

The logo features a red graphic element consisting of a diamond shape with a cross inside, and a red curved line that starts from the right side of the diamond and curves upwards and to the right.

**S P A C E**  
INNOVATION

**MEMBERS' PROFILES**

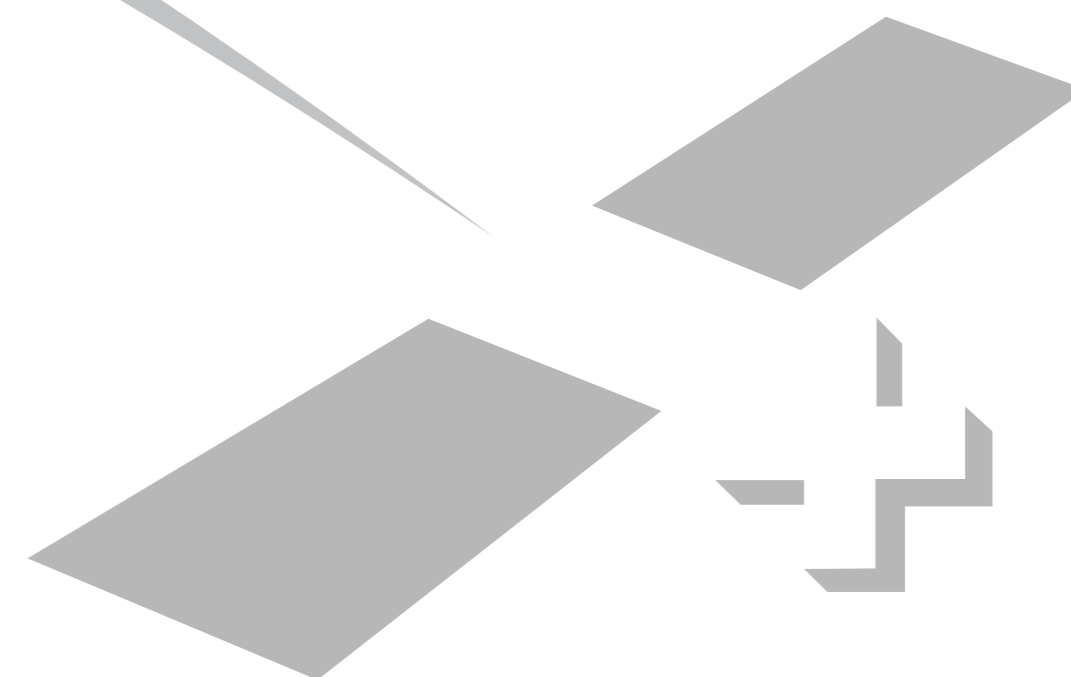
August 2022





**MEMBERS' PROFILES**

August 2022



**Cover Illustration :**

Switzerland as seen by Envisat (2006), ©ESA and modified by Space Innovation, CC BY-SA3.0 IGO

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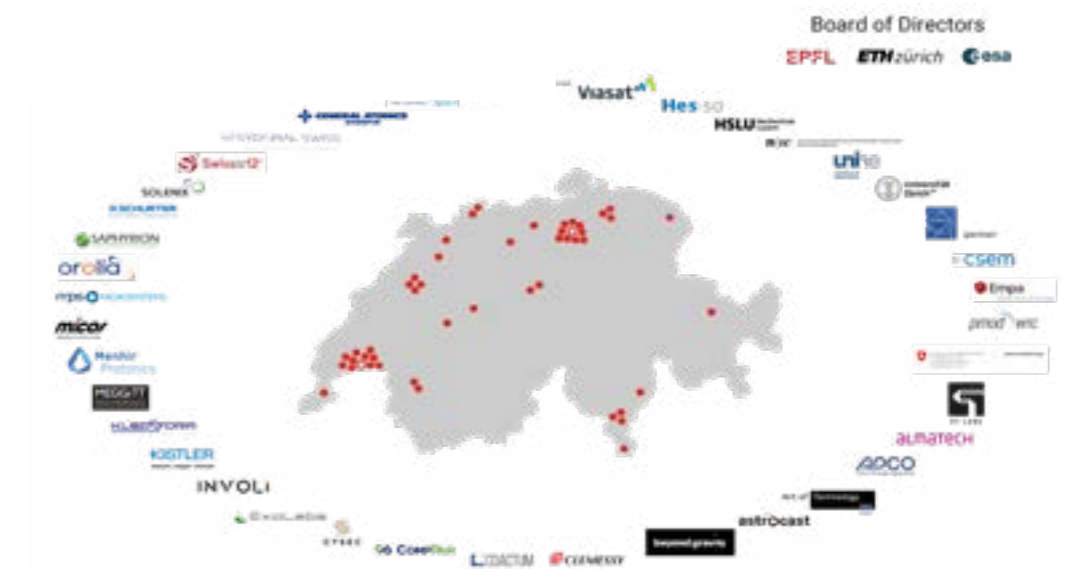
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## INTRODUCTION

You have in your hands the fifth edition of the brochure presenting the capabilities and competences of the Space Innovation members.

Space Innovation's goal is to involve societal actors in the development of space technologies by establishing and supportive innovative projects with its members and partners. It also aims to strengthen Switzerland's capabilities and to enable space technologies to contribute to sustainable development through its established network and access to cutting-edge technologies.

At the time of this fifth edition (June 2022) Space Innovation has 41 members throughout Switzerland, among which 28 industries, 8 universities and 5 Research and Technology Organisations (RTO). In addition, the European Center for Nuclear Research (CERN) based in Geneva signed a partnership agreement with Space Innovation in 2016.



We hope you will discover in more details what our members have to offer you in terms of expertise, products and potential collaborations. You may contact them directly or via Space Innovation. Please note that all the information within this brochure were provided by the entities and reflect the situation in July 2022.

**INDUSTRY**

# INDUSTRY

Segment	Research	Development	Production
Earth Observation			
Life and Physical Sciences			
Satellite-based Applications			
Instruments and Payloads			✓
Spacecraft and on-board Equipment			✓
Ground Segment			
Materials and Processes			✓
Structures			✓
Electronic Components			
Software			✓
Basic Research for Space Technology			
Small Satellite Activities			✓

## 9T Labs

### “All-in Solution for Digital Composite Production”

#### References

9T Labs' Technology has already been tested in aerospace, automotive, medtech, sports, and luxury. Among these users, following applications can be mentioned:

- Helicopter door hinge - University of Applied Sciences Northwestern Switzerland
- Automotive bracket - SetForge/ Renault

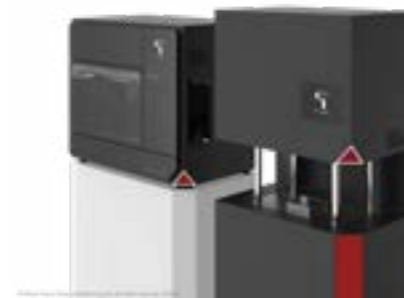
#### Profile

Founded in 2018 by a team of pioneers, passionate about bringing the next generation of high performance manufacturing, we aspire to mass produce high performance composites as easily as metals. We do this by automating and digitizing the production workflow of composite production at the most innovative companies.

Therefore, we built a software as a service suite, powered by integrated FEA simulation tools, that allows to quickly find the most optimal designs. Then we combined state of the art additive manufacturing equipment with advanced post processing technology to enable serial manufacturing of structural composite parts.

#### Field of Expertise

We are at the forefront of digital composite production with our all-in-one Red Series technology. To offer this level of technology to our customers, we developed a unique expertise in the production value chain of load-carrying composite structure from design to consolidated serial parts.



**9T LABS** 

#### 9T Labs AG

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Segment	Research	Development	Production
Earth Observation			
Life and Physical Sciences			
Satellite-based Applications			
Instruments and Payloads	✓	✓	✓
Spacecraft and on-board Equipment	✓	✓	✓
Ground Segment		✓	✓
Materials and Processes	✓	✓	✓
Structures	✓	✓	✓
Electronic Components			
Software			
Basic Research for Space Technology	✓	✓	✓
Small Satellite Activities	✓	✓	

## ALMATECH

### “Space and Naval Engineering”

#### Profile

Almatech is a privately-held Swiss SME specialized in the design, engineering and MAIT of ultra-stable structures, high-precision mechanisms and thermo-optical hardware for the European space market.

Since its inception in 2009, Almatech contributed to multiple ESA missions such as PREMIER, Bepi Colombo, Solar Orbiter, Sentinel-5, CHEOPS, Exomars 2020 and Metop-SG including numerous successful hardware deliveries.

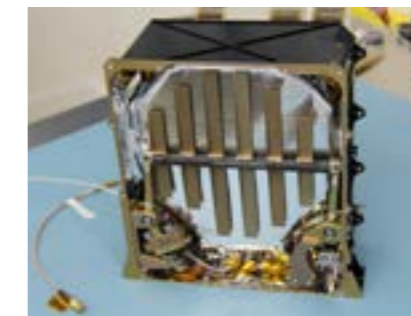
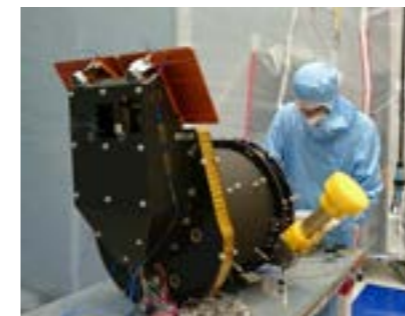
Almatech engineering competencies range from inventive concept definition through top-notch structural and thermal analyses to the final delivery of fully-tested flight hardware.

#### Field of Expertise

- Structural and thermal analysis
- High-precision mechanisms
- Compliant systems
- Lightweight Structures
- Ultra-stable CFRP Structures
- Exotic materials and processes
- Multi-layer insulation (MLI)
- Thermo-optical coatings

#### References

- FLEX Calibration Unit
- SVOM MXT Instrument Structure
- CHEOPS Telescope Optical Structure
- Sentinel-5 instrument Structure and Radiators
- Solar Orbiter Slit Change Mechanism (SCM) of the SPICE instrument
- Solar Orbiter Attenuator Mechanism (ATM) of the STIX instrument
- Exomars 2020 Carrier Module MLI and its support structure
- Metop-SG SAS MLI and MLI fixation
- Etc



**almatech**

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# INDUSTRY

Segment	Research	Development	Production
Earth Observation	✓	✓	✓
Life and Physical Sciences			
Satellite-based Applications			
Instruments and Payloads	✓	✓	✓
Spacecraft and on-board Equipment	✓	✓	✓
Ground Segment	✓	✓	✓
Materials and Processes	✓	✓	✓
Structures	✓	✓	✓
Electronic Components			
Software			
Basic Research for Space Technology			
Small Satellite Activities	✓	✓	✓

## APCO Technologies

“We take up technical challenges.”

### References

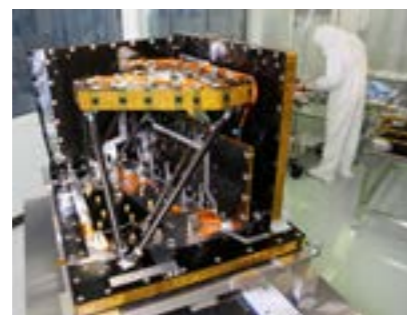
- LSTM, ADRIOS, Triton-X, Biomass, S-5P, Triton-2, MTG, ELECTRA, H2Sat S/C Structures
- S-2, S-3, Euclid, EarthCARE, SoIo Instr. Structure, Harness & Thermal Subsystems
- Euclid VIS RSU and SoIo SPICE Door Mechanisms
- Ariane 6 MGSE
- Ariane 6 Booster Upper & Lower Attachments
- Soyouz, VEGA, Ariane 5, VULCAN, ATLAS 5 MGSE
- JUICE, MetOp-SG, S-1/2/3/4/5/6, MTG, Euclid, ELECTRA, PACE, Biomass MGSE

### Profile

APCO Technologies is a system/subsystem integrator and turnkey solution provider, specialized in the development of high quality mechanical and electro-mechanical equipment for the Space (Satellites, Launchers and Services), Energy and Naval domains, including project management, co-engineering, design, production, integration, testing, installation, operation and on-site support. APCO Technologies is certified EN/AS 9100, ISO 9001, ISO 14001, ISO 27001, ISO 45001. APCO Technologies is employing more than 400 highly qualified people in Switzerland, France and French Guiana.

### Field of Expertise

- Launcher and Spacecraft Structures (metallic and composite), Harness & Thermal Control
- Spacecraft Instruments
- Spacecraft Instrument Structures, Harness, Thermal Control & Mechanisms
- Mechanical Ground Support Equipment
- Services at the European Space Port in French Guiana: Operations and maintenance of the EPCU, Mechanical Group within the BET and responsible of the Individual Protection Gears



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Segment	Research	Development	Production
Earth Observation			
Life and Physical Sciences			
Satellite-based Applications			
Instruments and Payloads		✓	
Spacecraft and on-board Equipment			
Ground Segment			
Materials and Processes			
Structures			
Electronic Components		✓	
Software		✓	
Basic Research for Space Technology			
Small Satellite Activities		✓	

## Art of Technology

“We make your electronics work.”

### Profile

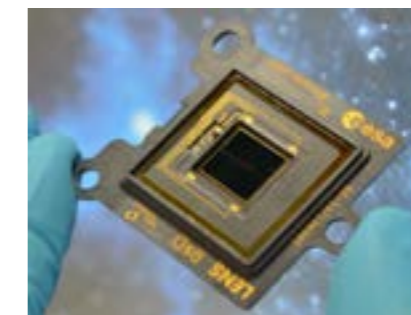
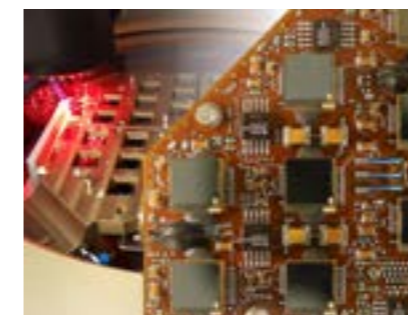
Art of Technology is a contract engineering company specialising in the design, development and miniaturisation of complex electronic devices and embedded systems (hardware and software) for medical devices, intelligent implants, data communication, space applications and other extreme environments where exceptional reliability is required. We can develop devices that might not have been possible with conventional technologies only a few years ago. Increased reliability, reduced consumption, optimised thermal management and cost reductions at system level being some of the advantages resulting directly from this approach.

### Field of Expertise

- System miniaturisation & cost optimisation
- Low power electronics & power management
- Cryptography & security electronics
- Analogue & digital electronics
- Concept & technology studies
- Design reviews & troubleshooting services
- Design & development (hardware & software)
- Prototype production & industrialisation
- Documentation support
- Support for start-ups & universities

### References

- STIX Instrument (on Solar Orbiter) Detector Electronics Module (DEM), High Voltage Electronics (HVE), Back-End Electronics (BEE)
- POLAR (on Tiangong-2) Low Voltage Power Supply (LVPS) High Voltage Power Supply (HVPS)
- 3D-MID3Space (ARTES 5.1) Characterisation of 3D-MID technology for future space applications
- ESA BIC Switzerland



Art of Technology



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# INDUSTRY

Segment	Research	Development	Production
Earth Observation			
Life and Physical Sciences			
Satellite-based Applications	✓	✓	✓
Instruments and Payloads	✓	✓	✓
Spacecraft and on-board Equipment	✓	✓	✓
Ground Segment	✓	✓	✓
Materials and Processes			
Structures	✓	✓	✓
Electronic Components	✓	✓	✓
Software	✓	✓	✓
Basic Research for Space Technology			
Small Satellite Activities	✓	✓	✓

## Astrocast

“Taking IoT further”

### References

Astrocast is the first Swiss satellite operator. The company was built from the ground up in about 5 years and includes the following elements:

- Partly automated Ground Segment & Mission Control Center
- Space Segment of 12 advanced nanosatellites (as of 2021) equipped with deorbiting capability
- Complete nanosatellite manufacturing and testing facility capable of producing 20+ satellites per year
- Development and industrialisation capabilities to mass produce low-power and low-cost IoT modems and antennas.

### Profile

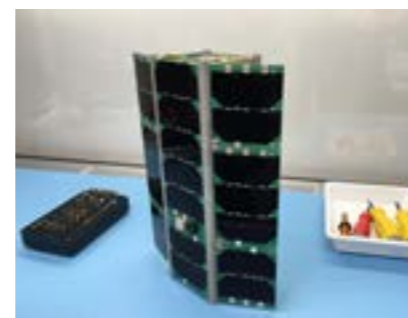
Now a listed company, Astrocast SA is the most advanced global nanosatellite IoT network, tackling challenges in industries such as Agriculture & Livestock, Oil, Gas & Mining, Maritime, Environmental, Connected Vehicles, and IoT devices.

The Astrocast network enables companies to monitor, track, assess, and communicate with critical remote assets from anywhere in the world. In partnership with Airbus, CEA/LETI, the European Space Agency, and Thuraya, Astrocast developed the Astronode S, a cutting-edge modem featuring low profile L-band antenna, ultra-low power consumption, and a small form factor.

Founded in 2014 by a renowned team of experts, Astrocast designs builds, and tests all its products in-house, from the satellites to the modules. The Astrocast network will consist of 100 Low Earth Orbit (LEO) nanosatellites.

### Field of Expertise

- Design, manufacturing, integration, testing, launch and operations of LEO nanosatellites
- Machine-to-Machine (M2M) telecommunications, Internet-of-Things (IoT)
- Design, testing, industrialisation and integration of low-power IoT L-band modems and antennas



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Segment	Research	Development	Production
Earth Observation		✓	✓
Life and Physical Sciences			
Satellite-based Applications		✓	✓
Instruments and Payloads		✓	✓
Spacecraft and on-board Equipment		✓	✓
Ground Segment			
Materials and Processes	✓	✓	✓
Structures	✓	✓	✓
Electronic Components	✓	✓	✓
Software		✓	✓
Basic Research for Space Technology	✓	✓	✓
Small Satellite Activities	✓	✓	✓

## beyond gravity

“We turn your mission into a success”

### Profile

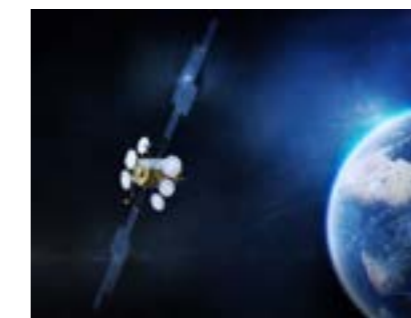
Beyond gravity is the number one independent space product supplier and the leading supplier of products for the space industry in Europe, with a growing presence in the United States. Experience, outstanding reliability, customer focus and a comprehensive, clearly structured product portfolio all make beyond gravity the partner of choice for integrators of satellites and launchers. The skills and services beyond gravity offers cover all the essential aspects of space projects, ranging from mission analysis, systems engineering and project management through engineering services, assembly and integration, to support and testing at the launch site.

### Field of Expertise

- Launcher Structures & Separation Systems
- Satellite Structures, Mechanisms & Mechanical Equipment
- Digital Electronics for Satellites and Launchers

### References

- Development and manufacturing of payload fairings for the Ariane, Vega and Atlas programs
- Providing satellite structures and dispensers for OneWeb - aiming to secure global broadband internet service



### beyond gravity

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Segment	Research	Development	Production
Earth Observation			
Life and Physical Sciences			
Satellite-based Applications			
Instruments and Payloads			
Spacecraft and on-board Equipment			
Ground Segment		✓	✓
Materials and Processes			
Structures			
Electronic Components		✓	✓
Software		✓	✓
Basic Research for Space Technology			
Small Satellite Activities			

## Clemessy Switzerland

“Custom-made simulators and EGSE for spacecraft builders”

### References

- MeteoSat Third Generation: EGSE for platform validation, for FCI instrument validation and IA-DEA instrument validation
- ExoMars: EGSE for 2016 and 2020 missions, covering platform of the spacecrafts, Rover Module and Carrier Module

### Profile

Clemessy Switzerland designs, integrates, develops and delivers electrical ground support equipment for monitoring and control systems, for aeronautics and space, transport infrastructures, scientific end environment.

### Field of Expertise

- Electrical ground support system: Solar array simulator, battery simulation and load simulation
- Monitoring and control system
- Test stands
- Maintenance and operations



### Clemessy Switzerland AG

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Segment	Research	Development	Production
Earth Observation			
Life and Physical Sciences			
Satellite-based Applications			
Instruments and Payloads		✓	
Spacecraft and on-board Equipment		✓	
Ground Segment			
Materials and Processes			
Structures		✓	
Electronic Components		✓	
Software		✓	
Basic Research for Space Technology	✓	✓	
Small Satellite Activities	✓	✓	✓

## Coactum

“Moving around in space made simple”

### Profile

Coactum aims to make space mobility simple by providing simple, safe and fast services of in-space transportation. Our scheduled orbital circuits will ease the access of small satellites to high Earth orbits and beyond - making it affordable.

