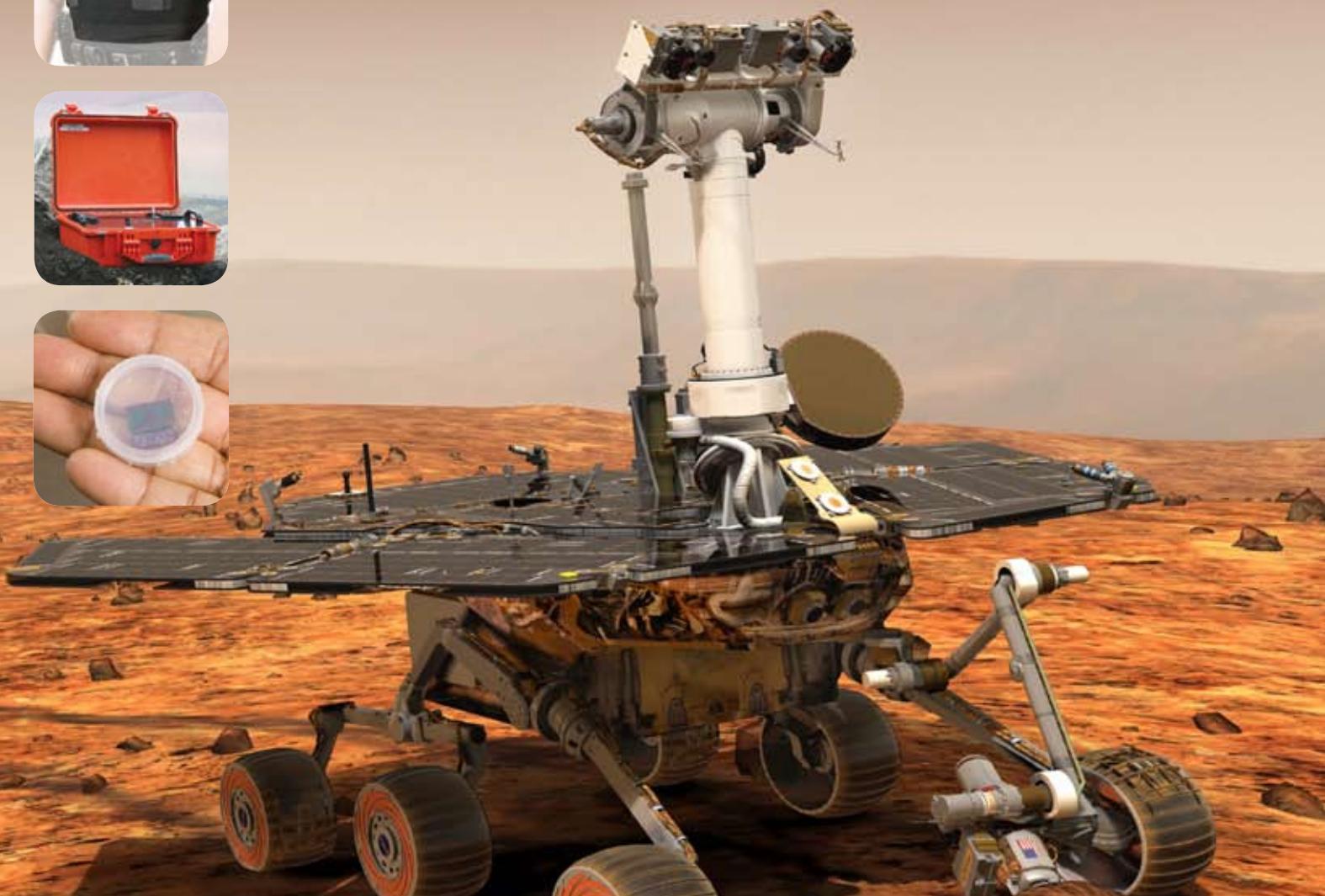




# Mars Spinoffs



In 1997, NASA's Sojourner robot became the first rover to explore the surface of Mars. NASA has since launched other successful rover missions, gathering precious information in preparation for an undertaking that has long captured people's imaginations—a manned mission to Mars. The challenges such an enterprise poses have necessitated new technologies that are not only bringing us closer to the Red Planet, but also improving life on Earth. Life-saving robots, panoramic cameras, and pathogen-detecting sensors are just a few of the remarkable spinoffs to emerge from these efforts, with many more sure to come before the first human sets foot on Martian soil.



## Mars Cameras Make Panoramic Photography a Snap

Mars rover technology inspired the Gigapan robotic platform for consumer cameras. Using photographic stitching software, the platform automates the creation of digital panoramas containing incredible detail.



## Anthrax Detector Protects Air Supplies

Designed originally as a bacterial spore detection system for Mars-bound spacecraft, the technology in the Anthrax Smoke Detector tests airborne particles for weaponized anthrax. The device is being used at airports, office buildings, and post offices worldwide.



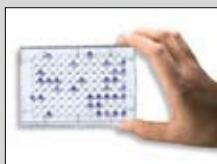
## Portable Device Analyzes Rocks and Minerals

NASA funded research into the next generation of scientific instruments for materials analysis—an important component of future Mars rover missions to study the Red Planet's surface. The resulting analyzer provides fast identification of rocks and minerals, useful for chemical, pharmaceutical, and forensics applications.



## Voltage Sensors Monitor Harmful Static

Concern over static electricity damaging components on the Mars rovers led to the development of tiny sensors, small enough to be worn on clothing, for monitoring voltage changes near sensitive instruments, fuel operations, avionics, or anywhere a jolt of static electricity could prove harmful.



## Cell Analysis Tools Support Drug Discovery

Research into space-grown plants—a potential food supply for astronauts on a long mission to Mars—inspired the creation of technology for measuring thousands of cell traits at once, assisting in the evaluation of new drugs by providing critical information on how drugs affect specific cells.



## Advanced Sensors Boost Optical Communication, Imaging

Powerful photodetectors are necessary for laser communications—a way that Mars colonists might one day phone home. NASA supported development of a small, energy-efficient sensor capable of detecting single photons and now commercially available for multiple light sensing applications, such as night vision goggles.



## Mars Mapping Technology Brings Main Street to Life

Publicly accessible, geospatial views of cities—including every road, alley, and freeway—are now created with the help of 3-D data-generation software invented by NASA for imaging and navigation of the surface of Mars. The 3-D city maps are used for municipal and commercial applications.



## Sensors Provide Early Warning of Biological Threats

Powerful NASA biosensor technology has been incorporated into a water analyzer that can alert organizations to potential biological hazards in water used for agriculture, food and beverages, showers, and at beaches and lakes—within hours, instead of the days required by conventional laboratory methods.



## Tough Textiles Protect Public Safety Officers

Multilayer textiles created for the airbags that cushioned the landings of the Mars Pathfinder and rovers have enabled the creation of body armor—more comfortable than traditional protective gear yet comparable to rigid steel plates—for public safety officers and the military.



## Intelligent Robot Braves Battlefront to Save Lives

NASA expertise developed while building the Mars rovers has allowed for the creation of tough, highly mobile tactical robots with the ability to search dangerous or inaccessible areas, helping keep soldiers and first responders out of harm's way.