Europlanet TA Report

Please see Annex 1 below

Infrastructure short name	Installation ID	Installation short name
Distributed Planetary Simulation Facility (DPSF)	TA2-4	CSS

PROJECT LEADER – APPLICANT 1

Project number: 18-EPN4-070		
Name: Jacqueline Campbell		
Home Institution full address: **UCL Mullard Space Science Laboratory,** **Holmbury Hill Rd,** **Dorking,** **RH5 6NT**		
Country: United Kingdom		
Legal Status* UNI		
*__UNI__ (University and other higher education organisations) **RES** (Public research organisation (including international research organisation as well as private research organisation controlled by a public authority) **SME** , **PRV** (Other Industrial and/or profit Private organisation) or **OTH**		
Tel: +44 (0)1483 204256	**Fax: +44 (0)1483 278312**	**E-mail: Jacqueline.campbell.16@ucl.ac.uk**
Gender: F	**Year of birth: 1982**	**Group Leader N**
New user: N	**Number of visits: 2**	**Nationality: British**
Affiliation: UCL/MSSL	**Researcher Status:** PGR	**Activity Domain*** : Earth Sciences & Environment

CO - APPLICANT – if applicable

Name:		
Home Institution:		
Tel:	**Fax:**	**E-mail:**
Gender: M/F	**Year of birth:**	**Group Leader Y/N**
New user: Y/N	**Number of visits:**	**Nationality:**
Affiliation:	**Researcher Status:** UND / PGR / PDOC / EXP / TEC	**Scientific background*** (see below) :

**Please select the most appropriate description from the list below:*

Physics	Chemistry	Life Sciences & Biotech	Earth Sciences & Environment
Mathematics	Energy	Material Sciences	Engineering & Technology
Social Sciences	Humanities	Information & Communication Technology	

How did you hear about us?

Website	Advertising email **X**	Colleague	
Other:-			

HOST (TA Facility) **–** Please be accurate. This information is required for reporting.

Name:	**Host laboratory:**
Bernard Schmitt	Institut de Planétologie et d'Astrophysique de Grenoble
Start Date of visit	12 November 2018
Finish Date of visit:	16 November 2018
No. of days: Please do not include travel days, this is lab/field access only	5
Applicant/Co-applicant reimbursed? Please indicate Yes or No	No

VISITORS TO LAB (If different from above applicant and co-applicant) **–**

Name:	**Affiliation:**	**Date**

Project Title – Laboratory analysis of Martian Recurring Slope Lineae (RSL) analogues for comparison with CRISM observations for detection of polycyclic aromatic hydrocarbons

Scientific Report Summary.
(plain text, no figures, maximum 250 words, to be included in database and published)

The aims of the experiments carried out were to generate a diagnostic spectrum for PAHs of astrobiological interest in the context of Mars, to constrain the detectability limit of PAHs in RSL-like environments, and to establish the spectral characteristics of Martian soil analogue, $MgCl_2.6H_2O$, PAHs, and various mixes of these components at various ratios and under various environmental conditions.

The site of the experiments was the "Cold Surface Spectroscopy" facility (CSS) at Institut de Planétologie et Astrophysique de Grenoble (IPAG) Grenoble, France in order to use the spectro-gonio radiometer and its CarboN-IR environmental cell, which has been specifically developed for studying planetary analogues.

18 distinct samples were examined, with additional sub-samples examined in various stages of hydration. The detectability limit of PAHs was established within RSL analogues, and diagnostic absorption features for higher concentrations of PAHs were recorded at a number of wavelengths. A number of series of spectra were recorded with varying ratios of PAH and salt content, and we found that drying brines within soil sample increased the detectability of PAHs compared with soil samples void of salt.

Full Scientific Report on the outcome of your TNA visit

My TA visit at the "Cold Surface Spectroscopy" facility was between 12th and 16th November 2018 (5 full days).