By applying our proprietary high-thrust propulsion technologies, we aim to radically increase the safety and reduce the cost of in-space transportation, allowing fast access to orbits which are otherwise expensive to reach for any size of small satellites. For example, reaching Moon orbits independently in just 4 days!

We envision a future when moving around in space is as safe, agile, low-cost as doing it on Earth.

### Field of Expertise

- In-space propulsion
- Satellite design and integration
- Satellite operation
- In-space transportation service provider

### References

- In-space transportation services
- Orbital transfer vehicle
- High-thrust in-space propulsion
- Expand the applicability of small satellites
- Scheduled circuits to reach varied LEO orbits
- Deploy any size of small satellite
- Impulsive maneuvers
- 4 days from GTO to the Moon



### Coactum SA

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Segment	Research	Development	Production
Earth Observation			
Life and Physical Sciences			
Satellite-based Applications			
Instruments and Payloads			
Spacecraft and on-board Equipment			
Ground Segment			
Materials and Processes	✓	✓	✓
Structures	✓	✓	
Electronic Components			
Software			
Basic Research for Space Technology	✓	✓	
Small Satellite Activities	✓		

Segment	Research	Development	Production
Earth Observation			
Life and Physical Sciences			
Satellite-based Applications		✓	✓
Instruments and Payloads			
Spacecraft and on-board Equipment			
Ground Segment		✓	✓
Materials and Processes			
Structures			
Electronic Components			
Software		✓	✓
Basic Research for Space Technology			
Small Satellite Activities		✓	✓

## CompPair

“Healable and sustainable composite materials”

### References

- ESA BIC Switzerland support
- MOU with Almatech SA

### Profile

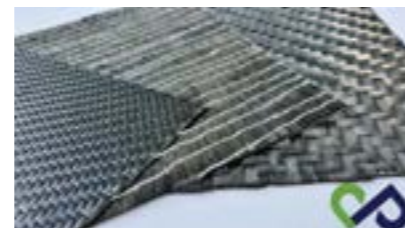
A major limitation of composites is their sensitivity to damage; current repair solutions are costly and time consuming; and recycling is mostly inexistent. CompPair tackles these composite limitations and leads a paradigm change for the industry.

CompPair has developed a composite material able to repair itself and be better recycled, bringing circularity to the industry. HealTech™, a ground-breaking innovation in the industry, enables the production of structures that can heal damage on site in 1 minute. Made with HealTech™, composites can be repaired 400 times faster, multiple times, with an improved production quality.

### Field of Expertise

CompPair first product family is called HealTech™, 6 different reinforcements preimpregnated with our innovative chemistry. HealTech™ can be customised to any type of reinforcement and other product families with various chemistries are in development. Our activities include:

- Production of prepregs and healable composites
- Customer specific technical support for products implementations
- R&D of further product families
- R&D on recyclability



### CompPair Technologies Ltd.

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## CYSEC

“Cybersecurity for satellite communications”

### Profile

Cysec SA is a cybersecurity company based on the EPFL Innovation Park offering end-to-end protection of satellite communications.

Cysec commercializes ARCA, a secured server that is used on ground by satellite operators and ground segment providers to run the mission control software.

ARCA includes all cryptographic functionalities and key management system to perform security-related operations such as encryption-decryption, authentication and digital signature. ARCA on ground is completed by a security module on board the satellite to provide the first end-to-end protection of satellite communications.

### Field of Expertise

- Cybersecurity
- Cryptography
- Key management
- Software development
- Software Integration
- Cloud computing
- IT infrastructure

### References

- Satellite operators, including Astrocast
- Ground segment providers



### CYSEC SA

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Segment	Research	Development	Production
Earth Observation	✓	✓	✓
Life and Physical Sciences	✓	✓	✓
Satellite-based Applications	✓	✓	✓
Instruments and Payloads			
Spacecraft and on-board Equipment			
Ground Segment			
Materials and Processes			
Structures			
Electronic Components			
Software		✓	
Basic Research for Space Technology			
Small Satellite Activities			

## Exolabs

### “Earth Observation as a Service”

#### References

- Spin-off from the University of Zurich, member of the UZH Space Hub & the Swiss Alliance for Data-Intensive Services, supported by Innosuisse
- Research projects with ESA, SSC, federal agencies, universities, industry
- National and international customers from the tourism, energy and natural resources sectors
- Global near real-time monitoring of snow characteristics (COSMOS, ExoSnow App)

#### Profile

ExoLabs is a spin-off from the University of Zurich, founded in 2017 and registered in Zurich, Switzerland.

In the context of climate change and the associated changes in environmental conditions, ExoLabs enables businesses to better apply insights from Earth Observation data across sectors ranging from energy, insurance, tourism, commodity trading or agriculture to research and government.

We ensure that cutting-edge scientific research finds a direct implementation in user-defined applications by providing unique data products and by building customized solutions for our clients that deliver financial and operational advantages.

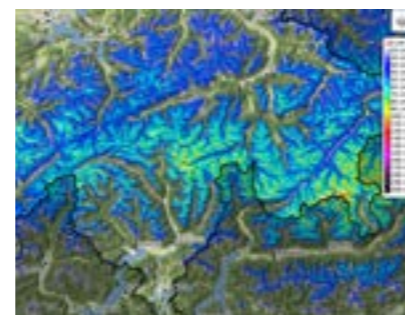
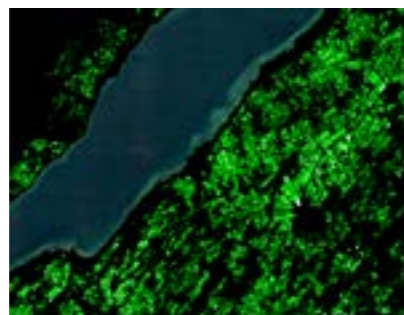
#### Field of Expertise

- Earth system science
- Multi-sensor Earth Observation image processing (satellite, airborne, drone)
- Global near real-time monitoring of environmental variables
- Land use/land cover classification and change detection
- Machine learning and big data handling
- Cloud computing
- Software development (SaaS)



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Segment	Research	Development	Production
Earth Observation			
Life and Physical Sciences			
Satellite-based Applications	✓	✓	✓
Instruments and Payloads			
Spacecraft and on-board Equipment			
Ground Segment	✓	✓	
Materials and Processes	✓	✓	
Structures			
Electronic Components			
Software	✓	✓	✓
Basic Research for Space Technology			
Small Satellite Activities			

## INVOLI

### “Safely integrating Drones into the Air Traffic”

#### Profile

INVOLI enables the safe integration of drones into the air traffic to avoid collisions with aircraft. INVOLI provides unique air traffic data to drones, data gathered through a ground network of in-house developed sensors and satellite information/imagery.

Currently, the patented system is deployed throughout all of Switzerland and is a part of the Swiss U-Space Implementation (SUSI), providing surveillance data to the aerospace sector.

The system detects all cooperative aircraft in real-time, especially the ones flying low and at risk of hitting drones.

#### Field of Expertise

- Surveillance data for aerospace applications with focus on drones
- Software and hardware development of SSR
- Mechanical design and analysis
- Multilateration
- Algorithms & AI

#### References

- ESA BIC Switzerland
- Swiss U-Space Implementation, alongside with FOCA and skyguide
- Armasuisse
- Meteomatics
- Swisscom



#### INVOLI SA

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# INDUSTRY

Segment	Research	Development	Production
Earth Observation			
Life and Physical Sciences	✓	✓	
Satellite-based Applications	✓	✓	✓
Instruments and Payloads	✓	✓	✓
Spacecraft and on-board Equipment	✓	✓	✓
Ground Segment			
Materials and Processes	✓	✓	✓
Structures	✓	✓	✓
Electronic Components			
Software			
Basic Research for Space Technology	✓	✓	✓
Small Satellite Activities	✓	✓	✓

## Kistler

“Your Space & Aviation Testing Partner”

### References

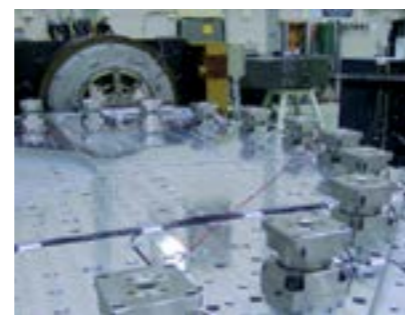
Kistler works in partnership with renowned aerospace centers all around the world. Our space testing expertise allows us to offer you in a proven choice of force, torque, pressure and acceleration sensors based on piezoelectric (PE), integrated electronic piezoelectric (IEPE), strain gage or piezoresistive technologies and that are designed for space payload or rocket testing.

### Profile

Kistler is the global market leader for dynamic pressure, force, torque and acceleration measurement technology. Cutting-edge technologies provide the basis for Kistler's modular solutions. Customers in industry and scientific research benefit from Kistler's experience as a development partner, enabling them to optimize their products and processes so as to secure sustainable competitive edge. Unique sensor technology from this owner-managed Swiss corporation helps to shape future innovations in aerospace sector.

### Field of Expertise

- Dynamic pressure, force, torque and acceleration measurement technology
- Piezoelectric sensors
- Cryogenic sensors
- Low outgassing cables
- Rocket engine testing
- Force-limited vibration testing (FLVT)
- Ground vibration test (GVT)
- Micro-vibration and jitter tests
- Thermal vacuum chamber tests



**KISTLER**  
measure. analyze. innovate.

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Segment	Research	Development	Production
Earth Observation		✓	
Life and Physical Sciences			
Satellite-based Applications		✓	
Instruments and Payloads			
Spacecraft and on-board Equipment		✓	
Ground Segment		✓	
Materials and Processes			
Structures			
Electronic Components			
Software		✓	
Basic Research for Space Technology		✓	
Small Satellite Activities		✓	

## Klepsydra Technologies

“Edge computing software for today’s data hungry world”

### Profile

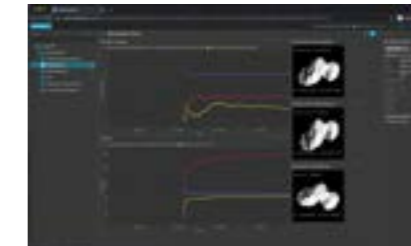
In today's increasingly data-hungry world, the bottleneck preventing the large-scale adoption of edge solutions is the processing of large data volumes on resource-limited devices. Inspired by the fastest software technologies in the world: high frequency trading, Klepsydra has developed, a lightweight software for embedded systems, which is capable of boosting data processing and reducing power consumption of the board. As usability and interoperability is embedded by design, Klepsydra's platform is an easy-to-use, accessible framework aimed at enabling the next generation of high-performance space applications.

### Field of Expertise

- We are experts in embedded software development, and in particular, we have expertise in:
- Space robotics
  - Vision based navigation
  - Object detection
  - Machine Learning on-board
- Our core skills are in parallel data processing including sensor fusion and image processing. Our technical skills are:
- Flight software development
  - Real-time OS (RTEMS, FreeRTOS)
  - FPGA, GPU and CPU

### References

- High-throughput Earth Observation paper, co-authored with LuxSpace for ESA OBDP2019
- Presentations and papers for ESA CANInSpace2019 and ESA GNC 2020
- Benchmarks for Space computers: Xilinx, Cobham, Ruag, Teledyne, etc.
- References from existing clients can be provided upon request.
- Klepsydra Community Edition, tutorials demos available via our website.



**KLEPSYDRA**  
TECHNOLOGIES

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# INDUSTRY

Segment	Research	Development	Production
Earth Observation			
Life and Physical Sciences			
Satellite-based Applications	✓	✓	✓
Instruments and Payloads	✓	✓	✓
Spacecraft and on-board Equipment	✓	✓	✓
Ground Segment	✓		
Materials and Processes			
Structures			
Electronic Components			
Software	✓		
Basic Research for Space Technology			
Small Satellite Activities			

## MEGGITT

“Smart engineering for extreme environments”

### References

Meggitt has been designing systems for space applications since the early 1970s, including high-performance vibration and dynamic pressure transducers and electronics for launchers and satellites. Meggitt's instrumentation further supported the development of the Vulcain and Vulcain 2 engines of the Ariane 5 launcher. Many of Meggitt's systems are flight qualified for Ariane 5.

### Profile

Meggitt PLC is an international group operating in North America, Europe and Asia. Known for its specialised extreme environment engineering, Meggitt is a world leader in aerospace, defence and energy. Meggitt employs approximately 12,000 people at over 40 manufacturing facilities and regional offices worldwide. Meggitt SA – trading as Meggitt Sensing Systems Switzerland – has become worldwide recognised as a leading supplier of high-performance and high reliability sensing and monitoring systems measuring physical parameters in the extreme environments.

### Field of Expertise

- Piezo-electric transducers
- Vibration and dynamic pressure transducers
- Our systems measure displacement, relative and absolute vibration, rotational speed and dynamic pressure for space applications
- Meggitt's sensors withstand temperatures from -253°C to +780°C, pressures up to 350 bar and vibration up to 10,000g
- Meggitt's sensors use the eddy current measurement principle



**MEGGITT**

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Segment	Research	Development	Production
Earth Observation			
Life and Physical Sciences	✓	✓	
Satellite-based Applications			
Instruments and Payloads			
Spacecraft and on-board Equipment	✓		
Ground Segment			
Materials and Processes			
Structures			
Electronic Components			
Software			
Basic Research for Space Technology			
Small Satellite Activities			

## Menhir Photonics

“Laser precise and reliable as a Swiss timepiece”

### Profile

Menhir Photonics is a worldwide supplier of ultrafast lasers (femtosecond lasers) and related photonics solutions. We focus on customer satisfaction and industrial-grade quality, by placing the emphasis on the reliability and robustness of our products. Thanks to innovative technology and design, we have developed a unique high-repetition rate (GHz) laser platform with ultra-low noise performances at 1550 nm. Our lasers are used in numerous applications including synchronization electronics, microwave generation or telecommunication.

### Field of Expertise

- Ultrafast lasers design, production and testing
- Ultra-low noise RF signal generation using photonics solutions
- Timing-distribution with pulsed lasers

### References

- LIDAR wavelength calibration unit for space applications.
- Ultra-low noise RF signal generation for aerospace applications.
- Lasers for frequency-comb and timing-distribution.



**Menhir Photonics**

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Segment	Research	Development	Production
Earth Observation		✓	✓
Life and Physical Sciences		✓	✓
Satellite-based Applications			
Instruments and Payloads	✓	✓	✓
Spacecraft and on-board Equipment			
Ground Segment	✓	✓	
Materials and Processes			
Structures			
Electronic Components			
Software	✓	✓	
Basic Research for Space Technology	✓	✓	
Small Satellite Activities		✓	

## Micos Engineering

“Optical Systems for Space and Industry”

### References

Programmes:

- MTG Calibration Blackbodies (BB) & IRS Spectral Algo.
- Sentinel-4&5 AIT-OGSE & Calibration Subsystem
- Copernicus CO2M Flight Calibration Unit
- Proba-3 FFLS Opto-Mech. Sub-system
- MetOp 3MI Calibration M/EGSE, METImage ReImager
- FORUM Perf. Modelling, Spectral/Radiometric Calibration & BB

Products:

- Miniaturized Aerosols Monitoring Nephelometers
- Waveguided High Resolution Spectrometers

### Profile

Micos Engineering GmbH is an independent system engineering SME that focuses on optical instrumentation for the European space market. Micos serves its customers with design, engineering and AIT of ground support equipment and flight hardware. Micos facilities dedicated to integration and testing account for ISO5, ISO6 and ISO7 cleanroom areas equipped with quality and metrology instrumentation to support opto-mechanical integration and verification; TVAC facility with double cooling circuit; optical laboratory for breadboarding activities; thermometry calibration and vibration monitoring equipment are also in-house.

### Field of Expertise

Our multi-disciplinary team runs projects with a professional network of industrial and institutional partners. Micos key competences:

- Optical, Opto-Mechanical Design and AIT
- Characterization & Calibration Systems and GSEs
- Optical fibre based Metrology Systems
- Spectroscopic and Interferometric Systems
- Prototype Processing and Algorithms
- Project and Subcontractor Management, Product Assurance



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Segment	Research	Development	Production
Earth Observation			
Life and Physical Sciences			
Satellite-based Applications		✓	✓
Instruments and Payloads		✓	✓
Spacecraft and on-board Equipment			
Ground Segment			
Materials and Processes			
Structures			
Electronic Components			
Software			
Basic Research for Space Technology			
Small Satellite Activities			

## MPS

“Let's innovate together”

### Profile

MPS Microsystems develops and manufactures high precision, high-performance and very efficient electro-mechanical microsystems. Managing the miniaturization and integration of functions in small spaces, MPS Microsystems provides solutions perfectly suited to specific customer requirements. MPS Microsystems also offers a standard and scalable range of products, such as linear bearings and ball screws. MPS's strengths particularly appreciated by its customers are:

- Innovative and reliable solutions
- Performance and miniaturization
- High quality service
- Trusted relationship

### Field of Expertise

- Miniature highly accurate ballscrews
- Miniature linear ball bearings
- Custom made complex and highly accurate electromechanical systems
- Miniature active optical systems such as zoom and laser focus mechanisms

### References



### MPS Micro Precision Systems AG

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Segment	Research	Development	Production
Earth Observation			
Life and Physical Sciences			
Satellite-based Applications		✓	✓
Instruments and Payloads		✓	✓
Spacecraft and on-board Equipment		✓	✓
Ground Segment		✓	✓
Materials and Processes			
Structures			
Electronic Components		✓	✓
Software		✓	✓
Basic Research for Space Technology			
Small Satellite Activities			

## Spectratime – Orolia

### “iPrecision Timing Solutions®”

#### References

Spectratime is the world's larger manufacturer of Swiss-made space atomic clocks with over 100 clocks flying onboard space satellites around the earth, providing the high-precision “heart beat pulse” for the land, sea and air operations of positioning, navigation and timing applications. The company supplies atomic clocks for the following major space GNSS and other satellite communications programs:

- Beidou
- Galileo
- IRNSS
- GAIA
- GAGAN
- METOP

#### Profile

Founded in 1995 in Neuchâtel, Switzerland, Spectratime designs, manufactures and markets a full range of high-performance, low-cost crystal, rubidium and maser sources, smart integrated GPS or GNSS reference clocks, and clock testing systems. Its products are used in a wide variety of applications, including telecommunications, defense, navigation, instrument, broadcasting, and space. The company is a recognized leader in the industries it serves and distributes its products globally through Spectratime's sales offices in Europe, Asia, and United States.

#### Field of Expertise

- High-performance crystal, rubidium & maser clocks
- Commercial & rugged military rubidium oscillator sources
- Space crystal, rubidium and maser clock sources
- GPS/GNSS synchronized crystal and rubidium clocks
- Integrated, low noise GPS/GNSS rubidium reference standards
- High-resolution ADEV clock analyzers
- Time & frequency clock experts



#### Spectratime

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Segment	Research	Development	Production
Earth Observation	✓	✓	
Life and Physical Sciences			
Satellite-based Applications	✓	✓	✓
Instruments and Payloads	✓	✓	✓
Spacecraft and on-board Equipment		✓	✓
Ground Segment	✓	✓	✓
Materials and Processes	✓		
Structures			
Electronic Components	✓	✓	✓
Software		✓	✓
Basic Research for Space Technology	✓	✓	
Small Satellite Activities			

## Saphyrion

### “Space-qualified integrated circuits and GNSS data processing instruments”

#### Profile

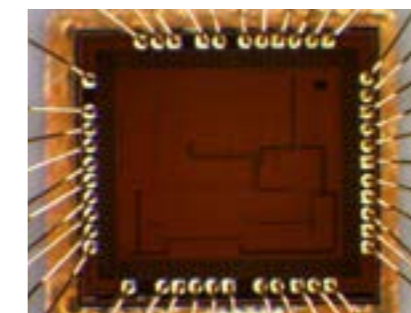
Saphyrion Sagl, located in Bioggio (Ticino), is key player in the industry domain of space-borne RF, analog and mixed mode electronics, and its enabling technology allowed the European Space Agency to pioneer compact GNSS receivers for satellite orbit control and other scientific applications. SAPHYRION developed a solid background in signal processing and systems and subsystems for ground applications, like high performance GNSS systems and laboratory instruments for GNSS data acquisition and processing.

