

SPACE DOMAIN

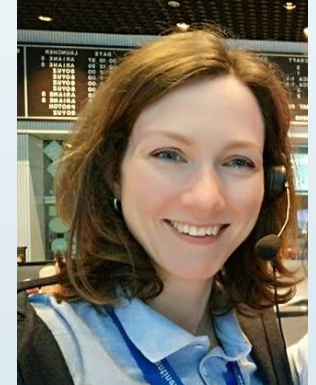
The background of the slide is a photograph of a large, classical building with a prominent dome and a portico supported by many columns. The building is made of light-colored stone and is set against a clear blue sky. Some greenery is visible on the left and right sides of the frame.

ESA_Lab@UCL

Professor Alan Smith
Director, UCL Space Domain



UCL Lab coordinator
since 09/2019:
Prof. Alan Smith



ESA Lab coordinator
since 09/2020:
Michelle Baker



ESALAB Goal

Establish an **institutional link between academia and ESA**. ESA_Lab@ is not a funding mechanism but a cooperation scheme, between ESA, academia and even other entities, to **intensify research, development, and outreach**. ESA_Lab@ should in particular support inspiration, European identity and cohesion and the growth of the space sector.



UCL Areas of Collaboration

Research and development

Promote topics of mutual interest

Implement activities related to the UCL lab research themes

Outreach

Disseminate knowledge through activities and new materials for students

Encourage the contribution of other space actors

Inspiration

Organise at least one seminar, conference or event developed jointly, on space related topics

- **17+ Areas of interest established**
- Each topic has a dedicated ESA point of contact and UCL Theme Leader

Science and Exploration

- Planetary Science
- Space Science Instrumentation
- Exoplanets Research
- Off-world-living
- Space Medicine

Enabling and Support

- Space Project Management and Systems Engineering
- Materials Science
- Data Systems Applications/Robotics and Artificial Intelligence

Applications

- Interdisciplinary Space Studies and Research
- Earth Observation
- Economics Innovation and Public Policy
- Cubesats/Nanosats
- Telecommunications

Safety and Security

- Orbital Dynamics and Space Safety
- Space Law and Regulation
- Space Policy, Governance and Security
- Space Weather

- ESA_Lab@UCL falls within its more general Space Domain
- UCL Domains are thematic, horizontal structures within UCL's essentially vertically oriented organisation.
 - They fall under the Office for the Vice Provost Research, Innovation and Global Engagement
- ESA_Lab@UCL was established within the context of many already strong relationships between UCL and ESA
 - E.g. UCL's engagement with many space science and EO mission
 - As such ESA's programme has had a profound impact on the choice of PhD and Masters topics, and group project topics
 - ESA_Lab@UCL seeks to support existing areas of endeavour (e.g. through the dissemination of ESA opportunities for students) and to encourage new areas (e.g. in AI, Off-World Living, Quantum technologies)

December 2020 – ESA AI Strategy Webinar for ESA_LABs

- Opened to **all** ESALABs and LAB experts, attended by > 60 participants.
- ESA AI strategy presented.

December 2020 – ESA_LAB@UCL – ESA AI workshop.

May 2021 – Off-world Living Workshop

- ESA_LAB@CH (Swiss Space Centre) joined in.

