TEAM INDUS
LAB2MOON

SCAP
SOCIEDAD CIENTÍFICA DE ASTROBIOLOGÍA DEL PERÚ
EXPLORACIÓN E INVESTIGACIÓN PARA LA CIENCIA EN EL PERÚ

TEAM KILLA LAB

Natural Biofilm Biotech
Mission : NatBio Mission

Team:
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Saul perez (exploration)
Haydee montoya(microbiology)
Sergio santa maría (payload)

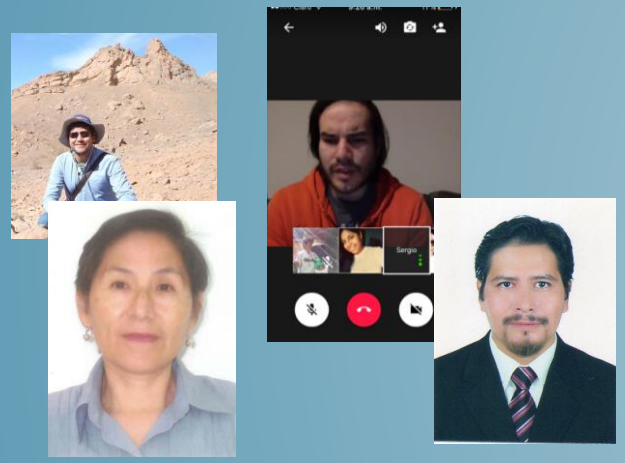
Speaker: Ruth Quispe
Web page: www.killalab.org.pe

FOR PRESENTATIONS

JOURNEY

How do we start?

ADVISORS FOR THE PROJECT



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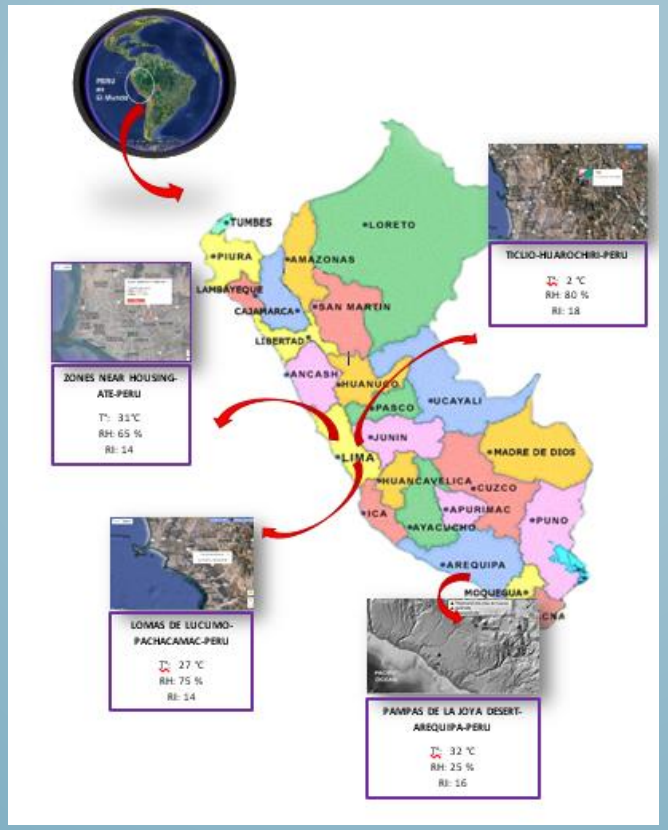
COLLECTION OF BIOLOGICAL SAMPLES IN VERY REMOTE PLACES



TO COMLEMENT BIOLOGY WITH ENGINEERING

Natural Biofilm Biotech Mission

WHY CYANOBACTERIAS?