#### Field of Expertise

- Design of radiation-hardened integrated circuits (RF, analog and digital logic):
- Processing of signals in different bands (L, S, X, K)
- Electronic for RF and analog stages of space-borne telecom equipment
- Advanced instrumentation for GNSS integrity monitoring
- GNSS data processing and software defined GNSS receivers
- Data fusion (GNSS/IMU, GNSS/UWB and others) for hybridized platforms
- Consultancy in IC design and signal processing

#### References

- ASICs for space-borne GNSS receivers on all recent ESA Earth Observation missions: Sentinel, Swarm, Earthcare, Metop
- Strategic partnership in European-based GNSS receiver production with: RUAG Space, Airbus Defense & Space, Thales Alenia Space
- Wide experience partnering or coordinating ESA and EU-funded projects with large enterprises, academies, research centers, SMEs, end users and integrators.



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# INDUSTRY

Segment	Research	Development	Production
Earth Observation			
Life and Physical Sciences			
Satellite-based Applications			
Instruments and Payloads			
Spacecraft and on-board Equipment			
Ground Segment			
Materials and Processes			
Structures			
Electronic Components	✓	✓	✓
Software			
Basic Research for Space Technology			
Small Satellite Activities			✓

## SCHURTER

“Safety is our Business”

### References

SCHURTER is the sole European supplier of qualified fuses by the ESA. The cooperation has led to two products for protecting electronic modules in aerospace applications:

- MGA-S, a surface mount fuse for space application
- HCSF, a solid state, thin film, surface mount fuse for high current space application

### Profile

SCHURTER is an internationally leading innovator and manufacturer of electric and electronic components. The company focuses on safe power supply and easy-to-use equipment. Its extensive product portfolio comprises standard solutions in the fields of circuit protection, plugs and connectors, EMV products, switches, input systems and electronic manufacturing services. SCHURTER's global network of representative offices ensures reliable delivery and professional customer service. Where standard products are unsuitable, the company develops client-specific solutions.

### Field of Expertise

SCHURTER is proud to meet standards such as defined in the ESA Internal Requirement Definitions or in Military Standards (e.g. MIL, NF, NNO, GAM T1) and Aviation Standards.

- We focus on the safety for power systems
- We develop customer specific fuse designs for over-current protection under extreme conditions
- We guarantee that the certification of our products, the manufacturing and the logistics are audited regularly
- We ensure a product lifetime of up to 30 years and a documented life cycle as well as lifelong information



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Segment	Research	Development	Production
Earth Observation		✓	✓
Life and Physical Sciences			
Satellite-based Applications		✓	✓
Instruments and Payloads			
Spacecraft and on-board Equipment			
Ground Segment	✓	✓	✓
Materials and Processes			
Structures			
Electronic Components			
Software	✓	✓	✓
Basic Research for Space Technology			
Small Satellite Activities			

## Solenix

“Engineering Inspiration”

### Profile

Solenix is an international group offering high-quality software engineering services, operations and consultancy services, and software products in the space industry. We develop innovative solutions to complex problems, combining state-of-the-art technology with proven and established practices. We are well known for being a reliable, capable and flexible partner. Our customers are European space agencies and satellite operators.

Solenix was established in Switzerland in 2004 with Solenix GmbH and over the years has expanded its activities to other countries. Today, Solenix has evolved into an international group with places of business in several European countries. The group employs about 60 staff.

### Field of Expertise

Development of distributed software systems with a focus on data processing and web applications:

- End-to-End System & Service Monitoring
- Electronic Event Logging, Alarming & Processing
- Artificial Intelligence and Machine Learning applied to Mission Operations
- Intelligent Planning, Scheduling and Optimisation
- Earth Observation End-to-End Processing Chains
- Mission Data Analysis & Visualisation
- Mission Monitoring & Control Systems
- Robotics & Automation Control Systems

### References

- Überlog is an operations logbook solution for tracking events and activities, used daily by major satellite operators.
- Elveti is an easy to use, flight-proven mission control system designed to operate both single and constellations of nano & small satellites.
- Multiple contracts for ESA and the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) in which we offer a broad range of services in support of ground segment development and operations, including the design and development of new systems, the evolution and maintenance of existing ones and the research and prototyping of innovative solutions.



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# INDUSTRY

Segment	Research	Development	Production
Earth Observation		✓	
Life and Physical Sciences			
Satellite-based Applications			
Instruments and Payloads		✓	
Spacecraft and on-board Equipment		✓	
Ground Segment			✓
Materials and Processes			✓
Structures		✓	
Electronic Components		✓	
Software			
Basic Research for Space Technology	✓		
Small Satellite Activities	✓	✓	

## SWISSto12

### “3D printed antennas, waveguides and filters”

#### References

SWISSto12 is a highly innovative technology company, which has already successfully tested its products with key industrial customers in the satellite telecommunications industry such as:

- The European Space Agency
- Cobham antenna systems
- Thales Alenia Space
- Airbus Defense and Space

The company is currently in the process of completing the qualification of its products for aerospace and space applications in view of first flights in 2018. In parallel, its products are already commercialized for use on the ground and for scientific research applications.

#### Profile

SWISSto12 is a start-up company that spun off from the Swiss Federal Institute of Technology in Lausanne (EPFL), in 2011. The company pioneers in the field of radio frequency antenna, waveguide and filter products based on additive manufacturing. Specialized product designs are 3D printed in high-performance polymers or metals and subsequently metal plated through proprietary processes. This novel approach to manufacturing features drastic weight reductions, extended design flexibility and reduced costs. SWISSto12 products are commercialized for use both on ground and in space for satellite telecommunication applications.

#### Field of Expertise

- RF antennas, waveguides and filters
- Satellite RF payload components
- Satellite user terminal RF components
- Additive manufacturing of polymers and metals for RF applications
- Surface treatment of additive manufactured products
- RF and mechanical design and testing of RF components



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Segment	Research	Development	Production
Earth Observation	✓	✓	✓
Life and Physical Sciences			
Satellite-based Applications	✓	✓	✓
Instruments and Payloads	✓	✓	✓
Spacecraft and on-board Equipment	✓	✓	✓
Ground Segment			
Materials and Processes			
Structures			
Electronic Components	✓	✓	✓
Software	✓	✓	✓
Basic Research for Space Technology			
Small Satellite Activities	✓	✓	✓

## SYDERAL SWISS

### “Electronics and Software for Space”

#### Profile

Building upon the 25 years of SYDERAL SA's recognized competence and experience, SYDERAL SWISS designs and produces on-board electronic equipment for space applications, with a particular focus on competitive products for new space markets. To develop our innovative products, SYDERAL SWISS has end-to-end engineering capabilities in digital and analog electronics design as well as embedded software development, and we produce our electronic equipment in our clean-room production facilities, qualified to ESA standards.

SYDERAL SWISS also offers competence in “commercial off-the-shelf” (COTS) electronics and is becoming the Swiss reference center in electronic equipment for innovative and affordable commercial small satellites and New Space applications.

#### Field of Expertise

- Space electronics design and development (compliant with ESA ECSS)
- FPGA/ASIC design
- Embedded software development
- In-house electronics board production
- Development of a COTS (Commercial Off-The-Shelf) offer:
  - Standard Mechanism Drive Electronics (sMDE)
  - Modular Architecture for Versatile Standard Instrument Controller (MAVERIC)



#### References

- SEIS E-Box: SYDERAL SWISS has developed the Seismometer E-Box of the Martian probe InSight.
- FLORIS Instrument Control Unit (ICU): SYDERAL has been selected to develop the main electronic unit between the FLORIS instrument and the FLEX platform.
- COPERNICUS HPCM: SYDERAL is developing CIMR Scan Control Electronics as well as LSTM Mechanism Drive Electronics and ICU. The largest Swiss contribution of this program has been attributed to SYDERAL.



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Segment	Research	Development	Production
Earth Observation			
Life and Physical Sciences			
Satellite-based Applications	✓	✓	✓
Instruments and Payloads	✓	✓	✓
Spacecraft and on-board Equipment	✓	✓	✓
Ground Segment	✓	✓	✓
Materials and Processes		✓	✓
Structures			
Electronic Components	✓	✓	✓
Software		✓	✓
Basic Research for Space Technology	✓		
Small Satellite Activities			

## Synopta (General Atomics)

“Opto-electronic systems for space and terrestrial use”

### References

GA Synopta is involved in or responsible for following OGS types:

- ESA Optical Ground Station (OGS)
  - Mobile Tesat OGS
  - Transportable Adaptive Optical Ground Station (T-AOGS)
- Synopta delivers CPA 135 for Tesat LCTs used in Copernicus/ EDRS, for the following missions:
- EDRS-A and EDRS-C
  - Sentinel 1A, 1B, 2B, 1C, 2C, 1D, 2D

### Profile

General Atomics Synopta GmbH develops and produces complex opto-electronics systems for space and terrestrial use, both as serial products with small or medium-sized numbers, as well as individual productions/ prototypes. The focus is on free-space optical communication between satellites as well as between satellites and optical ground stations.

### Field of Expertise

- The competences of GA Synopta include
- Consulting in business development and strategic planning
  - Public Affairs Management
  - Risk and Project management
  - Development skills in the fields of: Systems Engineering, Orbit analysis, Atmospheric channel modeling, Optics, Opto-Electronics, Adaptive Optics, Mechanisms, Control Electronics, Communication electronics, Software
  - Beam steering and -stabilizing systems
  - Optical Ground Stations
  - Communication Systems
  - Test systems for optical and optoelectronic devices
  - Design, development and production of devices for space applications



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Segment	Research	Development	Production
Earth Observation	✓	✓	✓
Life and Physical Sciences		✓	
Satellite-based Applications			
Instruments and Payloads	✓	✓	✓
Spacecraft and on-board Equipment	✓	✓	✓
Ground Segment			
Materials and Processes			
Structures			
Electronic Components			
Software			
Basic Research for Space Technology		✓	
Small Satellite Activities			

## Thales Alenia Space Schweiz

“Space for Life”

### Profile

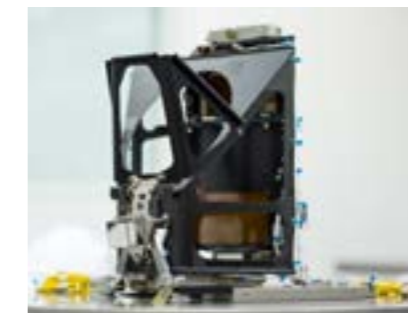
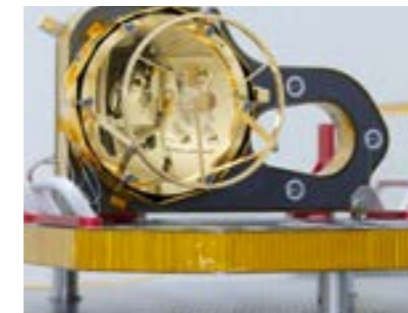
Thales Alenia Space in Switzerland entered the field of Optics and Electronics Systems more than 20 years ago. During this time our engineers gained substantial know-how that resulted in the design and manufacturing of sophisticated optics and electronics systems for space applications. In parallel, the needed infrastructure in the sense of clean rooms and measurement equipment was implemented to support the activities. Thales Alenia Space in Switzerland has demonstrated its high level of competence in several projects involving engineering, testing and production of optics and electronics.

### Field of Expertise

- Thales Alenia Space in Switzerland has demonstrated its high level of competence in several projects involving engineering, testing and production of optics and electronics, such as:
- Cameras for Planetary Research
  - Front End Electronics for various sensors, including CCD readout
  - Radiation Monitors
  - Optical Terminals for broadband inter-satellite and space-to-ground communications
  - Highly stable optical structures
  - Optical Harnesses for satellites
  - Laser Altimeters for planetary research

### References

- BepiColombo - Receiver Subsystem for BELA Instrument
- Sentinel-5p - Detector Module for TROPOMI Instrument
- Exomars Trace Gas Orbiter - Telescope for CaSSIS Instrument
- LISA Pathfinder - Laser Modulator, Delta-CCU Electronics and Inertial - Sensor Front End Electronics
- Alphasat, Sentinel-1/2 A/B - Telescope for Laser Communication Terminal
- SMOS - Optical Harness for MIRA



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Segment	Research	Development	Production
Earth Observation			
Life and Physical Sciences			
Satellite-based Applications			
Instruments and Payloads	✓	✓	✓
Spacecraft and on-board Equipment			
Ground Segment			
Materials and Processes	✓	✓	✓
Structures			
Electronic Components			
Software			
Basic Research for Space Technology			
Small Satellite Activities			

## TSS InnovationsProjekte

“Flexibility is our own DNA”

### References

- ESA CONTRACT 4000123630/18/ NL/PS/gp: Development and Testing of a High Temperature Shape Memory Alloys Actuator for HDRM. Status: completed
- Interreg IT-CH 2014-2020: Shape memory alloys for damping. Status: current
- Shape Memory mechanism for latch and release of satellite and aerospace modules and payload (SHREK). Status: completed. TSI in collaboration with SELEX ES, AEREA SpA, CNR-IENI.

### Profile

TSS InnovationsProjekte GmbH has been established in 2011 as the Swiss spin-off of one of the main Italian spring manufacturer (Technosprings Italia srl, TSI), inheriting its know-how and technical expertise. This includes also a fifteen-years experience in the field of shape memory alloys. TSS designs and produces high quality metallic springs and bent components for any application, in particular aerospace, automotive, medical and watchmaking. TSS is active also in innovative research projects in the aerospace and medical fields. The company quality system is certified ISO 9001, EN 9100 and ISO 13485.

### Field of Expertise

- Design and manufacturing of high quality springs and bent components from Ø0.06mm in any metallic material, e.g. steel, Titanium, Inconel, Nivaflex, Pt-Ir, Copper, Bronze
- Design and manufacturing of actuators and devices based on shape memory alloy
- Contract Manufacturing of high quality metal springs and shape memory components for invasive medical devices for dental and vascular applications



### TSS InnovationsProjekte GmbH

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Segment	Research	Development	Production
Earth Observation	✓		
Life and Physical Sciences			
Satellite-based Applications	✓	✓	✓
Instruments and Payloads	✓	✓	✓
Spacecraft and on-board Equipment			
Ground Segment	✓	✓	✓
Materials and Processes			
Structures			
Electronic Components	✓	✓	✓
Software	✓	✓	✓
Basic Research for Space Technology	✓		
Small Satellite Activities			

## ViaSat Antenna Systems

“Truly Global, Truly Broadband”

### Profile

ViaSat is on a mission to connect the world. As a global broadband services and technology company, ViaSat designs, integrates and delivers secure, high-performance satellite and wireless services. Its business unit in Lausanne is a centre of excellence for phased arrays and new technologies, products and applications for satellite communications. Applications for satellite communication include drone systems, connected vehicles, 3D printing and IoT. It is also a service and operations centre for Europe, developing key elements of the satellite system for ViaSat's next generation of high capacity satellites.

### Field of Expertise

- Satcom systems for high-capacity satellites
- Design, manufacture and test antennas for mobile satellite telecommunication
- Centre of excellence for phased array
- Drones systems and applications
- Connected vehicles
- Internet of Things
- 3D Printing

### References

- Project AIDAN - Public Private Partnership with European Space Agency (ESA) to develop, validate and roll out a highly innovative ground segment for third generation class satellite system ViaSat-3.
- SatCare - ESA project of in-ambulance telemedicine with broadband satellite connectivity.
- ViaDrone - ESA project to fly Remotely Piloted Aircraft Systems in civilian airspace for new applications.



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# RESEARCH

# RESEARCH

Segment	Research	Development	Production
Earth Observation			
Life and Physical Sciences	✓	✓	✓
Satellite-based Applications			
Instruments and Payloads	✓	✓	✓
Spacecraft and on-board Equipment	✓		
Ground Segment	✓		
Materials and Processes	✓	✓	
Structures	✓		
Electronic Components	✓	✓	✓
Software	✓	✓	✓
Basic Research for Space Technology	✓		
Small Satellite Activities	✓	✓	

Segment	Research	Development	Production
Earth Observation	✓		
Life and Physical Sciences	✓	✓	
Satellite-based Applications			
Instruments and Payloads	✓	✓	
Spacecraft and on-board Equipment	✓		
Ground Segment			
Materials and Processes	✓		
Structures			
Electronic Components	✓		
Software			
Basic Research for Space Technology	✓		
Small Satellite Activities	✓	✓	

## CERN

### Space Activities

- Support of scientific space missions, including on ISS, mainly in astroparticle physics, and in astronomy, and cosmology (e.g., Euclid, AMS). Instrument performance characterisation and calibration.
- Testing facilities: ground testing and qualification of flight equipment, mainly for irradiation (e.g., CHARM, VESPER, IRRAD), and for materials characterisation, cryogenics and magnetic testing.
- Technologies: from microelectronics to data handling, from radiation monitoring to cryogenics and from thermal management to superconducting magnets.

### Profile

Physicists and engineers at the European Organization for Nuclear Research use the world's largest and most complex scientific instruments to study the basic constituents of matter – fundamental particles. The particles are made to collide at close to the speed of light. The process gives physicists clues about how the particles interact, and provides insights into the fundamental laws of nature. CERN's mission is: to provide a unique range of particle accelerators that enable research at the forefront of human knowledge, to perform world-class research in fundamental physics, to unite people from all over the world, and to push the frontiers of science and technology, for the benefit of all.

### CERN at a Glance

- World-class research in particle physics
- Expertise in the fields of accelerators, detectors, and computing
- 2560 members employed by CERN, but up to 13 000 people on site at any one time
- 22 Member States
- 2016 Budget: 1153.2 MCHF
- Currently 18 start-ups using CERN technology
- Main application fields beyond particle physics: medical technologies and aerospace applications
- CERN's dedicated Knowledge Transfer group engages with experts in science, technology and industry to create opportunities for the transfer of CERN's technology and know-how.



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## CSEM

### Profile

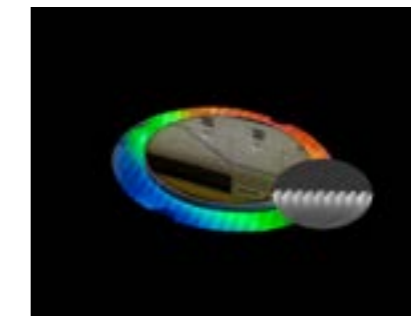
CSEM is a private, non-profit research and technology organization and a Swiss innovation accelerator—a catalyst for the transfer of technologies and know-how from fundamental research to industry. CSEM delivers unique advanced technologies to the industrial sector, thereby reinforcing the sector's competitive advantage. Supported by federal and cantonal authorities CSEM bridges the gap between academic findings and industrial requirements. CSEM's research strategy is built around five strategic programmes: microsystems technology, systems engineering, ultra-low power integrated systems, surface engineering and photovoltaics and energy management.

### CSEM at a Glance

- Headquartered in Neuchâtel, with 4 regional centres in Zurich, Muttenz, Alpnach, and Landquart.
- Total Income: 83 MCHF
- Income in Space: 5.4 MCHF
- 450 employees
- 47 nationalities
- Over 15 years, 42 new ventures (start-ups & spin-offs)
- 186 overall patent families (Status 2015)

### Space Activities

- High precision mechanisms and scientific instrumentation
- Atomic clocks
- Flash imaging LiDAR
- Robotics, control engineering, firmware
- Micro-sensors, MEMS and MOEMS (from design to small volume production and reliability)
- Biomedical engineering (integrated sensors, telemedicine)
- Life support and habitation systems at the ISS
- Telecommunication (intra-satellite wireless communication, antenna miniaturisation, etc. )



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Segment	Research	Development	Production
Earth Observation	✓	✓	
Life and Physical Sciences	✓	✓	
Satellite-based Applications			
Instruments and Payloads	✓	✓	
Spacecraft and on-board Equipment			
Ground Segment			
Materials and Processes	✓	✓	
Structures			
Electronic Components			
Software	✓	✓	
Basic Research for Space Technology	✓	✓	
Small Satellite Activities			

Segment	Research	Development	Production
Earth Observation	✓	✓	✓
Life and Physical Sciences			
Satellite-based Applications			
Instruments and Payloads	✓	✓	✓
Spacecraft and on-board Equipment			
Ground Segment			
Materials and Processes	✓	✓	
Structures			
Electronic Components			
Software	✓		
Basic Research for Space Technology	✓		
Small Satellite Activities	✓		

## Empa

### Space Activities

- Air pollution and climate change: remote sensing and modeling
- Energy: flexible high efficiency solar cells
- Safety: body monitoring with smart sensing textiles
- Reliability: electronic systems
- Materials and processes: additive manufacturing & X-ray analytics

### Profile

Empa, the Swiss Federal Laboratories for Materials Science and Technology, an interdisciplinary research institute of the ETH Domain, conducts cutting-edge materials and technology research. Our research and development activities focus on meeting the requirements of industry and the needs of society, and thus link applications-oriented research to the practical implementation of new ideas in the areas of nanostructured, "smart" materials and surfaces, environmental, energy and sustainable building technologies as well as bio-technology and medical technology.

