# Experimental Investigation of Small Ice Particles in the Context of Planet Formation


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*Open-Minded*

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## Introduction

In the past years the influence of ice particles in the process of planet formation got more and more important. While the characteristics of dust as well as the outcome of dust-dust collisions are well investigated, the behaviour and molecular properties of micron sized ice particles and aggregated are still quite unknown.

We develope an experiment to create and investigate ice particles by spraying liquid water into a cooled vacuum chamber.

This setup is primarily suitable to produce ice aggregates consisting of micron sizes ice particels but it is also possible to investigate aggregaton of ice and (free) collision of ice aggregates under PPD-like conditions.

## What we are doing

We produce micrometer sized ice particles by spraying liquid water into a low pressured vacuum chamber. Depending on the concrete setup we are able to create large-sized aggregates and measure the porosity of the resulting aggregates. Also multiple particle-aggregate collisions can be observed which can be compared to existing results from dust experiments.
With this setup we are also capable of producing defined small-sized aggregates which can be studied in detail in other experimental setups which are currently in development.

Since there are still a few minor issues which have to be fixed we present our basic setup within this poster.

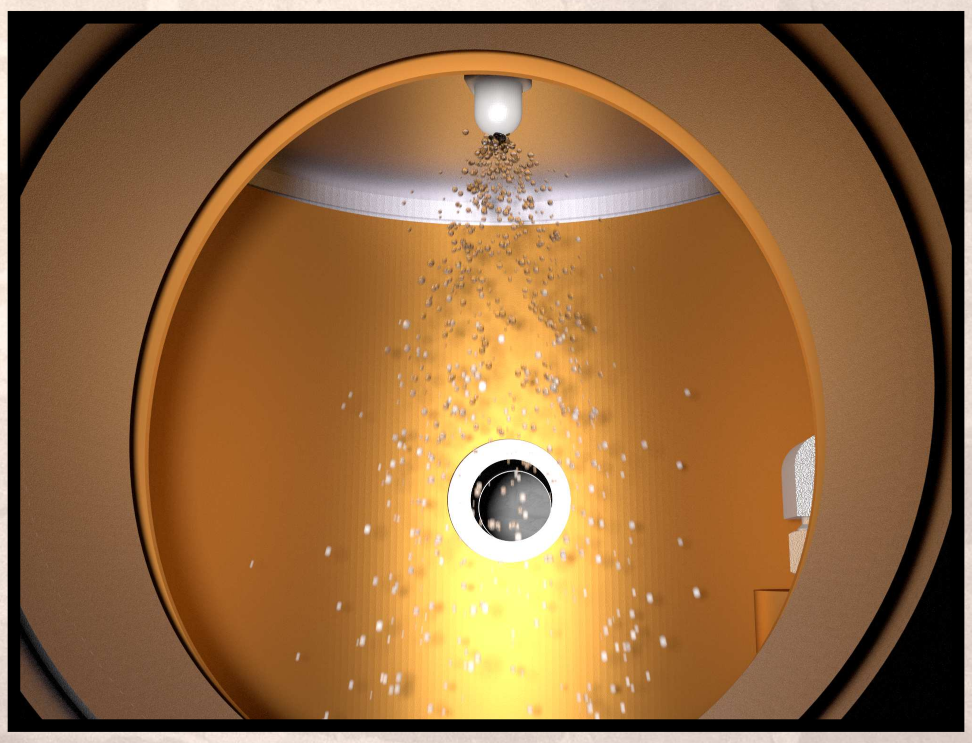


FIG. 1. View of the inner chamber through the vacuum window. Using a nozzle and a high-pressure water delivery system, water is sprayed into the vacuum chamber resulting in droplets of sizes in the micrometer range. The complete chamber is lined with a chopper-cooling-system to provide ambient temperaures below 125 K.