2021 – Material Sciences and Manufacture in Space/Off-world

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Safety and Security

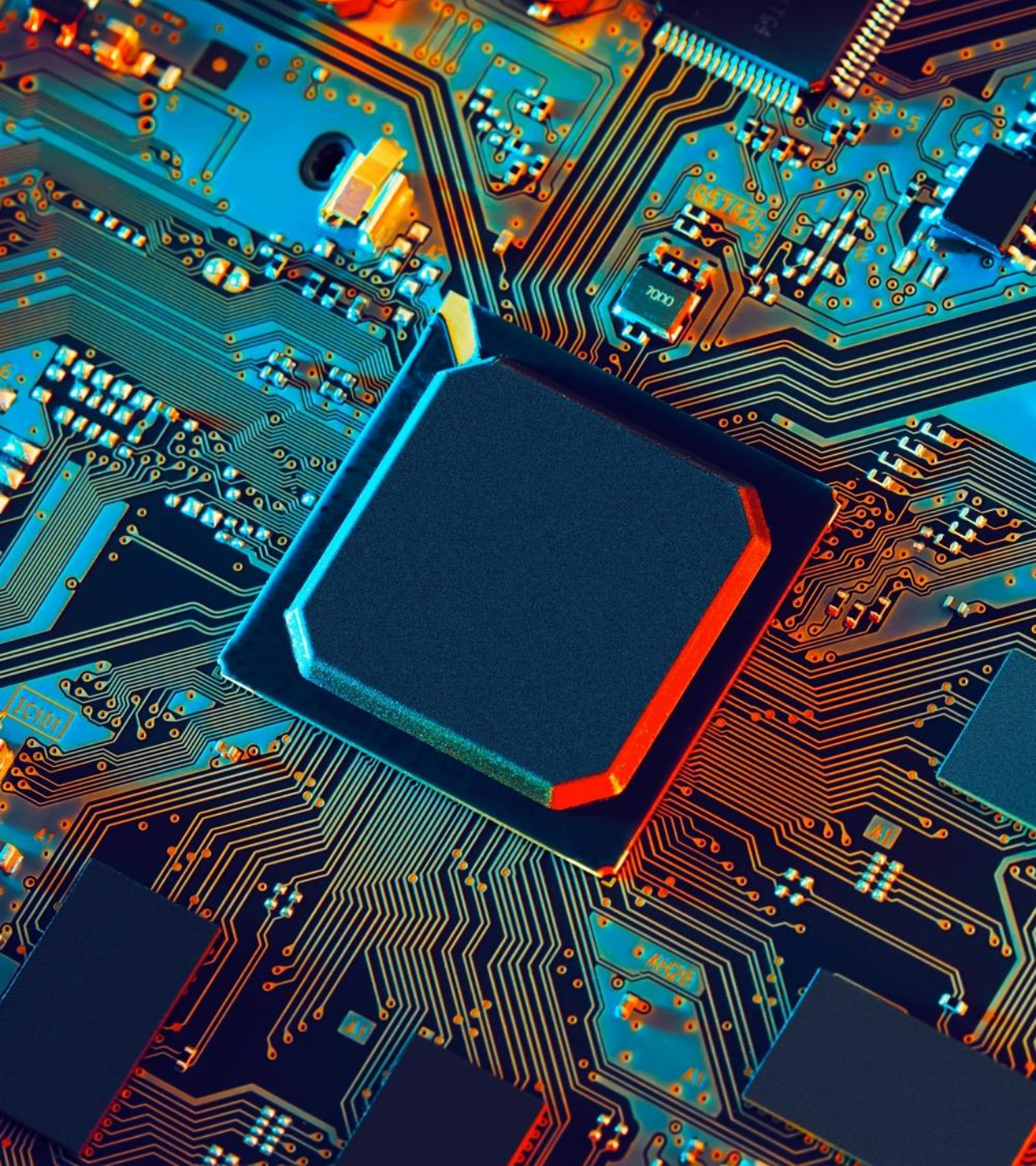
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UCLQ