### Empa at a Glance

- Operating Income: 192.5 MCHF
- 966 staff members
- 65 prizes and awards (in 2017)
- 72 spin-offs and start-ups
- 120 SNSF, 103 CTI/Innosuisse and 69 EU currently undergoing projects

## PMOD/WRC

### Profile

The Physikalisch-Meteorologisches Observatorium and World Radiation Center is a private non-commercial organization, which is a branch of the SFI foundation in Davos.

### The PMOD/WRC

- Serves as an international center for the calibration of meteorological instruments measuring radiation;
  - Develops radiometers and telescopes for ground-based and space-based use.
  - Researches the Earth's ozone layer, climate evolution and the causes of solar activity
- Measurements obtained in space and on the ground are used for research projects, which assess the relation of the solar variations to climate change and space weather.

### PMOD/WRC at a Glance

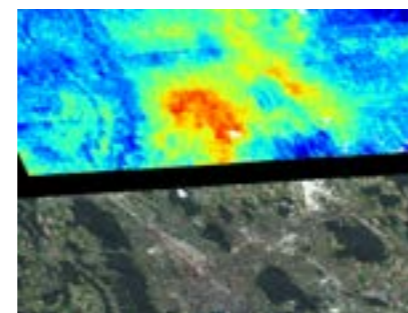
- Annual budget: 5.8 M CHF
- 50+ staff members
- Operational service of four calibration centers for the World Meteorological Organization:
  - Solar Radiometry Section (WRC-SRS)
  - Infrared Radiometry (WRC-IRS)
  - Atmospheric turbidity (WRC-WORCC)
  - UV radiometry (WRC-WCC-UV)
- Research: Radiation metrology, Solar physics, solar influence on climate, atmosphere, and Space Weather
- Collaborations nationally with ETH Zürich, University of Bern, University of Zürich, FHNW, IRSOL

### Space Activities

- Mechanical Workshop
- Electronic Workshop
- Cleanroom Iso7
- Cleanbench Iso5
- Vacuum Chamber
- Optical Laboratory



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Segment	Research	Development	Production
Earth Observation	✓	✓	
Life and Physical Sciences			
Satellite-based Applications	✓	✓	
Instruments and Payloads	✓	✓	
Spacecraft and on-board Equipment	✓	✓	
Ground Segment	✓	✓	
Materials and Processes			
Structures			
Electronic Components			
Software	✓	✓	
Basic Research for Space Technology			
Small Satellite Activities	✓	✓	

## Swiss Armed Forces

### Space Activities

- SSA and common operational picture of space activities
- Software development for own SSA tools, applications and data
- Development of new space-based operational capabilities within the Swiss Armed Forces

### Profile

The Space Domain is responsible of the integration of space to all activities of the Swiss Armed Forces and of the development of operational capabilities related to space. It has to ensure that space-based capabilities will be available to Swiss military units in all situations regarding SSA, IMINT/SIGINT, SATCOM, PNT and Force Protection.

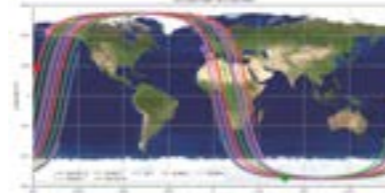
### The Swiss Armed Forces at a Glance

- Created in 2017
- Small professional core within the Joint Operations Command
- More than 30 reserve staff officers on duty one month per year
- Operational, technical and conceptual activities
- Expertise in SSA with recurrent products and reports
- More than 12 R&D projects ongoing with armasuisse S+T
- Supports Master Projects, PhDs from an operational perspective



### Swiss Armed Forces

Armed Forces Joint Staff, Space Domain  
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# ACADEMIA



Segment	Research	Development	Production
Earth Observation	✓		
Life and Physical Sciences	✓		
Satellite-based Applications	✓	✓	
Instruments and Payloads	✓	✓	✓
Spacecraft and on-board Equipment	✓	✓	✓
Ground Segment	✓	✓	
Materials and Processes	✓	✓	✓
Structures	✓		
Electronic Components	✓	✓	✓
Software	✓	✓	✓
Basic Research for Space Technology	✓		
Small Satellite Activities	✓	✓	✓

## EPFL

### Profile

The École Polytechnique Fédérale de Lausanne (EPFL) is Europe's most cosmopolitan technical university with students, professors and staff from over 110 nations.

A dynamic environment, open to Switzerland and the world, EPFL is centered on its three missions: teaching, research and technology transfer.

EPFL works together with an extensive network of partners including other universities and institutes of technology, developing and emerging countries, secondary schools and colleges, industry and economy, political circles and the general public, to bring about real impact for society.

### EPFL at a Glance

- Created in 1968 (roots back to 1853)
- 10'124 students (BSc, MSc, PhD)
- 338 faculties
- Annual Expenses: 965 MCHF
- 210 start-ups established between 2000 and 2015
- 14th World University for Engineering and Technology (2015 THE)



# EPFL

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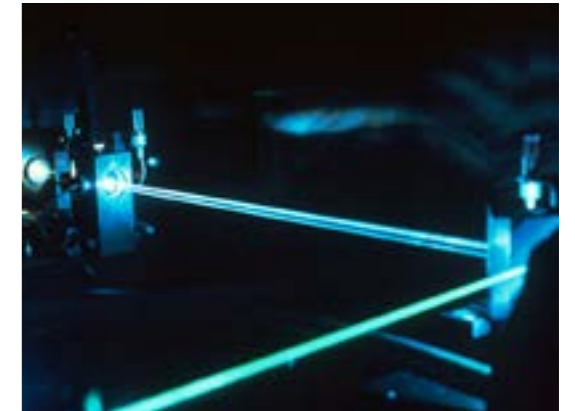
## Applied Computing and Mechanics Laboratory (IMAC)

### Profile

The mission of IMAC is to take advantage of multi-disciplinary synergies in order to study the real behavior large civil-engineering structures. We maintain competence in structural mechanics, dynamics, measurement of full-scale structures, optics, material science and information technology.

### Space competences

- Active and intelligent structures
- Infrastructure monitoring, diagnosis and prediction



### Contact

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# EPFL

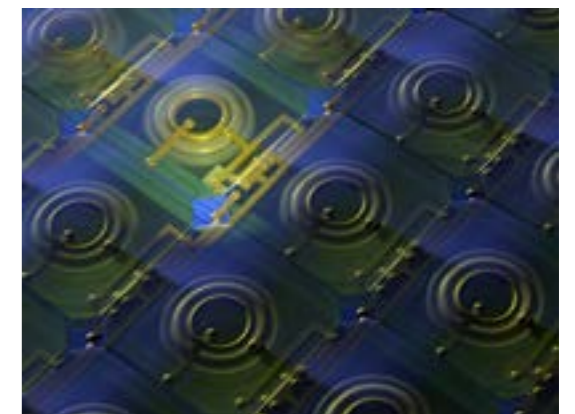
## AQUA Lab

### Profile

As a pioneer in CMOS-compatible single-photon avalanche diodes (SPADs) and SPAD image sensors, the AQUA lab have been instrumental in the adoption of these sensors in industry. Proximity sensors and LiDAR technology based on SPADs are now mass produced for consumer and automotive applications. The AQUA lab has pioneered the use of cryogenic CMOS for the control of solid-state qubits in quantum computing, an approach that is now accepted as the way forward to achieve scalable quantum processors and to demonstrate quantum advantage.

### Space competences

- Time-resolved single-photon sensing and imaging
- LiDAR
- Megapixel cameras with picosecond timing resolution
- Light-in-flight imaging
- Million frames-per-second image sensors



### Contact

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# aqualab

## Biorobotics Laboratory (BIOROB)

### Profile

The BioRob works on the computational aspects of locomotion control, sensorimotor coordination, and learning in animals and in robots. We are interested in using robots and numerical simulation to study the neural mechanisms underlying movement control and learning in animals, and in return to take inspiration from animals to design new control methods for robotics.

### Space competences

- Self-reconfigurable modular robots
- Amphibious field robotics
- Bio-inspired control methods for articulated robots



### Contact

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## Composite Construction Laboratory (CCLAB)

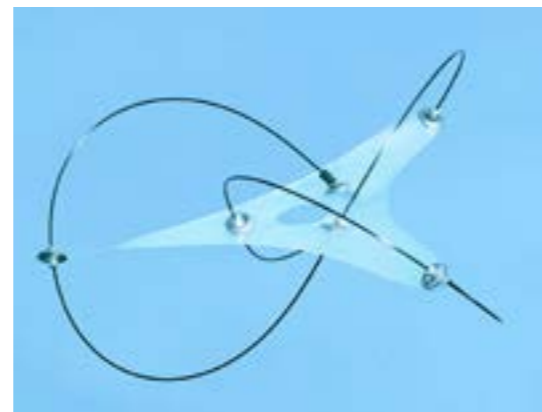
### Profile

CCLab's research mission is to make significant contributions to the development of a new generation of sustainable high-performance infrastructure systems. Research interests focus on composite or hybrid solutions on the material, component and structural system levels with an emphasis on advanced composite materials and lightweight structures.

### Space competences

CCLab's research can contribute to the development and design of multifunctional and deployable load-bearing structures based on lightweight advanced composite materials.

- Bending-active structures
- Tensegrity structures
- Deployable structures
- Multifunctional structures
- Fire endurance, fatigue and fracture



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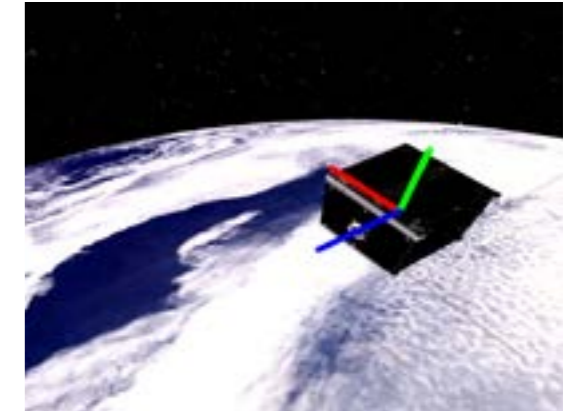
## Computer Vision Laboratory (CVLAB)

### Profile

The Computer Vision laboratory (CVLab) focuses on developing algorithms that provide an understanding of a scene from visual data, including primarily images and videos but also 3D point clouds. In particular, this encompasses tackling tasks such as image recognition, object detection and segmentation, 3D reconstruction of rigid and deformable objects from images, human pose estimation, and 3D shape modeling and optimization.

### Space competences

- 6DoF object pose estimation from in-orbit images or LiDAR measurements for space debris capture
- Deep network compression and quantization for deployment on embedded platforms
- Domain adaptation and generalization to account for the lack of real annotated data
- Space debris tracking from telescope observations



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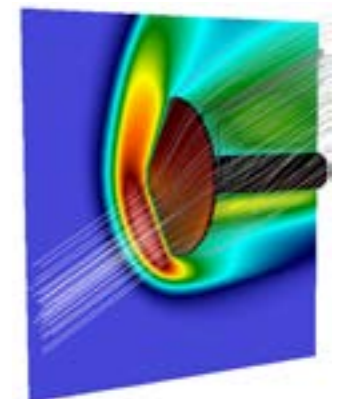
## Computational Mathematics and Simulation Science (MCSS)

### Profile

The MCSS focuses on the development, analysis and application of high-order accurate computational methods for time-dependent partial differential equations, including research activities in reduced order methods, methods of uncertainty quantification, methods for multiscale problems in time and space, and the use of machine learning techniques in computational science and predictive simulation science.

### Space competences

- Large scale electromagnetics and plasma physics simulations
- Uncertainty quantification for complex systems
- Reduced order models for complex multi-physics problems
- Trajectory modeling and collision avoidance under uncertainty
- Data driven decision support
- Sensor integration and optimal placement
- Digital twins of complex systems



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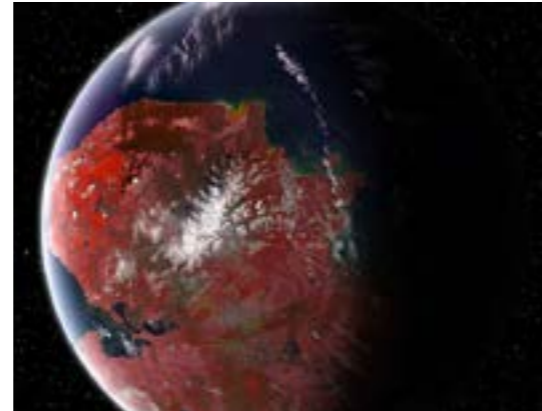
## Earth and Planetary Science Laboratory (EPSL)

### Profile

The EPSL aims at understanding how planetary bodies formed and evolved through the study of processes happening on surfaces, in mantles and in cores. Scientists in the group use various techniques of physics and chemistry to characterize the composition and behavior of planetary materials with application to planets (the Earth, Mars), moons (the Moon, icy satellites), and smaller objects (asteroids and meteorites).

### Space competences

- Science Lead in the phase 0 of the SOLVE mission
- Remote sensing of planetary surfaces
- Study of meteorite samples
- Earth observation from space



### Contact

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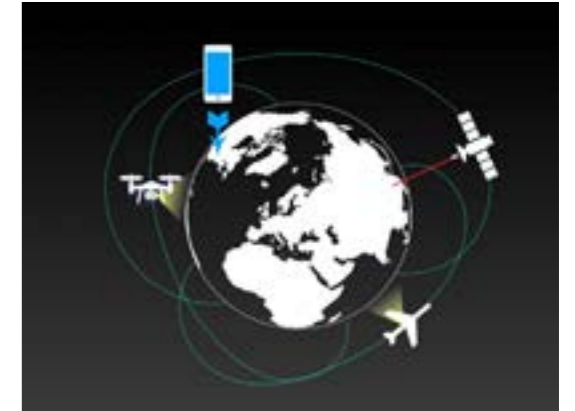
## Environmental Computational Science and Earth Observation Laboratory (ECEO)

### Profile

The ECEO laboratory works at the interface between Earth observation, machine learning and environmental science. Through the development of interpretable, yet accurate algorithms rooted in machine and deep learning, ECEO tackles environmental problems as the dynamics of forest treelines and diversity, the estimation of animal populations or the health of coral reefs. Thanks to a multi-sensor, interactive approach, remote sensing data becomes a queryable resource to study environmental problems.

### Space competences

- Optical Remote sensing of the Earth: from drones to satellites in space
- Development of machine learning approaches: accurate, interpretable, interactive
- Advances in environmental science: forest dynamics, coastal areas, mountain areas, wildlife monitoring



### Contact

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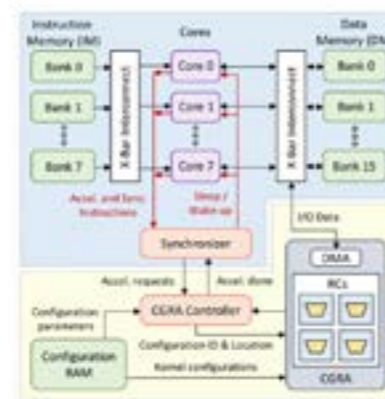
## Embedded Systems Laboratory (ESL)

### Profile

The Embedded Systems Laboratory (ESL) focuses on the definition of system-level multi-objective design methods, optimization methodologies and tools for high-performance embedded systems and machine-learning based Multi-Processor System-on-Chip (MPSoC) architectures.

### Space competences

- 3D Stacked Architectures with Interlayer Cooling
- Design of Artificial Intelligence (AI) coarse-grained reconfigurable array (CGRA) accelerators on reconfigurable hardware (FPGA)
- Dynamically Adaptive Power, Thermal and Reliability Aware Architectures for MPSoCs
- Smart Wearable Technologies for Continuous Human Monitoring



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## EPFL Space Center

### Profile

With the creation of the Space Engineering Center (eSpace) in 2014, EPFL positioned itself as a key player in space technology. As part of its mission, eSpace is actively training a new generation of space engineers, ready to respond to the upcoming rise in small satellite constellations. eSpace is at the forefront of spacecraft development, pushing the capabilities of small satellites beyond anything achieved until now.

### Space competences

- Earth and space observation
- Electronics
- Materials and structures
- Microtechnology and optics
- Modeling and aerothermodynamics
- Plasma and energy science
- Robotics and mechanical systems
- Software



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## Flexible Structures Laboratory (FLEXLAB)

### Profile

Research at EPFL's Flexible Structures Laboratory (the fleXLab) focuses on developing a fundamental understanding of the large deformation of slender structures that emerge in their post-buckling regime. We seek to harvest the underlying mechanical instabilities towards understanding and exploiting novel functional mechanisms, over a wide range of length scales. Our work is rooted on the basis of recognizing scaled high-precision model experiments as a powerful tool for discovery and exploration in Mechanics, supported by theory and computation, in a vision of science-enabled engineering & engineering-motivated science.

### Space competences

- Slender Structures
- Mechanical instabilities
- Thin Rods
- Shells and Plates
- Fluids and Fluid-Structure Interaction
- Soft Materials and Structures
- Fracture
- Granular Materials



### Contact

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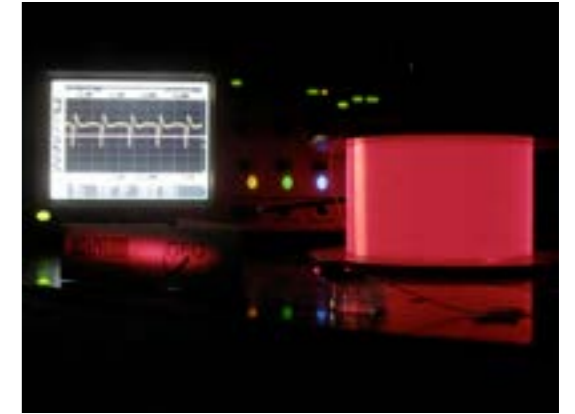
## Group for Fibre Optics (GFO)

### Profile

The core research of the group is oriented towards advanced applications of optical fibres that range from optical signal processing to sophisticated sensing techniques. The group is also a key player in distributed fibre sensing based on optical nonlinearities. This type of sensors is foreseen to be an essential tool to secure critical installations, such as dams, tunnels and pipelines.

### Space competences

- Optical fibres for advanced applications
- Optical signal processing
- Optical sensing
- Distributed fibre sensing
- Microwave photonics
- Several ESA funding for PhD, advanced research and industrial applications



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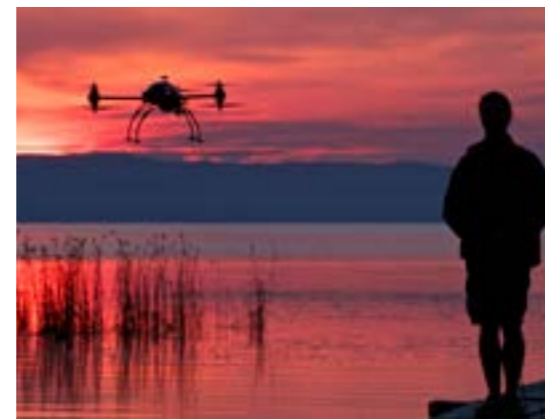
## Geodetic Engineering Laboratory (TOPO)

### Profile

Position and attitude determination of moving platforms or subjects is the mainstream of the lab research activity. The expertise in algorithm development for real-time or post-mission positioning is applied to precise trajectory determination of land or airborne vehicles and pedestrians. TOPO makes use of satellite based (GPS, Glonass, Galileo) positioning, inertial sensors, magnetic sensors, imagery and networked based positioning.

### Space competences

- Geodesy, surveying and cartography
- Development of algorithms in the field of geodesy
- Integration and calibration of sensors
- Development in the field of satellite positioning



### Contact

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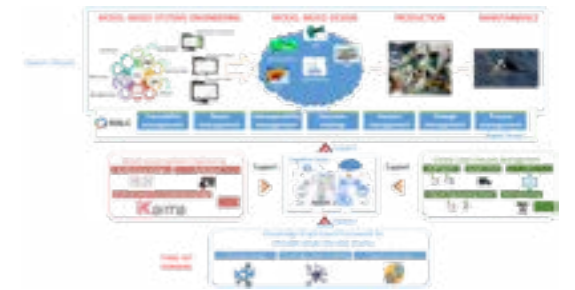
## ICT for Sustainable Manufacturing Group (ICT4SMG)

### Profile

The ICT4SM Group studies the underlying principles and methods for designing the complex Cyber-physical systems and Internet of things (IoT) systems involving a combination of systems engineering, ontology engineering, design methodology and software engineering. Our focus is on the space and other critical systems including product development, manufacturing and large scale system of systems.

### Space competences

- Cognitive Twins for space system development and operation.
- Systems engineering approach for architecture development and lifecycle management of space systems.
- Model-based systems engineering for space system architecture design, process management, and verification.
- A knowledge graph modeling framework (IOF) to support decision-makings and data integration of space system development.