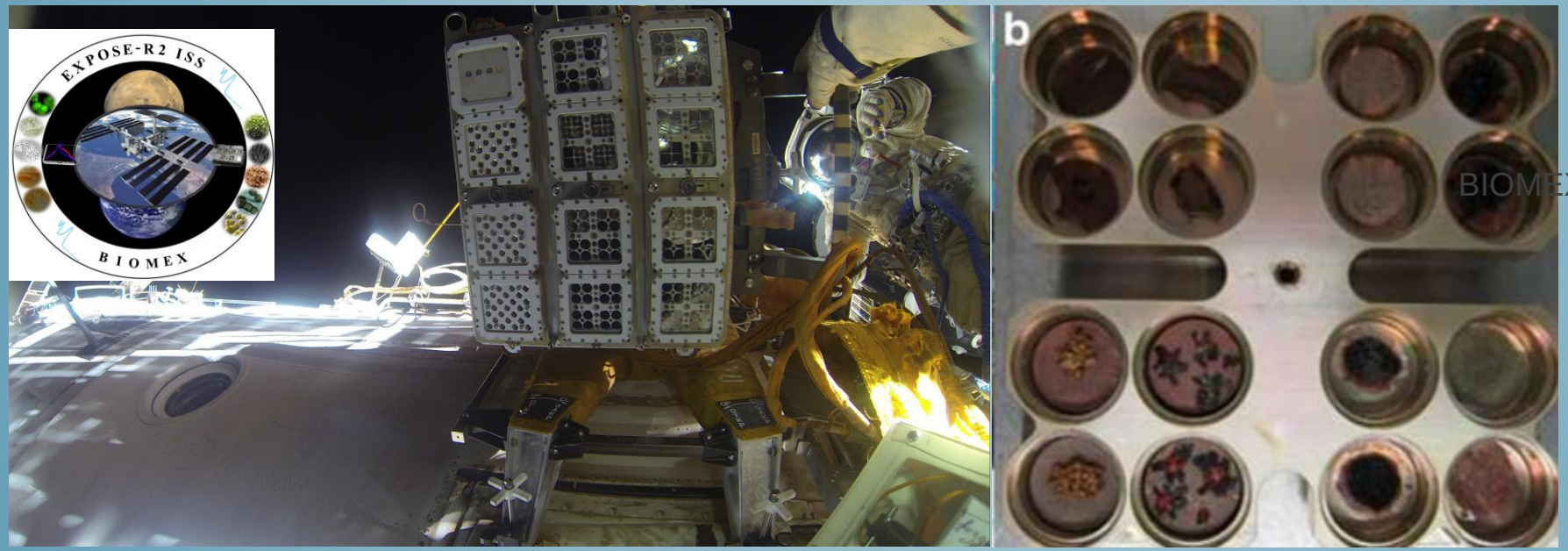
- Are ubiquitous and have adapted to live in some of the most extreme environments on Earth.
- Excellent for ISRU systems.
- Good heritage information on space research.

WHY EXTREME BIOFILMS?

- Biofilms are complex
- Biofilms are composed by cyanobacterias and microalgaes (with metabolites) collected on expeditions from peruvian extreme enviroments.
- Biofilms were identify with this morphology under microscope.
- Biofilms could be alive and dormant.
- Biofilms that have grown naturally have evolved years and are more complex than those that have grown in the laboratory.Real answer about survival state.

HERITAGE

- Cryomyces *antarcticus* , a fungi , was able to withstand and viable but no cultivable
- Adenine, adenine with nontronite (a kind of clay mineral detected on Mars) resist and chrysene and glycine with nontronite and Organic matter were degradated (1)
- The algal strains had to endure some 16 months on the outside of the ISS - with only neutral-density filters reducing the effects of radiation. Sensors measured and logged temperature changes and amounts of cosmic radiation.
- Two algae survived 16 months despite extreme temperature fluctuations and the vacuum of space as well as considerable UV and cosmic radiation. Only one specimen did not survive its space flight.



BIOMEX AND BIOSS ON EXPRES R2

1. Rouquette, L., Stalport, F., Cottin, H., Coll, P., Szopa, C., Saiagh, K., ... & Chaouche, N. (2016, October). Evolution of organic molecules under Mars-like UV radiation with EXPOSE-R2, a photochemistry experiment outside the International Space Station. In *AAS/Division for Planetary Sciences Meeting Abstracts* (Vol. 48).

