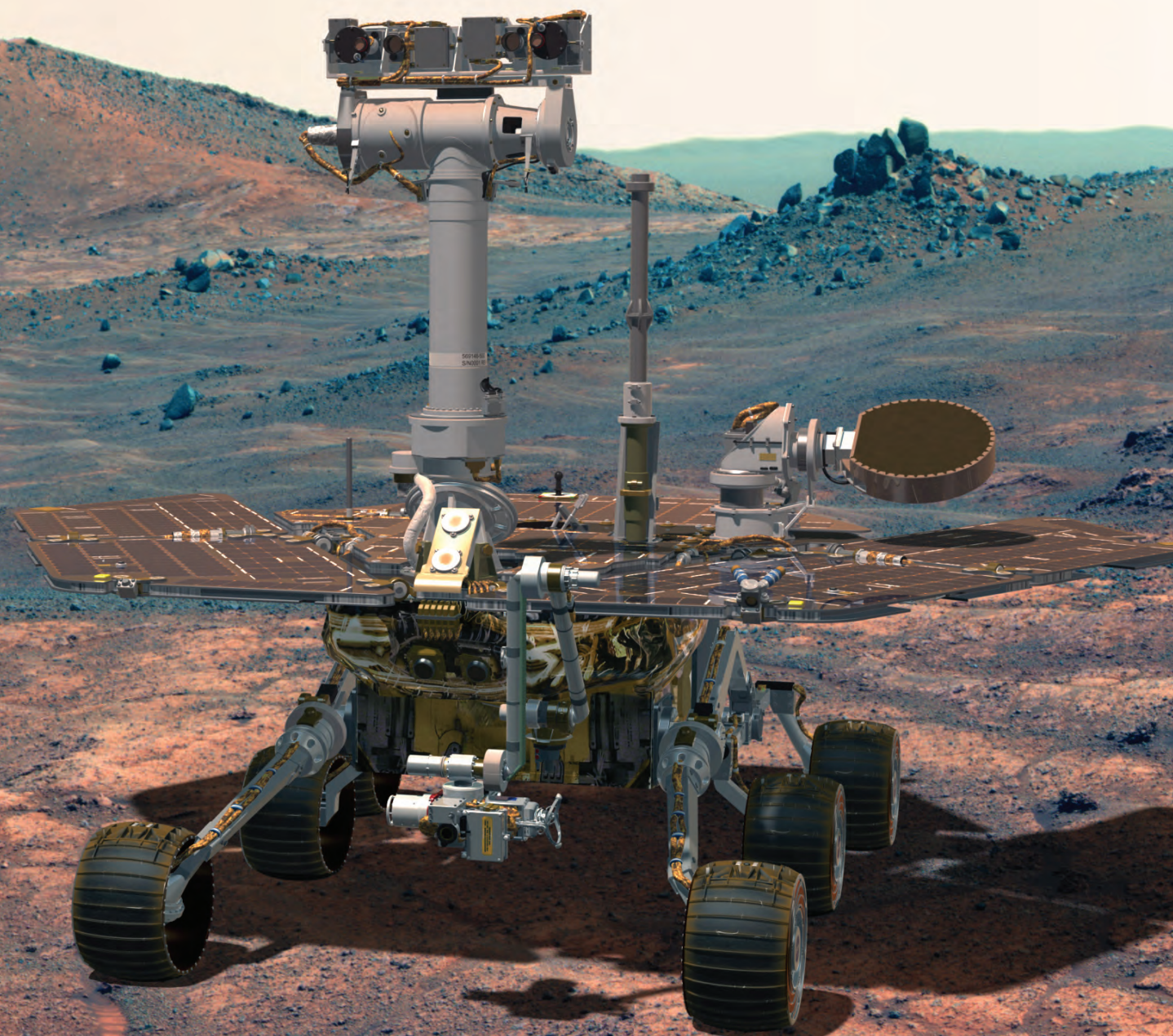


# Mars Exploration Rovers

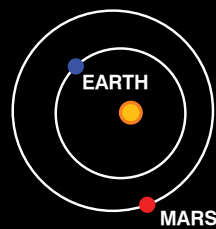
# 2017 2018

One Martian Year • Two Earth Years





How to Use the Calendar



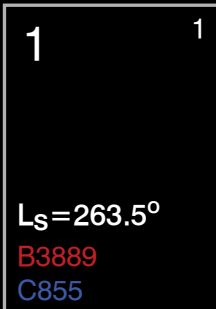
**Cover** *An elongated crater called Spirit of St. Louis, with a rock spire in it, dominates this scene from Opportunity's Pancam. The crater—about 110 feet (34 meters) long and about 80 feet (24 meters) wide—has a floor slightly darker than the surrounding terrain. The rocky features toward the far end of the crater is about 7 to 10 feet (2 to 3 meters) tall, rising higher than the crater's rim. Opportunity itself is overlain and scaled to its surroundings.*