### Contact

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## Immersive Interaction Research Group (IIG)

### Profile

Our researches focus on embodied interactions, i.e. involving users through full-body movements to achieve new classes of tasks or activities not feasible with traditional human-computer interfaces. It can be employed for training and rehabilitation or for the evaluation of potentially complex environments.

### Space competences

- Experimental evaluation of human activity (presence, embodiment, motion sickness)
- Real-time full-body motion capture and retargeting (including fingers)



### Contact

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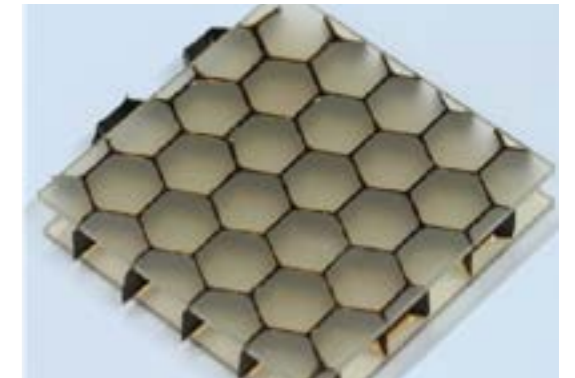
## Laboratory for Processing of Advanced Composites (LPAC)

### Profile

LPAC aims to establish the scientific base for the next generation of materials and processes in the fast-growing fields of polymers and composites. This involves novel approaches to develop material systems and process cycles, with controlled flow, solidification kinetics and surface characteristics, process simulation and costing, and quantitative durability analysis for optimal life cycle strategies.

### Space competences

- Advanced composite materials processing, out-of-autoclave processes
- Functional composites: self-healing, integration of sensors, actuators (SMA), tailored damping
- Bonding and adhesion
- Physical (DSC, DMA, CTE, optical microscopy..) and mechanical testing of composites, simulation of thermal/ environmental cycling
- Materials for demisability of space structures



### Contact

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## Laboratory for Applied Mechanical Design (LAMD)

### Profile

The LAMD focuses on (1) automated design and optimization methodologies using adaptive surrogate modeling techniques, (2) small-scale turbomachinery for small scale gas turbines, compressors for heat pump cycles and fuel cell blowers as well as for expanders for waste heat recovery and (3) gas lubricated bearings for high-speed rotors and low friction. The LAMD seeks strong ties with industry as well as with other academic institutions connecting its research with "real world" problems through collaborative projects.

### Space competences

- Integrated design and optimization methodologies for automated design
- High-fidelity surrogate modeling techniques
- Design and selection of bearing technologies
- Scaling issues on the aerodynamic turbomachinery design
- High power density gas-bearing supported turbocompressors for high temperature lift heat pumps and fuel cell blowers
- Gas-bearing supported turboexpanders for waste heat recovery



### Contact

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## Laboratory of Astrophysics (LASTRO)

### Profile

LASTRO addresses fundamental questions regarding the dark sectors of the Universe as well as the formation and evolution of galaxies. These dark sectors include the study of dark matter and the elusive dark energy responsible for the observed accelerated expansion of the Universe.

### Space competences

- Mapping the redshift distribution of galaxies and quasars within the last 11 billion years of the Universe
- Mapping the distribution of matter within the last 7 billions years of the Universe with imaging surveys
- Probing the first galaxies, which ended the dark ages



### Contact

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Tel: +41 (0) 22 379 24 22 • lastro@epfl.ch • www.epfl.ch/labs/lastro/



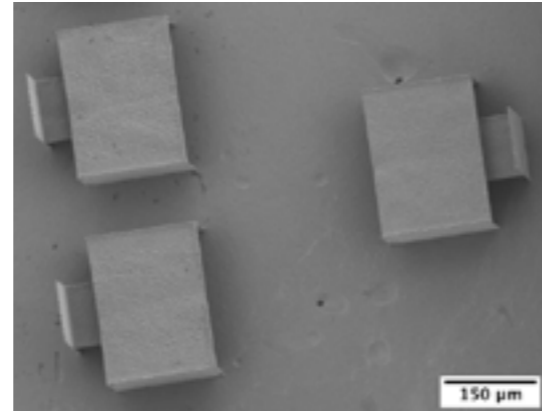
## Laboratory of Mechanical Metallurgy (LMM)

### Profile

Research at the Laboratory for Mechanical Metallurgy addresses the science and engineering of structural metallic materials, with particular focus on advanced metallic materials. It spans the spectrum from materials processing to the exploration of links between the microstructure and the mechanical or physical properties of metallic materials, generally but not only destined for structural applications.

### Space competences

- Infiltration processing
- Solidification processing
- Microcasting
- Metal matrix composites
- Microcellular metals
- Mechanical behaviour of metallic materials and micromechanics



### Contact

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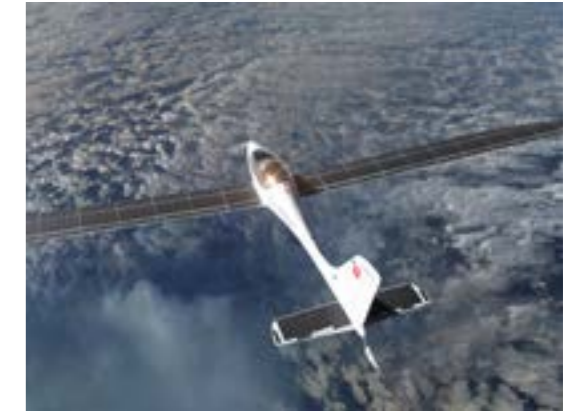
## Laboratory of Photovoltaics and Thin-films Electronics (PV-lab)

### Profile

The PV-lab is one of the academic leaders in the fields of photovoltaics, designing, fabricating and characterizing, e.g. high-efficiency silicon and silicon/perovskite tandem solar cells. The activities include manufacturing of PV products/ prototypes, as well as testing and reliability science, and range from basic research to technology transfer. The lab also develops expertise for specialty detectors. It has been designated as a centre of national importance by the Swiss Federal Office for Energy.

### Space competences

- Characterization of solar cells and solar modules for space and stratospheric applications
- Temperature dependence of photovoltaic solar cells performance
- Failure modes
- Light weight PV panel design for stratospheric and other applications
- Customized PV solutions
- Energy production and consumption modeling



### Contact

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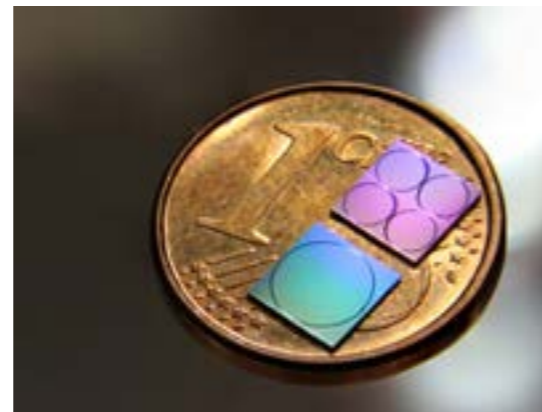
## Laboratory of Photonics and Quantum Measurements (K-LAB)

### Profile

As a pioneer in cavity optomechanics and microresonators for frequency comb generation, Prof. Kippenberg and the LPQM have remained at the forefront of both fields. The highly sensitive quantum control of macroscopic oscillators via optomechanical coupling is of tremendous interest for displacement sensing, time keeping, or RF filtering. Simultaneously, the integrated silicon nitride photonic platform developed at EPFL enables the generation of frequency combs with a wide spectral coverage, with on-chip microresonators fabricated at the wafer scale.

### Space competences

- Unprecedented sensitivity in displacement sensing via optomechanical coupling
- Space compatible on-chip generation of precise frequency combs.
- LIDAR
- Record Tbit/sec bandwidth in soliton frequency comb based coherent communication
- Frequency combs with >10 GHz mode spacing for spectrometer calibration in the search for exoplanets



### Contact

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## Laboratory of Renewable Energy Science and Engineering (LRESE)

### Profile

LRESE aims at developing efficient, economic, sustainable, and robust conversion and storage approaches of renewable energies in fuels, chemical commodities, and power. We specifically focus on the conversion of (concentrated) solar energy into fuels through high temperature solar thermochemical approaches and low temperature photoelectrochemical approaches.

### Space competences

- Development of kinetic models for ablation materials
- Coupled experimental-numerical techniques for the morphological and transport characterization in ablation and insulation materials
- Material testing in our high-flux solar simulator



### Contact

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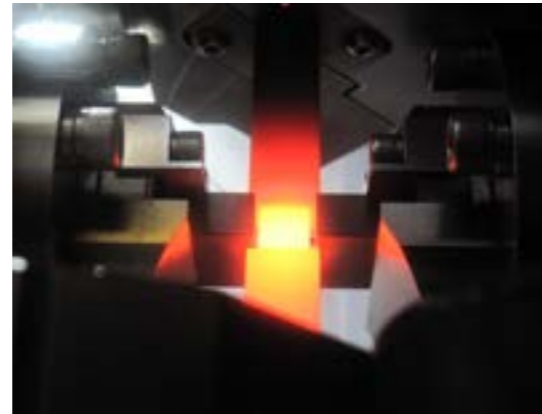
## Laboratory of Thermomechanical Metallurgy (LMTM)

### Profile

Research activities are focused on the control and design of microstructures in metals and alloys through a combination of thermal and mechanical treatments. Different microstructure phenomena are experimentally quantified, and analytically or numerically modelled at different scales. Phenomena of interest include recrystallization, grain growth, twinning, texture evolutions, precipitation, and phase transformations, under variable temperature conditions, and with the possibility of concurrent plastic deformation.

### Space competences

- Advanced characterization of metals and alloys
- Mechanical testing
- Additive Manufacturing
- Microstructure design and
- Multiscale modelling of microstructure evolution



### Contact

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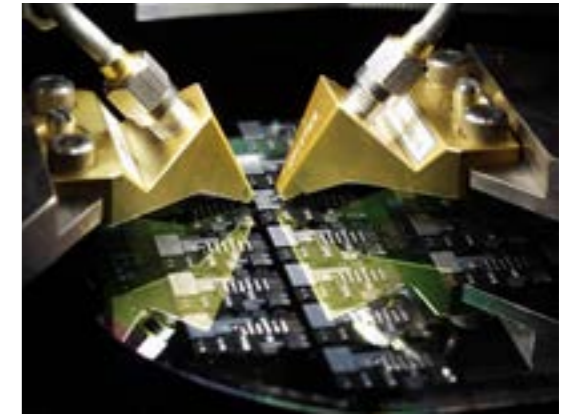
## Microwaves and Antennas Group (MAG)

### Profile

The Microwaves and Antennas Group (MAG) research focuses on antennas and passive mm-wave and microwave components, covering the theoretical modeling, design process and characterization of these structures. Current research interests comprise antennas for smart wearables, mm-wave antennas, cavities for microwave sensors and periodic structures. Space related domains include the design of microwave resonators for atomic clocks, antennas for for CubeSats and micro satellites.

### Space competences

- Microwave resonators for atomic clocks
- Antennas for CubeSats and micro satellites
- Antennas in for SatCom



### Contact

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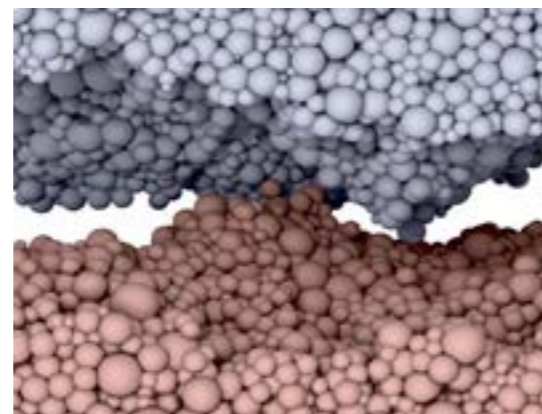
## Computational Solid Mechanics Laboratory (LSMS)

### Profile

LSMS conducts cutting-edge research at the interface between Mechanics, Materials Science, and Scientific Computing. Its projects in both fundamental and applied science benefit from active collaborations with academic and industrial partners in several countries. LSMS develops robust, physics-based numerical methods for High-Performance Computing, and shares its knowledge by releasing diverse open source software (Molecular Dynamics, Discrete Dislocations, Finite Elements, Direct Multiscale Methods).

### Space competences

- Finite element modelling of solids with frictional contact (e.g. www.akantu.ch)
  - Large rotation&deformation dynamics
  - Non linear constitutive material laws
- As part of its participation in the Capture System Concept Validation, the LSMS assembles an efficient contact dynamics simulation tool, which allows for a representative and reliable simulation/analysis of capture scenarios.



### Contact

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## Multimedia Signal Processing Group (MMSPG)

### Profile

Multimedia Signal Processing Group (MMSPG) is active in three highly interconnected areas of media coding, media analysis and media security. These areas include efficient compression of pictures and video and plenoptic representations (light field, point cloud), transcoding, assessment of the quality of experience, compressed domain processing and computer vision tasks, notably based on artificial intelligence, copyright, privacy protection content integrity verification, image forensics, deepfakes, secure NFTs and biometrics.

### Space competences

- Giga-pixel imaging (aerial, deep space, multi and hyper-spectral)
- Explainable artificial intelligence applied to space imaging
- Efficient space image communication
- Compressed domain spatial image analytics
- Immersive imaging and Extended Reality imaging - XR (VR, AR and MR)
- Quality of Experience/Life assessment
- Volumetric video compression
- Secure imaging



### Contact

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## Physics of Aquatic Systems Laboratory (APHYS)

### Profile

The aims of the APHYS Laboratory are to understand the physical processes in natural waters and specifically the responses and sensitivities of aquatic systems to external forcing. The main focus is on anthropogenic influences, such as nutrient and particle inputs, hydropower production, use of heat and cold from natural waters, and climate change.

### Space competences

- Inland water remote sensing using hyperspectral imagers
- Automated sampling of in situ hyperspectral water optical properties in Lake Geneva for the validation of Sentinel 3 data from ESA
- Algorithm development addressing vertical heterogeneities in bio-optical models for NASA's PACE mission



### Contact

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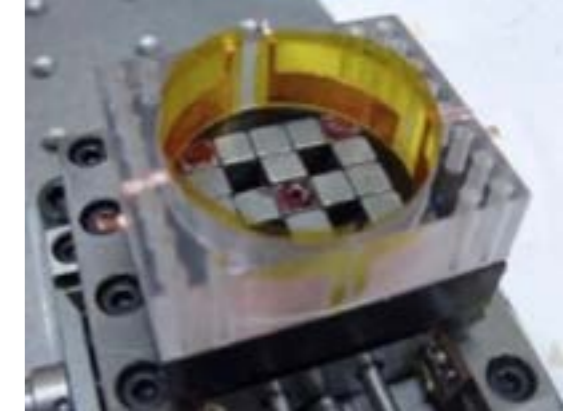
## Robotic Systems Laboratory (LSRO)

### Profile

Robotic Systems Lab is interested in the design and realization of advanced robotics hardware, mainly in the fields of industrial, ultra-precision and medical robotics. We are specialists in ultra-precision robotics (gravity balance and light trap for Cesium atomic clock built for METAS, the Swiss Office of Standards and Metrology).

### Space competences

- Ultra-precision devices based on flexure hinges and parallel kinematics used for telescopes (PRIMA DDL)
- Contact-free magnetic levitation, diamagnetic levitation, very fast rotors (3 mil rpm)
- Electrostatic drives



### Contact

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## Reconfigurable Robotics Lab (RRL)

### Profile

At the Reconfigurable Robotics Lab we focus on design, actuation, fabrication, and control of unique robotic systems. Our research is committed to inventing and developing interactive robots with novel fabrication techniques and integration processes that push the limits of mechatronic systems. These efforts enable us to create and study soft, reconfigurable, and interactive robots that are highly adaptable to their environment and the task at hand.

### Space competences

- Multi-functional modular robots for astronaut assistance, maintenance and repair tasks, as well as extraterrestrial exploration
- Origami-based actuation systems and shape-changing mechatronic structures
- Compliant soft robotic technologies for human and environment interactions



### Contact

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## Swiss Plasma Center (SPC)

### Profile

The SPC contributes to advancing basic plasma physics of interest for fusion and for space and astrophysical plasmas, as well as for developing industrial plasma applications covering a wide range, from solar cells to packaging industry to aircraft and satellite technology.

### Space competences

- Development and basic studies of novel concepts for helicon thrusters for space propulsion
- Experimental and simulation/ numerical studies of satellite slip-ring vacuum breakdown
- Low pressure plasma spraying for high power plasma for thermal testing, surface treatment, and fast coating of surfaces



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## Visual Intelligence for Transportation VITA

### Profile

The Visual Intelligence for Transportation VITA Laboratory pushes the limits of Artificial Intelligence (AI) in the context of transportation and mobility. Technically, our research brings together Computer Vision (Real-time Perception), Machine Learning (Deep learning) and Robotics (Navigation).

### Space competences

- Autonomous navigation
- Real-time computer vision
- Deep learning



### Contact

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Segment	Research	Development	Production
Earth Observation	✓		
Life and Physical Sciences	✓	✓	✓
Satellite-based Applications	✓	✓	
Instruments and Payloads	✓	✓	✓
Spacecraft and on-board Equipment	✓		
Ground Segment			
Materials and Processes	✓		
Structures	✓	✓	
Electronic Components	✓	✓	✓
Software	✓	✓	✓
Basic Research for Space Technology	✓		
Small Satellite Activities	✓	✓	

## ETH Zürich

### Profile

Freedom and individual responsibility, entrepreneurial spirit and open-mindedness: ETH Zurich stands on a bedrock of true Swiss values. Our university for science and technology dates back to the year 1855, when the founders of modern-day Switzerland created it as a centre of innovation and knowledge. At ETH Zurich, students discover an ideal environment for independent thinking, researchers a climate which inspires top performance. Situated in the heart of Europe, yet forging connections all over the world, ETH Zurich is pioneering effective solutions to the global challenges of today and tomorrow.

### ETH Zürich at a Glance

- Created in 1855
- 22'200 students including 4,170 doctoral students, from 126 countries
- 500 professors
- Annual revenue: 1,897 CHF million
- 438 spin-offs since 1973
- 6th International University Ranking (QS 2020)



**ETH** zürich

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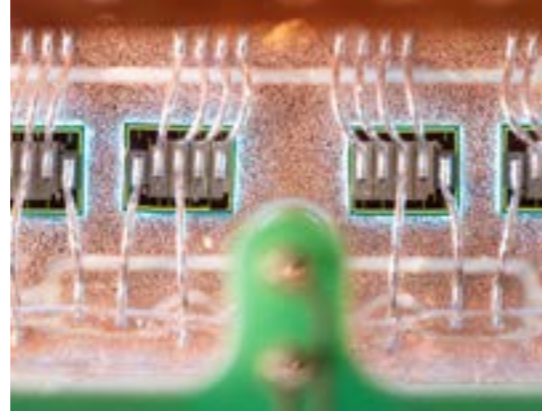
## Advanced Power Semiconductor Laboratory (APS)

### Profile

The Advanced Power Semiconductor Laboratory (APS) is a competence center for both electrical characterization as well as for the reliability and ruggedness testing of bare and packaged power semiconductor devices. A fully equipped electrical characterization lab in a radiation-controlled zone allows for the analysis of active material (e.g. directly after radiation hardness testing).

### Space competences

The research focus of the APS lab lies on power semiconductor devices and their packaging. Areas of interest include device fabrication, characterization and testing as well as device modeling. Special emphasis is placed on improving current understanding of device reliability and ruggedness of modern power devices including wide-bandgap materials.



### Contact

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## Institute of Agricultural Science (IAS)

### Profile

The Institute of Agricultural Sciences (IAS) is the platform for research and teaching in agricultural sciences at ETH Zurich. Today and in the future agricultural research requires a multifaceted approach, integrating agricultural and natural science-based methods and concepts. Agricultural production systems are closely interrelated with other systems and are highly complex.

### Space competences

- Agricultural Ecology
- Biocommunication and Entomology
- Crop Science
- Glasland Sciences
- Molecular Plant Breeding
- Plant Nutrition
- Sustainable Agroecosystems



### Contact

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## Institute for Atmospheric and Climate Science (IAC)

### Profile

The Institute of Atmosphere and Climate Science (IAC) focuses on atmospheric and climate processes. Research is directed at understanding how human activities alter these processes via changes in greenhouse gases, aerosols, chemical constituents, and land surfaces and how this impacts upon climate, ozone, UV radiation, pollutant exposure, ecosystems, water resources and extreme events.