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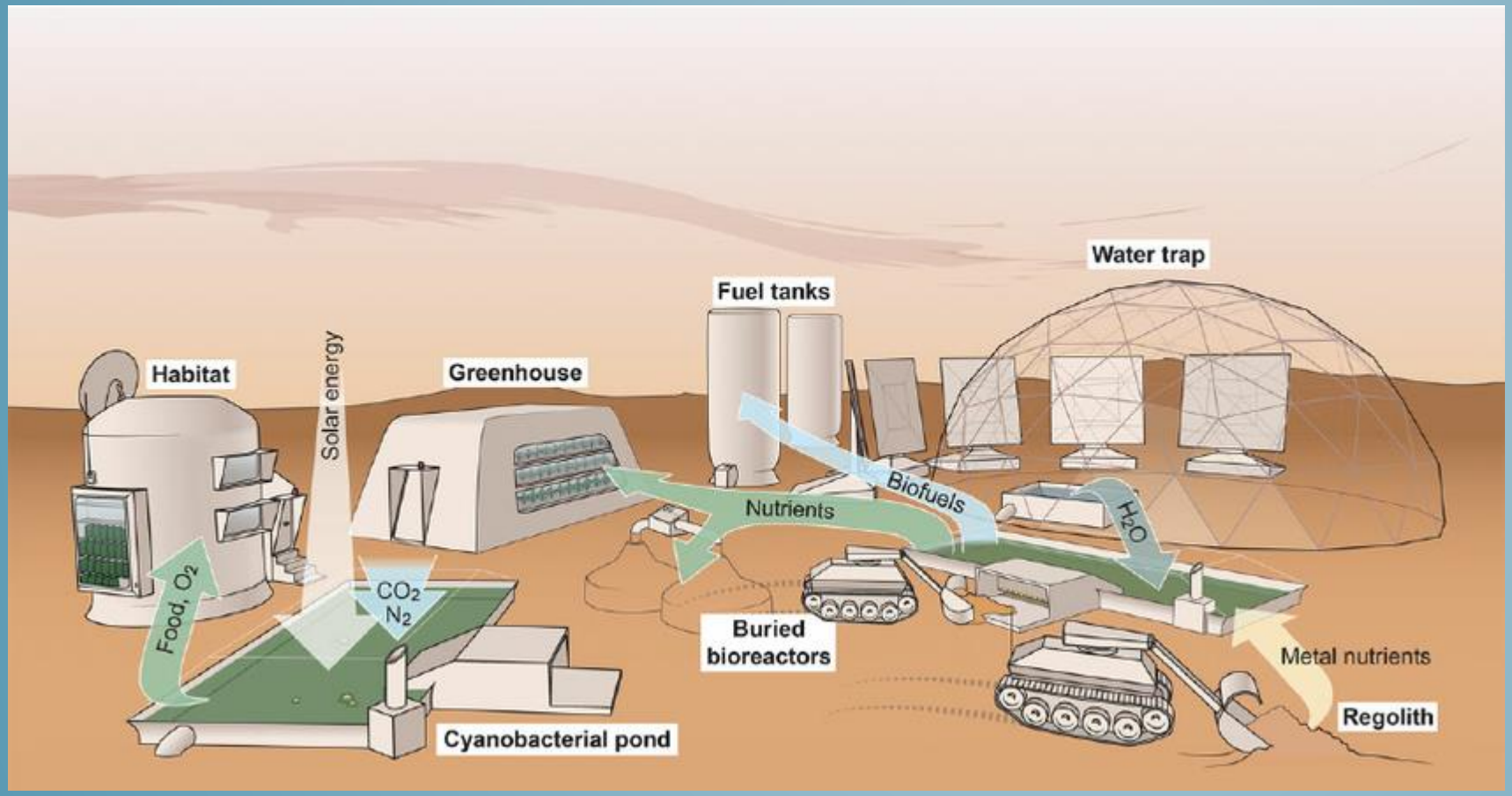
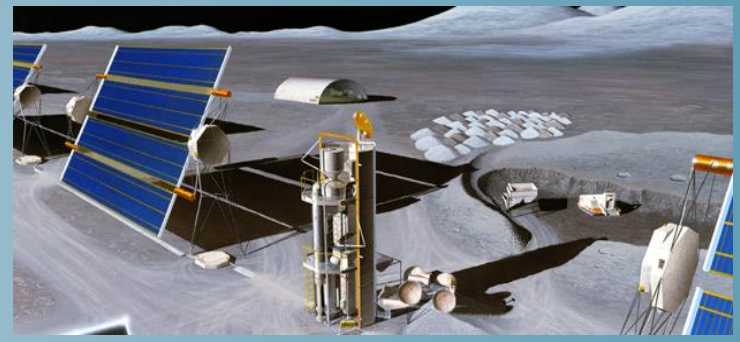
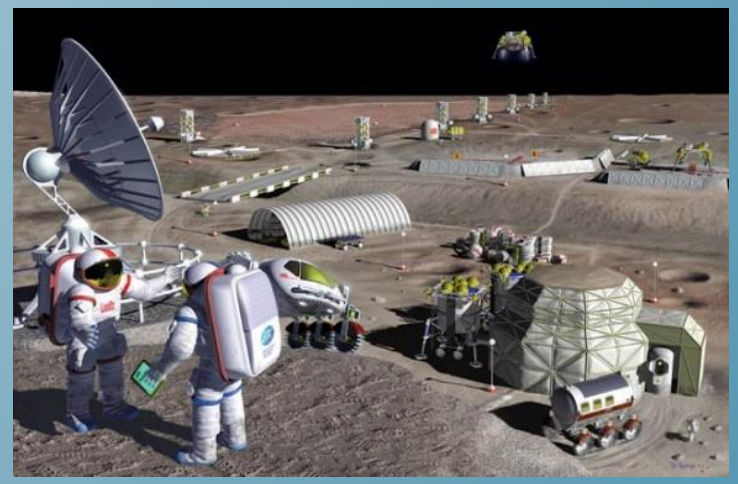
BIOFILMS FOR ISRU AND PRODUCTION OF BIOMATERIALS ,ENERGY AND FOOD.

