'Together, we shall aspire to the stars with wisdom, vision and effort'.

The International Space University

BERTRAND GOLDMAN ISU

UCL ONE O'CLOCK

NOVEMBER 16, 2021

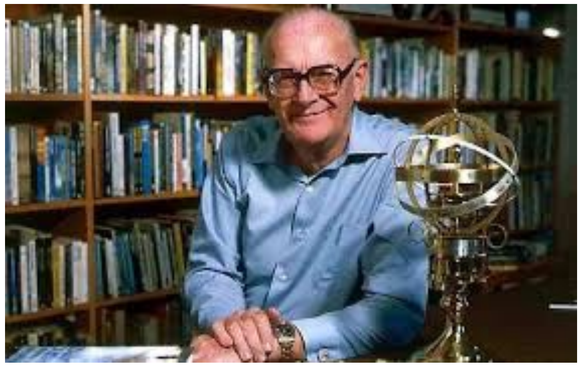
Origin and goals

- The youngest university?
- An international effort, started at MIT
- (…) preservation of its home planet, the increase of knowledge, the rational utilization of the vast resources of the Cosmos
- Started with an itinerary summer program, established a campus in 1995
- (…) you, as leaders of industry, academia and government

INTERNATIONAL SPACE UNIVERSITY is an institution founded on the vision of a peaceful, prosperous and boundless future through the study, exploration and development of Space for the benefit of all humanity.

ISU is an institution dedicated to international affiliations, collaboration, and open, scholarly pursuits related to outer space exploration and development. It is a place where students and faculty from all backgrounds are welcomed; where diversity of culture, philosophy, lifestyle, training and opinion are honored and nurtured. (…)

ISU Chancellors



Arthur C Clarke

Jean-Jacques Dordain

Buzz Aldrin

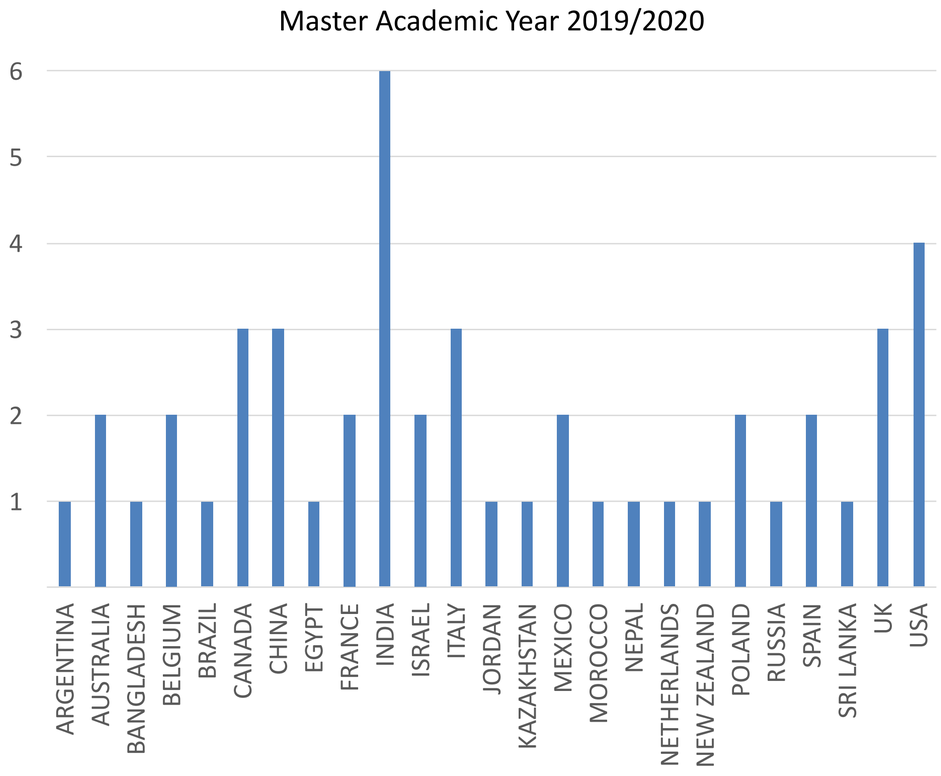
Pascale Ehrenfreud

3Is: International

- Founded in the USA in 1987, based in France since 1994, but
- International Board of Trustees and stakeholders
- Many agreements or partnerships internationally:
  - space agencies: NASA, ESA, CNES, UKSA, POLSA, ASI, CASC, ISRO,…
  - major companies: Airbus, Boeing, Lockheed-Martin,…
  - small companies and start-ups
  - universities: Florida Tech, U. of South Wales, U. College London, IRS in Stuttgart, the AIR Centre in Lisbon, Tohoku U. in Sendai,…
  - international organisations: UNOOSA, COSPAR, African Union,…