Cover image credit

*The component images of this mosaic view were acquired with Opportunity's panoramic camera (Pancam) on Sols 3,973 and 3,974 (March 29 and 30, 2015). NASA/JPL-Caltech/Cornell Univ./Arizona State Univ. 3D rendering of Opportunity: NASA/JPL-Caltech/Dan Maas*

*Spirit landed in Gusev crater on January 4, 2004. Opportunity landed at Eagle crater on Meridiani Planum January 25, 2004. The rovers were originally planned to operate for 90 Martian days (called sols). They have surprised even their designers with their longevity and accomplishments. Spirit lasted for over six years and 2017 marks the thirteenth anniversary of Opportunity's continuing exploration on the surface of Mars.*

Visit [mars.jpl.nasa.gov](https://mars.jpl.nasa.gov)



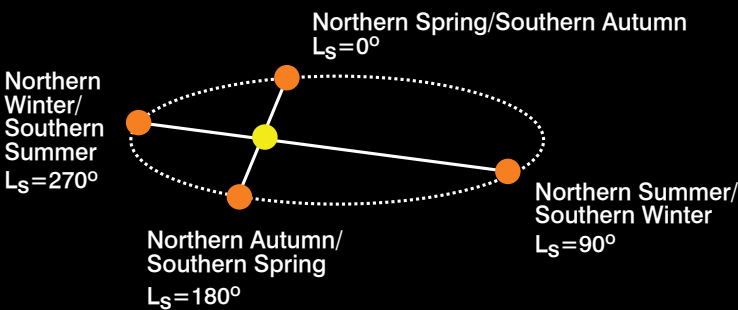
**A Martian Year** Each page of the calendar has a diagram showing the relative position of Earth and Mars on the first day of the month. Mars is farther from the Sun compared with Earth, so it takes Mars longer to complete one orbit and its year is longer than an Earth year. A Mars year is 687 Earth days long - almost two Earth years. This calendar covers one Martian year and two Earth years.

**A Martian Day** Mars rotates on its axis similarly to Earth, but a little more slowly, so a Mars day is a little longer than an Earth day. The Mars day, which we call a “sol,” takes 24 hours, 39-1/2 minutes. The red and blue numbers in the calendar squares indicate how many sols have passed since Opportunity (designated “B” and shown in red type) and NASA's other operating rover, Curiosity (“C” in blue type) landed on Mars (Spirit had the “A” designation while she was in operation). Those dates were January 25, 2004, for Opportunity and August 6th, 2012 for Curiosity. For example, on January 1, 2015, the numbers **B3889** and **C855** mean that this date marks the 3889th sol that MER-B (technical name for Opportunity) has spent on Mars and the 855th sol for Curiosity. You will notice that because a sol is slightly longer than a day, about every 36 days, the calendar skips an Earth day in counting the sols for each of the rovers. This way, the days and sols can stay synchronized on the calendar.

**Day of Year** The number in the top right corner of each calendar square is the consecutive day of year (DOY) number, commonly used in space mission operations as a shorthand way of giving the date.

**DSN Week Number** This number helps all operating deep space missions schedule use of Earth-based antennas in the Deep Space Network (DSN). DSN week 1 begins on the first Monday of the calendar year and is numbered sequentially to the end of the year.

**Mars Seasons** Mars solar longitude (the  $L_S$  number on the first day of each month in the calendar) determines seasons on Mars. As Mars travels around the Sun through  $360^\circ$ , it experiences seasons just as Earth does.



# ROVER INSTRUMENTS

## Spirit and Opportunity

Opportunity has six science instruments, along with six engineering cameras.

Remote Sensing Instruments

**Panoramic Camera (Pancam)** - Creates high-resolution color images with a stereoscopic camera pair that can rotate in a complete circle and look straight up and down.

