

EUROPEAN LUNAR SYMPOSIUM 2018

13-16 MAY



SCIENCE ORGANIZING COMMITTEE

Patrick Pinet IRAP, Toulouse University, France (Chair)

Mahesh Anand Open University, UK (Co-Chair)

James Carpenter

Ana Cernok

Serge Chevrel

Doris Daou

Simone Pirrotta

Kristina Gibbs

Harry Hiesinger

Greg Schmidt

Alice Stephant

Wim van Westrenen

LOCAL ORGANIZING COMMITTEE

Patrick Pinet

Serge Chevrel

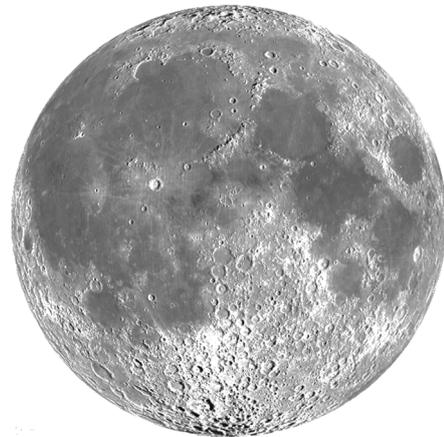
Marie-Ange Albouy

Gaël David

Yves Daydou

Dolorès Granat

Jérémie Lasue



European Lunar Symposium Toulouse 2018

Meeting information

Welcome to Toulouse at the Sixth European Lunar Symposium (ELS)! We are hoping to have a great meeting, demonstrating the diversity of the current lunar research in Europe and elsewhere, and continuing to provide a platform to the European lunar researchers for networking as well as exchanging news ideas and latest results in the field of lunar exploration.

We acknowledge the support of Toulouse University and NASA SSERVI (Solar System Exploration Research Virtual Institute). Our special thanks to our SSERVI colleagues, Kristina Gibbs, Jennifer Baer, Ashcon Nejad and to Dolorès Granat at IRAP (Institut de Recherche en Astrophysique et Planétologie)/OMP (Observatoire Midi-Pyrénées) for their contribution to the meeting preparation and program implementation.

Members of the Science Organizing Committee are thanked for their input in putting together an exciting program and for volunteering to chair various sessions in this meeting. Our special thanks for Ana Cernok and Alice Stephant from the Open University for putting together the abstract booklet.

MEETING VENUE

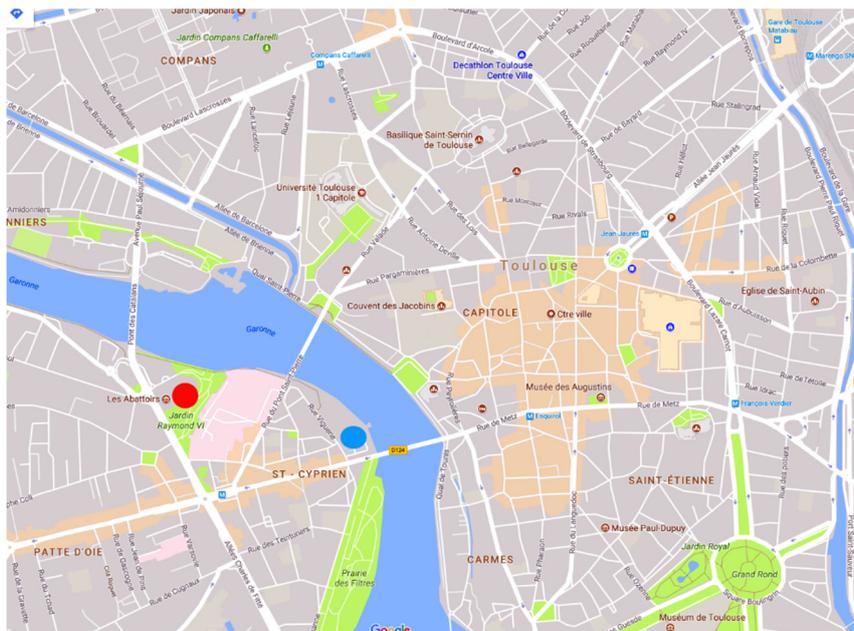
The ELS will take place at the museum of modern and contemporary art, called “Les Abattoirs”. It is located in the center of Toulouse, close to the “Garonne” river. The street address is 76 Allées Charles de Fitte, 31300 Toulouse. After entering the building through the main entrance, you will immediately find the registration/help desk on the ground floor. The meeting room, called “Auditorium” is in the basement of the building. The room seats 200 people and is equipped with a beamer (HDMI, VGA). There is also a second room called “La Salle du Conseil” (25 seats) available for break-out meetings upon request. This second room is also equipped with a beamer. Oral sessions will be held in the “Auditorium”; the posters will be located in the Hall of the museum, which is next to the “Auditorium”.



