Robust systems for sample acquisition from the subsurface of planetary bodies are critical to the next generation of robotic explorers. Limited spacecraft resources (power, volume, mass, computational capabilities, and telemetry bandwidth) demand innovative, integrated sampling systems that can survive and operate in challenging environments (extremes in temperature, pressure, gravity, vibration and thermal cycling).

Research should be conducted to develop compact, low-power, lightweight subsurface sampling systems with access to depths of 1 - 3 m below the surface. A relevant mission scenario for this type of drill would include drilling multiple holes from a mobile platform, such as a rover. For reference, current Mars-relevant rovers range in mass from 200 - 800 kg. Also of interest are integrated systems for 1-10 cm subsurface sampling.

Consideration should be given to potential failure scenarios for integrated systems. For example, recovery and mitigation techniques for platform slip and borehole misalignment should be addressed. Significant attention should be given to the sensing and automation required for real-time control, fault diagnosis and recovery. Additional areas of interest include understanding the limitations of dry drilling into mixed media such as icy mixtures of rock and regolith and hot subsurface materials at high pressure (up to 740 K in a 90 bar CO\textsubscript{2} environment).

Sample manipulation technologies are needed to enable handling and transfer of unstructured samples from a sampling device to instruments and sample processing systems. Shallow rock core and regolith samples may be variable in size and composition so a sample manipulation system needs to be flexible enough to handle the sample variability. Core samples will be on the order of 1 cm diameter and up to 10 cm long. Soil and rock fragment samples will be of similar volumes. Actual samples to be analyzed in instruments will likely be small subsamples so the means for subsampling and manipulation of the original sample and subsamples needs to be developed. Minimal size and mass components and systems have the greatest benefit.
Also of particular need are means of acquiring subsurface rock and regolith samples with minimum contamination. This contamination may include contaminants brought to the sample by the drill itself, material from one stratigraphic layer contaminating samples collected at another depth (sample cross-contamination), or Earth-source microorganisms brought to the Martian surface prior to drilling ('clean' sampling from a 'dirty' surface).