**Miniature Thermal Emission Spectrometer (Mini-TES)** - Analyzes infrared light to identify rock-forming minerals; measures the heat-holding properties (thermal inertia) of rocks and soils; measures atmospheric temperatures from the surface to 10 kilometers (6.2 miles) in altitude. (No longer operational)

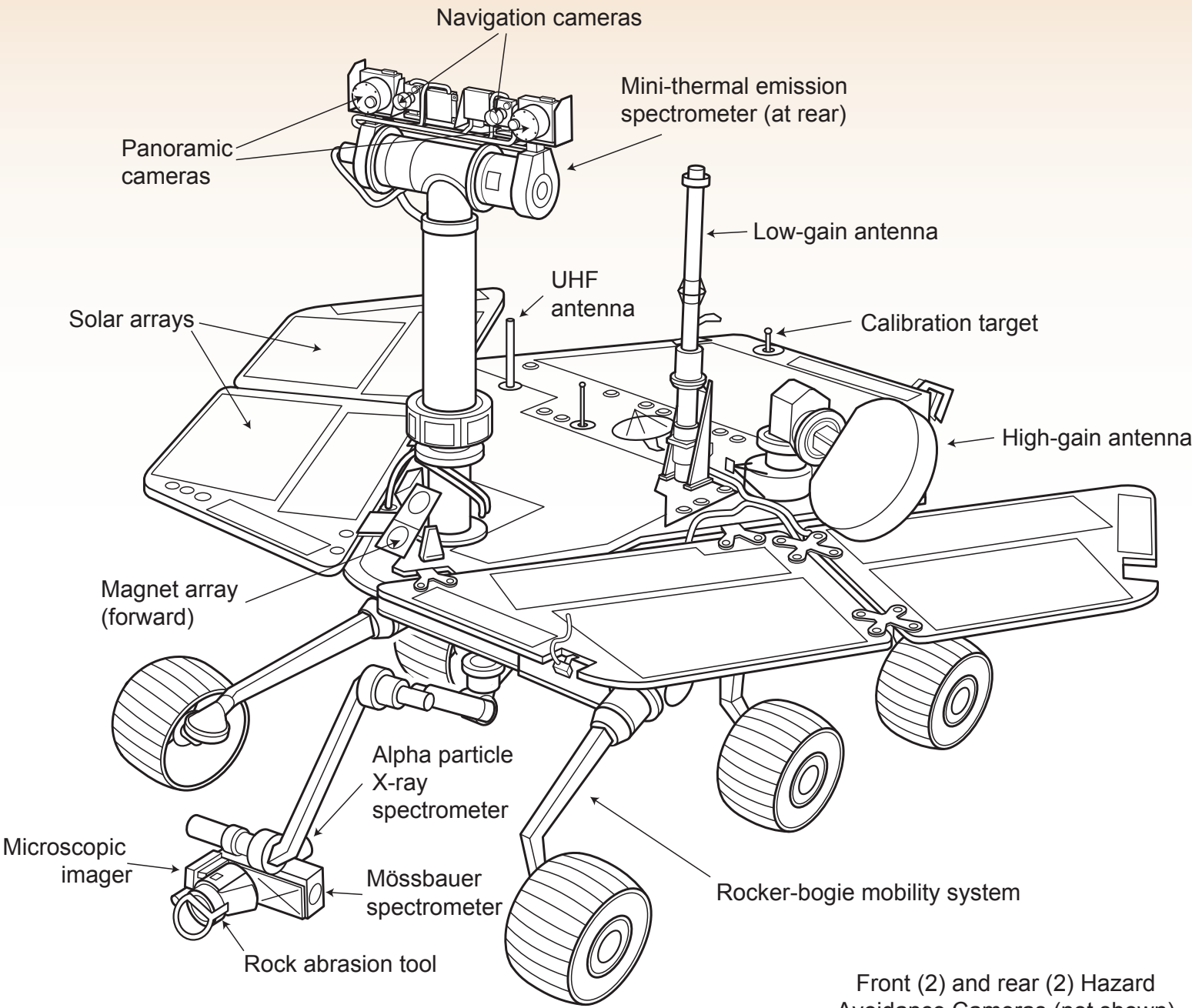
Contact Science Instruments

**Rock Abrasion Tool (RAT)** - Brushes and grinds rocks to clean away dust and other surface deposits so the spectrometers can analyze their composition.

**Alpha Particle X-ray Spectrometer (APXS)** - Measures the chemical composition of Martian rocks and soils.

**Mössbauer Spectrometer (MB)** - Measures iron-bearing mineralogy of rocks and soil. (No longer operational)

**Microscopic Imager (MI)** - Provides high-resolution images of the small-scale features of Martian rocks and soils.



Front (2) and rear (2) Hazard Avoidance Cameras (not shown)



# OPPORTUNITY'S MARATHON JOURNEY!

First Marathon "Run" on Another Planet  
Distance: 26.2 miles    Time: 11 years, 2 months

A GREAT START




At landing, Opportunity finds signs of salty, acidic water in Mars' ancient past.

LONG WAY TO GO



Rock layers show this area was wet off and on. Any microbes could have had a tough time.

