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Martian Surface Mineralogy from Rovers with Spirit, Opportunity, and Curiosity.

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Beginning in 2004, NASA has landed three well-instrumented rovers on the equatorial martian surface. The *Spirit* rover landed in Gusev crater in early January, 2004, and the *Opportunity* rover landed on the opposite side of Mars at Meridian Planum 21 days later. The Curiosity rover landed in Gale crater to the west of Gusev crater in August, 2012. Both Opportunity and Curiosity are currently operational. The twin rovers Spirit and Opportunity carried Mossbauer spectrometers to determine the oxidation state of iron and its mineralogical composition. The Curiosity rover has an X-ray diffraction instrument for identification and quantification of crystalline materials including clay minerals. Instrument suites on all three rovers are capable of distinguishing primary rock-forming minerals like olivine, pyroxene and magnetite and products of aqueous alteration in including amorphous iron oxides, hematite, goethite, sulfates, and clay minerals. The oxidation state of iron ranges from that typical for unweathered rocks and soils to nearly completely oxidized (weathered) rocks and soils as products of aqueous and acid-sulfate alteration. The in situ rover mineralogy also serves as ground-truth for orbital observations, and orbital mineralogical inferences are used for evaluating and planning rover exploration.