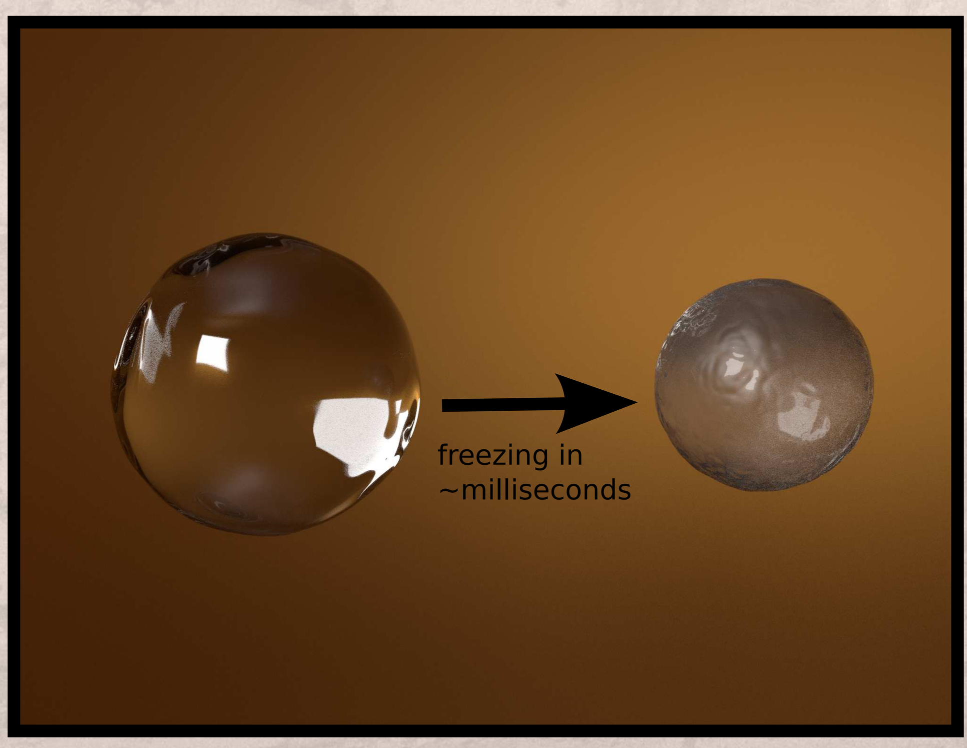
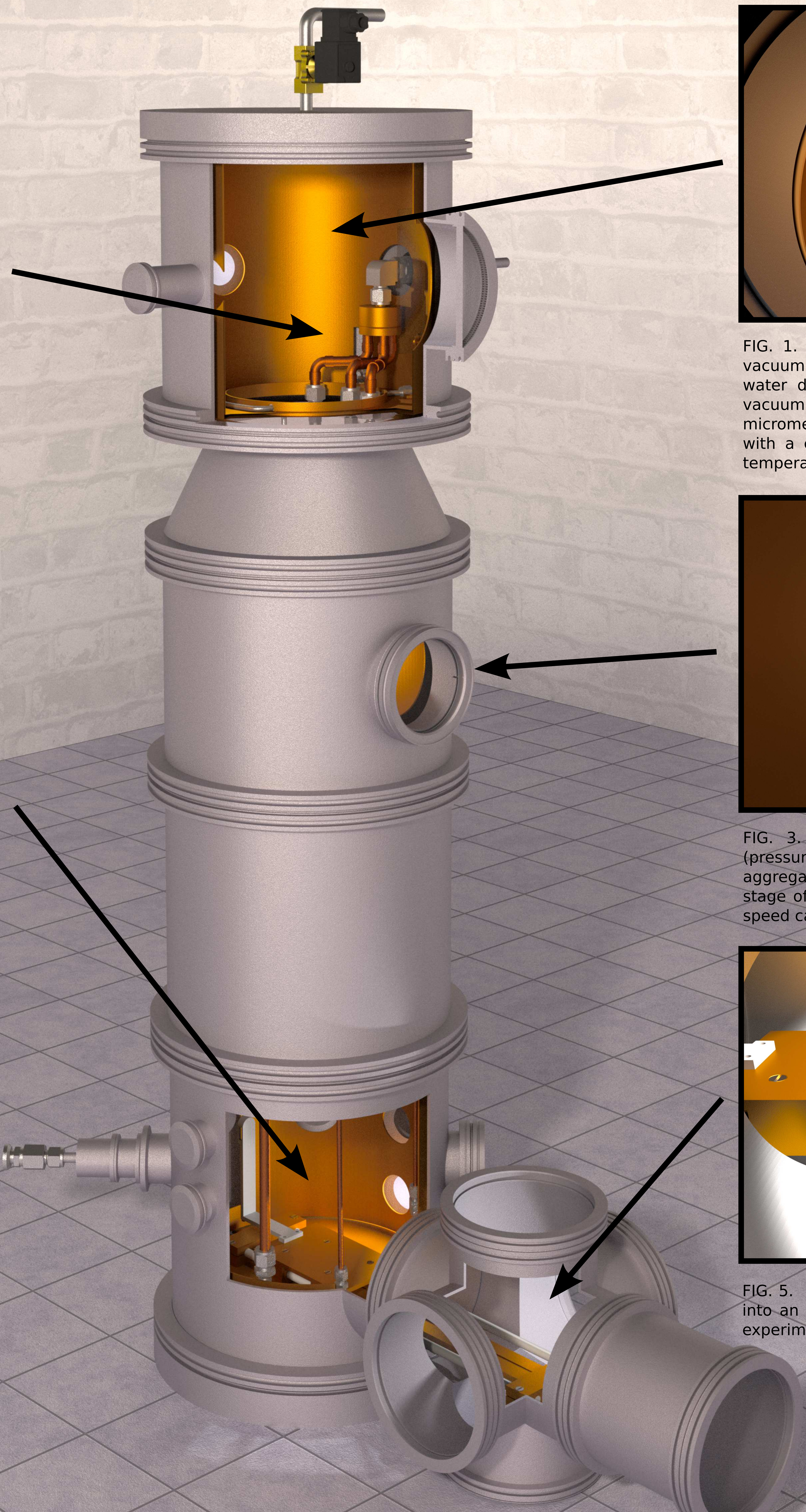