International

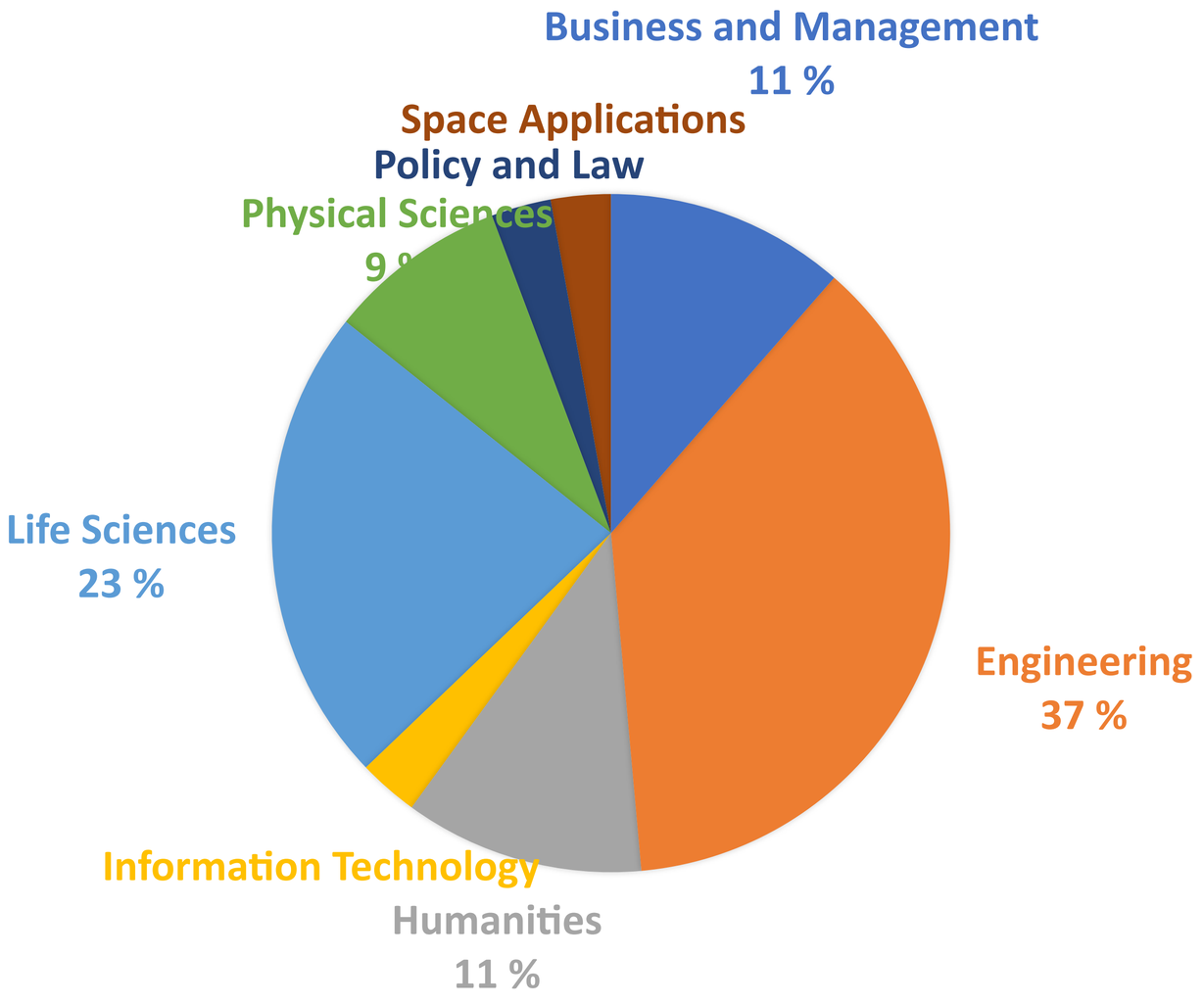
- International staff and faculty
- International student cohorts



Interdisciplinary

Seven disciplines:

- Space Business and Management
- Human Performance in Space
- Space Policy and Law
- Space Physical Sciences
- Space Applications
- Space Engineering
- Space Humanities



Background of Master students 2020/21

Intercultural

- Put your pre-conceived ideas to test
- Academic, cultural and national diversity
- Most major space projects are international
- « Intercultural nights »

