In 2020, NASA plans to send a rover to Mars to collect and store tubes of rock and dirt. If it succeeds, it will be the first step in bringing carefully documented Martian samples back to Earth for study. Engineers are now designing the robotic system to gather the samples — and they have to make it excruciatingly clean, so as not to contaminate any possible traces of Martian life.

**NEW LANDING TECHNIQUE**
When it reaches Mars, the mission will use an updated version of the entry, descent and landing sequence used by the Curiosity probe in 2012. The new method, known as ‘terrain relative navigation’, allows the entry, descent and landing sequence used by the Curiosity probe in 2012.

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**RECOVERY IN STEPS**
1. The 2020 rover is only the first step in bringing Martian rocks to Earth. After collecting samples and storing them in sealed tubes, the vehicle will land on the planet’s surface, in one of more than 100 candidate sites.
2. Once on the surface, the rover will collect and store tubes of rock and dirt close up.
3. Sample-return orbiters will rendezvous with the Mars lander, collecting sample tubes from them in a vehicle to blast them into Martian orbit.

**SAMPLING AND CACHING**

- **MEDIA**: The rover’s weather station, to measure temperatures, wind speed and other meteorological data.
- **NASCAMS-Z**: A zoomable panoramic camera.
- **RIMFAX**: A radar penetrator that can dive beneath the surface.
- **SUPERCAM**: A laser blaster that can investigate chemical compositions of Martian rocks and dirt from a distance.
- **SHERLOC**: A miniature spectrometer to study surface and soil chemistry. (Its camera is named MEDA.)
- **MASTCAM-Z**: A zoomable panoramic camera.
- **PIXL**: An ultraviolet camera for studying Martian rock and dirt.
- **SHERLOC**: An X-ray spectrometer for probing the chemical composition of rocks and dirt.
- **MOXIE**: A device to produce oxygen from carbon dioxide in the Martian atmosphere, as a test for creating resources for future astronauts.
- **ROBOTIC ARM**: The rover arm can extend outwards to make scientific measurements and gather samples. Its instruments can study, in detail, an area about the size of a postage stamp.
- **HELICOPTER**: The helicopter will fly through the thin atmosphere and scout out the path ahead.
- **SUPERCAM**: The rover may carry a helicopter that would fly through the thin atmosphere and scout out the path ahead.
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The sampling system will use steel and tungsten, rather than materials that would carry the samples to Earth. This could be an extension of the fetch rover or a separate third one.