Les Abattoirs from the street



L'Auditorium



<https://www.google.fr/maps/place/Les+Abattoirs/@43.60075,1.4270853,17z/>

<https://www.google.fr/maps/place/H%C3%B4tel-Dieu+Saint-Jacques/@43.5995584,1.435377,18z>

The meeting venue is shown with the red circle on the map above. The place for the conference dinner on Tuesday evening, at the “Hotel-Dieu Saint-Jacques” is shown with the blue circle. It is within a walking distance on the order of half a mile from the museum. Central station (Gare Matabiau) is to the upper right.

TRANSPORTATION

Métro : Line A - station "Saint-Cyprien République"

Bus : line 31, bus-stop "les Abattoirs"

Bicycles rent: « Vélo Toulouse », 2 stations are very close to the museum.

REGISTRATION

All participants should register and collect their name badges and conference material at the registration/help desk (located in the main hall of the museum) on Sunday 13th May evening (6:00 – 8:00 pm) or on Monday 14th or Tuesday 15th May (preferably between 8:15 am and 8:45 am).

MEALS

We will provide coffee, tea, water, juice, and cookies during ‘coffee breaks’ in the hall of the museum. Lunch, where provided, will be served next door to the museum in a place called “L’Hémicycle”.

PRESENTATIONS

All oral presentations will take place in the museum “Les Abattoirs” in the Auditorium. Posters will be presented in the Hall of the museum and next to the Auditorium. Those presenting talks are encouraged to upload their presentation on the designated computers in the Auditorium as early as possible to ease the organization and to avoid any delays in the schedule. Those presenting on Monday morning, please come to the “Auditorium” no later than 8:20 am. Those presenting in the afternoon session, please upload your presentation during lunch break at the latest. Those presenting on Tuesday, please upload your presentation on Monday. Those presenting on Wednesday, please upload your presentation on Tuesday. At the very latest, all presenters should have uploaded their presentations during the preceding refreshment/lunch break prior to their session.

Presentations should be provided both in Microsoft PowerPoint **and** PDF formats. Any delay caused by technical problems will be taken out from your presentation time.

Each speaker will have a 15 minute slot allocated in the timetable. A maximum of 12 min will be allocated to the actual presentation, with 3 min for Q&A/changeover. The posters will be on display in the foyer area (Hall of the museum) for the entire time of the meeting.

Posters can be put up for display from Monday, 8:00 am until Wednesday, 5:00 pm. We encourage presenters to put up their posters as early as possible to guarantee maximum visibility. Posters can be a maximum size of 119 x 84 cm (format A0) in a portrait mode. Mounting material will be available at the registration/help desk. Any uncollected poster will be disposed at the end of the meeting.

WIFI ACCESS

The meeting hall is equipped with Wifi access. However due to the number of participants, the speed of internet connection may be limited.

SOCIAL EVENT

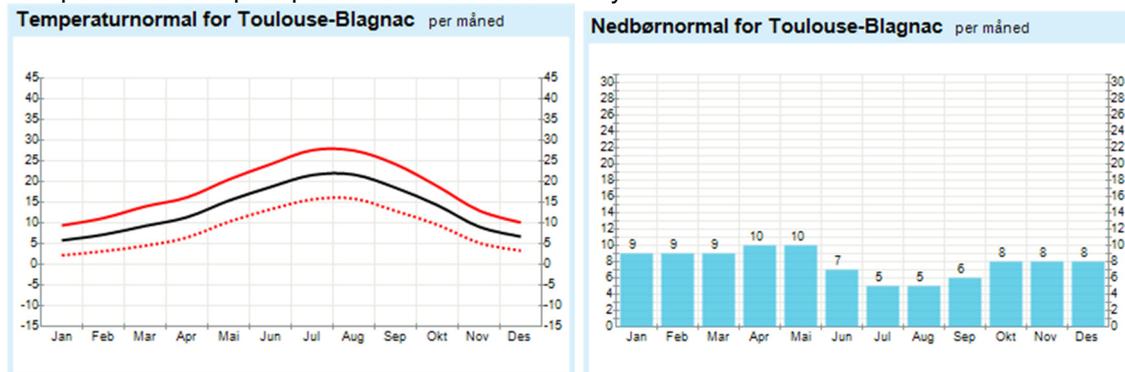
On Tuesday evening (6:15-6.30 pm) we will leave the museum for a short (1 km; 0.6 mile) cultural stroll by the Garonne river to the Hotel-Dieu Saint-Jacques, an historical monument, where the conference dinner will take place. At 7:30 pm refreshments will be served within the building in the "Salle des Pèlerins" (Pilgrims Room) and the dinner will commence at 8:00 pm in the "Salle des Colonnes" (Columns Room).

