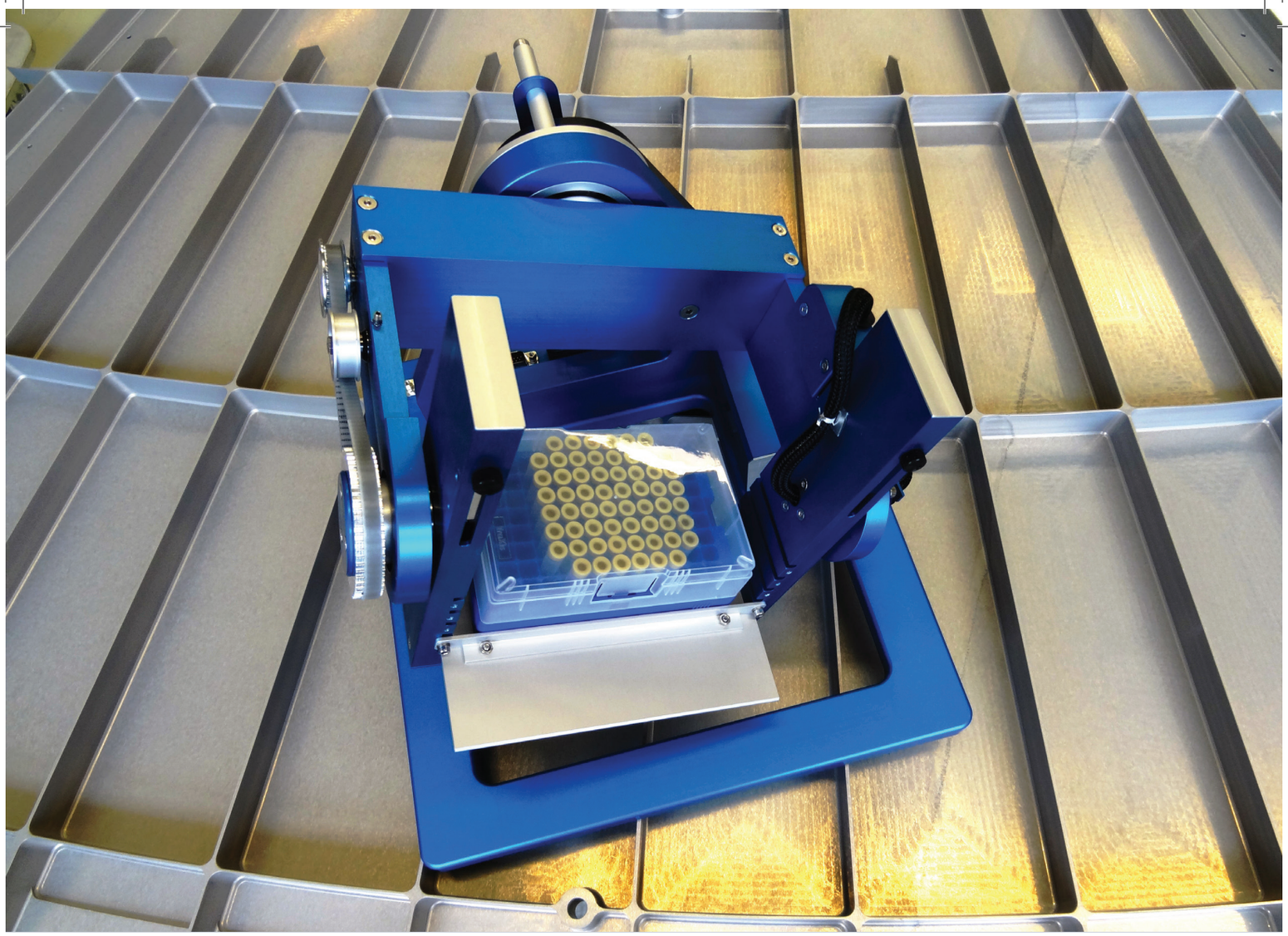


RPM 2.0

Micro- and Partial Gravity Simulation through Random Positioning

The Random Positioning Machine (RPM) enables micro- and partial gravity research for scientific, educational and industrial applications.

The RPM achieves microgravity by providing a continuous random change in orientation of an accommodated experiment. This generates effects similar to the effects of true microgravity (space) when the changes in direction are faster than the object's response time to gravity.

Additionally, the RPM 2.0 can generate every partial gravity level between 0g and 0.9g, by randomly changing direction such that Earth's gravity has partly influence on the sample.