TOUGH CHALLENGE



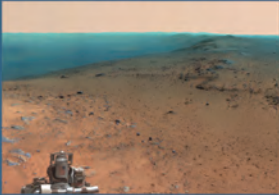
After Victoria Crater, scientists wonder, "Was this ancient water too acidic for life to start?"

GETTING IN STRIDE



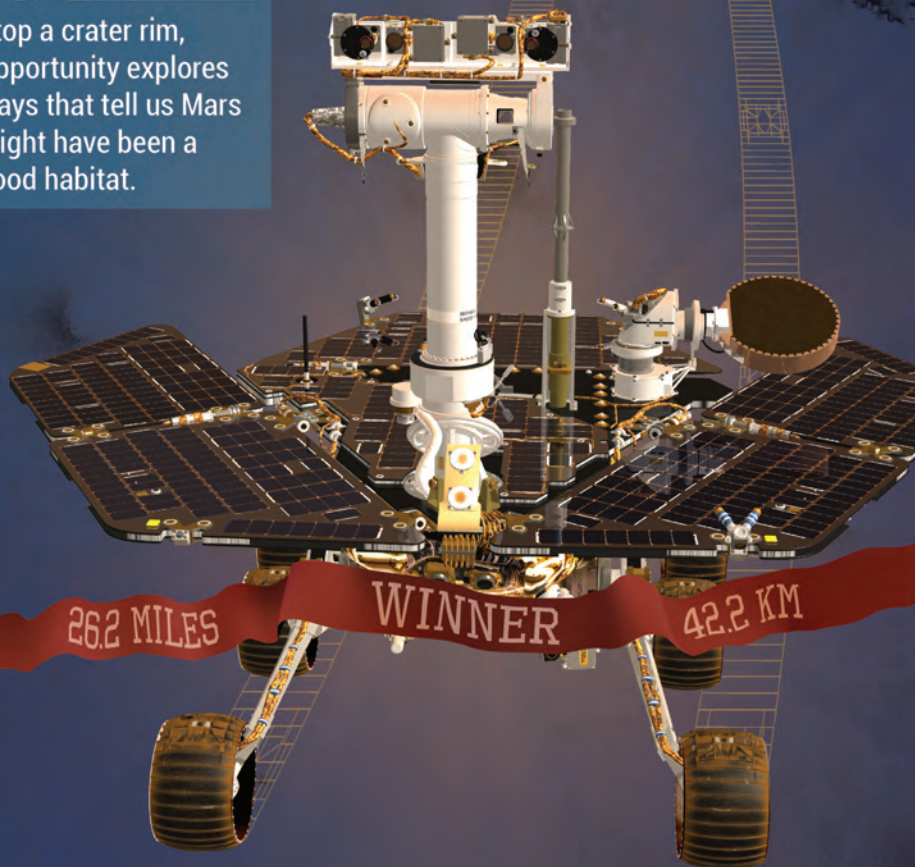
At last! Opportunity finds the first signs of water conducive to the formation of life!


A RUNNING HIGH



Atop a crater rim, Opportunity explores clays that tell us Mars might have been a good habitat.

Eagle Crater    Endurance Crater    Victoria Crater    Endeavour Crater

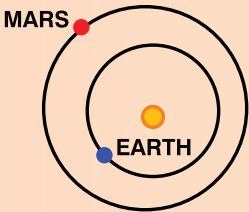


N  Follow along: [mars.nasa.gov](http://mars.nasa.gov)

## Opportunity's Marathon Journey

Eleven years and two months after landing on Mars, the total driving distance of NASA's Mars Exploration Rover Opportunity surpassed the length of a marathon race: 26.219 miles (42.195 kilometers). This map shows the southward path driven by Opportunity from late January 2004 until it passed marathon distance on March 24, 2015, during the 3,968th sol of the rover's work on Mars.

*The rover's traverse shown here has been mapped onto an image from the High Resolution Imaging Science Experiment (HiRISE) camera on NASA's Mars Reconnaissance Orbiter. Image credit: NASA/JPL-Caltech/Univ. of Arizona*



