Introduction: On 22 August 1976, 170 grams of lunar samples were returned to Earth by the Soviet Luna 24 mission. This marked an end to lunar exploration for almost two decades and it was also the last landed lunar mission to date.

The 1990s saw three orbiter missions, of which Lunar Prospector was the most significant. The Neutron Spectrometer data revealed large, potentially water ice deposits in the polar craters. This renewed interest in lunar exploration with eight missions launched between 2003 and 2010. The 2009 LCROSS mission provided direct evidence of ground ice. This water reservoir could be an enabling resource to support human presence on the Moon and human exploration of other Solar System.

Drilling Technologies: Since 1990s, Honeybee Robotics has been developing numerous drilling and sample acquisition technologies [1, 2]. These could be either fully autonomous or astronaut-deployable. The latest systems are at TRL of 5/6 and include a 1 meter rotary percussive and fully autonomous drilling system weighing 10 kg, a numerous surface core drills at TRL 4-5 weighing from 1 kg to 3 kg. The excavation systems include pneumatic and vibratory/percussive which make sampling much faster and easier to do.

In addition, we have developed planetary several geotechnical systems that enable measurement of soil strength from near surface to 1 m depth.

Other systems include fully autonomous Heat Flow Probe weighing just 1.5 kg and anchoring system with a Corner Cube reflector.

During the presentation, we will discuss past, present, and future technology developments as well as as challenges of drilling, regolith and rock acquisitions on the Moon.