### Space competences

- Atmospheric chemistry
- Atmospheric dynamics
- Atmospheric physics
- Climate and water cycle
- Climate physics
- Land-climate dynamics



### Contact

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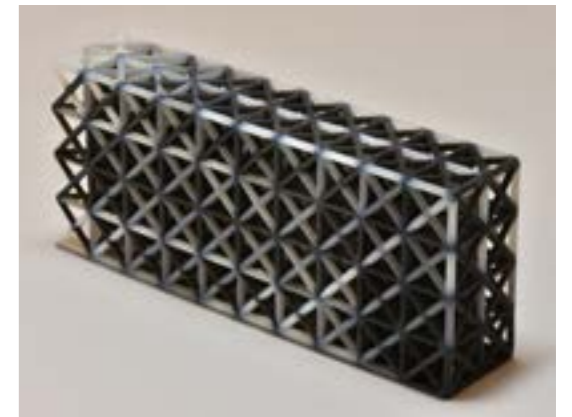
## Institute of Design, Materials and Fabrication (IDMF)

### Profile

The Institute of Design, Material and Fabrication (IDMF) focuses on Engineering Design as a fundamental discipline within Mechanical Engineering including novel material systems, design methodology, methods and tools, development of innovative technical solutions and novel fabrication processes. IDMF will develop new synergies in research and industrial collaboration as well as in the Engineering Design education at MAVT.

### Space competences

- Composite materials
- Adaptive, reconfigurable and active structures
- Product development
- Additive manufacturing
- Design for additive manufacture
- 4D printing
- Computational design methods including design automation, generative design, multi-disciplinary optimization, topology optimization



### Contact

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## Institute for Dynamic System and Control (IDSC)

### Profile

Research at the Institute for Dynamic Systems and Control addresses the efficient monitoring, control and design of complex systems. The considered applications cover a wide range of problems, from autonomous aerial and ground vehicles, to combustion engines and even biomedical systems.

### Space competences

IDSC offers various competences around automatic control systems relevant for space applications, including:

- System modeling
- Optimal planning and control
- Multi-agent systems
- Learning-based control
- Efficient computation methods



### Contact

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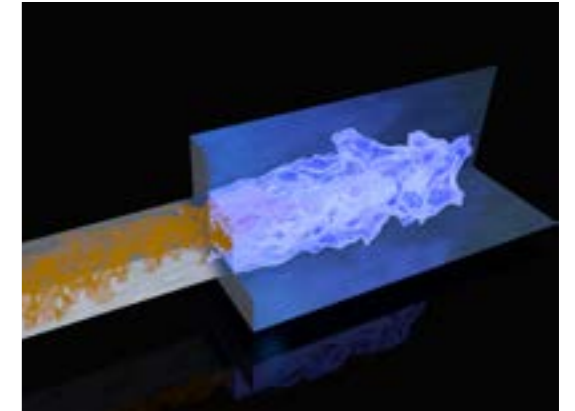
## Institute of Energy Technology (IET)

### Profile

The Institute of Energy Technology (IET) is active in research and education in the field of energy science and engineering, aimed at the realization of sustainable energy systems that are environmentally friendly, economically viable, socially compatible, reliable and secure.

### Space competences

- Aerothermochemistry and Combustion Systems
- Combustion and Acoustics for Power Systems
- Reliability and Risk Engineering
- Energy Conversion



### Contact

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## Institute of Electromagnetics Fields (IEF)

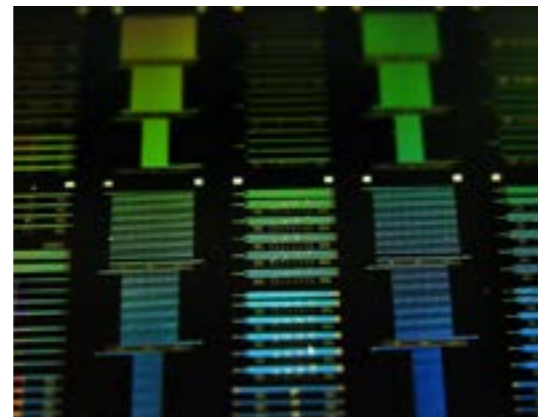
### Profile

The Institute of Electromagnetic Fields (IEF) performs research on the wave and particle characteristics of electromagnetic fields at all frequencies. Of particular interest are fields in the optical, the terahertz and microwave regime. In practice, the IEF members work on theoretical aspects, perform numerical simulations, design, fabricate and characterize latest components. The institute has its own software library and maintains state-of-the art labs. The institute is interacting and collaborating with leading companies and universities across the globe.

### Space competences

A strong focus of the institute is on exploiting electromagnetic fields for important applications such as:

- System modeling
- High-speed optical communications (Tbit/s superchannel, silicon photonics, plasmonics)
- Wireless communications (THz communications, beam forming,...)
- Applied photonics and plasmonics
- Photovoltaics
- Wireless power transmission
- Electromagnetics for medical applications



### Contact

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## Institute of Environmental Engineering (IfU)

### Profile

The Earth Observation Research Group of Institute of Environmental Engineering focuses on remote sensing using innovative techniques and tools for the derivation of quantitative environmental parameters for future satellite missions such as Polarimetric Synthetic Aperture Radar (Pol-SAR), Multi-Parametric SAR Interferometry (Pol-InSAR, TomoSAR), science coordination of ongoing and future SAR missions, and coordination and execution of ground-based and airborne campaign.

### Space competences

- Radar Remote Sensing (Synthetic Aperture Radar)
- Environmental Product Development (Hydrosphere, Geosphere, Cryosphere, Biosphere, Urban)
- Electromagnetic Modeling and Inversion
- Image Processing
- Operation of Ground Base Radars (KAPRI)



### Contact

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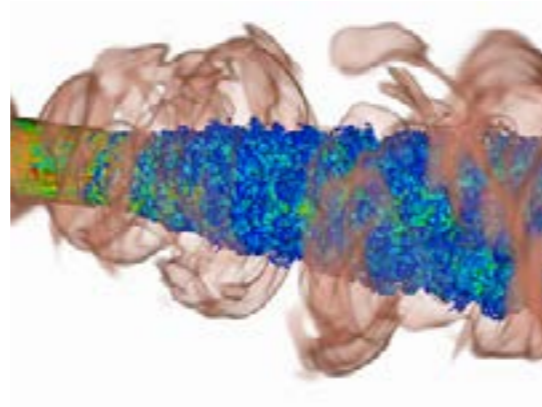
## Institute of Fluid Dynamics (IFD)

### Profile

The IFD conducts research in the area of computational and experimental fluid mechanics. Current research includes simulation of turbulent single-phase and multi-phase flows, implementation of modern imaging techniques, simulations of turbulent and unsteady separated flows and the application of probability-densityfunction (PDF) methods to turbulent flows.

### Space competences

- Modeling of turbulence and turbulent reactive flows
- Flow in porous Media
- Rarefied gas kinetics
- Flow imaging techniques



### Contact

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**D** MAVT

## Institute for Quantum Electronics (IQE)

### Profile

The Institute for Quantum Electronics (IQE) was founded in 1988 on the initiative of Prof. Hans Melchior and Prof. Fritz Kneubühl and has since then been situated on the ETH Hönggerberg campus. Currently, the institute consists of seven research groups, working on quantum optics, quantum optoelectronics, trapped-ion quantum information, ultrafast dynamics, quantum photonics, ultrafast-laser physics, and optical nanomaterials.

### Space competences

The Institute for Quantum Electronics (IQE) cover a broad range of topics, including quantum optics, quantum-structure engineering, laser physics, ultrafast phenomena and high-field physics. We provide teaching of the physics curriculum for ETH students at all levels, including specialized lectures in quantum optics and quantum electronics. Another strength is the connection between fundamental science and technological applications. A number of successful companies have spun-off from IQE.



### Contact

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**D** PHYS

## Institute of Geochemistry and Petrology (GeoPetro)

### Profile

Research at the Institute of Geochemistry and Petrology combines theoretical, experimental and analytical work on many sample types. Its goal is to better understand the fundamental principles behind the origin of the solar system and the Earth, the formation of continents, mountains and oceans as well as the occurrence of volcanism and ore deposits. Space competence is particularly central in the Planetary Geochemistry group. Its research focuses on processes, which occurred before, during and after the formation of the planets including the Earth.

### Space competences

- Analyses of extraterrestrial samples returned by space missions or found on Earth (meteorites, interplanetary dust, lunar or asteroidal materials, solar wind)
- Cosmochemistry: Detection of elements and their isotopes at high-precision
- Mass spectrometry
- Planetary volcanology
- Planetary differentiation and core formation



### Contact

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**D** ERDW  
EARTH SCIENCES

## Institute of Geodesy and Photogrammetry (IGP)

### Profile

The Institute of Geodesy and Photogrammetry core competences are the science of geomatics, especially Geodetic Metrology and Engineering Geodesy, Satellite Geodesy Physical Geodesy and Geodynamics, Photogrammetry, Image Analysis and Remote Sensing.

### Space competences

- Geodetic metrology
- Satellite geodesy
- Physical geodesy
- Geodynamics
- Photogrammetry
- Image analysis
- Earth observation and remote sensing
- Development of cubesat (CubETH)



### Contact

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Tel:+41 (0) 44 633 30 55 • sek@geod.baug.ethz.ch • www.igp.ethz.ch

**D** BAUG

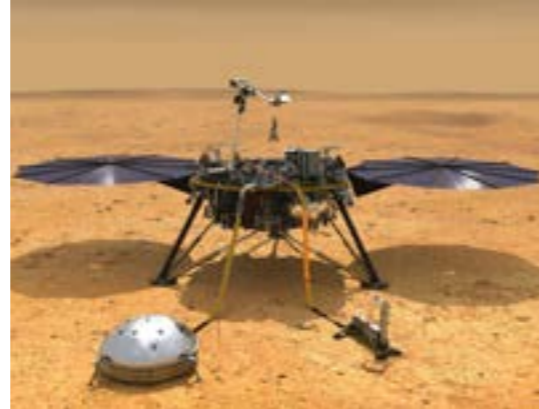
## Institute of Geophysics

### Profile

The Institute of Geophysics performs leading research and teaching activities over a wide range of geophysical disciplines. Activities range from theoretical modelling towards experimental and observational geophysics, from studying small-scale processes in the shallow subsurface towards large-scale processes forming the Earth and other planets.

### Space competences

- Involved in the Mars mission "InSight" in the area of seismology and characterization of the shallow Martian subsurface, and the instrument's electronics (<http://www.insight.ethz.ch>).
- Responsible for the sensing and control electronics of the gravitational reference sensor for the Laser Interferometer Space Antenna "LISA" mission.
- Developing methodologies for highly cost-effective acquisition of geophysical data during space missions



### Contact

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**DERDW**  
EARTH SCIENCES

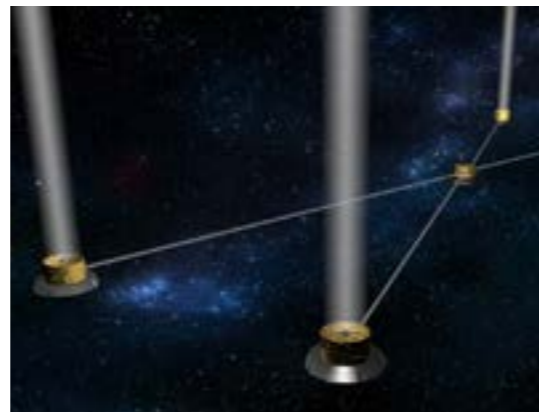
## Institute for Particle Physics and Astrophysics (IPA)

### Profile

The Institute for Particle Physics and Astrophysics has around 200 staff and students and is organized into 11 research groups. Our work ranges from high-energy interactions between fundamental particles, neutrino physics, astroparticle physics, precision particle physics experiments at low energies, ion beam physics, cosmology and structure formation, galaxy and black hole astrophysics and star and planet formation. We are also developing instruments and components for space experiments utilizing our laboratory facilities.

### Space competences

- Infrared Instrumentation for James Webb Space Telescope, Very Large Telescope and Extremely Large Telescope
- Cryogenic Space Engineering
- Space Instrumentation for solar physics (e.g. Solar Orbiter, Proba-3, etc.)
- Observational Astrophysics and Cosmology



### Contact

ETH Zurich • IPA Administration • HIT J 21.2 • Wolfgang-Pauli-Strasse 27 • CH - 8093 Zürich • Tel:+41 (0) 44 633 27 70 • [milena.ramirez@phys.ethz.ch](mailto:milena.ramirez@phys.ethz.ch) • [www.ipa.phys.ethz.ch](http://www.ipa.phys.ethz.ch)

**IPA**

## Institute of Robotics and Intelligent Systems (IRIS)

### Profile

The Institute of Robotics and Intelligent Systems (IRIS) of ETH Zurich, is doing cutting edge robotics research in a large diversity of fields. It currently consists of eight laboratories that conduct research in areas ranging from nano-robots for biomedicine, to systems for rehabilitation and autonomous aerial vehicles and legged robots.

### Space competences

IRIS offers a large variety in robotics competences of interest for space applications including:

- Solar Airplanes for multi-day operations
- Visual Navigation Systems
- Health monitoring and training
- Compliant Robot Arms
- Walking and wheeled robots for space applications



### Contact

ETH Zurich • Inst. of Robotics and Intelligent Systems • Roland Siegwart • Leonhardstr. 21 • LEE J-205 • CH - 8092 Zürich • Tel:+41 (0) 44 632 23 58 • [rsiegwart@ethz.ch](mailto:rsiegwart@ethz.ch) • [www.iris.ethz.ch](http://www.iris.ethz.ch)

**IRIS**

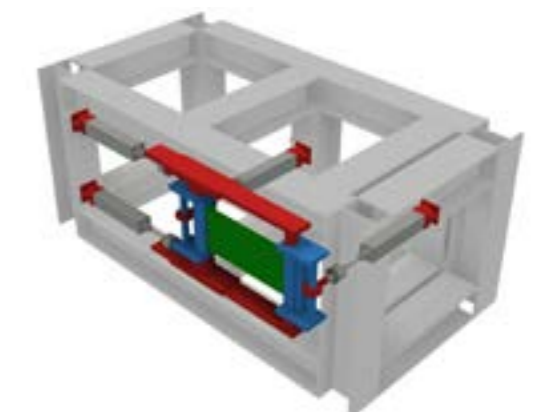
## Institute of Structural Engineering (IBK)

### Profile

Institute of Structural Engineering (IBK) competences span from classical fields of structural engineering, including design of concrete, steel, timber, masonry and composite structures, structural mechanics, analysis and modeling, and seismic and fire risk assessment and uncertainty quantification. IBK also addresses challenges in monitoring, upkeep, resilience and renewal of urban infrastructures, sustainable design in changing environment, and work to incorporate digitalization and artificial intelligence into structural design processes.

### Space competences

- Coupled thermal and mechanical structural testing of spacecraft components
- Coupled thermal and mechanical structural modeling and response analysis of spacecraft systems and components
- Hybrid physical-numerical simulation of coupled multi-physics response of spacecraft systems
- Response uncertainty quantification and stochastic hybrid simulation



### Contact

ETH Zürich • Prof. Božidar Stojadinović • Inst. of Structural Engineering • HIL E14.1 • Stefano-Franscini-Platz 5 • CH - 8093 Zürich • Tel:+41 (0) 44 633 70 99 • [stojadinovic@ibk.baug.ethz.ch](mailto:stojadinovic@ibk.baug.ethz.ch) • [www.ibk.ethz.ch](http://www.ibk.ethz.ch)

**ibk**  
Institut für Baustatik und Konstruktion, ETH Zürich

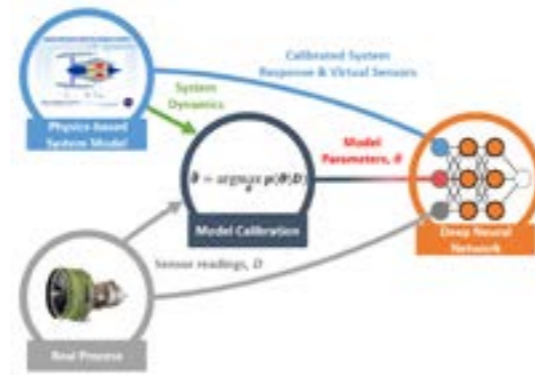
## Intelligent Maintenance Systems

### Profile

The Chair of Intelligent Maintenance Systems focuses on developing intelligent algorithms to improve performance, reliability and availability of complex industrial and infrastructure assets and make their maintenance more cost efficient. From the algorithmic perspective, the research focuses on hybrid algorithms fusing physics-based models and deep learning algorithms, domain adaptation, self-supervised learning, deep reinforcement learning and multi-agent systems.

### Space competences

- Deep learning applied to space applications in particular to Space Operations (OPS) and Assembly, Integration, and Test (AIT)
- Fault detection, diagnostics and prediction of the remaining useful life (prognostics)
- Power Management of Multi-power source systems with reinforcement Learning (e.g. for unmanned aerial vehicles (UAVs))
- Hybrid operational digital twins



### Contact

Chair of Intelligent Maintenance Systems • HIL F 27.1 • Stefano-Franscini-Platz 5 • CH - 8093 Zürich •  
Tel: +41 (0) 44 633 41 69 • limbach@ibi.baug.ethz.ch • www.ims.ibi.ethz.ch

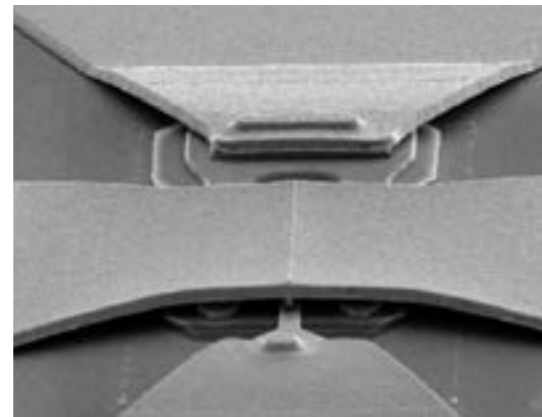
## Millimeter-Wave Electronics Laboratory (MWE)

### Profile

The Millimeter-Wave Electronics group members focus on III-V compound semiconductor devices and processes from modern sub-terahertz applications to all-electronic terahertz sources.

### Space competences

- High Electron Mobility Transistors
- Heterojunction Bipolar Transistors



# DITET

### Contact

ETH Zurich D-ITET • MWE - Millimeter-Wave Electronics Group • Gloriastrasse 35 • ETH/ETZ K 82 • CH - 8092 Zürich • Tel: +41 (0) 44 632 28 10 • bettina.gronau@mwe.ee.ethz.ch

Segment	Research	Development	Production
Earth Observation	✓	✓	
Life and Physical Sciences		✓	
Satellite-based Applications	✓	✓	
Instruments and Payloads	✓	✓	✓
Spacecraft and on-board Equipment		✓	
Ground Segment	✓	✓	
Materials and Processes	✓	✓	
Structures	✓	✓	✓
Electronic Components	✓	✓	
Software	✓	✓	
Basic Research for Space Technology	✓	✓	
Small Satellite Activities	✓	✓	

# FHNW

### Profile

The FHNW University of Applied Sciences and Arts Northwestern Switzerland dedicates a fair amount of resources to space projects. Representing the cantons of Aargau, Basel, Basel-Landschaft, and Solothurn, near the borders of Germany and France, and midway between the cities of Basel and Zurich, it exploits its strategic position for the success of its endeavors in this domain. Its research program involves national and international partners from industry and academy, therefore creating a link between these two poles. In particular, the School of Engineering leads several national and international initiatives that include hardware construction, software development, and project management.