The Hotel-Dieu is located close to the "Pont Neuf" on the left bank of the Garonne River. The address is 2 Rue Charles Viguerie, 31059 Toulouse. A map will be provided during the meeting.

WEATHER

« À la Saint-Honoré, s'il fait gelée, le vin diminue de moitié. » « At Saint-Honoré (May 16th) if it is freezing, wine production is divided by two"»

Temperatures and precipitations in Toulouse in May.



Left: Max temperature: Average max daily (24h) temperature per month

Minimum temperature: Average minimum daily (24h) temperature per month

Right: average amount of days (24h) with precipitation during a month. When precipitation has surpassed 1mm per day (24h) it is defined as a day with precipitation.

See also:

<https://weatherspark.com/m/46070/5/Average-Weather-in-May-in-Toulouse-France>

<http://www.toulouse.climatemps.com/may.php>

SIGHTSEEING

Toulouse is the fourth largest city in France with a population of 476 500 (2015) and growing 6000 per year; 1 330 950 habitants within the urban era. **Toulouse** is the capital of Haute-Garonne *département*, Occitanie *région*, southern France. It is situated in a plain where the Garonne River curves northwest from the Pyrenean foothills. The city's architecture was long characterized by rose-red brick. Founded in ancient times, Toulouse developed as Tolosa during the Roman period. As capital of the Visigoths (419–507) it was taken (508) by Clovis I and included in the Merovingian kingdom. The university was founded in 1229. Its Parlement, established in 1420, had jurisdiction over Languedoc province until the French Revolution. The "Canal du Midi" connecting Toulouse to the Mediterranean, was completed in the 17th century. It was designated a UNESCO World Heritage site in 1996. The aerospace industry has seen extraordinary development in aeronautics and space industry: research.

Updated: 2 May 2018

**Program for ELS 2018,
the Sixth European Lunar Symposium**

<http://els2018.arc.nasa.gov/>

Venue

**Les Abattoirs
76 Allées Charles de Fitte
31300 Toulouse, France**



Science Organizing Committee

Patrick Pinet - IRAP, Toulouse University, France (Chair)
 Mahesh Anand - Open University, UK (Co-Chair)
 James Carpenter – European Space Agency, NL
 Ana Cernok – Open University, UK
 Serge Chevrel - IRAP, Toulouse University, France
 Doris Daou – NASA Headquarters, USA
 Kristina Gibbs, SSERVI, NASA Ames, USA
 Harry Hiesinger – WWU, Germany
 Simone Pirrotta – ASI, Italy
 Greg Schmidt - SSERVI, USA
 Alice Stephant - Open University, UK
 Wim van Westrenen - VU Univ. Amsterdam, NL

Sunday 13th May 2018

ELS 2018 - Registration and Reception

18:00 - 19:30	Registration
18:30 - 20:00	Reception

Monday 14th May 2018				
08:15	Registration			
08:45	Welcome Address (Patrick Pinet) + Opening Remarks (Greg Schmidt)			
All talks: 15 mins (including Q&A)				
Exploration and Future Missions				
Chair: Anand				
<i>SN</i>	<i>Time</i>	<i>Abstract #</i>	<i>Author</i>	<i>Title</i>
1	09:00	085	Bussey	NASA'S Human Exploration and Operations Mission Directorate's Lunar Activities
2	09:15	042	Carpenter	Lunar Exploration Plans in ESA
3	09:30	069	Ohtake	Planning a Japanese Lunar Polar Mission
4	09:45	046	Kring	A Lunar Sample Return Strategy for the Schrodinger Basin that Taps into the Volatile Cycle of the Lunar Farside
5	10:00	094	Futaana	Key Sciences of the Lunar Space Environment to be Investigated by the Mission SELMA
6	10:15	018	Porcelli	MoonLIGHT and INRRI for Next Lunar Missions: the Return of Laser Retroreflectors to the Moon
7	10:30	128	Barber	L-DART: Direct Analysis of Resources Traps within Lunar Permanently Shadowed Regions by a Penetrator Mission
10:45 - 11:05 Tea/coffee break				
Remote Sensing and Geological Implications				
Chair: Hiesinger				
8	11:05	104	Meyer	Observations from a New Global Map of Light Plains from the Lunar Reconnaissance Orbiter Camera
9	11:20	032	Wohler	M ³ -based Abundance Maps of Lunar Refractory Elements
10	11:35	041	Moriarty	The Four Compositional Zones of the South Pole - Aitken Basin Revealed by Moon Mineralogy Mapper Data
11	11:50	052	Martinot	Survey of the Lunar Crust-Mantle Interface with the Moon Mineralogy Mapper Data
12	12:05	087	Pinet	Mineralogical Mapping at Copernicus Crater from MGM Deconvolution of M3 Observations
13	12:20	134	McBride	Diversity of Volcanic Eruption Styles in the Central Procellarum Region of the Moon
14	12:35	137	Horgan	Constraints on Lunar Eruption Styles from the Mineralogy of Small Lunar Pyroclastic Deposits
13:00 - 14:00 Lunch (provided onsite)				