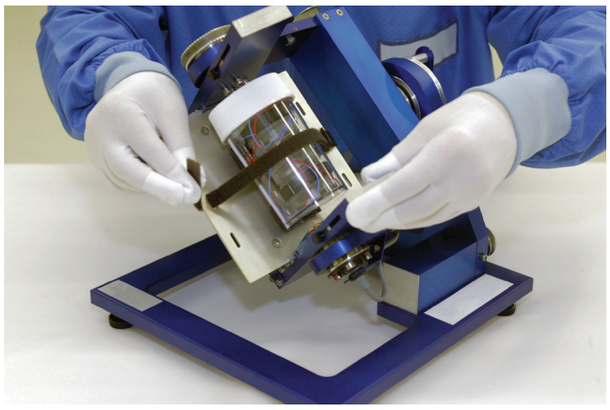
The RPM is a proven asset and valued by the scientific community as a simulation platform for micro- and partial gravity experiments.

Moreover, the RPM is used for preparation and post-analysis of experiments that fly on the International Space Station.

AIRBUS

RPM 2.0

Partial and Microgravity Simulation through Random Positioning



RPM 2.0 Key Features

The key features of the Random Positioning Machine are:

- Provides micro- and partial gravity simulation for scientific, educational and industrial applications.
- Multiple motion modes: clinostat, random, partial-g, etc.
- Unique and proven path algorithms with protection against pole bias.
- Integrated power and communication interfaces on platform.
- Compact design to support experiments in incubator and radiation facilities.

The RPM provides a platform for mounting the experiment package, which is adjustable in height. The system is designed to operate inside an incubator for control of temperature, CO_2 and RH (non-condensing). PC and software are included to operate the RPM and to monitor its parameters, such as average g-level.

RPM 2.0: providing every partial gravity level from 0g up to 0.9g

Cell Biology and Regenerative Medicine

The RPM is used in many (micro)biological and medical experiments. For example, in cell biology, the RPM provides the required microgravity to prevent the particles from settling within cells. Furthermore, the RPM provides a new approach in stem cell research and 3D tissue engineering.

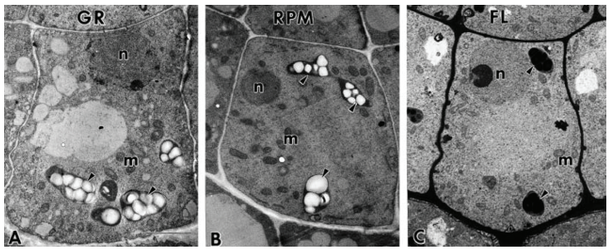
Astriobiology

Planetary science and mission preparation programs require control over the exact gravity level. The RPM supports this research field through partial-gravity simulation. For instance, it can provide 0.38g for Mars or 0.17g for Moon gravity related research.

User Experiences

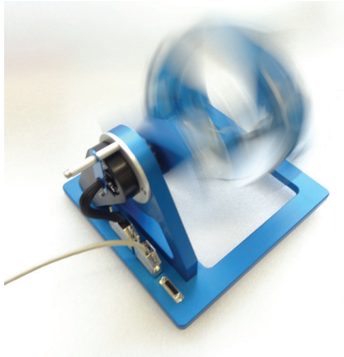
Recently, a BioMed 2015 paper concluded: ***"The RPM has been established as a reliable tool supporting ground-based microgravity studies. [...] The RPM is furthermore an ideal tool for preliminary microgravity tests, screening studies in which simulated microgravity effects are checked on various organisms and hardware testing."***

Source: "Simulated Microgravity: Critical Review on the Use of Random Positioning Machines for Mammalian Cell Culture"
Simon L. Wuest, Stéphane Richard, Sascha Kopp, Daniela Grimm and Marcel Egli



Electron micrographs of story-2 central columella cells of Arabidopsis seedlings grown on the ground (fig. A), on the RPM (fig. B) and during space flight (fig. C)
Source: "Plastid position in Arabidopsis columella cells is similar in microgravity and on a random-positioning machine."
Tristan F. B. Kraft, Jack J. W. A. van Loon, John Z. Kiss

RPM 2.0 Performance Data	
RPM 2.0 Instrument Volume (LxWxH)	< 38 x 31 x 35 cm^3
RPM 2.0 Instrument Mass	7.5 kg
Supported Experiment Gravity Levels	< 10^{-3}g up to 0.9g
Supported Experiment Volume	< 15 x 15 x 15 cm^3
Supported Experiment Mass	up to 1.5 kg



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