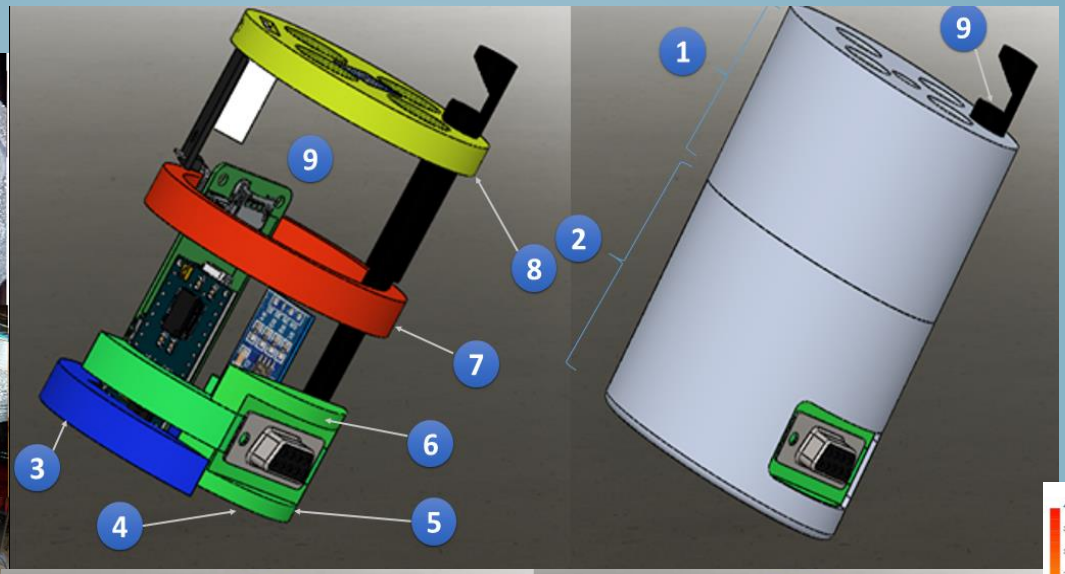
- TO UNDERSTAND IT WE MUST PUT IT ON THE MOON
- RADIATION Ionizing and non ionizing are FUNDAMENTAL.
- METABOLITES THAT BIOFILMS COULD RELEASED ON LUNAR CONDITIONS WILL BE USED FOR ISRU.

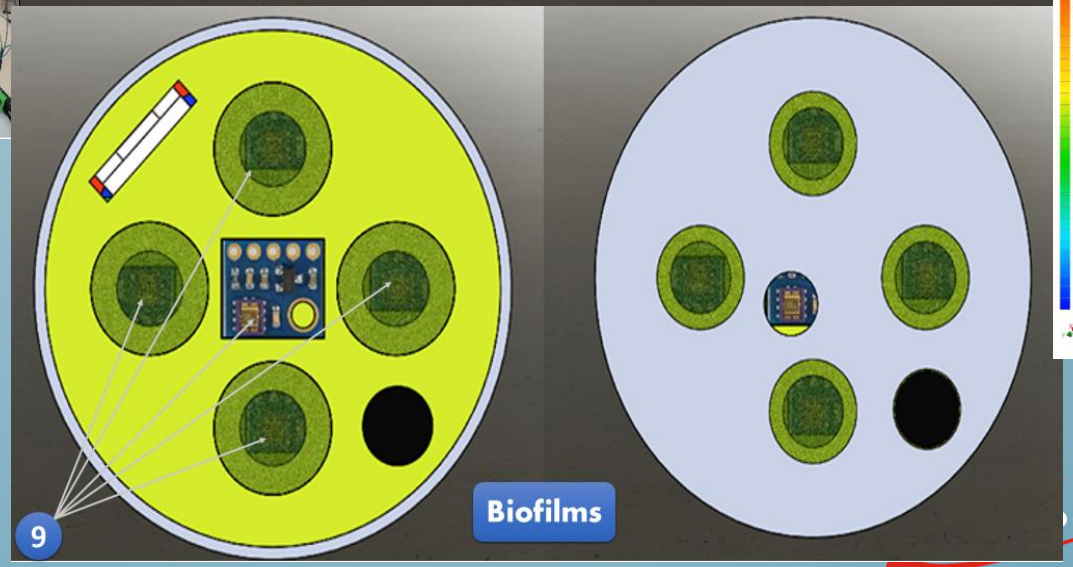


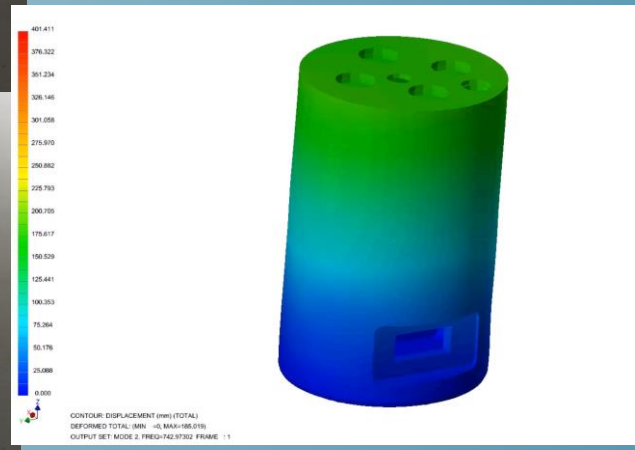




EXPLOITATION OF OPPORTUNITY







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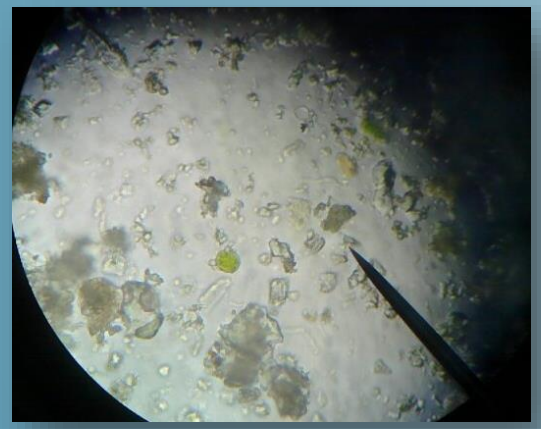
*Pampas de La Joya desert – Frange of Atacama desert.