Volatiles, Dust and Lunar Environment				
Chair: Schmidt				
15	14:00	038	Costello	A Model for the Comparative Role of Impact Gardening as a Control of Near-Surface Ice on the Moon and Mercury
16	14:15	047	Horanyi	The Dust Environment of the Moon
17	14:30	101	Sefton-Nash	Far-IR Emissivity Temperature Dependence In Lunar South Polar Permanently Shaded Terrain
18	14:45	141	Meslin	Radon and Polonium as Tracers of Lunar Outgassing, Volatiles and Dust
19	15:00	086	Biswas	Mobile In-Situ Exploration of Lunar Volatiles with the LVS on LUVMI
20	15:15	065	O'Brien	Risks and Rewards Amidst Inescapable Fine Dust on the Moon: Measurements from APOLLO 11 to CHANG'E-3 & -4
15:30 - 15:55 Tea/coffee break				
Lunar Interior: Structure, differentiation and Evolution of the Moon				
Chair: Stephant				
21	15:55	023	Laneuville	Supercooling and High Magnetic Field on the Early Moon
22	16:10	074	Schwinger	Compositional Changes in the Lunar Mantle Resulting from Giant Impact - Induced Melting
23	16:25	129	Zhao	A Single Plume Upwelling on Lunar Near Side that Provides a Source for Titanium-Rich Volcanism
24	16:40	049	Garcia	An International Team to Create Reference Models and Data Sets for Moon Seismology
25	16:55	044	Gillet (presented by Calvet)	Characterization of Shallow Moonquakes and the Megaregolith: New Insights from Apollo Data
26	17:10	130	Kawamura	Future Seismic Exploration on the Moon: Possible Launch Opportunity from Asia
Poster session from ~17:30 to 19:00 (cocktail and drinks sponsored by iSpace)				
				

Tuesday 15th May 2018				
08:30		Registration		
All talks: 15 mins (including Q&A)				
Remote Sensing and Physical Implications				
Chair: Pinet				
SN	Time	Abstract #	Author	Title
27	09:00	033	Wohler	Correlation Between Lunar Soil Composition and Weakly Bounded Surficial OH/H ₂ O Component
28	09:15	116	Denevi	Space Weathering and the Stratigraphy of the Lunar Regolith
29	09:30	120	Greenhagen	Investigating Thermal Emission from the Lunar Epiregolith
30	09:45	136	Martin	Modal Mineralogy and Maturity Estimates of Apollo 14, 15, and 16 Soils using FTIR and QUEMSCAN Techniques
31	10:00	117	Patterson	Mini-RF S- and X-band Bistatic Radar Observations of the Moon
32	10:15	007	Liu	Regolith Mixing by Impacts: Lateral Diffusion of Basin Melt
33	10:30	064	Klima	Integrating Crystal Chemistry with Laboratory Analysis to Model Bound and Adsorbed OH- and H ₂ O
10:45 - 11:05 Tea/coffee break				
Remote Sensing and Physical Implications (Cont'd)				
Chair: Chevrel				
34	11:05	034	Wohlfarth	Simulation of the Effect of Space Weathering on the 3-micrometer Absorption Band based on Mie Theory.
35	11:20	115	Cahill	Scrutinizing the Presence of LAMP Identified Lunar Swirls Relative to Modeled Magnetic Sources
36	11:35	138	Pieters	What Lunar Swirls Represent (...probably)
37	11:50	072	Kreslavsky	Dependence of Albedo on Slope in Lunar Highlands: Results from LOLA Normal Reflectance Data Analysis
38	12:05	109	Speyerer	Investigating Recent Surface Changes with Temporal Image Pairs and Photometric Sequences
39	12:20	091	Hiesinger	The Potential LUNA-GLOB Landing Site: Contributions of Lunar Basin Ejecta Materials
40	12:35	146	Jawin/Schmidt	Lunar Science for Landed Missions Workshop Findings Report https://lunar-landing.arc.nasa.gov/downloads/LunarLandedScience_Summary_180315.pdf