February 1, 2017

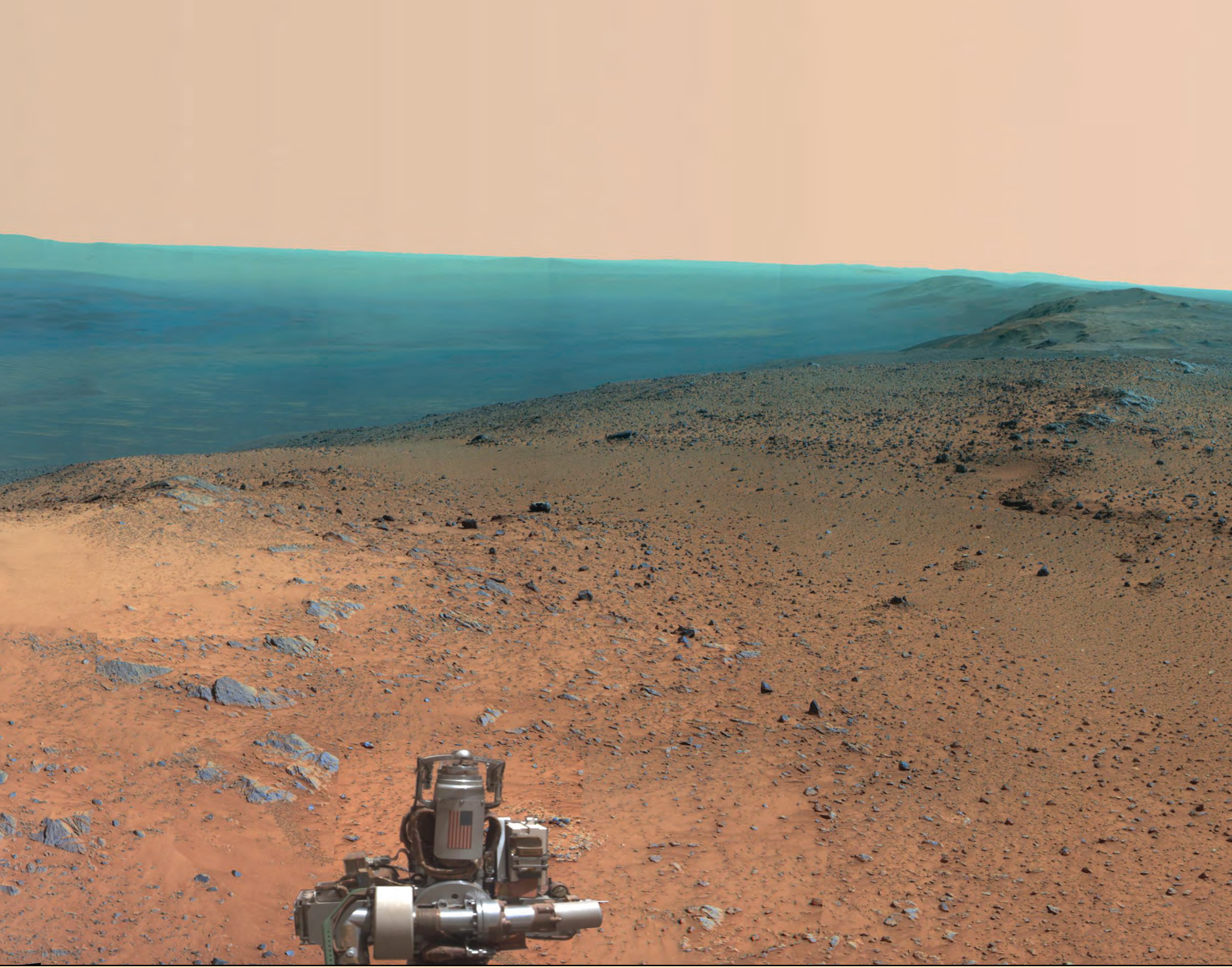
## January 2017

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
11 L <sub>s</sub> =290.9° B4600 C1567	212 DSN Week 1 B4601 C1568	313 B4602 C1569	414 Spirit Landed 2004 B4603 C1570	515 B4604 C1571	616 B4605 C1572	717 B4606 C1573
88 B4607 C1574	99 DSN Week 2 B4608 C1575	1010 B4609 C1576	1111 B4610 C1577	1212 B4611 C1578	1313 B4612 C1579	1414 B4613
1515 B4614 C1580	1616 DSN Week 3 B4615 C1581	1717 B4616 C1582	1818 B4617 C1583	1919 B4618 C1584	2020 B4619 C1585	2121 B4620 C1586
2222 B4621 C1587	2323 DSN Week 4 B4622 C1588	2424 B4623 C1589	2525 Opportunity's 13th Earth Anniversary B4624 C1590	2626 B4625 C1591	2727 B4626 C1592	2828 B4627 C1593
2929 B4628 C1594	3030 DSN Week 5 B4629 C1595	3131 B4630 C1596				

## February 2017

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			132 L <sub>s</sub> =309.4° B4631 C1597	233 B4632 C1598	334 B4633 C1599	435 B4634 C1600
536 C1601	637 DSN Week 6 B4635 C1602	738 B4636 C1603	839 B4637 C1604	940 B4638 C1605	1041 B4639 C1606	1142 B4640 C1607
1243 B4641 C1608	1344 DSN Week 7 B4642 C1609	1445 B4643 C1610	1546 B4644 C1611	1647 B4645 C1612	1748 B4646 C1613	1849 B4647 C1614
1950 B4648 C1615	2051 DSN Week 8 B4649 C1616	2152 B4650 C1616	2253 B4651 C1617	2354 B4652 C1618	2455 B4653 C1619	2556 B4654 C1620
2657 B4655 C1621	2758 DSN Week 9 B4656 C1622	2859 B4657 C1623				