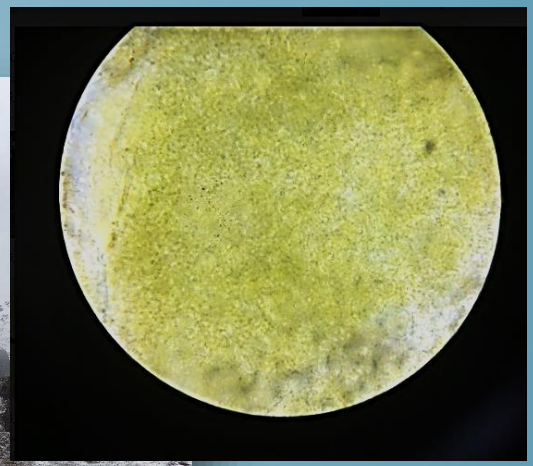
Denomination	Coordinates	Altitude (masl)	Relative Humidity (HR)	Temperature (°C)	Radiation index (mW/cm²)
Pampas de la Joya-Arequipa-Peru	16° 00' 00"S 71° 30´ 00´´ W	1000 – 2000 masl	Max 29% - Min 40 %	Max 36 °C - Min -5 °C	16



Microalgaes which are been cultivating in BG-11 in Peruvian [Natural History Museum]

*Ticlio – Region with large range of extreme temperaturas.

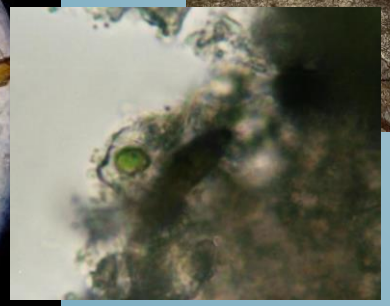
Denomination	Coordinates	Altitude (masl)	Relative Humidity (HR)	Temperature (°C)	Radiation index (mW/cm²)
Ticlio-Huarochiri-Peru	11°35'55" S 76°11'35" W	4818 masl	Max 82% - Min 77%	Max 09°C – Min - 02 ° C	18



Mostly they were *Nostoc sp*.

*Lomas de Lucumo – High UV radiation levels.

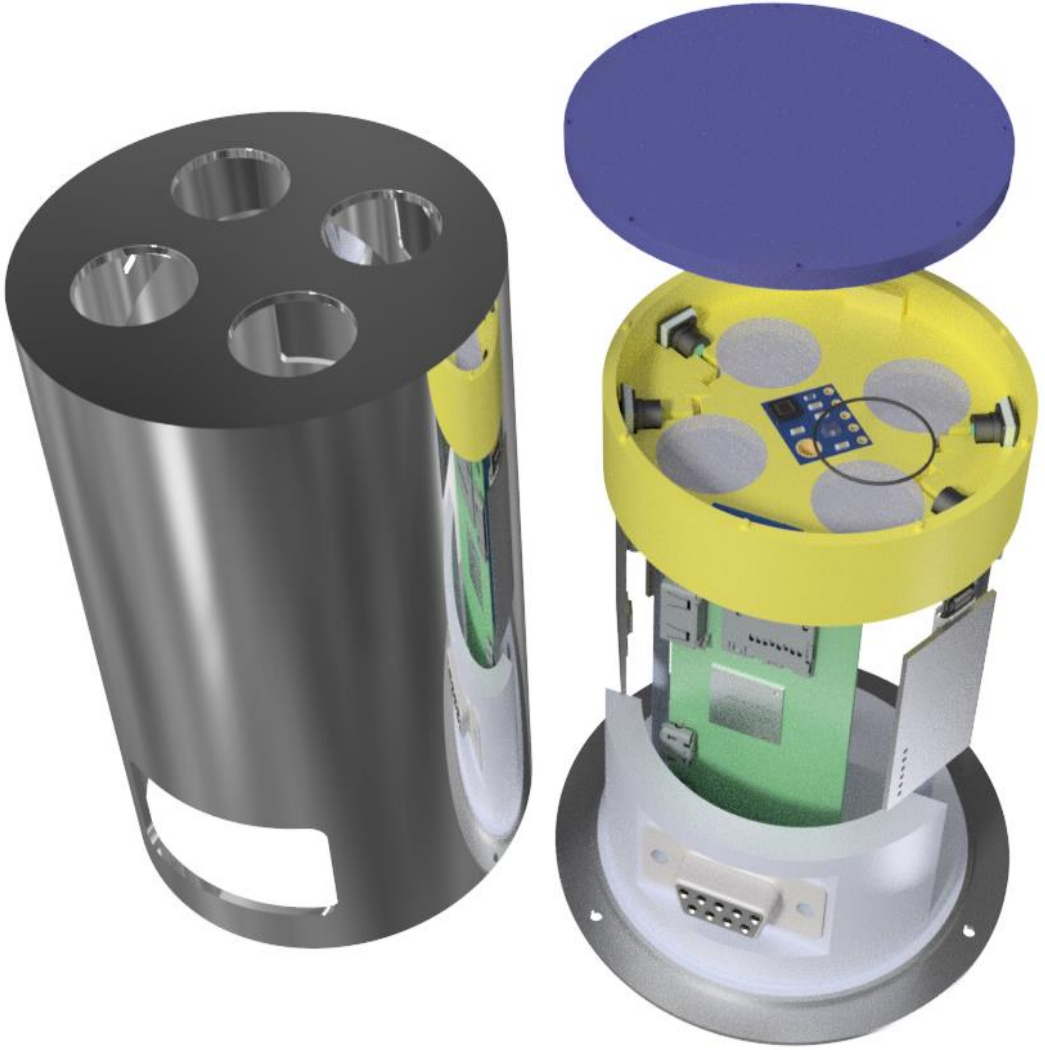
Denomination	Coordinates	Altitude (masl)	Relative Humidity (HR)	Temperature (°C)	Radiation index (mW/cm²)
Lomas de Lucumo-Pachacamac-Peru	12°13'0" S 76°45'0" W	770 masl	Max 71% - Min 92 %	Max 23°C - Min 27 °C	14