13:00 – 14:00 - Lunch (provided onsite)				
Sample Analysis and Experiments				
Chair: Anand				
41	14:00	118	Greenwood	Oxygen Isotope Evidence for a High-Energy Moon-Forming Giant Impact and Early Delivery of Earth's Water.
42	14:15	150	Poitrasson	Impact of Mineral-Scale Isotopic Heterogeneity on Iron Isotope Composition Estimates of Lunar Igneous Reservoirs
43	14:30	029	Furi	The Noble Gas Bouillabaisse in Apollo 15426 Green Glasses
44	14:45	105	Stephant	Abundance and Isotopic Composition of Hydrogen and Chlorine in Apatite from Lunar Meteorite NWA 10989
45	15:00	125	Cernok	Abundance and H Isotopic Composition of Water in Shocked Lunar Apatite from Mg-Suite Rocks
15:15 – 15:40 Tea/coffee				
46	15:40	055	Tremblay	Revisiting the $^{40}\text{Ar}/^{39}\text{Ar}$ Chronology of Lunar Meteorite NWA 773 Provides New Constraints on its Diachronous Geologic History
47	15:55	084	Bell	Understanding the Apollo 15 Magmatic Plumbing System using Crystal Size Distribution Analysis
48	16:10	059	Lin	The Origin of the High-TiO ₂ Lunar Basalts: Constraints from Experiments on Remelting of Shallow Magma Ocean Cumulates
49	16:25	142	Riedo	Spatially Resolved Chemical Analysis using a Miniature LIMS System Designed for In Situ Space Exploration Missions
<p><i>~16:45 to 18:15 - Poster session</i> <i>18:15-19:30 – Stroll by the river to Hotel Dieu / Outside cultural visit</i></p> <p>(conference dinner from 19:30)</p>				

Wednesday 16th May 2018				
08:30	Registration			
All talks: 15 mins (including Q&A)				
Impact and cratering of the Moon / age dating				
Chair: Cernok				
<i>SN</i>	<i>Time</i>	<i>Abstract #</i>	<i>Author</i>	<i>Title</i>
50	09:00	054	Werner	Lunar Cratering Chronology - Revisited
51	09:15	111	Van Der Bogart	Constraining the Age of the Crisium Impact Basin
52	09:30	068	Bultel	Spectral Mapping and Crater Statistics Reevaluated for all Apollo Landing Sites
53	09:45	095	Iqbal	Studying the Crater Size-Frequency Distribution of the Apollo 12 Landing Site.
54	10:00	008	Cadogan	Automated Counting of the Smallest Craters at Lunar Landing Sites
55	10:15	112	Mahanti	Investigating Size-Dependent Small Lunar Crater Degradation using Chebyshev Coefficients
56	10:30	062	Clark	An Investigation of the Seismic Record around Lunar Lobate Scarps
10:45 – 11:05 Tea/coffee break				
ISRU: Instrumentation and Lunar Simulants				
Chair: Favier (Guest expert, former astronaut (STS 78))				
57	11:05	114	Sefton-Nash	ESA's PROSPECT Package For Exploration of Lunar Resources: Investigation Domains
58	11:20	135	Levin-Prabhu	Microwave Heating of Lunar Simulants JSC-1A and NU-LHT-3M: Experimental and Theoretical Analysis
59	11:35	022	Sperl/Meurisse	Solar Sintering of Lunar Regolith for Shielding Habitats on the Moon
60	11:50	009	Denk	Full-Scale Terrestrial Demonstrator for Ilmenite Reduction with Concentrated Solar Power
61	12:05	100	Sargeant	Hydrogen Reduction of Ilmenite in a Static System for a Lunar ISRU Demonstration
62	12:20	127	Reiss	In-Situ Hydrogen Reduction of Lunar Polar Regolith: from Proof of Concept Experiments with ProSPA to Larger Scale ISRU Demonstrators
63	12:35	126	Reiss	Demonstration of Volatiles Extraction from NU-LHT-2M with the ProSPA Instrument Breadboard
12:50 – 14:20 Lunch (sponsored by Team Indus)				

ISRU: Preparation and Commercial Strategies				
Chair: Carpenter				
64	14:30	043	Carpenter	Preparing for In Situ Resource Utilisation on the Moon
65	14:45	056	Cowley	Spaceship EAC - Overview of Ongoing Initiative Projects Relating to Lunar Exploration at the European Astronaut Centre
66	15:00	108	Acierno	Moving Forward after the Google Lunar Xprize, ispace's Plan for the Commercial Exploration and Exploitation of the Moon
67	15:15	020	Berinstain	Future Low-Cost Lunar and Planetary Missions Enabled by Commercial Space Companies
68	15:30	145	Hegde	TEAMINDUS: Commercial Lunar Exploration Missions and Future Technologies
15:45 - 16:00		Pinet/Anand		Wrap up/Next ELS announcement
16:00 - 17:00		Networking event with Champagne (sponsored by Team Indus)		



