RPM & CLINOSTAT

Simulate Microgravity with Yuri

2023

www.yurigravity.com

YURI

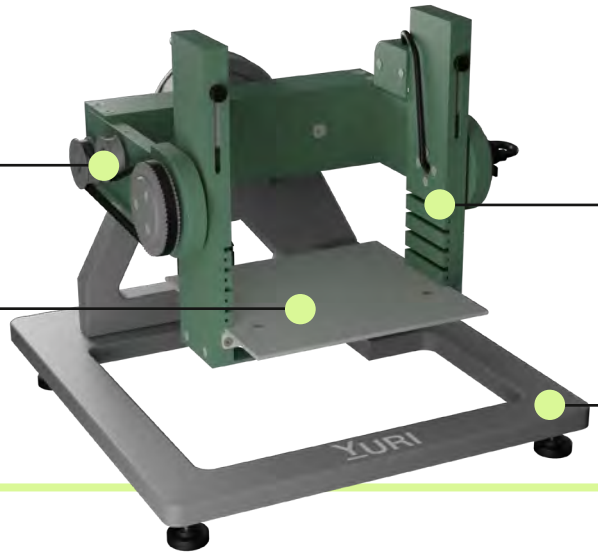
RPM 2.0

formerly Airbus, now Yuri

Micro- and Partial Gravity Simulation for Scientific, Educational and Industrial Applications

The RPM achieves simulated microgravity (s-µg) by providing a **continuous random change in orientation** of an accommodated experiment relative to the Earth gravity vector. When the changes in direction of the object on the RPM are faster than the object's response to gravity, this generates effects similar to the **effects of real microgravity in space**.

The RPM was developed >20 years ago by **Airbus** and has now found a new home at Yuri. It is a proven asset and valued by more than **60 research groups** around the globe, incl. **NASA** and **ESA**. It is used as a **simulation platform** for micro- and partial gravity experiments as well as for preparation and post-flight analysis of experiments on the International Space Station.



Works in **multiple motion modes**: clinostat, random, partial-g

Supports experiments **up to 1.5 kg** and **< 15x15x15 cm³**

Platform for mounting the experiment package is **adjustable in height**

Size: < 38x31x35 cm³
Weight: 7.5 kg

Performance Data

- **Compact design** supports experiments in **incubators** (control of temperature, CO2 and RH) and **radiation facilities**
- Supports experiment **gravity levels between 10-3 g and 0.9 g** (e.g. Moon or Mars gravity)

Key Features

- **PC and software are included** to operate the RPM and to monitor its parameters, such as average g-level
- Unique and proven path algorithms with **protection against pole bias**
- Integrated power and communication interfaces

RPM 2.0

Research Applications with the RPM 2.0

Cellular Biology

To this date, changes in the expression of many genes were found in multiple cell types when cells grown in normal gravity were compared with cells grown in s-µg on the RPM. These changes were found at **transcriptional level** (e.g. qRT-PCR) as well as at **post transcriptional level** (e.g. proteomics, cellular markers...).

Cancer Research

Many of these genes play important roles in **cancer-relevant cellular processes** such as cell cycle, proliferation, apoptosis, cellular morphology (cytoskeleton), adhesion (extracellular matrix), migration.
For this reason, the behavior of many tumorous cell lines are investigated in s-µg on the RPM.

Tissue Engineering

The changes in cellular morphology and behavior arising from µg lead to cells growing differently in these conditions.
Instead of growing two dimensional and adhering on the culture support, some can form **three-dimensional** structures called **spheroids**.
This behavior is of great interest in growing tissue-like structures from (stem) cells, e.g. for regenerative medicine.

Microbiology

Besides mammalian cells, **unicellular organisms** are investigated in the context of gravitational biology.
Research was conducted on both **pro- and eukaryotes**. Pathogens such as Pseudomonas aeruginosa were investigated as threatening to the health of humans in space.
Other microorganisms, e.g. Rhodospirillum rubrum are part of programs aimed to design systems capable of recycling waste produced in space into compounds such as water or oxygen.
Finally, model organisms such as Paramecium are investigated in a more fundamental view.

Plant Biology

The Earth's gravity plays an important role in plant development and cellular processes. Thus, plants belong to the first organisms investigated in altered gravity with experiments going back to the 19th century. E. g., plants grown in s-µg on RPMs show **changes in cell cycle, cell wall and gene expression.**
This research is of great interest to study overall plant physiology and cellular processes but can also be applied to investigate cultivating plants without gravity to **develop bioregenerative life support systems.**

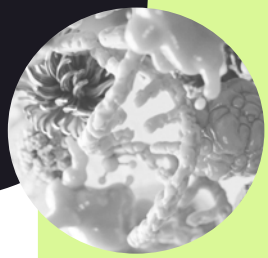
Other Organisms

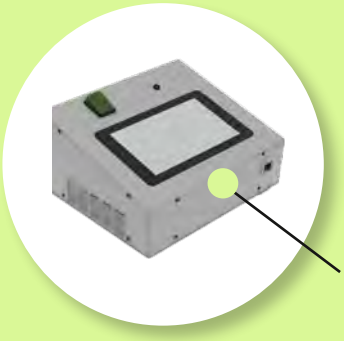
The RPM is very flexible and can be **adapted to specific needs** of different organisms and models in terms of experimental setup.
Examples hereof include the study of regeneration in µg on Platyhelminthes, the investigation of cellular and physiological processes in Xenopus, the analysis of changes occurring in Drosophila upon gravity deprivation and the observation of Zebrafish development on an RPM.

CLINOSTAT

The Microgravity Simulator for your Lab

Your entry ticket to the microgravity world.
An easy-to-use device for 24/7 microgravity research in your lab.





Simple touch user interface

Capabilities

- Base Module with up to 2 expansion modules (**max. 45 samples**)
- **Microgravity**, **Moon gravity** (0,17g) and **Mars gravity** (0,38g) possible
- Wide range of compatible sample sizes (1-15ml)
- Designed to use inside incubators and lab conditions, easy to clean
- **Control unit** outside incubator for permanent surveillance and control
- **Automated calculation** of optimal rotational velocity
- **Temperature sensor** in Base Module for additional redundancy