### FHNW at a Glance

- 9 schools
- More than 11'000 students
- 29 bachelor and 18 master programmes
- 58 institutes



**n|w** University of Applied Sciences and Arts  
Northwestern Switzerland

### FHNW

Fachhochschule Nordwestschweiz FHNW  
Bahnhofstr. 6  
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info.technik@fhnw.ch  
www.fhnw.ch/technik

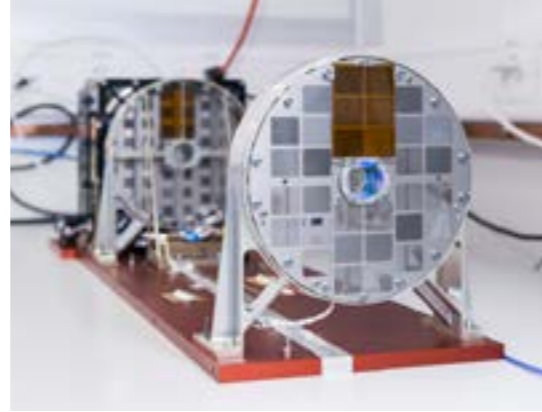
## Institute of Data Science (I4DS)

### Profile

The Institute of Data Science consists of a team of about 60 specialists, including computer scientists, physicists, mathematicians, designers, and communicators. It addresses challenges in a wide variety of projects, exploiting possible synergies across application fields. Space is one of its most prominent domain of activity, for which it develops software as well as hardware for scientific instruments

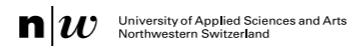
### Space competences

- STIX: X-ray telescope on Solar Orbiter
- X-ray detectors and Grids
- Instrument design
- Testing and calibration
- Ground software
- Date analysis software
- Data mining and analytics
- Project Management



### Contact

Prof. André Csillaghy • FHNW Institute of Data Science • Bahnhofstr. 6 • CH - 5210 Windisch • [andre.csillaghy@fhnw.ch](mailto:andre.csillaghy@fhnw.ch)



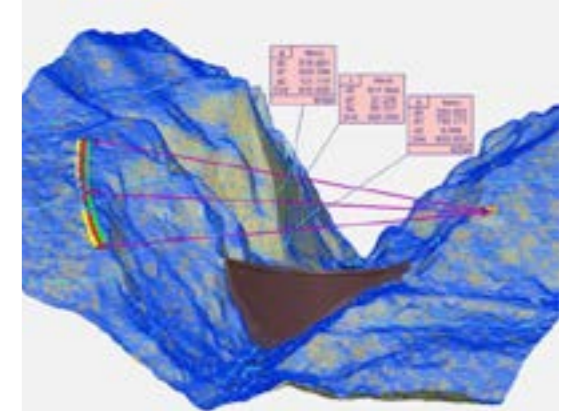
## Institute of Geomatics (IGEO)

### Profile

Key topics of application-oriented research and development at IGEO are methods and technologies for earth observation, monitoring and satellite-based navigation and measuring, for example using GNSS (Global Navigation Satellite System). Our competences range from the integration of sensors, the development of software and implementation of applications to name but a few.

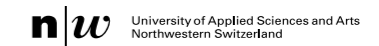
### Space competences

- Semi-automatic photogrammetric and spectral processing of multispectral satellite imagery for various applications (e.g. agriculture, archaeology, 3D-modelling)
- Object-based image analysis and change detection by combining spectral and geometric features extracted from satellite imagery
- Development of methods based on GNSS- and IMU-techniques for navigation of unmanned vehicle systems



### Contact

FHNW Institute of Geomatics (IGEO) • Hofackerstrasse 30 • CH - 4132 Muttenz • Tel:+41 (0) 61 228 55 80 • [geomatik.habg@fhnw.ch](mailto:geomatik.habg@fhnw.ch) • <http://www.fhnw.ch/igeo>



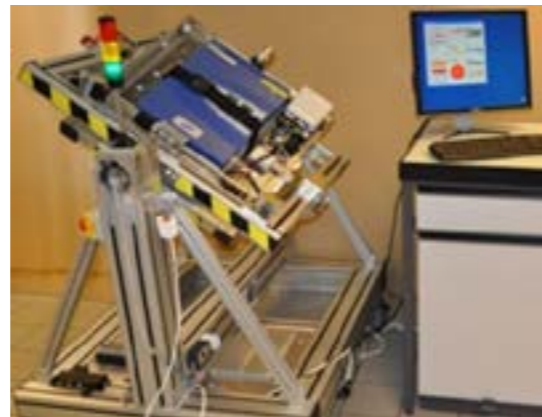
## Institute of Automation Engineering (IA)

### Profile

The IA focuses its application-oriented research and development in the promising systems engineering domain, ranging from the development of smart systems to the integration of sensors and actors to improve functionalities of automated devices & processes. Our main competences include the advancement of automated handling systems, systems analysis & modelling, advanced control systems & signal processing methods, measurement & diagnostic devices, microsystems technology.

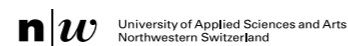
### Space competences

- Systems integration of measurement & control devices (e.g. with smart sensors & actors)
- Mechatronics test equipment (e.g. for microgravity simulation on earth)
- Miniaturization of high-rel instruments & sensors (e.g. for cometary ultralow pressure measurement, for outgassing detection on spacecraft and satellite test facilities)
- Ultrafast FPGA algorithms (e.g. for FFT & filter bank algorithms for radio astronomy, atmosphere physics, general purpose spectral analysis)



### Contact

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## Institute of Polymer Engineering (IKT)

### Profile

The IKT is working in the field of polymer science, development of fibre reinforced materials, design of fibre reinforced structures and related manufacturing methods. The institute covers competences all along the value chain for composite materials starting from material development, material characterization, structural design, manufacturing engineering and prototype manufacturing and testing on lab scale.

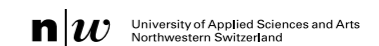
### Space competences

- Systems based on polymers
- Composite structures
- Joining technology for composites
- Landing technologies
- Manufacturing processes



### Contact

FHNW Institute of Polymer Engineering • Klosterzelgstr. 2 • CH - 5210 Windisch • Tel:+41 (0) 56 202 74 75 • [info.ikt.technik@fhnw.ch](mailto:info.ikt.technik@fhnw.ch)



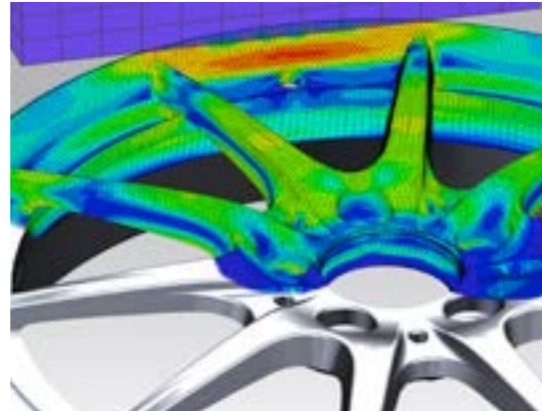
## Institute of Product and Production Engineering (IPPE)

### Profile

The IPPE is focussed on application-oriented research and development of products and production processes involving cutting-edge technology. The competences include simulation and testing of mechanical systems, additive manufacturing and 3D laser micro-machining. Latest CAE/ CAM systems and modern laboratory infrastructure enable the experimental and numerical expertise required to support our industrial partners.

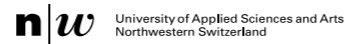
### Space competences

- Lightweight structure design and development
- Material and process development for automation
- Additive manufacturing
- Mechanical testing (static, sine and random vibration, shock, fatigue)



### Contact

FHNW Institute of Product and Production Engineering • Klosterzelgstr. 2 • CH - 5210 Windisch •  
Tel: +41 (0) 56 202 77 00 • info.ippe.technik@fhnw.ch



## Institute for Sensors and Electronic (ISE)

### Profile

The ISE is the competence center for sensors with special focus on aerosol technology as well as for microelectronics, signal processing and communication. We support our partners with the execution of research, development and consulting including serial production according to industrial standards. Our interdisciplinary team consists of approximately 35 specialists in electrical engineering and physics, often with extensive industrial experience.

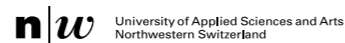
### Space competences

- Space Competences
- Classical and Quantum Cryptography
- Ground Segment for Nanosatellites
- Communication Technologies
- High Altitude Balloons
- Microelectronics for Functionally Safe Communication
- Aerosols Technology and Sensors



### Contact

Prof. Dr. Gerd Simons • FHNW Institute for Sensors and Electronics • Klosterzelgstr. 2 • CH-5210 Windisch •  
gerd.simons@fhnw.ch



Segment	Research	Development	Production
Earth Observation			
Life and Physical Sciences			
Satellite-based Applications		✓	
Instruments and Payloads	✓	✓	
Spacecraft and on-board Equipment	✓	✓	
Ground Segment			
Materials and Processes	✓	✓	✓
Structures	✓	✓	
Electronic Components	✓	✓	
Software	✓	✓	
Basic Research for Space Technology	✓	✓	
Small Satellite Activities	✓	✓	

## HES-SO

### Profile

The HES-SO Engineering and Architecture Faculty has three missions: to provide practical training at university level, to foster applied research and to deliver technical services to private sector partners. The Faculty offers interdisciplinary competences within its 6 schools. Its activities are devoted to the realisation of high quality and reliable products and anchored into the regional industrial systems. The HES-SO schools collaborate closely with SMEs, industries and research institutes.

### HES-SO at a Glance

- 21'000 students
  - 28 schools of higher education across Western Switzerland
  - 43 Bachelors and 31 Masters
- The HES-SO Engineering and Architecture Faculty includes :
- 4'827 students
  - Schools of higher education amongst which Haute Ecole Arc Ingénierie, School of Engineering and Architecture Fribourg (HEIA-FR), Geneva School of Engineering, Architecture and Landscape - HEPIA, School of Engineering – HES-SO Valais-Wallis – HEI and School of Engineering and Management - HEIG-VD, CHANGINS – School of Viticulture and Enology
  - 19 Bachelors and 8 Masters



# Hes·SO

**HES-SO**  
HES-SO Engineering and Architecture  
Rectorat  
Route de Moutier 14, CH - 2800 Delémont  
Tel: +41 (0) 58 900 00 00  
info@hes-so.ch  
www.hes-so.ch



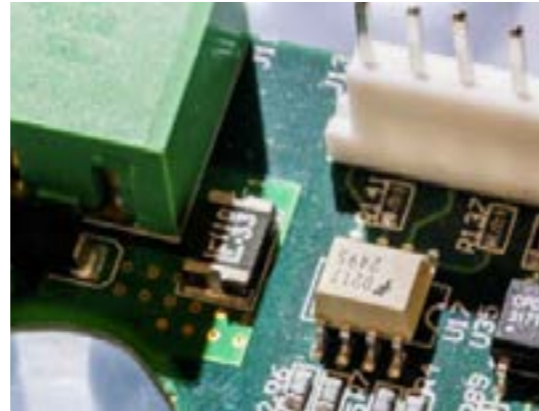
## Embedded-Computing Systems, HE-Arc, Neuchâtel

### Profile

Defined as an autonomous system, often in real time, specialising in a specific task and with limited resources, an embedded IT system is built on three main pillars: Hardware, Software and programming, Signal processing and communication. We employ our expertise to optimise the efficiency of industrial processes, develop smart medical systems and address various challenges facing society, such as global water management.

### Space competences

- Hardware development
- Embedded Software
- Low Power Embedded Systems
- Communication Systems
- Signal Processing



### Contact

Dr. Nuria Pazos • Espace de l'Europe 11 • CH - 2000 Neuchâtel •  
Tel:+41 (0) 32 930 22 50 • nuria.pazos@he-arc.ch



## Institute of Systems Engineering, HEI, Sion

### Profile

The focus of the institute is to specify the mechanical dimensions of the building blocks and their connections for CubeSats with their limits in space and power supply. These systems comprise the mechanical housing of the satellite, an On-Board Computer (OBC), the Attitude and Orbital Control System (AOCS), the communication system to the ground and the instruments dedicated to the satellite's mission.

### Space competences

- Development of electronic (digital or analog) and mechanic devices used in spacecrafts
- Fulfilment of the requirements in relation to flight electronics: quality, reliability, high performance, good integration, energy efficiency
- Acquisition and processing of low intensity analogical signals • Integration of processors and complex digital functions (IP core)
- Design of actuators using shape-memory alloys



### Contact

Prof. F. Corthay • Instrumentation & Control systems • Tel:+41 (0) 27 606 87 57 • francois.corthay@hevs.ch • www.hevs.ch • Prof. E. Carreño-Morelli • Powder Technology & Advanced Materials •  
Tel:+41 (0) 27 606 88 37 • efrain.morelli@hevs.ch • www.hevs.ch



## Inst. des Sciences et Technologies Industrielles (inSTI) - HEPIA, Geneva

### Profile

inSTI is the research Institute of the Industrial Technology Department of the HES-SO / Geneva. Aiming at being a partner of choice in research and development for the local and regional industrial fabric, inSTI develops its R&D activities through technology transfers toward the economy (Innosuisse projects, EU projects, mandates...) on one hand, and through scientific publications and conferences on the other hand.

### Space competences

- REXUS rocket based microgravity experiment
- Bioengineering
- Eco-Engineering
- Fluid mechanics applied to the fields of energy and microgravity
- Materials, nanotechnology and micro technology designs
- Tribology
- Robotics



### Contact

HES-SO School of Engineering, Architecture and Landscape - HEPIA • Rue de la Prairie 4 • 1202 Genève • Roberto Putzu • Tel:+41 (0) 546 28 89 • roberto.putzu@hesge.ch



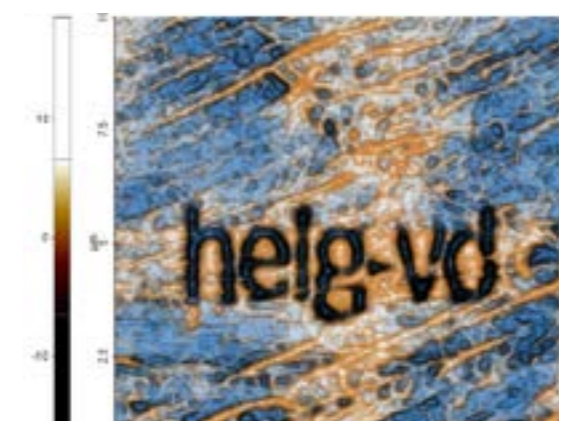
## Laboratory of Applied NanoSciences (COMATEC-LANS)

### Profile

The Laboratory of Applied NanoSciences is specialized in advanced materials engineering and surface micro- and submicrostructure characterization. Its interdisciplinary team of engineers and scientist develops and designs advanced materials and processes for coating, printing, and surface treatment for decorative and functional applications.

### Space competences

- Advanced atomic force microscopy, optical profilometry: nano- & microstructure analysis of metals, oxides and polymer surfaces or thin films
- Atmospheric pressure plasma surface treatment
- Pilot tests & feasibility studies for industrial surface treatment, processing, coating, and inkjet printing
- Polymer nanocomposites, nano- and microfiber membranes and filters
- Electrical, optical and wetting properties of materials and surfaces



### Contact

Prof. Dr. Silvia Schintke • HEIG-VD/HES-SO Laboratory of Applied NanoSciences • Avenue des Sports 20 • CH - 1401 Yverdon-les-Bains • Tel:+41 (0) 24 557 61 67 • silvia.schintke@heig-vd.ch • www.comatec-lans.ch



## Reconfigurable & Embedded Digital Systems (REDS), HEIG-VD, Yverdon-les-Bains

### Profile

The Reconfigurable and Embedded Digital Systems institute (REDS) is a team of passionate researchers composed of eight professors and twenty engineers, very active in the design of embedded systems, from the idea to the prototype, from the PCB design to the software application through FPGA and firmware. We are capable of crafting an entire system from hardware to software for low-consumption and high-performance applications, with the aim of reducing their energy footprint, whether for IoT or data analysis.

### Space competences

- FPGA accelerator design and integration
- Failsafe software development (bootloader and application)
- Heterogeneous device support (GPU, FPGA, CPU)
- Design of embedded systems
- Software defined radio (SDR)
- Formal verification hardware and software
- Antenna custom design
- Video and image signal processing



### Contact

Alberto Dassatti • HEIG-VD School of Engineering and Management • Route de Cheseaux 1 • CH - 1400 Yverdon-les-Bains • Tel:+41 (0) 24 557 61 60 • reds@heig-vd.ch • http://www.reds.ch



## ROSAS Center, HEIA-FR, Fribourg

### Profile

The Robust and Safe Systems Fribourg (ROSAS) Association, established in June 2015 as a non-profit organization, has the objective to operate the "ROSAS Center Fribourg", a unique in its kind Competence Center for robust, safe, reliable and secure systems. ROSAS is an industry-driven association with members.

### Space competences

- Definition of high-level reliability and safety requirements for a future Space Traffic Management System (STM) including space debris, space weather, clean space, hazard and risk assessment and mitigation measures
- Development of a Space Navigation Service Provider (SNSP) Certification Process based on ANSP regulations including the suitability of ground / aircraft CNS equipment for suborbital spaceflights



### Contact

Haute Ecole d'ingénierie et d'Architecture Fribourg • ROSAS Center Fribourg • Passage du Cardinal 13B • CH - 1700 Fribourg • Tel:+41 (0) 26 429 67 90 • info@rosas.center • www.rosas.center



## Surface Engineering, HE-Arc, Neuchâtel

### Profile

Our surface engineering expertise enables us to develop custom solutions and applications. Reflecting the expectations and needs of industrial players, we use our skills to improve and optimise surfaces by working on their design, the choice of materials and their properties.

### Space competences

- Surface characterization services
- Surface treatment for decorative and functional purposes



### Contact

Dr. Oksana Banakh • Espace de l'Europe 11 • CH - 2000 Neuchâtel • Tel:+41 (0) 32 930 25 20 • Oksana.Banakh@he-arc.ch



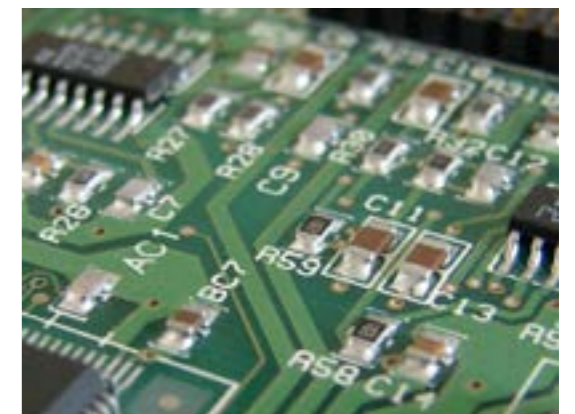
## Swiss Welding Institute (SWI)

### Profile

The center of Sainte-Croix specializes in electronic soldering. Its team will assist you for your certifications, for your trainings in high-reliability or industrial electronic soldering, for the choice of soldering parameters, of soldering process and the implementation of validation tests.

### Space competences

- Spatial certifications:
- Operator ECSS-Q-ST-70-08 Cat. 3 (Hand soldering THT)
  - Operator/Inspector ECSS-Q-ST-70-26 Cat. 2/3 (Crimping)
  - Operator ECSS-Q-ST-70-28 Cat. 3 (Repair and modification)
  - Operator/Inspector ECSS-Q-ST-70-30 Cat. 2/3 (Wrapping)
  - Operator ECSS-Q-ST-70-38 Cat. 3 (Hand soldering SMT)
  - Inspector ECSS-Q-ST-70-08/38 Cat. 2



### Contact

Pierre Rogé • Swiss Welding Institute • Rue du Nord 3 • CH - 1400 Yverdon-les-Bains • Tel:+41 (0) 24 557 27 90 • pierre.roge@swi.ch • www.swi.ch



Segment	Research	Development	Production
Earth Observation		✓	
Life and Physical Sciences	✓	✓	
Satellite-based Applications		✓	
Instruments and Payloads	✓	✓	
Spacecraft and on-board Equipment	✓	✓	
Ground Segment	✓	✓	
Materials and Processes	✓	✓	✓
Structures	✓	✓	
Electronic Components	✓		
Software	✓	✓	
Basic Research for Space Technology	✓	✓	
Small Satellite Activities	✓	✓	

## HSLU

### Profile

Since 1958, the Lucerne School of Engineering and Architecture has contributed and strengthened Switzerland as a business location by providing bachelor's and master's degree programs, continuing education programs and applied research. With around 2,000 students pursuing bachelor's and master's degrees and almost 1,000 attending continuing education programs, the School is one of the most in-demand institutions in Switzerland. The some 400 researchers organised in 12 competence centers carry out interdisciplinary research on two focal points: "Building as a System" and "Energy for the Future".

### HSLU at a Glance

- Bachelor's degree programs in Architecture, Interior Architecture, Civil Engineering, Building Technology, Electrical Engineering, Mechanical Engineering, Business Engineering Innovation, Medical Engineering and Energy Systems Engineering.
- The Center of Continuing Education offers practical and interdisciplinary education and training, from seminars and certificate courses to continuing education programs.

**HSLU** Hochschule  
Lucerne

**Lucerne School of Engineering and Architecture**

Technikumstrasse 21  
CH - 6048 Horw  
Tel: +41 (0) 41 349 33 11  
technik-architektur@hslu.ch



## Biotechnology Space Support Center (BIOTESC)

### Profile

BIOTESC (Biotechnology Space Support Center) acts on behalf of the European Space Agency ESA. It advises scientists who intend to perform biological experiments under zero-gravity conditions onboard the International Space Station (ISS) in the Columbus space laboratory and supports the astronauts conducting experiments.