Space University @ISUnet · 29 janv. 2018

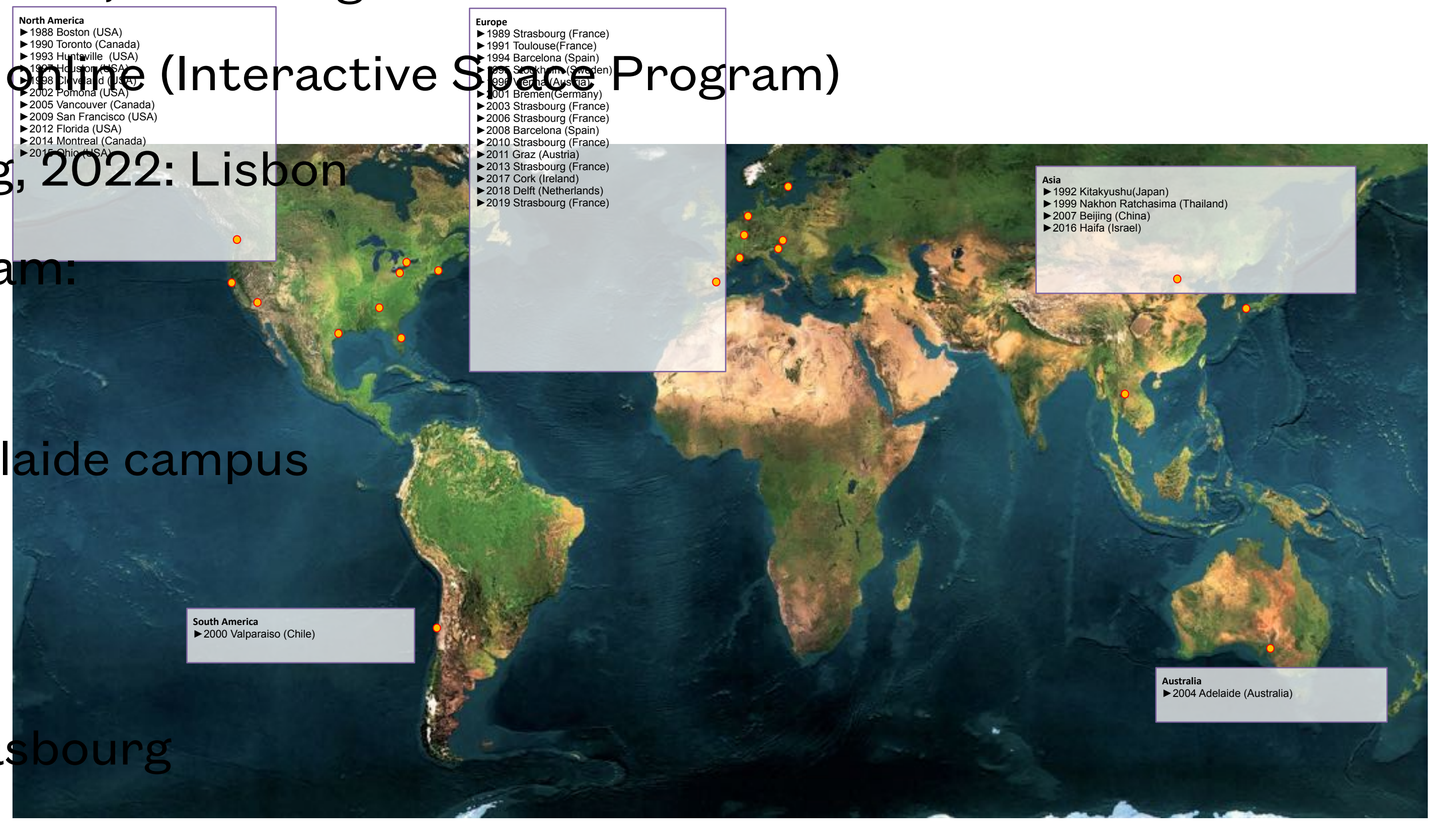
#ISUnet #MSS18 Intercultural Night on 2 February with presentations of Jordan, Mexico and Serbia followed by traditional food tasting !

Teaching: Master of Space Studies

- 12 months (9 months taught, 3–6 month internship), plus optional 2nd year
- very intense and integrated
- taught modules: introduction, deepening, electives
- practical modules: individual project, team project, internship
- 4–5 professional visits, workshops, and activities
- strong connexion student-teacher and student-student

Teaching: Short Programs

- Space Studies Program:
  - 9 weeks, intense, « life-changing experience », June–August
  - different locations world-wide, this year online (Interactive Space Program)
  - 2020: online, 2021: Granada+Strasbourg, 2022: Lisbon
- South Hemisphere Space Studies Program:
  - 5 weeks, Jan–February
  - at the University of South Australia Adelaide campus
  - 2021 and 2022: online
- Executive Space Courses
  - one week, three locations/year incl. Strasbourg