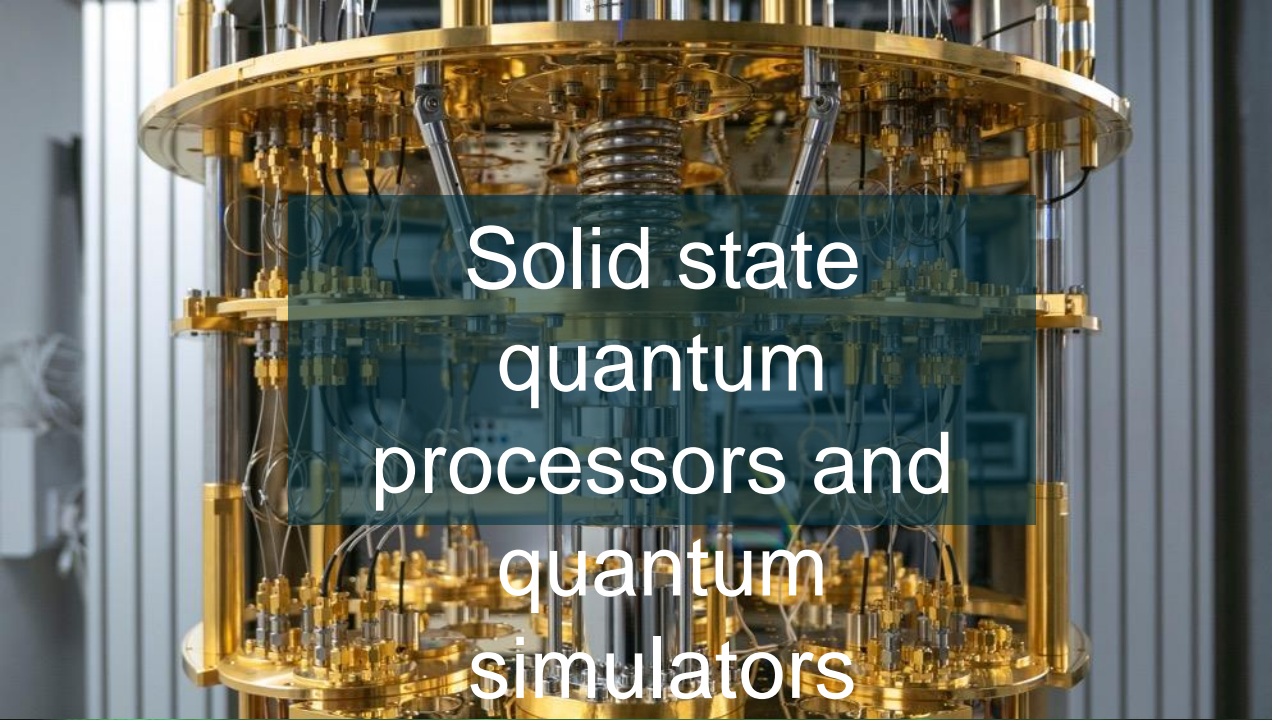
Quantum Science &
Technology Institute



Henry Bennie
Communications and
Business Development
Manager



£1 billion government and industry investment to commercialise quantum innovations and secure the UK's status as a world-leader in quantum science and technologies.



Solid state
quantum
processors and
quantum
simulators



Quantum algorithms
and architectures



Quantum interfaces
and communication



Quantum
sensors and
standards



UCLQ and ESA_LAB Aspirations

- Workshops to identify interest areas for development
- Join Seminars/Hackathons/Training
- MSc, Mres and PhD Projects

OWLI is spreading across UCL



The Bartlett (Faculty of the Built Environment)

- School of Architecture
- School of Construction & Project Management
- School of Planning
- Real Estate Institute

Vice Provost Research

Vice Provost Health

Dean of Maths and Physical Sciences

Dean of Faculty of Engineering Science

Dean of The Bartlett

Dean of Brain Sciences

A large, realistic image of the planet Mars, showing its reddish-orange surface with various craters and geographical features. The word 'OWLI' is superimposed in large, bold, black letters across the center of the planet.

OWLI

Mullard Space Science Laboratory

Anthropology and the
Centre for Outer Space Studies

Institute for Materials Discovery

Institute for Risk & Disaster Reduction

Space and Climatic Physics

Physics and Astronomy

Civil, Environmental &
Geomatic Engineering

Future Directions

Research

- Progress the many relevant research areas – to be furthered via the first ESA/UCL workshop TBH early May
- Start to recognise and appreciate the unique new OWL related knowledge we will need and generate new and novel research areas:
 - *starting to see the emergence of a new cadre of OWL related PhDs*
 - *novel research proposals expected*