Ultraviolet radiation levels are highest along Peru's coast and the central and southern Andes of Peru, Bolivia, Chile and Argentina.
Source: National Institute of Water and Atmospheric Research (NIWA), New Zealand.

Mostly they were *Scytonemin sp. , which is know by UV filtration capacity.* (2)

Browne, N., Donovan, F., Murray, P., & Saha, S. K. (2014). Cyanobacteria as bio-factories for production of UV-screening compounds. *QA Biotechnol*, *3*, 1-7.

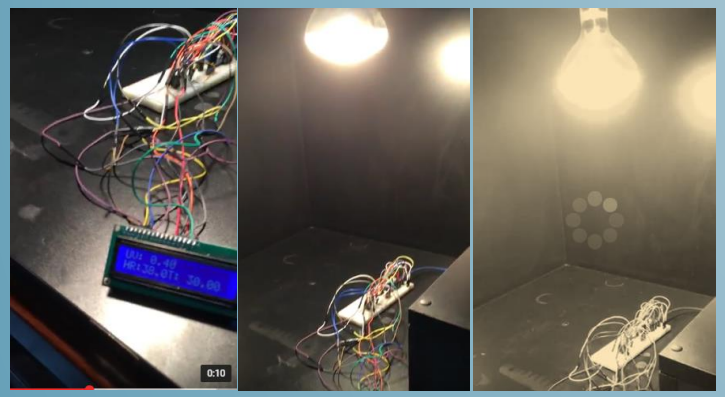


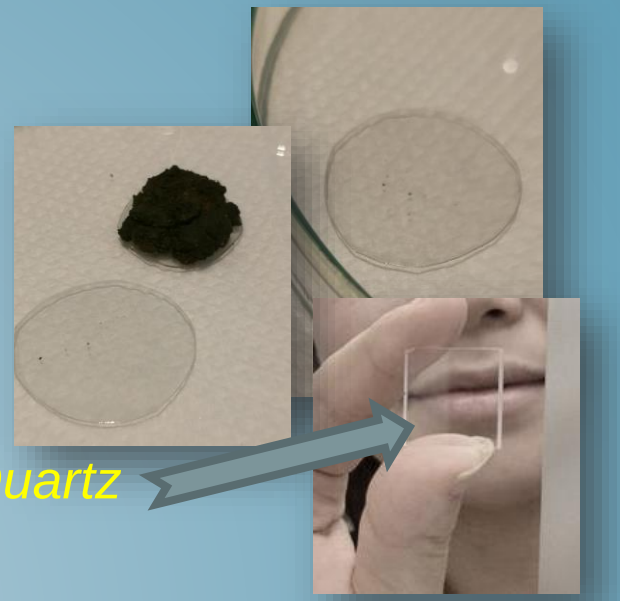
- 5 UV / Gamma Radiation Sensors (For Incidence and transmission measurments)
- 4 Nanoespectrometers (For pigment measurments)
- 1 microprocessor
- 1 Relative Humedity and Temperature Sensor
- 1 nanocamera
- Rs485 port

- 3 biofilm samples
- 1 control sample

Sterilization capacity of sample holders and additionally transmittance and resistance to UV and ionizing radiation