Posters: Monday, 14 th May (~17:30 – 19:00) and Tuesday, 15 th May (~16:45 – 18:15). <i>Posters can be put up from Monday, 14th May from 08:00; posters should be of no larger than A0 in size (in portrait mode); pins/velcro/tape provided).</i>				
SN	Poster #	Abs#	Presenter	Title
Exploration and Future Missions				
Lunar settlement and habitat				
69	1	015	Degtyarev	Lunar Industry & Research Base
70	2	021	Saunders	Commercial Lunar Mission Support Services
71	3	019	Chahla	ILWEG Euromoonmars exolab
72	4	026	Foing	ExoLab 2.0
73	5	057	van der Sanden	Optimizing Geological Exploration in an Analogue Lunar Habitat: Sub-System Analysis and Human-Factor Integration
74	6	058	Cowley	LUNA and FlexHab - A Mission Focused Analogue for Preparatory Exploration Activities
75	7 _(withdrawn)	066	Hong	Conceptual Construction Process for Lunar Lava Tube Habitation
76	8	076	Dubois	Remote Controlled Telescopes from a Moon Habitat: EUROMOONMARS Project
77	9	093	Pennec	Cryogenic Air Purification for Deep Space Exploration.
Field trip, EVA operations				
78	10 _(withdrawn)	016	Da Poian	CRAFT: Collaborative Rover and Astronauts Future Technology
79	11	073	via Espinal	Development of Electrostatic Spacesuit Cleaner for Lunar Exploration Missions
80	12	077	Foing	EUROMOONMARS Field Results & Moonvillage Activities: Update for ELS2018
81	13	096	Foing	MOONMARS Analogue Sample Spectro-Analysis in Laboratory & Field Campaigns
82	14	102	Bessone (presented by Cowley)	An Electronic Fieldbook Supporting Data Collection and Situational Awareness during Astronauts EVA Geologic Traverses on the Lunar Surface
83	15	106	Sauro (presented by Cowley)	Technologies and Operational Concepts for Field Geology and Exploration on the Moon: the ESA PANGAEA-eXstension Campaign in Lanzarote (Canary Archipelago, Spain)
Mission concept, strategy and technology for Moon exploration				
84	16 _(withdrawn)	017	Koryanov	INFLATE: INFLate Landing Apparatus Technology
85	17	110	Whittaker	Cuberover: A Low Cost, Reliable Platform for Planetary Exploration
86	18 _(withdrawn)	025	Pettinelli	Ground Penetrating Radar for Lunar Subsurface Exploration

87	19	123	Sheridan	Penetrator-Deployed Mass Spectrometers for Volatiles Analysis at the Moon
88	20	082	Lasue	Laser-Induced Breakdown Spectroscopy (LIBS): a Technique for Lunar Exploration
89	21 _(withdrawn)	071	Ahn	Dust Thermal Vacuum Chamber (DTVC) and Verification of Lunar Construction Technologies in Lunar Surface Environments
90	22	075	Karouji	Activity Report on the Landing Site and Return Sample of the Japanese Lunar Science Community in HERACLES Mission
91	23	037	Kerber	Moon Diver: A Discovery Mission Concept for Understanding the History of the Mare Basalts through the Exploration of a Lunar Mare Pit
92	24	035	Neklesa	Exploring New Horizons: EUROMOONMARS Simulation at ESTEC 2017
93	25	132	Hipkin	Lunar Science with HERACLES
Remote Sensing and Geological Implications/Physical Implications				
94	26	088	Chevrel	Investigation of Large Lunar Craters: Present and Future
95	27	083	Orgel	Potential Landing Sites for the Chang'E -4 Exploration Mission to the Apollo Basin, Moon.
96	28	040	Schnuriger	Characterization of Lunar Volcanism Features in the Arago Region, Western Mare Tranquillitatis.
97	29	024	Lee	Possible Impact Melt Lava Tube Skylights Near the North Pole of the Moon
98	30	133	Grava	The LAMP Spectrograph on the Lunar Reconnaissance Orbiter: Lunar Science with Ultraviolet Eyes
99	31	050	Francis	Candidate Selection for Change Detection and DTM Production on the Moon
Lunar Interior: Structure, Differentiation and Evolution of the Moon				
100	32	122	Maurice	Prolonged Lunar Magma Ocean by Heat-Piping from Cumulate Overturn
101	33	053	Drilleau	Seismic Velocity and Crustal Thickness Inversions: Moon and MARS
102	34	060	Fayon	Design and Development of an Interferometric Readout for Planetary Seismometers
103	35	027	Steenstra	Assessment of a High-Energy Origin of the Moon from Metal-Silicate Partitioning of Siderophile Elements at High Temperatures