### Space competences

- User support for operations onboard the ISS
- Public outreach activities
- Payload development
- ISS safety



### Contact

BIOTESC Biotechnology Space Support Center • Dr. Bernd Rattenbacher • Institute of Medical Engineering • Obermattweg 9 • CH - 6052 Hergiswil • Tel: +41 (0) 41 349 36 19 • bernd.rattenbacher@hslu.ch



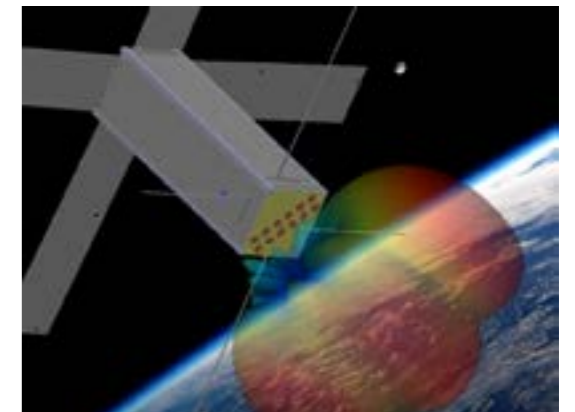
## Competence Center for Autonomous Systems and Robotics (CC ASR)

### Profile

CC ASR team has demonstrated core competences in key technology areas such as automation, signal processing, robotics, electronics, and communication. We develop highly automated systems around industrial robots. Advanced algorithms are designed and implemented to control complex processes and automatize the maintenance. Our signal processing solutions support development of communication and measurement systems. We design and build analog and digital electronics.

### Space competences

- Design and development of circuits and antennas for the high frequency and microwave range
- Design and development of payload electronic modules and communication modules (hardware and software)
- Design and development of ground station infrastructure
- Modelling and analysis of Multiphysics systems (acoustics, mechanics, em-waves and ac/dc thermoelectric systems)



### Contact

Prof. Marcel Joss • Technikumstrasse 21 • CH - 6048 Horw •  
Tel: +41 (0) 41 349 33 02 • marcel.joss@hslu.ch • www.hslu.ch/ccasr

**HSLU** Hochschule  
Lucerne

## CC Mechanical Systems

### Profile

The Competence Center (CCMS) provides all competences for a holistic and efficient design of mechanical systems, including their design and development up to their manufacturing, assembly and testing. It is specialized on applied research and sophisticated engineering services, including the fields of design, simulation, material and functional testing and prototype generation. The CCMS supports university level space activities and space segment companies.

### Space competences

- Design and structural/thermal analysis
- Multi-body analysis
- Materials mechanical testing
- Micro-mechanical testing
- Space mechanisms systems
- Systems engineering
- Zero-g experiment
- Random Positioning Machine
- Mechanism and scientific instruments



### Contact

Prof. Ralf Baumann • Head of Competence Center • Technikumstrasse 21 • CH - 6048 Horw •  
Tel: +41 (0) 41 349 32 55 • ralf.baumann@hslu.ch • www.hslu.ch/ccms

**HSLU** Hochschule  
Luzern

Segment	Research	Development	Production
Earth Observation	✓	✓	
Life and Physical Sciences			
Satellite-based Applications	✓	✓	
Instruments and Payloads	✓	✓	
Spacecraft and on-board Equipment	✓		
Ground Segment	✓	✓	
Materials and Processes			
Structures			
Electronic Components	✓	✓	
Software			
Basic Research for Space Technology	✓		
Small Satellite Activities			

## UniNE

### Profile

The University of Neuchâtel (UniNE) is an internationally recognized institution, known for its reasonable size and favorable student-teacher ratio. With more than 4000 students from Switzerland and beyond (22% international students), it provides high quality teaching and support and is ranked among the 20 best small universities worldwide. Bachelor and Master's degrees are compatible with most other European universities and are in line with society's expectations in a variety of innovative and cutting-edge fields. Situated halfway between Geneva and Zurich, UniNE is a perfect place for those who wish to study or to undertake high-level research in a magnificent environment, near lake and mountains.

### UniNE at a Glance

- 4 faculties: humanities, science, law, economics and business
- > 4'000 students
- 600 doctoral candidates
- 750 staff members (FTE equivalent)
- > 1'000 degrees (awarded in 2019)
- > 600 research projects



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## The Time and Frequency Laboratory (LTF)

### Profile

The mission of LTF is to explore and push the frontiers in time and frequency research, optical metrology, and ultrafast science and technology. In collaboration with METAS, LTF developed the Swiss primary atomic fountain clock FOCS-2. LTF closely collaborates with local and national space actors like EPFL, CSEM, atomic clocks industry, and others.

### Space competences

- Time & Frequency metrology
- Ultrafast lasers
- Optical frequency references for atomic clocks and space applications
- High-performance and miniaturized vapour-cell atomic clocks
- Various frequency combs systems
- Stabilization of microwave and optical oscillators
- State-of-the-art ion beam sputtering (IBS) machine for custom optics
- Cold atoms



### Contact

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Segment	Research	Development	Production
Earth Observation	✓	✓	✓
Life and Physical Sciences	✓	✓	✓
Satellite-based Applications	✓	✓	✓
Instruments and Payloads	✓	✓	
Spacecraft and on-board Equipment			
Ground Segment	✓	✓	
Materials and Processes		✓	
Structures			
Electronic Components	✓	✓	
Software	✓	✓	✓
Basic Research for Space Technology	✓	✓	
Small Satellite Activities			

## UZH

### Profile

With its 26'000 enrolled students, the University of Zurich (UZH) is Switzerland's largest university. Founded in 1833, UZH was Europe's first university to be established by a democratic political system. Today, UZH is one of the foremost universities in the German-speaking world. Made up of seven faculties covering more than 100 different subject areas, the University offers a wide variety of Bachelor's, Master's and PhD programs. In addition, UZH's continuing education programs offer excellent learning opportunities.

### UZH at a Glance

- Founded in 1833
- Largest, most diverse university in Switzerland
- Seven faculties and over 150 institutes
- Four University hospitals
- 26'000 students
- 5'000 researchers including > 650 professors
- A new patent every two weeks
- A new spin-off every two months
- Two research agreements with industry per day



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## Black Holes and Gravitational Wave Detection

### Profile

The groups of Prof. P. Jetzer and Prof. L. Mayer work on gravitational wave experiments, especially on ESA's future Laser Interferometer Space Antenna (LISA). Their research focuses on theoretical and computational modeling of gravitational wave sources and their resulting wave-forms. They are both members of the LISA Consortium. Prof. Jetzer is also member of the LISA Consortium Board and of the LISA Science Study Team, and coordinator of the ESA Topical Team on ACES and general relativity.

### Space competences

- Theoretical and observational astrophysics
- Astrophysical supercomputing simulations
- Gravitational wave research (LISA/LISA Pathfinder/LIGO)
- Tests of general relativity using the Atomic Clock Ensemble in Space (ACES)



### Contact

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## Cell Biology - Gravitational Biology and Biomechanics

### Profile

Using parabolic flights, suborbital rocket and International Space Station (ISS) experiments, the group of Prof. O. Ullrich investigates the role of gravity in cellular signal transduction, cell dynamics and gene expression regulation in order to understand how gravitational forces contribute to cellular homeostasis and how cells adapt to an altered gravity environment.

### Space competences

- Gravitational Biology
- Space Life Sciences
- Manned Spaceflight
- Hardware design and development
- Parabolic Flights (incl. Swiss Parabolic Flight program)
- Suborbital ballistic rockets
- International Space Station (ISS)



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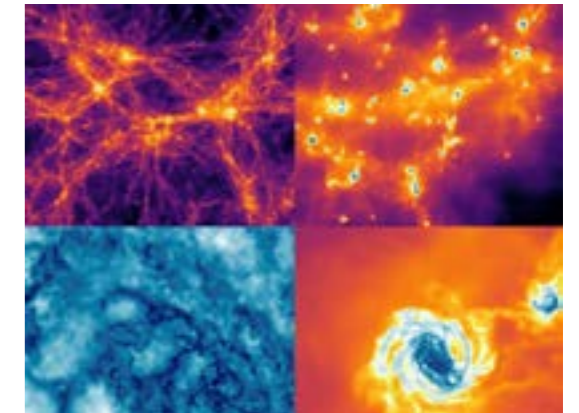
## Data Science in Astrophysics Group

### Profile

The Data Science in Astrophysics group, led by Prof. R. Feldmann, explores the distribution and evolution of galaxies, cosmic gas, and stars with the help of high performance computing and machine learning methods. Improving the theoretical modeling of astrophysical systems by leveraging data from current and future observatories such as the James Webb Space Telescope or the Square Kilometer Array will enable a better understanding of our cosmic origins.

### Space competences

- Machine Learning applied to astrophysical systems
- Formation of galaxies and cosmic structure
- Study of electromagnetic signals from gas and stars
- Square Kilometer Array Observatory



### Contact

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## Glaciology and Geomorphodynamics Group (3G)

### Profile

Research of the Glaciology and Geomorphodynamics Group (3G) at the Dept. of Geography has a focus on the cryosphere and high-mountain regions in the context of climate change. The group applies modeling, Earth observation data and digital elevation models (DEMs) from a variety of sources for the analysis of related processes, impacts and risks.

### Space competences

- Optical remote sensing of glaciers and change assessment
- DEM extraction from stereo images



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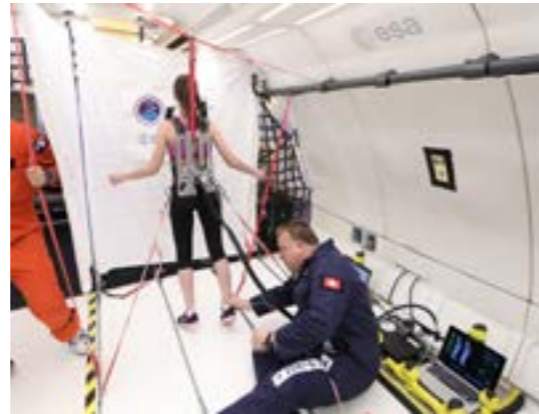
## Integrative Spinal Research (ISR) Group

### Profile

Using parabolic flights, the International Space Station (ISS), and ground reference studies, the Integrative Spinal Research Group investigates the effects of micro- and hypergravity on the human spine with the aim of improving spinal health.

### Space competences

- Parabolic Flights
- International Space Station (ISS)
- Ground Reference Studies
- Clinical Trials
- Back pain



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## Origin and Evolution of Exoplanets and Solar System

### Profile

The Origin and Evolution of Exoplanets and Solar System research group is divided into two entities. The other one is led by Prof. L. Mayer and focuses on astrophysics and planetary science, developing theoretical models for planet formation and evolution, planetary interiors, and the characterisation of exoplanets. Prof. L. Mayer's entity focuses on the origin and evolution of protoplanetary disks and on the early stage of planet formation.

### Space competences

- Theoretical astrophysics and Planetary Science
- Astrophysical supercomputing simulations
- Exoplanet Detection and Characterisation (PLATO)
- Solar System Exploration (Juno, JUICE)
- Exoplanetary Atmospheres (ARIEL)



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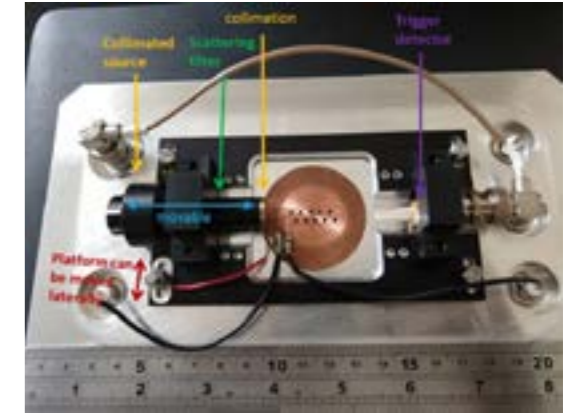
## Radiation Research Group

### Profile

The UZH Radiation Research Group is focusing on two main topics: quantifications of biological damage from space radiation; and the development of radiation protection models to estimate the long term detrimental health risks to astronauts from mission exposures. This research is based on bio-physical experiments and theoretical calculations. Ionization measurements are essential in reliable quantifications of relative biological effectiveness of different ion species found in space radiation.

### Space competences

- Quantifications of biological damage from space radiation
- Radiation protection models to estimate the long term detrimental health risks to astronauts from mission exposures.
- Nanodosimetry
- Monte Carlo simulations of the effects of cosmic radiation



### Contact

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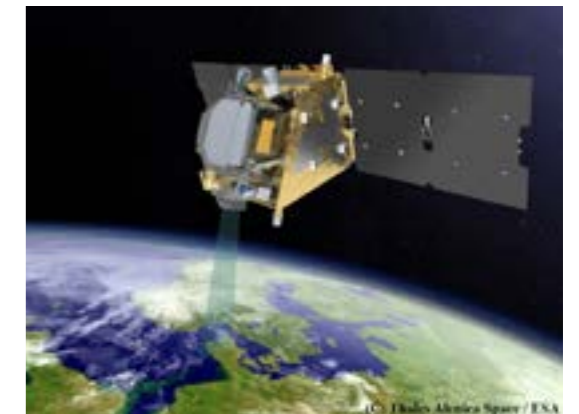
## Remote Sensing of Water Systems (RSWS)

### Profile

The Remote Sensing of Water Systems (RSWS) group is embedded in both, the Dept. of Geography at the University of Zurich and the Swiss Federal Institute of Aquatic Science and Technology, Eawag. RSWS's central goal is to advance water systems research using novel Earth observation technology (i.e. ESA's future FLEX satellite mission) and process models. Our fundamental research activities are centered around the measurement of water dynamics in the Earth system.

### Space competences

- Fluorescence spectroscopy (FLEX mission)
- Method development and processing infrastructure (FluoSpecchio)
- Remote sensing of terrestrial and aquatic photosynthesis
- Remote sensing for water and carbon cycle research
- Stakeholder solutions



### Contact

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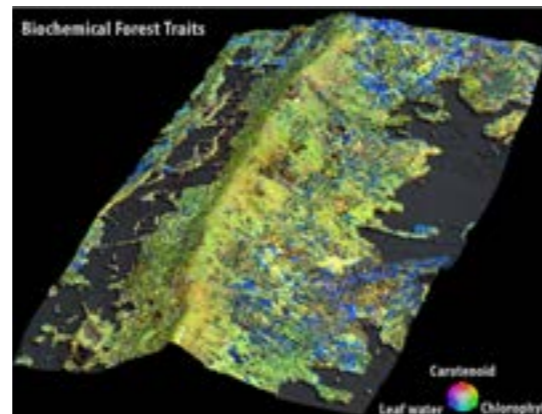
## Remote Sensing Laboratories

### Profile

The Remote Sensing Laboratories (RSL) are embedded in the Dept. of Geography. RSL's central research goal is to advance understanding of the Earth system sciences using Earth observation methods. Combining fundamental and applied research allows the group to assess the impact of the human dimension on regional, national and global change.

### Space competences

- Imaging spectroscopy, SAR & LiDAR research
- Methods, models, and software development
- Measurement and processing infrastructure
- National and international cooperation
- Policy and stakeholder advice



### Contact

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## Science Lab UZH

### Profile

The Science Lab UZH provides a modern and future oriented impression of natural sciences and promotes interdisciplinary skills for school pupils, students, teachers and the general public through interactive and cross-disciplinary workshops. The aims with the courses offered, inter alia, in the fields of Earth observation, robotics, data sciences, applied mathematics, physics/astrophysics or biology, is to foster the interest in natural sciences and to help young people understand the effects of human behavior on nature and on the environment.

### Space competences

- Science communication and cross-curricular education formats
- Applied Earth observation and remote sensing
- Software development and programming
- Augmented and virtual reality
- Digital skills and digital transformation
- National and international cooperation



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## Robotics and Perception Group

### Profile

The University of Zurich's Robotics and Perception Group, led by Prof. D. Scaramuzza, specializes in developing autonomous drones that navigate using only onboard cameras, without GPS. Their research activities are supported by funding from ERC, SNSF, NCCR Robotics, and several academic-industrial collaborations, such as SONY, HUAWEI, INTEL, HILTI.

### Space competences

- Computer vision
- Sensor fusion
- Autonomous navigation and exploration
- Localization and mapping
- Motion planning and control
- Machine learning & Deep Neural Networks



### Contact

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## Spatial Ecology and Remote Sensing

### Profile

Our research group focuses on the interaction of ecosystems with global change drivers, in an Earth System Science context. We combine ecological experimental approaches, field measurements, air- and spaceborne radiation measurements, and radiative transfer modelling, to connect processes from the leaf, to the plant and landscape scale, from the soil through the vegetation canopy up to the atmosphere.

### Space competences

- Remote sensing data analysis for ecological applications
- Radiative transfer modelling in vegetation canopies
- Energy fluxes
- Ecosystem monitoring using drones
- Remote sensing of arctic terrestrial ecosystems
- Validation of satellite-derived land surface products
- BRDF and albedo



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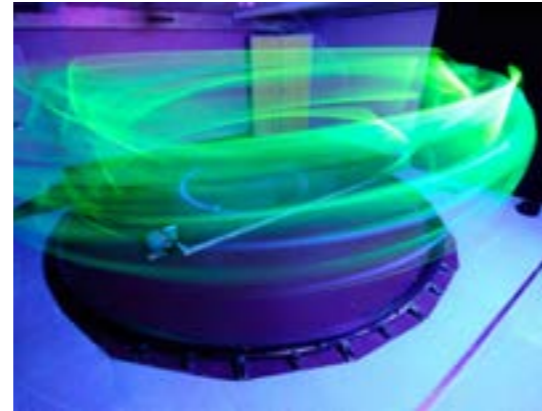
## Swiss Space Travel & AiR Sickness (SSTARS)

### Profile

We investigate habituation of self-motion perception in novel motion environments. This includes adaptation to artificial gravity and g-transitions and other Earth-based applications ranging from preventing motion sickness in aviation to rehabilitation in neurological patients. The group is within the Vestibulo-oculomotor Lab (Neurology/Ophthalmology/Otolaryngology departments, University Hospital Zurich) and has access to motion simulators, a human centrifuge, virtual reality setups, eye tracking systems and clinical test devices.

### Space competences

- Space motion sickness and its cognitive and autonomic correlates
- Motion sickness and disorientation
- Artificial gravity
- Motion simulators, perceptual motion illusions, virtual reality
- Motor responses (Eye movements, postural balance)
- Perceptual responses for orientation and self-motion perception



### Contact

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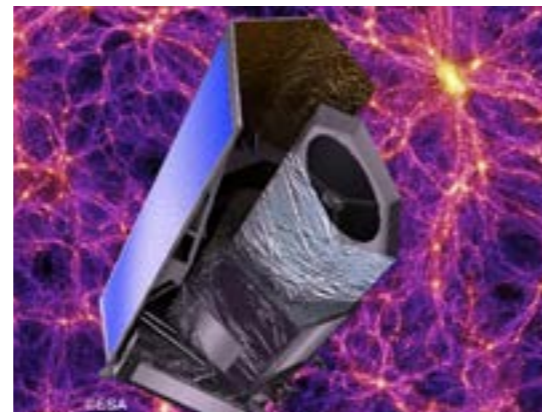
## The Dark Universe

### Profile

The astrophysics group is part of ESA's Euclid mission, whose goal is to map our entire observable Universe and get new insights on the nature of dark matter and dark energy. The astroparticle physics group focuses on the direct detection of particle dark matter with dual-phase (liquid and gas) xenon time projection chambers.

### Space competences

- Large scale simulations & analyses
- Liquid xenon detectors
- Low-noise and low-background electronics
- Radio-isotope detection with ultra-low background HPGe diodes
- Single-photon detection



### Contact

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## UZH Space Hub

### Profile

The UZH Space Hub is a strategic part of the University of Zurich's Innovation Hub with the focus on space and aviation activities bringing together groundbreaking fundamental research from the fields of astrophysics, earth observation and space life sciences with applied and marketable science and linking them with industry. Together with academic & industry partners the aim is also to strengthen innovative space and aviation activities at the Switzerland Innovation Park Zurich (IPZ) in Dübendorf by pooling experiences, expertise, networks and infrastructure.

### Space competences

- Established 2018
- Over 25 researchers from the fields of astrophysics, earth observation and space life sciences, robotics, and space sustainability
- Infrastructure, e.g. aircraft
- Airborne and spaceborne R&D
- Link academia with industry
- Swiss Parabolic Flights (ZERO-G)
- Access to International Space Station ISS



### Contact

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University of Zurich  
UZH Space Hub

## National Center for Biomedical Research in Space (NCBRS)

### Profile

The group is conducting biomedical and biotechnological research in space medicine, space biology, answering the fundamental question of how physical forces, such as gravity, are translated into biological responses. The related experiments are performed on microgravity research platforms like drop towers, airplanes performing parabolic flights, sounding rockets, or the ISS. Furthermore, the National Center operates various types of microgravity simulators in their laboratories. The center has a dual affiliation with the Hochschule Luzern.

### Space competences

- Construction of microgravity simulators
- Construction of space-proven bioreactors
- Construction of space-proven electrophysiological instruments
- Enabling real-time microscopy under simulated and real microgravity
- Facilitating alternative microgravity research platforms



### Contact

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