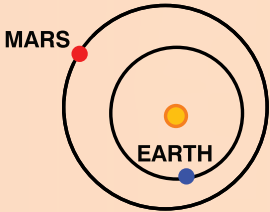




### View from the Summit

Opportunity raises the American flag at the top of the Cape Tribulation segment of the rim of Endeavour crater. This location is the highest elevation Opportunity has reached since departing the Victoria crater area in 2008 on a three-year, downslope journey to Endeavour crater.

*The component images were taken with Opportunity's panoramic camera (Pancam) during the week after the rover's arrival at the summit on Sol 3,894 (January 6, 2015). In this version of the panorama, the landscape is presented in false color to make differences in surface materials more easily visible. Image credit: NASA/JPL-Caltech/Cornell Univ./Arizona State Univ.*



April 1, 2017

## March 2017

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			1 <sup>60</sup>	2 <sup>61</sup>	3 <sup>62</sup>	4 <sup>63</sup>
			L <sub>S</sub> =325.4° B4658 C1624	B4659 C1625	B4660 C1626	B4661 C1627
5 <sup>64</sup>	6 <sup>65</sup> DSN Week 10	7 <sup>66</sup>	8 <sup>67</sup>	9 <sup>68</sup>	10 <sup>69</sup>	11 <sup>70</sup>
B4662 C1628	B4663 C1629	B4664 C1630	B4665 C1631	B4666 C1632	B4667 C1633	B4668 C1634
12 <sup>71</sup>	13 <sup>72</sup> DSN Week 11	14 <sup>73</sup>	15 <sup>74</sup>	16 <sup>75</sup>	17 <sup>76</sup>	18 <sup>77</sup>
B4669 C1635	B4670 C1636	C1637	B4671 C1638	B4672 C1639	B4673 C1640	B4674 C1641
19 <sup>78</sup>	20 <sup>79</sup> DSN Week 12	21 <sup>80</sup>	22 <sup>81</sup> Spirit ceased operation 2010	23 <sup>82</sup>	24 <sup>83</sup>	25 <sup>84</sup>
B4675 C1642	B4676 C1643	B4677 C1644	B4678 C1645	B4679 C1646	B4680 C1647	B4681 C1648
26 <sup>85</sup>	27 <sup>86</sup> DSN Week 13	28 <sup>87</sup>	29 <sup>88</sup>	30 <sup>89</sup>	31 <sup>90</sup>	
B4682 C1649	B4683 C1650	B4684 C1651	B4685 C1652	B4686	B4687 C1653	

## April 2017

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
						1 <sup>91</sup>
						L <sub>S</sub> =342.3° B4688 C1654
2 <sup>92</sup>	3 <sup>93</sup> DSN Week 14	4 <sup>94</sup>	5 <sup>95</sup>	6 <sup>96</sup>	7 <sup>97</sup>	8 <sup>98</sup>
B4689 C1655	B4690 C1656	B4691 C1657	B4692 C1658	B4693 C1659	B4694 C1660	B4695 C1661
9 <sup>99</sup>	10 <sup>100</sup> DSN Week 15	11 <sup>101</sup>	12 <sup>102</sup>	13 <sup>103</sup>	14 <sup>104</sup>	15 <sup>105</sup>
B4696 C1662	B4697 C1663	B4698 C1664	B4699 C1665	B4700 C1666	B4701 C1667	B4702 C1668
16 <sup>106</sup>	17 <sup>107</sup> DSN Week 16	18 <sup>108</sup>	19 <sup>109</sup>	20 <sup>110</sup>	21 <sup>111</sup>	22 <sup>112</sup>
B4703 C1669	B4704 C1670	B4705 C1671	B4706 C1672	C1673	B4707 C1674	B4708 C1675
113 B4709 C1676 B4716 C1683	23 <sup>114</sup> DSN Week 17	25 <sup>115</sup>	26 <sup>116</sup>	27 <sup>117</sup>	28 <sup>118</sup>	29 <sup>119</sup>
30 <sup>120</sup>	B4710 C1677	B4711 C1678	B4712 C1679	B4713 C1680	B4714 C1681	B4715 C1682

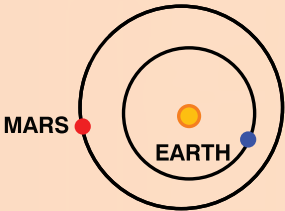




## Marathon Valley Overlook

A view of Marathon Valley, a destination on the western rim of Endeavour crater, as seen from an overlook north of the valley. The scene spans from east, at left, to southeast. The Opportunity rover team selected Marathon Valley as a science destination because observations of this location using the Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) instrument on NASA's Mars Reconnaissance Orbiter yielded evidence of clay minerals, a clue to ancient wet environments.