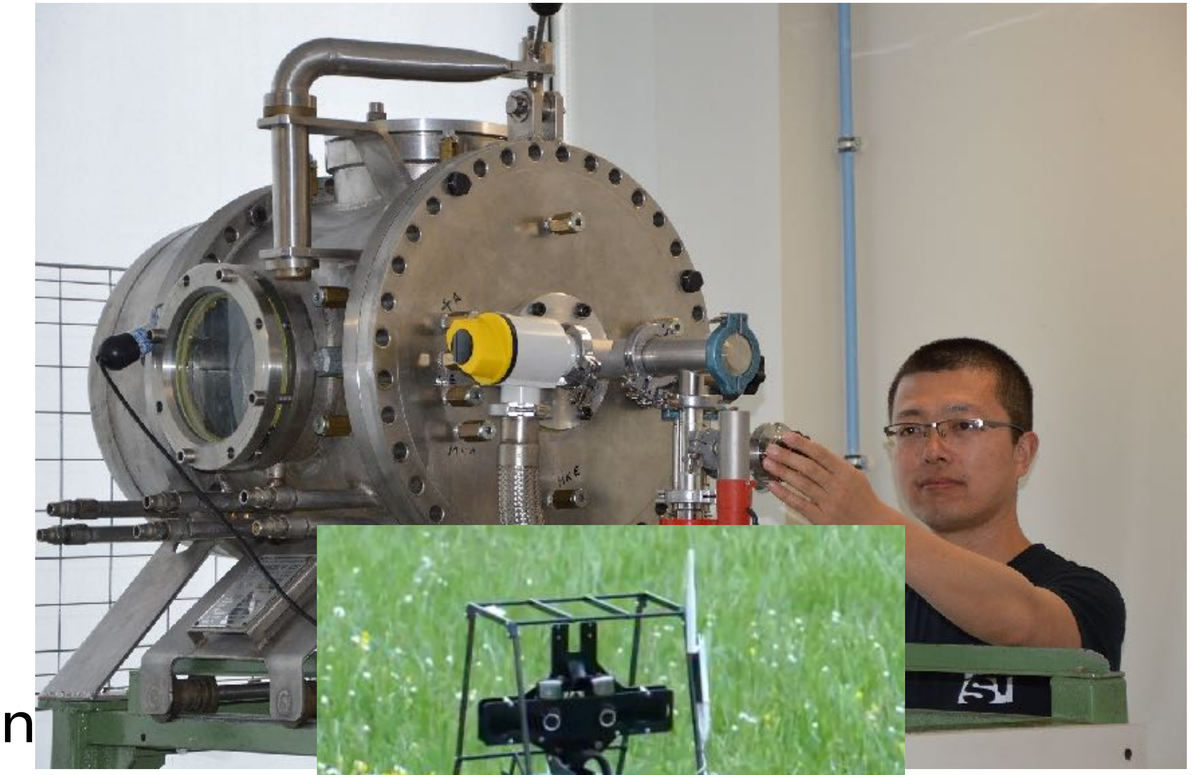


Team projects

- Provide experience with research, project management, organisation, communication
- The team conducts its research and chooses the direction freely
- Students interact with world experts
- 2–4 projects proposed for each program
- Master: 5 months @ 30%, 20 students
- See https://isulibrary.isunet.edu

Equipment

- Vacuum chamber
  (being prepared for regolith sintering)
- 2.5-m 21cm radio antenna
- 1-m 10–12GHz dish
- Satellite tracking station
- NASA Senseta Rover w/stereoscopic vision
- A Reddy shock tube
- Library dedicated to space (10k books)