UV radiation camera test

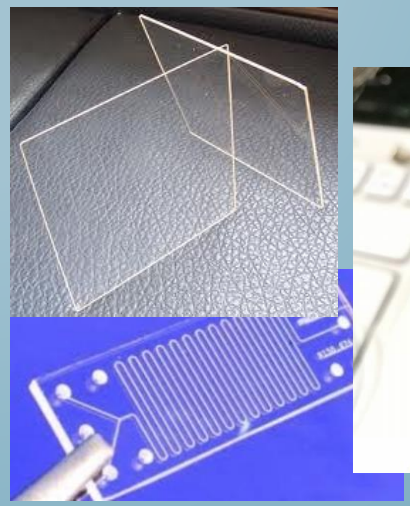


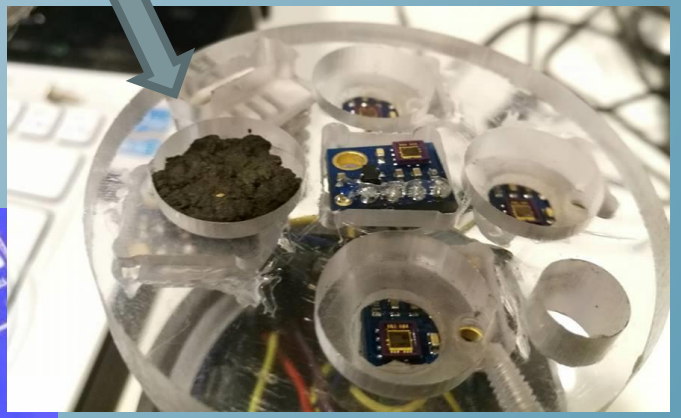


Crystal Quartz

Polycarbonate

Structural and physicochemical stability of biofilms





INGENUITY AND CHALLENGES

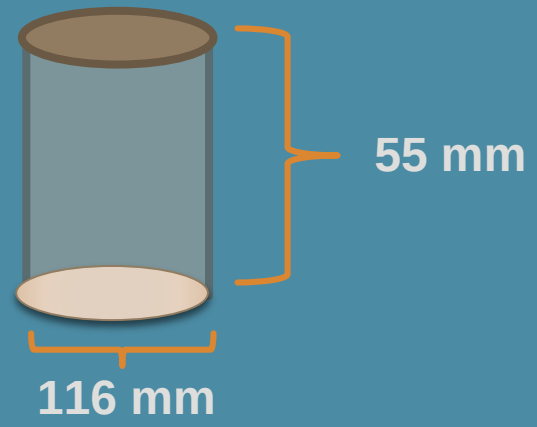
A lightweight material is required with suitable mechanical properties

TOTAL WEIGHT : 186 g

WE MEET ALL THE REQUIREMENTS ESTABLISHED BY THE LAB2MOON

Miniaturization of electronic components

DIMENSIONS



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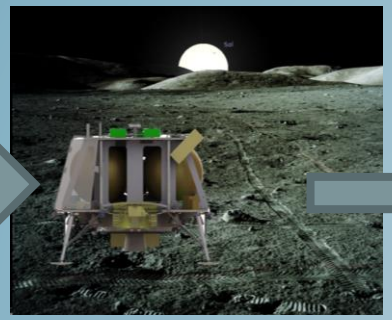
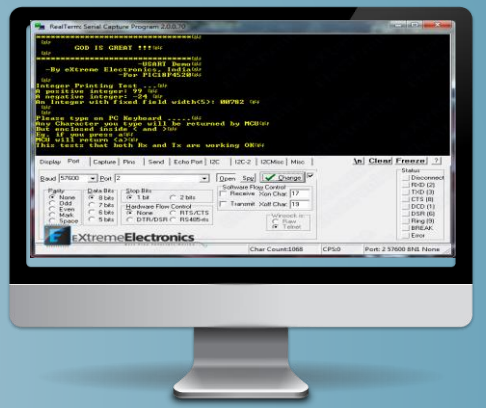
Reproducibility and background signal