104	36	028	Steenstra	Evidence for a Sulfur-Depleted Lunar Interior from the Solubility of S in Lunar Melts
Sample Analysis & Experiments				
105	37	039	Muftakhetdinova	Sources and Structures of Metallic Iron on the Moon
106	38	078	Zago Garcia	Investigation on Wetting Behaviour of Lunar Regolith Simulant
107	39	119	Mortimer	Update on the Preparation and Characterization of Carbonaceous Chondrite Standards for Verification of ESA's 'PROSPECT' Package
108	40	131	Cernok	Shock-Induced Microtextures in Lunar Apatite and Merrillite
109	41	099	Barber	PROSPA: An Instrument for Lunar Polar Volatiles Prospecting and In Situ Resource Utilization Proof of Concept
Impact and Cratering on the Moon/Age dating				
110	42	103	Michael	Evolution of the Presence of Impact Melt at the Near-Surface of the Moon
111	43	098	Cahill	Detection and Characterization of Present Day Lunar Impact Craters with MINI-RF/GOLDSTONE X-BAND Bistatic Observations
112	44	113	Ravi	Terrace Width Variations In Fresh Lunar Craters
ISRU Instrumentation and Lunar Simulants				
113	45	048	Calzada-Diaz	Commercial Exploration of the Moon: ispace's Polar Ice Explorer
114	46	090	Adachi	Granular Vibration-Pumping System for ISRU Missions on the Moon
115	47	067	Celotti	MESG - Moon Energy Storage and Generation: Concept Design and Analysis
116	48	124	Denk	Basics of Concentrated Solar Power for Moonwalkers
117	49	092	Pitcher	Volatile Extraction and Detection From Frozen Lunar Regolith Simulants in Preparation for the LUVMI Rover
118	50	089	Engelschion	EAC-1A: Evaluation of a Basanitic Material as a Novel Large-Volume Lunar Regolith Simulant
119	51	080	Donaldson Hanna	Update on the Characterization of Lunar Highlands Regolith Simulants in Preparation for Drilling and Sampling into the Polar Regolith by ESA's PROSPECT Package
120	52	061	Lim	Numerical Modelling of Microwave Sintering of Lunar Simulants under Near Lunar Atmospheric Condition
Miscellaneous				
121	53	051	Manaud	OpenPlanetaryMap: Building the first Open Planetary Mapping and Social

				Platform for Researchers, Educators, Storytellers, and the General Public
122	54	107	Schmitt	SSHADE: The European Solid Spectroscopy Database Infrastructure
123	55	036	Law/Day	NASA'S MOON TREK: Extending Capabilities for Lunar Mapping and Modeling.
124	56	121	Anand	The Lunar Meteorite Virtual Microscope Collection
125	57	045	Zaklynsky	Developing Structures For An International Art Gallery on the Moon

List of contributors

Name	Affiliation
Abigail Calzada-Diaz	ispace Europe
Aidan Cowley	European Space Agency
Alain Berinstain	Moon Express Inc.
Alessandro Zago García	DLR (german aerospace center)
Alexander Zaklynsky	MFA, KABK. The Royal Academy of Art & The Royal Conservatory of Den Haag
Alexandre Meurisse	Institute of Materials Physics in Space, DLR, 51170 Cologne, Germany
Alice Stephant	The Open University
Alistair Francis	Mullard Space Science Laboratory
Ana Cernok	Planetary and Space Sciences, The Open University, Milton Keynes, MK7 6AA, UK
Andreas Riedo	Sackler Laboratory for Astrophysics
Anna Neklesa	Bernard Foing
Ben Bussey	NASA
Benjamin Bultel	Centre for Earth Evolution and Dynamics (CEED), University of Oslo, Norway
Benjamin Greenhagen	Johns Hopkins Applied Physics Laboratory
Bernard Foing	ESA ESTEC
Bernard Schmitt	Institut de Planétologie et Astrophysique de Grenoble (UGA - CNRS)
Brett Denevi	Johns Hopkins Applied Physics Laboratory
Brian Day	NASA SSERVI
Brian O'Brien	School of Physics, University of Western Australia
Briony Horgan	Purdue University
Carle Pieters	Brown University
Carolyn van der Bogert	Westfälische Wilhelms Universität Münster
Cesare Grava	Southwest Research Institute
Chahla Cynthia	EuroMoonMars - ILEWG - ESA
Chris Saunders	Surrey Satellite Technology Limited
Christian Wöhler	Image Analysis Group, TU Dortmund
Craig Pitcher	Open University
Csilla Orgel	Freie Universität Berlin
Daniel Moriarty	NASA GSFC
David Kring	USRA - LPI

