leads the way in the journey into deep space near the Moon. In deep space, there is no protection from the atmosphere and much more magnetic shielding against space radiation is needed than at ISS. Space radiation can damage DNA, resulting in gene mutations and chromosomal aberrations. Consequently, exposure to space radiation may lead to an increased risk of cancer and mortality in long-term manned space missions. In outer space, a microgravity environment also prevails. Moreover, on the Moon, the gravity is one-sixth of that on Earth. However, we have no clear understanding of how the effects of space radiation are altered depending on the level of gravity experienced. I consider that the Deep Space Gateway is an appropriate laboratory of radiation research for living in space such as a settlement on the Moon. Here, I introduce our approach with ground-based simulated *in vitro* experiments [1, 2] using our 3D-clinostat synchronized irradiation system [3, 4], and *in vivo* experiments using hindlimb unloading [5]. I also propose future experiments to be performed in deep space.

REFERENCES

[1] Ikeda H, *et al*. (2019) Int J Mol Sci, 20:4791.
[2] Hada M, *et al*. (2019) Int J Mol Sci, 20:43.
[3] Ikeda H, *et al*. (2016) Biol Sci Space, 30:8-16.
[4] Ikeda H, *et al*. (2017) Life Sci Space Res, 12:51-60.
[5] Takahashi A, *et al*. (2018) Int J Mol Sci, 19:3959.

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