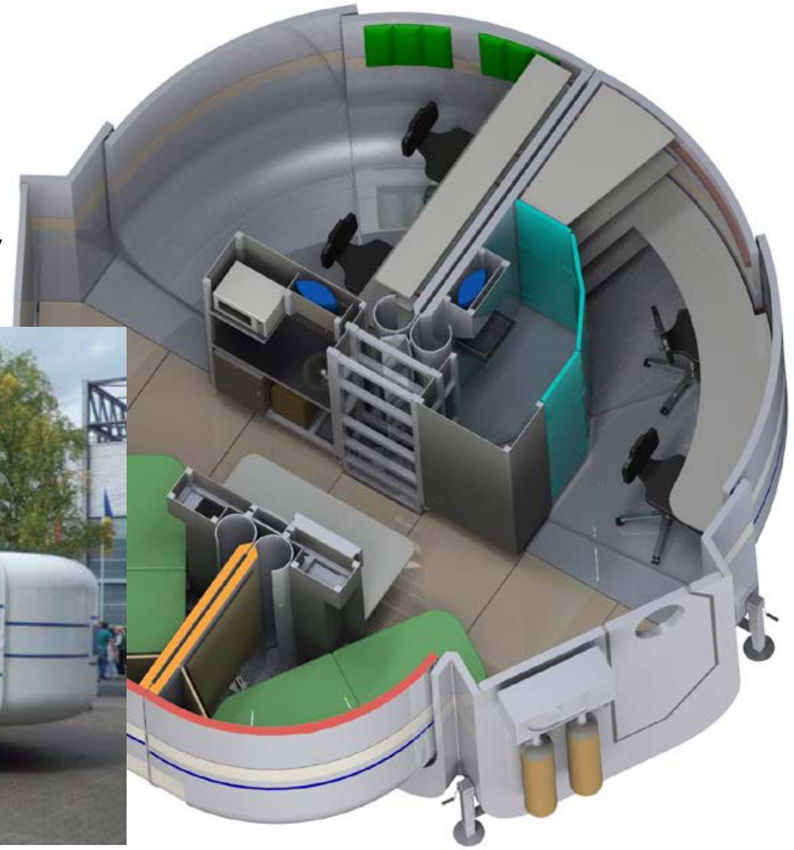
Research

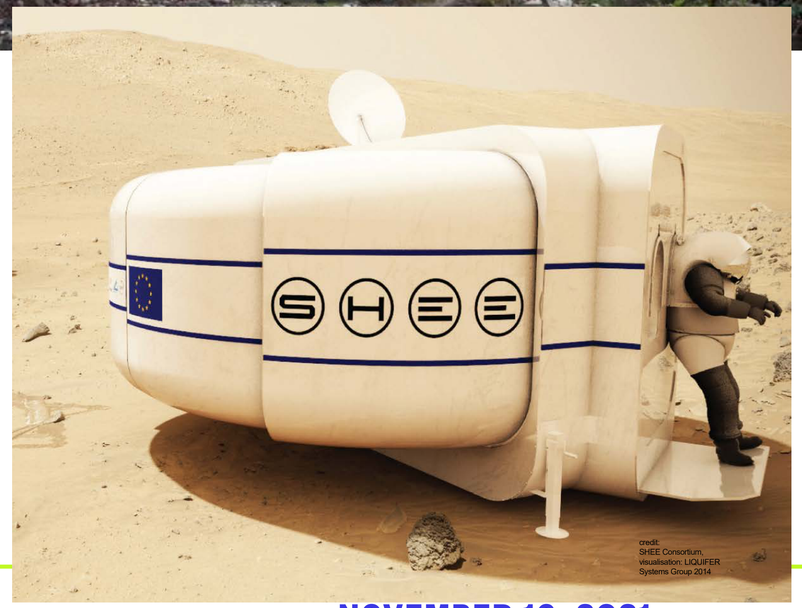
- Education and research go together
- Students perform research projects during the p
  under ISU/external supervision
- Some recent projects:
  - SHEE, a prototype for an Extreme Environment Habitat
  - Self-deployable

Executive Summary
SHEE consortium

Research: SHEE

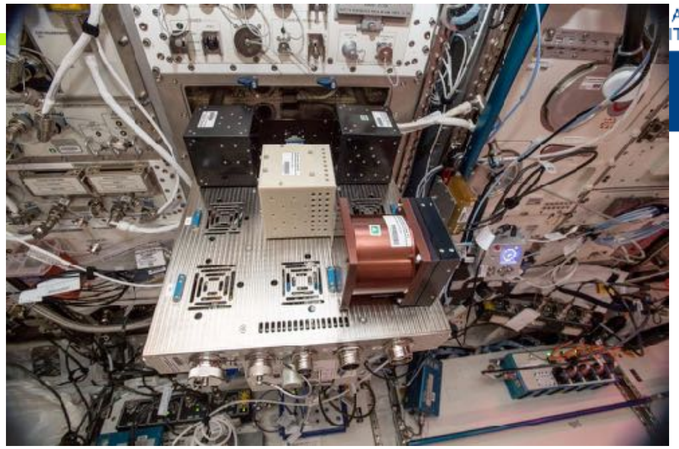
- Extreme environment habitat
- For two researchers, for two weeks
- Outreach opportunity