Teach

- Translate the above into taught material for both UG and PG, but also use OWL issues to drive new thinking about our planet and our responsibilities – *student interest is clear*

Engage

- OWL is an area ripe for wider interest from the general public and media – OWL fits the narrative and timing for UCL's new campus in east London - UCL East

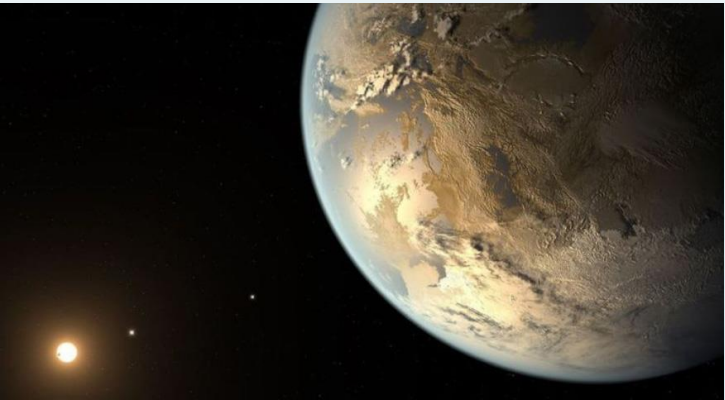
Enterprise

- OWL related issues and challenges seems likely to lead to new forms of collaboration between the public and private sector – especially in the area of knowledge transfer and the links between R and D
- OWL provides the opportunity to engage with and grow the established space industry. For example, as needs arise for the consideration of Off World sustainable habitat formation, operation and adaptation draw from and drive innovation and invention from those in (or new entrants to) the built environment sector