Dayl Martin	University of Manchester
Edgar Steenstra	Vrije Universiteit Amsterdam;
Elliot Sefton-Nash	European Space Agency, ESTEC
Emerson Speyerer	Arizona State University
Emily Costello	University of Hawai'i at Manoa
Frank Poitrasson	GET-CNRS, 14, avenue E. Belin, 31400, Toulouse, France
Francesco Sauro	University of Bologna
Füri Evelyn	CRPG-CNRS
Gennadiy Osinovyv	Yuzhnoye State Design Office
Gerald Patterson	Johns Hopkins University Applied Physics Laboratory
Germaine van der Sanden	ESA ESTEC + Free University of Amsterdam
Gregory Michael	Freie Universitaet Berlin
Hannah Sargeant	The Open University
Harald Hiesinger	Institut für Planetologie, Westfälische Wilhelms-Universität Münster
Heather Meyer	Arizona State University
Jaclyn Clark	Institut für Planetologie, WWU Münster
James Carpenter	ESTEC
James Mortimer	The Open University
János Biswas	TUM Chair for Astronautics
Jeremie Lasue	IRAP, Université de Toulouse, CNRS, CNES, Observatoire Midi-Pyrénées (OMP)
Joshua Cahill	JHU-APL
Kay Wohlfarth	TU Dortmund University
Kerri Donaldson Hanna	University of Oxford
Kyle Acierno	ispace Europe SA
Laura Kerber	Jet Propulsion Laboratory
Louis Dubois	ESA-ESTEC & ISAE Supaéro
Luca Celotti	Sonaca Space GmbH
Luca Porcelli	INFN-LNF
Lucile Fayon	IPGP
Makiko Ohtake	Japan Aerospace Exploration Agency
Marie Calvet	IRAP, Université de Toulouse, France
Marie McBride	Purdue University
Marissa Tremblay	Scottish Universities Environmental Research Centre
Masato Adachi	Deutsche Zentrum für Luft- und Raumfahrt
Matthieu Laneuville	Earth-Life Science Institute, Tokyo Institute of Technology
Maxime Maurice	DLR
Melanie Drilleau	Institut de Physique du Globe de Paris
Mélissa Martinot	VU University Amsterdam - UCB Lyon
Michael Provenzano	Carnegie Mellon University
Mihaly Horanyi	LASP and Physics, U. of Colorado
Mikhail Kreslavsky	University of California - Santa Cruz
N. S. Hegde	Team Indus
Nicolas Manaud	SpaceFrog Design

Nicolas Schnuriger	Institut de Recherche en Astrophysique et Planétologie - TOULOUSE
oriol via espinal	European Space Agency (ESA)
Pascal Lee	SETI Institute, Mars Institute & NASA Ames Research Center
Patrick Pinet	IRAP, Université de Toulouse, CNRS, CNES, Observatoire Midi-Pyrénées
Peter Cadogan	None
Philipp Reiss	Technical University of Munich
Pierre-Yves Meslin	IRAP, Université de Toulouse, CNRS, CNES, Observatoire Midi-Pyrénées
Prasun Mahanti	Arizona State University
Rachel Klima	JHUAPL
Raphael Garcia	ISAE-SUPAERO
Razilia Muftakhetdinova	Extra Terra Consortium, Ural Federal University, Russian Federation.
Richard Greenwood	The Open University
Sabrina Schwinger	German Aerospace Center (DLR) Berlin
Samantha Bell	University of Manchester
Serge Chevrel	IRAP, Université de Toulouse, CNRS, CNES, Observatoire Midi-Pyrénées
Simeon Barber	The Open University
Simon Sheridan	The Open University
Srinidhi Ravi	School of Earth and Space Exploration, Arizona State University
Stephanie C. Werner	CEED - University of Oslo, Norway
Sungwoo Lim	The Open University
Taichi Kawamura	National Astronomical Observatory of Japan/IPGP
Thorsten Denk	Ciemat-PSA, Ctra de Senés s/n, 04200 Tabernas, Spain
Tiantian Liu	Technische Universität Berlin
Vibha Levin Prabhu	The Open University
Victoria Hipkin	Canadian Space Agency
Victoria S. Engelschion	European Space Agency
Wajiha Iqbal	Westfälische Wilhelms-Universität
Yan Pennec	Air Liquide Advanced Technologies, 2 rue de clémencières. 38 360 Sassenage
Yanhao Lin	Department of Earth Sciences, Vrije Universiteit Amsterdam, The Netherlands
Yoshifumi Futaana	Swedish Institute of Space Physics
Yue Zhao	Vrije Universiteit Amsterdam
Yuzuru Karouji	Japan Aerospace Exploration Agency