*This image combines four pointings of the rover's panoramic camera (Pancam) on Sol 3,958 (March 13, 2015). In this version of the image, the landscape is presented in false color to make differences in surface materials more easily visible. Image Credit: NASA/JPL-Caltech/Cornell Univ./Arizona State Univ.*



June 1, 2017

## May 2017

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	1 <sup>121</sup> DSN Week 18  L <sub>S</sub> =357.8° B4717 C1684	2 <sup>122</sup>  B4718 C1685	3 <sup>123</sup>  B4719 C1686	4 <sup>124</sup>  B4720 C1687	5 <sup>125</sup>  Southern Autumnal Equinox B4721 C1688	6 <sup>126</sup>  B4722
7 <sup>127</sup>  B4723 C1689	8 <sup>128</sup> DSN Week 19  B4724 C1690	9 <sup>129</sup>  B4725 C1691	10 <sup>130</sup>  B4726 C1692	11 <sup>131</sup>  B4727 C1693	12 <sup>132</sup>  B4728 C1694	13 <sup>133</sup>  B4729 C1695
14 <sup>134</sup>  B4730 C1696	15 <sup>135</sup> DSN Week 20  B4731 C1697	16 <sup>136</sup>  B4732 C1698	17 <sup>137</sup>  B4733 C1699	18 <sup>138</sup>  B4734 C1700	19 <sup>139</sup>  B4735 C1701	20 <sup>140</sup>  B4736 C1702
21 <sup>141</sup>  B4737 C1703	22 <sup>142</sup> DSN Week 21  B4738 C1704	23 <sup>143</sup>  B4739 C1705	24 <sup>144</sup>  B4740 C1706	25 <sup>145</sup>  B4741 C1707	26 <sup>146</sup>  B4742 C1708	27 <sup>147</sup>  B4743 C1709
28 <sup>148</sup>  C1710	29 <sup>149</sup> DSN Week 22  B4744 C1711	30 <sup>150</sup>  B4745 C1712	31 <sup>151</sup>  B4746 C1713			

## June 2017

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
				1 <sup>152</sup>  L <sub>S</sub> =13.0° B4747 C1714	2 <sup>153</sup>  B4748 C1715	3 <sup>154</sup>  B4749 C1716
4 <sup>155</sup>  B4750 C1717	5 <sup>156</sup> DSN Week 23  B4751 C1718	6 <sup>157</sup>  B4752 C1719	7 <sup>158</sup>  B4753 C1720	8 <sup>159</sup>  B4754 C1721	9 <sup>160</sup>  B4755 C1722	10 <sup>161</sup>  Spirit launched 2003 B4756 C1723
11 <sup>162</sup>  B4757 C1724	12 <sup>163</sup> DSN Week 24  B4758 C1725	13 <sup>164</sup>  B4759	14 <sup>165</sup>  B4760 C1726	15 <sup>166</sup>  B4761 C1727	16 <sup>167</sup>  B4762 C1728	17 <sup>168</sup>  B4763 C1729
18 <sup>169</sup>  B4764 C1730	19 <sup>170</sup> DSN Week 25  B4765 C1731	20 <sup>171</sup>  B4766 C1732	21 <sup>172</sup>  B4767 C1733	22 <sup>173</sup>  B4768 C1734	23 <sup>174</sup>  B4769 C1735	24 <sup>175</sup>  B4770 C1736
25 <sup>176</sup>  B4771 C1737	26 <sup>177</sup> DSN Week 26  B4772 C1738	27 <sup>178</sup>  B4773 C1739	28 <sup>179</sup>  B4774 C1740	29 <sup>180</sup>  B4774 C1741	30 <sup>181</sup>  B4776 C1742	

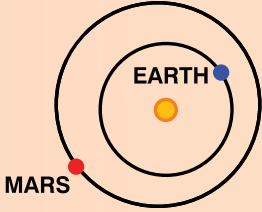




Lindbergh Mound

This view shows Lindbergh Mound, which is a 7-10 foot (2-3 meter) tall rocky feature inside Spirit of St. Louis crater. Another mosaic taken from a different position shows part of the hidden side of this rocky feature in the crater.