UCL – Birkbeck Centre for Planetary Sciences



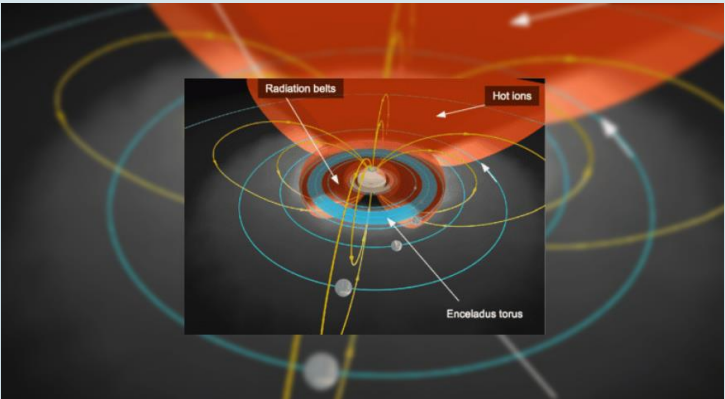
Astrobiology



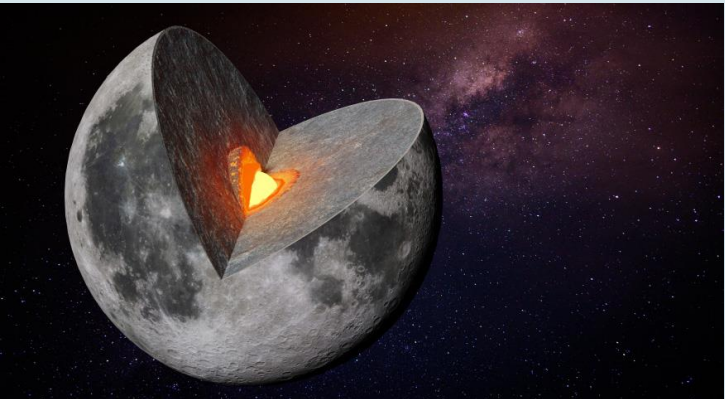
Exoplanets



Surfaces



Magnetospheres



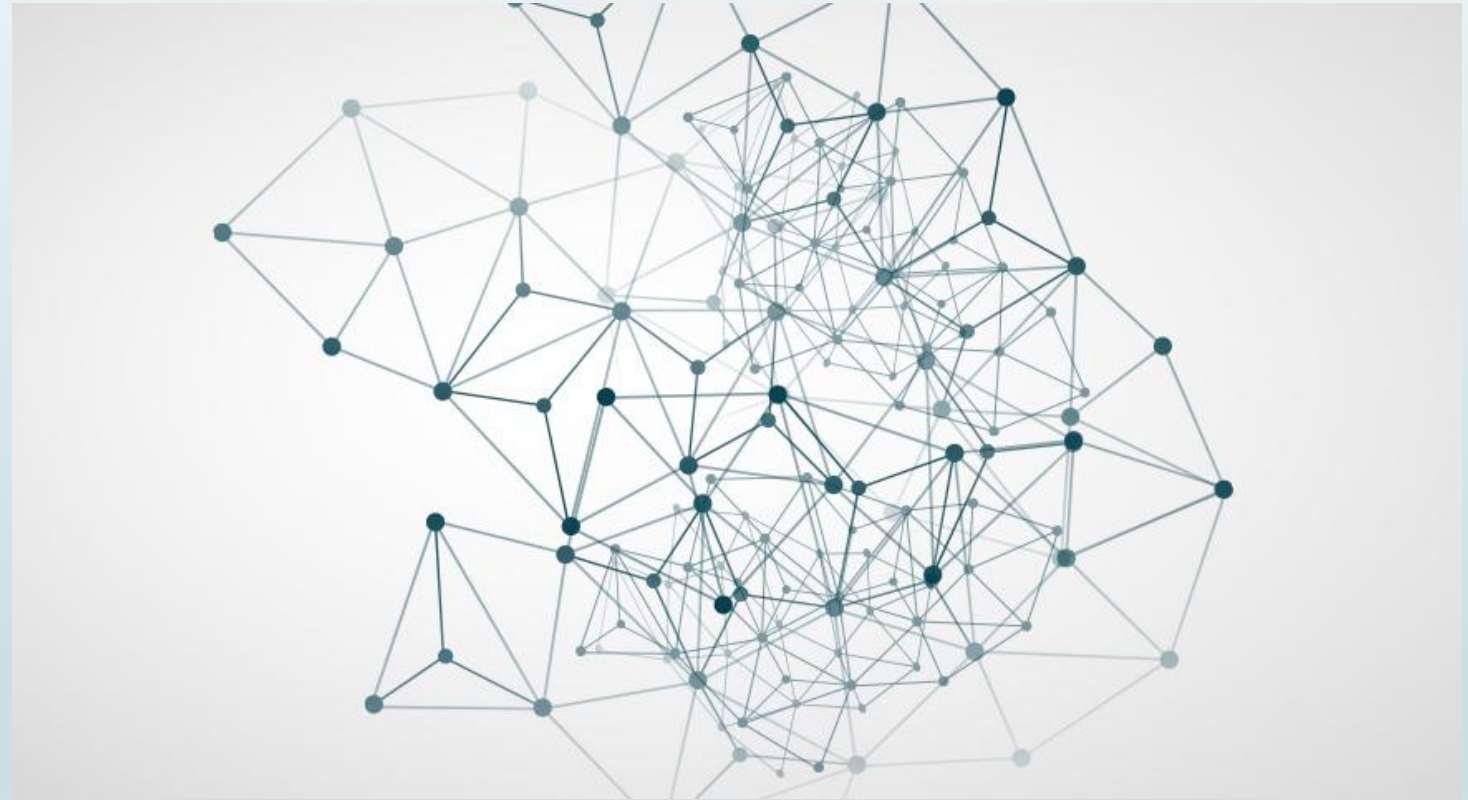
Interiors



Missions

The Centre for Space Exochemistry Data (CSED)

is an interdisciplinary hub that will take exoplanet science and astrochemical research to a new level by facilitating connections between observational data from space missions, deep learning techniques and quantum physics modelling of complex molecules.



ESA_LAB@UCL Summary of Activities

Input to Advisory Committee for Education

- Michelle Baker (ESA) and Prof. Alan Smith (UCL)
- 15.04.2021