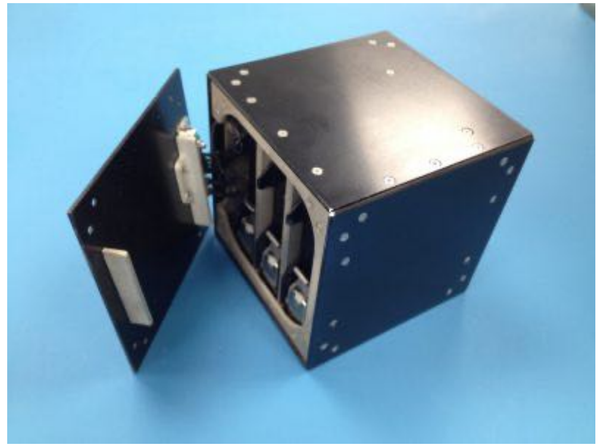


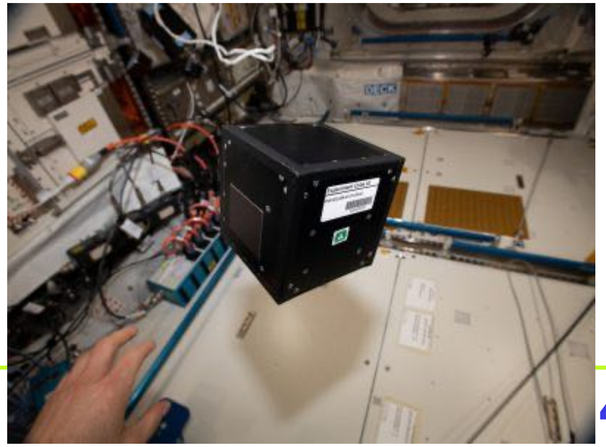


Research–payloads

- 3 payloads for the ISS:
  - plant growth experiment
  - methanogen growth
  - interactive kaleidoscope: Hydra-3 ISS
    - now at MacQuarie University and Bits-core company
- Next big project: launch a cubesat

