Deutsches Zentrum
DLR für Luft- und Raumfahrt
German Aerospace Center

Start your mission @ DLR in Cologne as a Master's Student in Aerospace Biology
DLR is the aerospace research center and space agency of the Federal Republic of Germany. Around 11,000 employees conduct joint research on a unique variety of topics in aeronautics, space, energy, transport, digitalization, and security. Our missions range from basic research to the development of innovative applications and products of tomorrow. Cutting-edge research needs excellent minds at all levels - especially more women - who can fully develop their potential in an inspiring environment. Start your mission with us.

Our group:
The department of Applied Aerospace Biology, embedded within the Institute of Aerospace Medicine, offers a position for a highly motivated **Master's student in bioinformatics or computational biology** to support ongoing research on **molecular adaptations to altered gravity** using **proteomic datasets** from spaceflight and ground-based experiments.

The project:
CyMoN (Cytoskeletal dynamics of Motor Neurons) investigates how altered gravity affects the function and maintenance of human iPSC-derived motor neurons. Within this framework, the project applies **proteomics and bioinformatic analyses** to characterize **gravity-dependent molecular adaptations** in neuronal systems. It's a unique opportunity to compare mass spectrometry datasets from real microgravity obtained in sounding rocket missions, ground-based simulations of microgravity, and laboratory controls. The study aims to identify key novel pathways, e.g. in neurodegeneration, metabolic regulations, cytoskeletal regulators, etc. involved in neuronal stress responses, maintenance, and synaptic integrity. These insights will advance understanding of **neuromuscular deficits in astronauts** and contribute to **terrestrial models of neurodegeneration and muscle atrophy**. This knowledge will help us to identify molecular targets of neuromuscular degeneration in order to facilitate the development of novel therapeutic approaches for astronauts and patients on Earth.

This thesis contributes to ongoing research on cellular and molecular responses to altered gravity, using data generated from microgravity obtained in sounding rocket campaigns, ground-based simulation experiments for hyper- and microgravity, and corresponding laboratory controls.
Samples from these experiments have been processed and analyzed via DIA mass spectrometry to investigate cellular and molecular changes under different gravitational conditions. The Master's project will focus on the comparative bioinformatic analysis of these proteomic datasets to identify gravity-dependent molecular signatures and regulatory pathways involved in cellular stress, adaptation, and neuronal maintenance.

The thesis will be conducted at DLR Cologne in collaboration with the University Hospital Bonn (Prof. Dr. Volker Busskamp). The analysis will be supported by the two Core Facilities "Proteomics" and "Bioinformatics" of the University of Bonn, focusing on the following objectives:

- **Data integration and preprocessing:** Curate, quality-check, and normalize proteomics data (LC-MS/MS) obtained from spaceflight, reference ground-based studies, and laboratory experiments, each with corresponding controls.
- **Comparative analysis:** Identify significantly regulated pathways, proteins and pathways using statistical and bioinformatics methods. Target molecules for neuromuscular research under altered mechanical load (e.g. under space conditions) should be identified for the development of future therapeutic (e.g. pharmacological) interventions.

- **Functional annotation:** Perform pathway enrichment, protein-protein interaction, and network analyses.
- **Cross-platform validation:** Compare results across different experimental systems (sounding rocket flight samples, clinostat ground-based simulations, hypergravity centrifuge experiments, laboratory controls, each with specific corresponding controls).
- **Data visualization and reporting:** Generate reproducible workflows and visual summaries of key findings.

The project will help uncover molecular mechanisms underlying cellular adaptation to altered gravity, contributing to future space biology and human spaceflight health research.
The aim is to reveal how altered gravity reshapes neuronal proteomes, providing insight into gravity-dependent mechanisms of neuronal maintenance and function. Identify molecular targets for neuromuscular adaptation under altered mechanical load to guide therapy development.

The candidate:
We are seeking a highly **motivated bioinformatics student** who possess a deep interest in leveraging computational tools to analyze biological datasets derived from unique spaceflight environments. Ideal candidates will have earned a a B.Sc. or equivalent degree in bioinformatics, computational biology or a related discipline.

Additional desirable qualifications include:
- Experience in the Perseus software platform
- Well-versed in interpreting protein quantification, interaction, and post-translational modification
- High-dimensional omics data analysis, including normalization, pattern recognition
- Time-series analysis, cross-omics comparisons, and multiple-hypothesis testing
- Familiarity of proteomics and mass spectrometry data
- Experience with statistical and bioinformatics tools (e.g., Python or similar)
- Strong analytical and problem-solving skills
- Familiarity with pathway and network analysis
- Proficiency in English

We offer:
- Supportive mentoring and career development plans
- An excellently equipped workspace and vibrant scientific environment
- An international and interdisciplinary team of scientists
- Access to unique proteomic datasets from spaceflight missions
- Opportunity to participate in cutting-edge aerospace biology research
- Opportunity to present the results in international conferences
- Authorship and inclusion of the results in publications, if applicable
- Possibility (but no obligation) to conduct the thesis at the University of Bonn
- Possibility (but no obligation) to receive a DLR-DAAD followship

Application:
Interested candidates should send their application (**letter of motivation, academic CV, contact details for references**) directly by email to Dr. Christian Liemersdorf, Department Head Applied Aerospace Biology (Christian.Liemersdorf@dlr.de).

Salary:
The Master's Student position is remunerated.

Start: Earliest April 2026