FIG. 2. Water droplets entering the chamber will evaporate partly due to the low pressure (below 5 mbar). Due to this (and the low ambient temperature), the water droplet shrinks and freezes out. This occurs a few hundred milliseconds after the injection into the chamber [1].



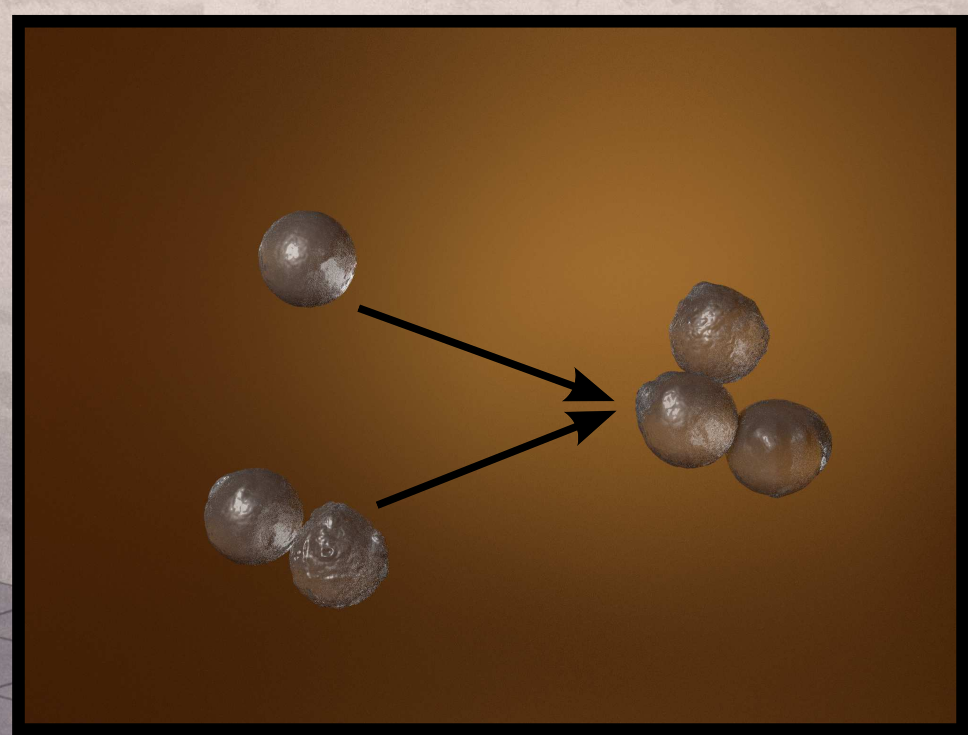


FIG. 3. Depending on the setup parameters (pressure, # of nozzels) collisions and possible aggregation can already be observed in the mid stage of the experiment using high-resolution high-speed cameras.