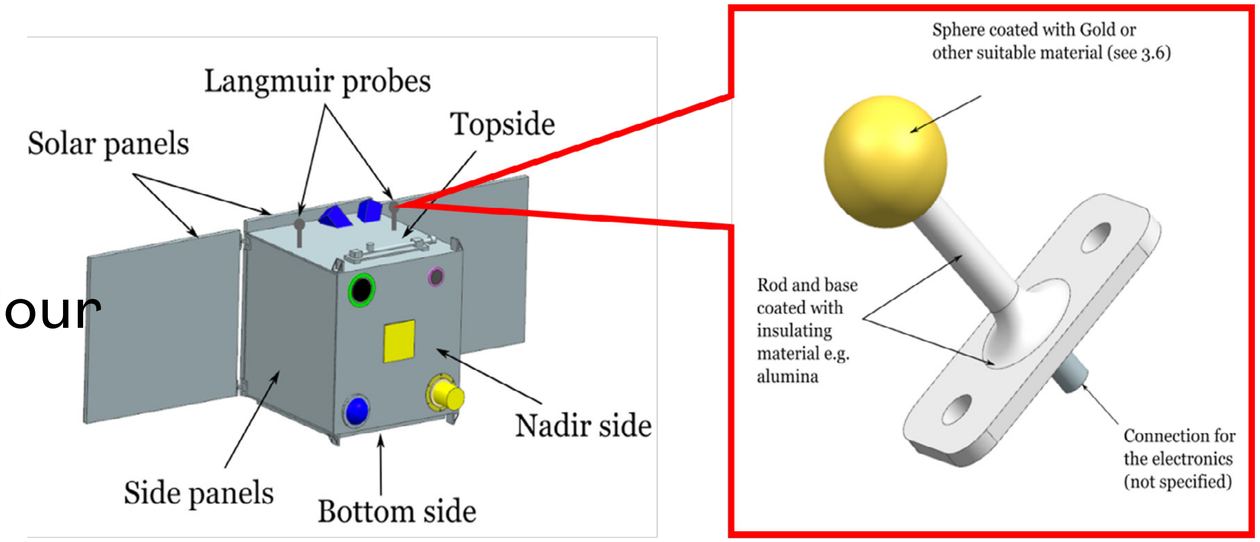






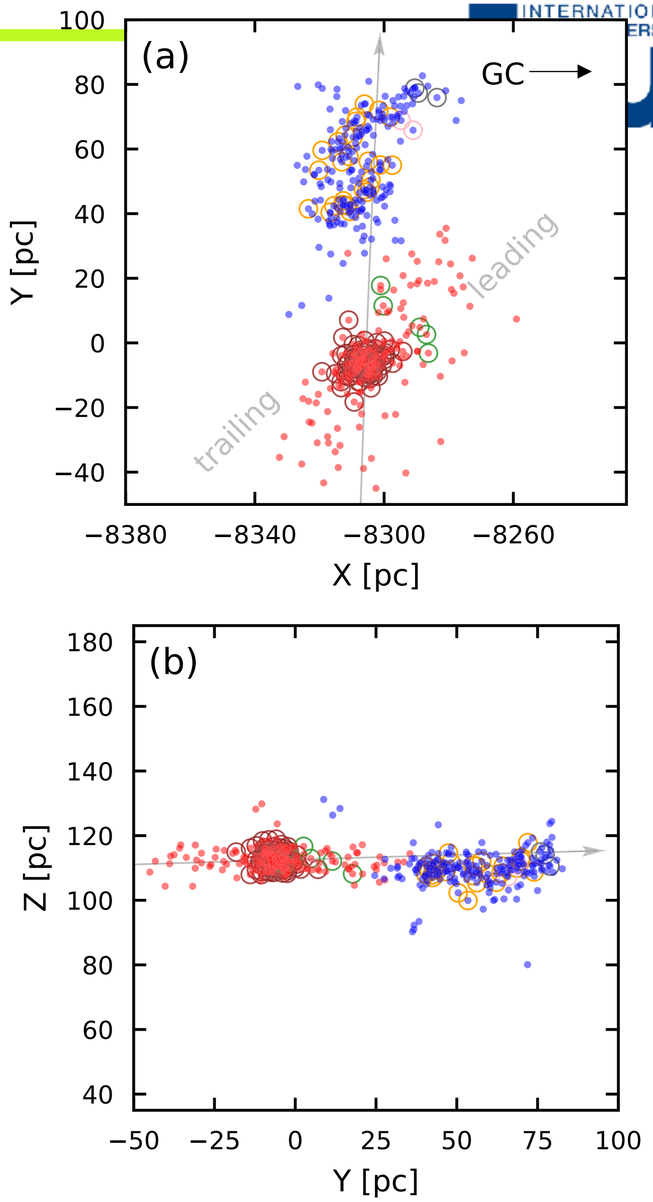
Research–payloads

- Design and Development of a Plasma Instrumentation
  - Dr. Taiwo Tejumola
  - Langmuir probes to measure temperature, density, and electric potential
  - to be mounted on the IRS-Stuttgart 60-kg ROMEO small sat
- Other research interests of Taiwo:
  - standardisation
  - using chipsat to monitor cubesat behaviour
- Next big project: launch a cubesat



Research – Astronomy

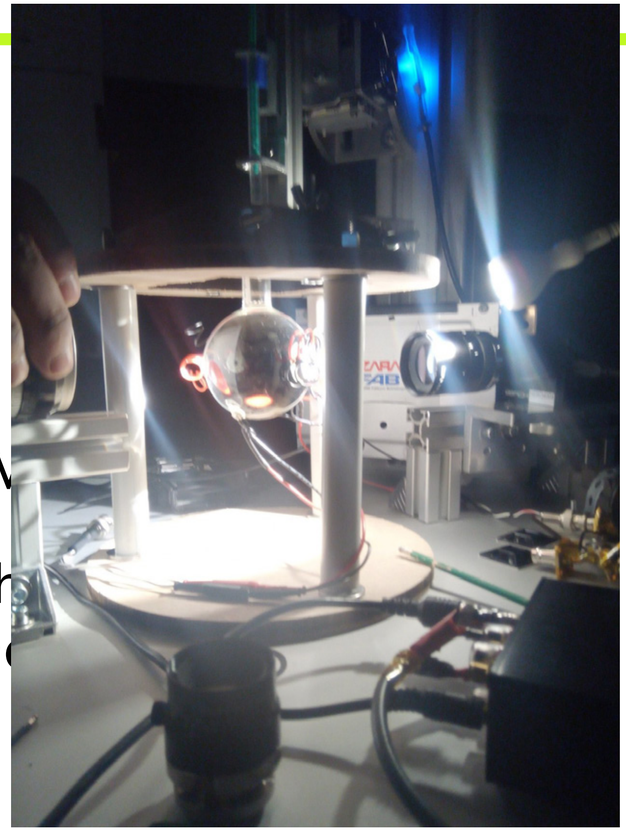
- Moving groups:
  - stellar clusters dissolve as members escape into the disk
  - the escaped members keep the same motion
  - use *Gaia* to identify the original stellar content
- Nearby low-mass stars and brown dwarfs
- Solar system and astrobiology–Prof. Hugh Hill
  - shock processing of nucleobases
  - using the Reddy shock tube



Coma Ber, Tang+ 2019

Research

- In Situ Resource Utilisation:
  - simulation performed with COM
  - laser sintering of Lunar regolith planned in 2022: in vacuum con
  - PhD thesis of Danijela Stupar
- Sonoluminescence:
  microgravity test of
  single bubble sonoluminescence
  dropped at the ZARM Bremen drop tower
  master thesis of James Hurrell