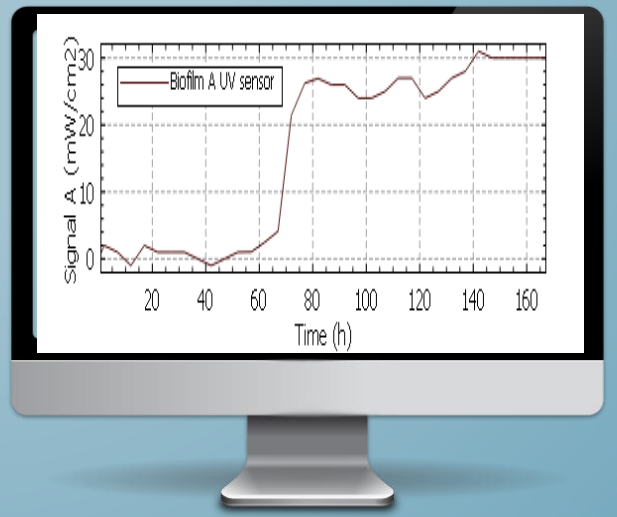
DATA PROTOCOL RS -485



DATA PROCESSING

REAL TERM SOFTWARE OPEN SOURCE

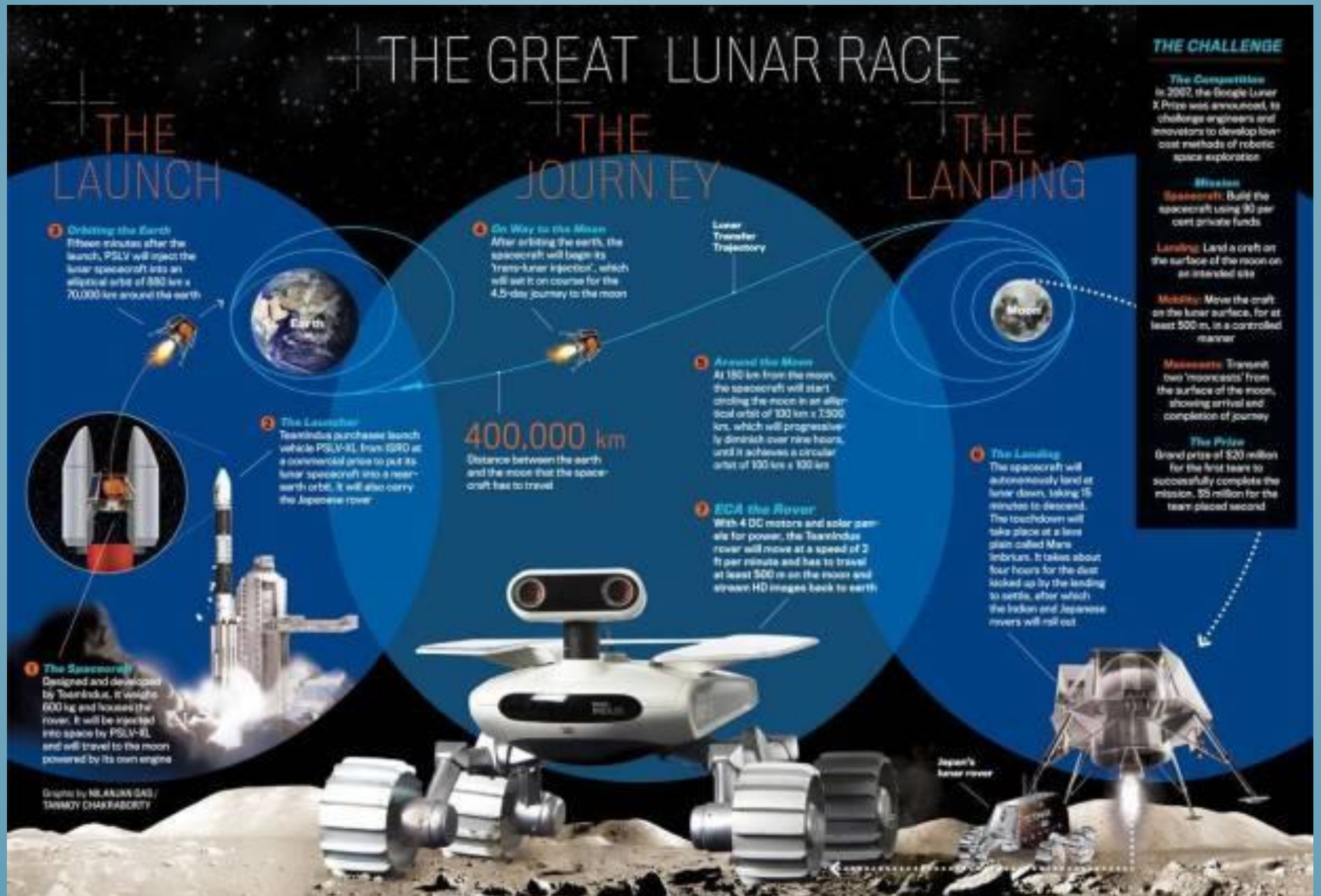




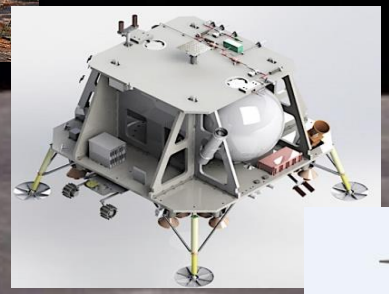
KST SOFTWARE OPEN SOURCE

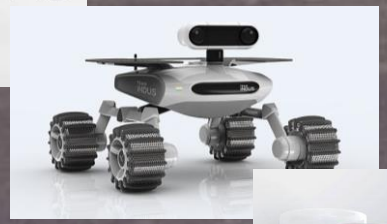
DATA ANALYSIS

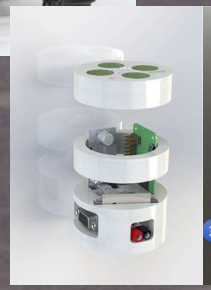
Rumbo a la Luna

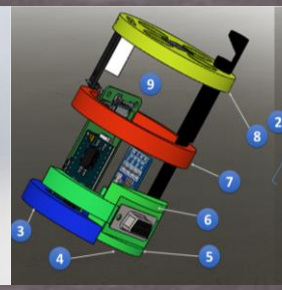


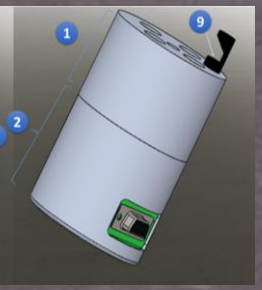
EL CONCURSO LAB2MOON











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Thank you