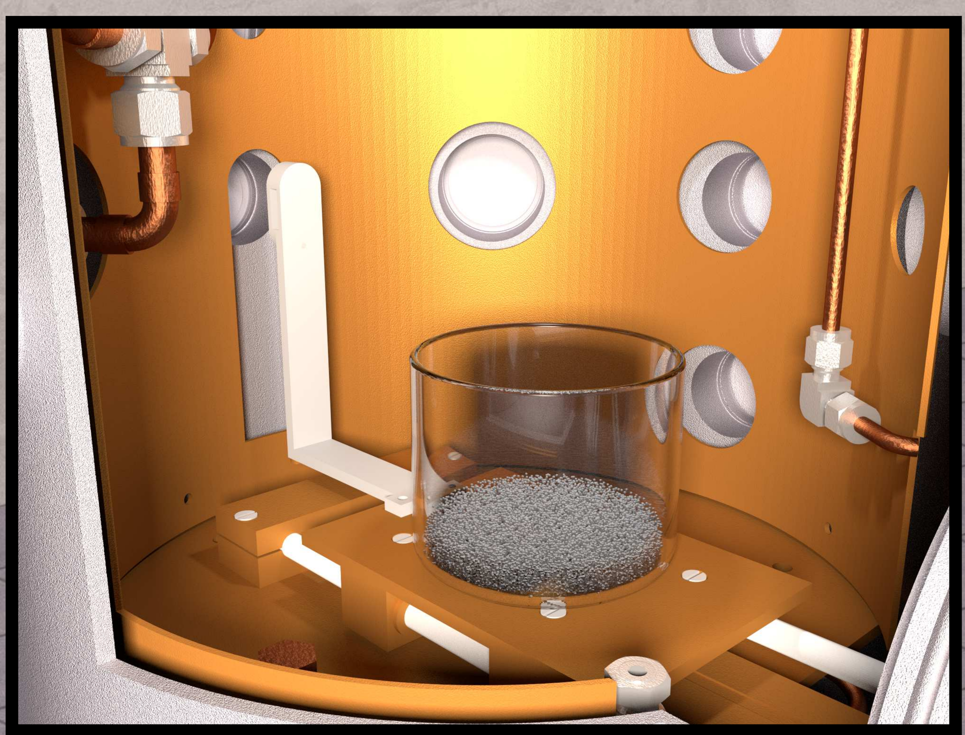


FIG. 4. Our Experiment is capable of running in continuous mode with automatic observation of the critical variables (temperature, pressure). Compared to other experiments [2] we can observe multiple particle-aggregate collisions with velocities of a few ten meters per second. Therefore we are able to measure porosities as well as analyse single collisions.

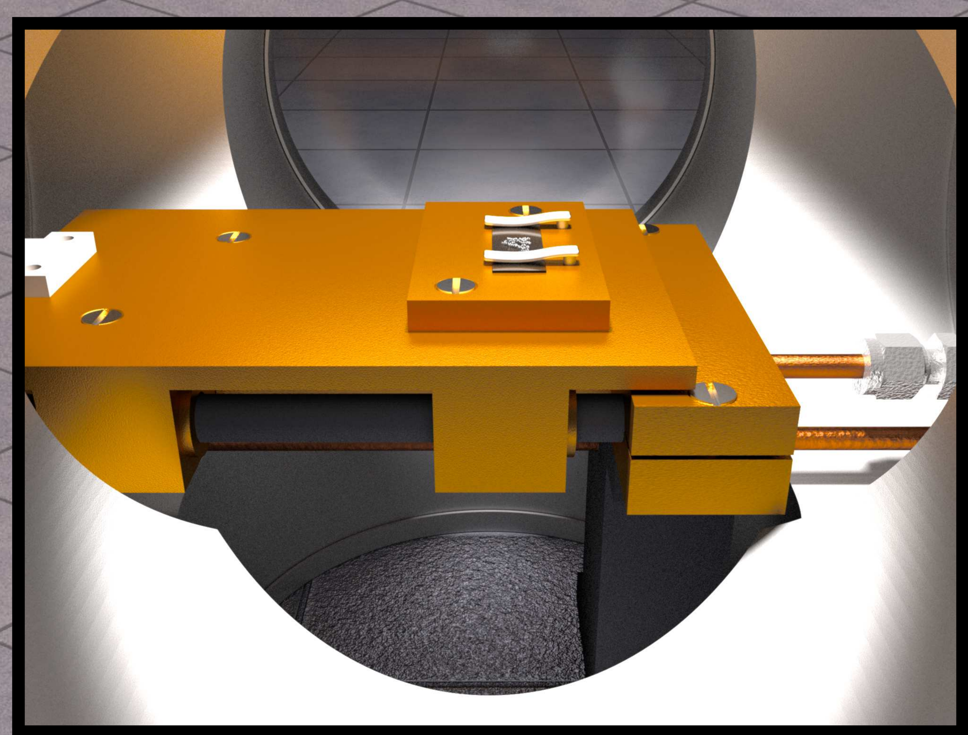


FIG. 5. Using a register we can transfer our probes into an analysis chamber and use them for further experiments in other applications.

## References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