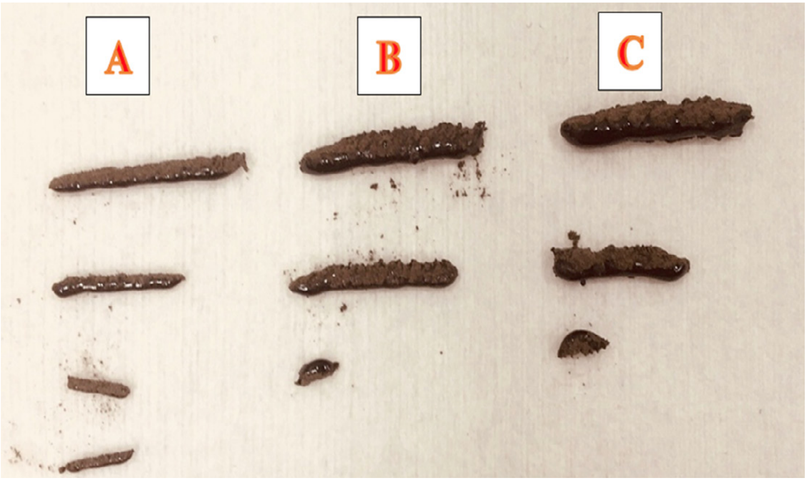


Fig. 24: Samples of 2D printed samples of regolith stimulants

Research – Life sciences

- Pharmacology and human performance in space: Prof. Virginia Wotring
  - systematic review of impact and counter-measures of micro-gravity environment in the Orion Crew Vehicle
  - physiology study of female astronauts re. the risk of venous thromboembolism
- Use flatworm Planaria in simulated space environments

Research – business

- Prof. Walter Peeters, since Sept.21 Nicolas Peter
- Impact of innovation, space-developing countries
  - utilisation of cubesats
- Role and comparison of incubators

Popularisation

- Part of curriculum in the Humanities discipline
- Related topics as Individual Project
- Students contribute to the Open Days
- On a voluntary basis, options to welcome classes (e.g. from Poland)
- Organiser of the first semi-final in France with EU–SDC (colonisation competition for high-school students)

Sustainability

- Space-based Earth observations crucial to quantify the impact
- The space sector has to adjust and contribute to the global reduction of greenhouse gas emissions
  - Paris agreement: economic activities to become carbon-neutral by 2050 (50% reduction by 2030) to limit the average temperature increase to 1.5ºC
- ISU WG developed a sustainability policy, applying to all ISU activities
- MSS21 year:
  TP on Plastics in the Oceans, « Space for a sustainable Earth » elective
- Participates to ESA sustainability efforts led by Andrea Vena

Entrepreneurship

- ISU Incubator
  - under the umbrella of the AeroSpace Valley & ESA BIC Sud France
  - « booster » supported by local authorities and the French government
  - support ISU alumni entrepreneurs in particular
- Seven start-ups in ~22 months
  - three offered internships to ISU Master students
  - one hired two ISU Master students (MSS20)

A strong network

- Global faculty
  150 experts from academia, agencies, companies
- Alumni

A few other alumni…

- Jessica Meir (MSS00), NASA Astronaut
- Jennifer Wiseman (SSP89), Senior Astrophysicist, NA
- Alexander McDonald (SSP05), NASA Chief Economist
- Andrew Aldrin (SSP01), Director, Aldrin Space Institut
- Stephanie Bednarek (SSP08), Director of Commercial
- William Pomerantz (MSS04), Vice President, Special F
- Elodie Viau (MSS08), Director for Telecommunication
- Philippe Clerc (MSS96), Head of Compliance and Ethic
- So-yeon Yi (SSP09), South Korea's first astronaut anc
- Yansheng Wu (SSP01), President, China Aerospace Sc
- Takemi Chiku (SSP92), Senior Administrator, JAXA
- Timiebi Aganaba-Jeanty (MSS08), Assistant Professor, Arizona State University
- Peter Platzer (MSS12), CEO, Spire Global Inc.

4. Chang'e-5 mission with ISU contribution

Mr. Yansheng WU (ISU SSP01)
Chairman of CASC

Mr. Dengyun YU (ISU SSP03)
Deputy Chief Program Architect

Mr. Dong Li (ISU SSP05)
Chief Designer of LM-5

APPLYING FOR ISU PROGRAMS

- Tuition fees:
  - MSS: 25,000 €
  - Space Studies Program: 18,500 €, including accommodation and meals. Next one, June-August 2021: in Granada
  - Southern Hemisphere Space Studies Program: 9,000 AU$, online in January-February 2021
  - Commercial Space Program, in Florida: 14,892 US$
  - Partial **ESA scholarships available for UK applicants**, depending on application evaluation
- Applications dead-line to request scholarships
  - MSS deadline: 15 March
  - SSP deadline: 31 January
  - SHSSP deadline: 30 November (flexible)
  - CSP deadline: 30 April

Take-home messages from ISU

- International, Interdisciplinary, Intercultural
- Space-related research programs
- Upcoming online « Open Day » end of January
  - bertrand.goldman@isunet.edu or discover@isunet.edu