The PAHs used were a mixture of 3 of astrobiological interest: (anthracene, phenanthrene and pyrene) in raw form and mixed into a sample of equal parts of each PAH species. This reflects typical PAH content from Martian meteorite analysis. The Martian soil analogue used was JSC Mars-1, and the salt used to create brines was $MgCl_2.6H_2O$.

Samples were examined using both the SHADOWS and SHINE spectro-gonio radiometers with the CarboN-IR Environmental Cell.

Bidirectional reflectance spectra (at single geometry) on both full Vis-NIR and partial spectral ranges were recorded to reflect regions of interest for later comparison to observational results from orbital sensors.

18 samples were analysed between various spectral ranges and at 10nm spectral resolutions for PAHs mixed with brines and Martian soil simulant.

A series of 1% PAH mix within $MgCl_2.6H_2O$ was mixed with dust at various ratios from 24-70% dust to create a series.

A further series of $MgCl_2.6H_2O$ with between 1-5% PAH was also measured, with the 5% PAH concentration clearly visible within pure $MgCl_2.6H_2O$, and with the detectability limit at 2% PAH.

Wet samples with 1% PAH mixture in $MgCl_2.6H_2O$ in soil allowed PAHs to be detected, but PAH signatures became less pronounced after drying.

We discovered that dried $MgCl_2.6H_2O$ content within JSC Mars-1 increased the ability to detect PAHs, as PAHs at 1.5% within soil were not visible, but <1% PAH was visible in soil mixed with $MgCl_2.6H_2O$. This is likely due to decreased opacity of the soil due to salt crystals.

Finally, we established end member spectra for the full CRISM range from 0.4-4 μm for JSC Mars-1, PAH mixture, $MgCl_2.6H_2O$ and for the non-hydrated version of the salt, $MgCl_2$.

The results of these novel experiments are extremely useful in allowing the comparison of empirical data with orbital observations from the CRISM instrument on Mars Reconnaissance Orbiter, and establishing the detection limit of PAHs in RSL analogues, and the limitations of observing PAHs in briny and non-briny Martian regoliths.

Please include:

- Publications arising/planned (include conference abstracts etc)

I plan to present my results at the 9th International Mars conference in 2019, to produce a results paper, to carry out modelling for end members and for this work to be incorporated into a PhD thesis.

Please add the Europlanet official Acknowledgement to each publication and dissemination activity

"Europlanet 2020 RI has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 654208"

- Host approval

The host is required to approve the report agreeing it is an accurate account of the research performed.

The two managers of the facility, Bernard Schmitt (CNRS/IPAG, Grenoble), and Pierre Beck (UJF/IPAG, Grenoble), approve the report and agree that it is an accurate account of the research performed during the visit of the Cold Surface Spectroscopy facility (DPSF/CSS/TA2-4).

Annex 1

Access provider short name	*Short name of infrastructure*	*Installation*		*Installation Country code*
		ID	*Short name*	
INTA	PFA	TA1-1	Rio Tinto	ES
IRSPS	PFA	TA1-2	Ibn Battuta	IT
Matis	PFA	TA1-3	Iceland	IS
INTA	PFA	TA1-4	Tirez Lake	ES
IRSPS	PFA	TA1-5	Danakil	IT
DLR	DPSF	TA2-1	PEL	DE
MUG	DPSF	TA2-2	IMRF	AT
AU	DPSF	TA2-3	PEF	DK
CNRS	DPSF	TA2-4	CSS	FR
UJF	DPSF	TA2-4(8)	CSS – 3rd party	FR
VUA	DPSF	TA2-5	HPHT	NL
OU	DPSF	TA2-6	LMC	GB
NHM	DPSF	TA2-7	PMCF	GB
VUA	DAFS	TA3-1	GGIF	NL
CNRS	DAFS	TA3-2	HNIF	FR
CNRS	DAFS	TA3-3	SRIF	FR
OU	DAFS	TA3-4	HS50L	GB
OU	DAFS	TA3-5	LFS	GB
OU	DAFS	TA3-6	CSSIA	GB
WWM	DAFS	TA3-7	RNTSI	DE
CNRS	DAFS	TA3-8	IPF	FR