*This approximately 32 degree wide mosaic was acquired with Opportunity's panoramic camera (Pancam) on Sol 4,066 (July 2, 2015). Pancam's 753nm, 535nm, and 432nm filters were used in making this mosaic. Image credit: NASA/JPL-Caltech/Cornell Univ./Arizona State Univ.*



August 1, 2017

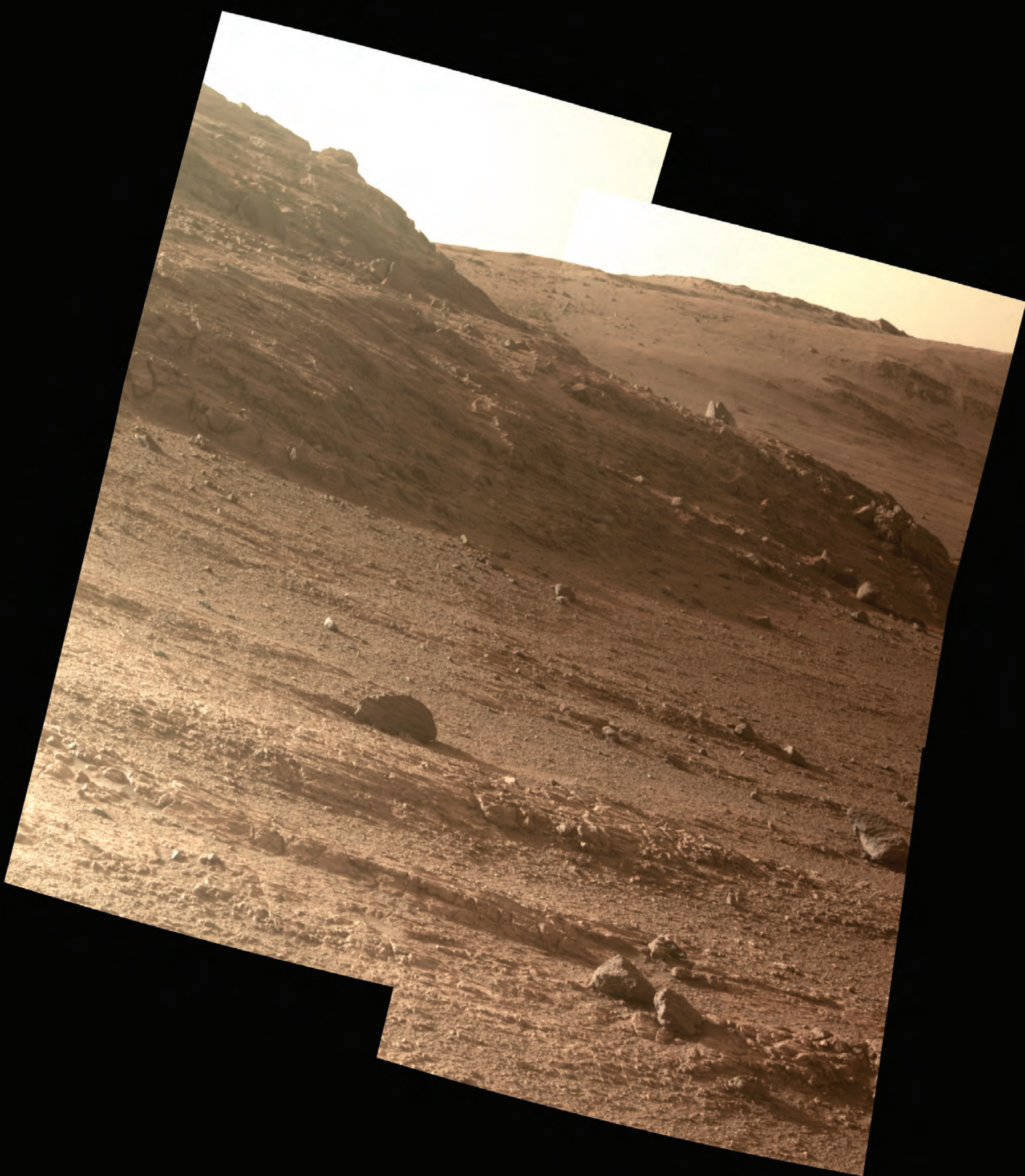
July 2017

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
						1182  Ls=27.1° B4777 C1743
2183  B4778 C1744	3184 DSN Week 27  B4779 C1745	4185 Mars Pathfinder/ Sojourner landed 1997  C1746	5186  B4780 C1747	6187  B4781 C1748	7188 Opportunity launched 2003  B4782 C1749	8189  B4783 C1750
9190  B4784 C1751	10191 DSN Week 28  B4785 C1752	11192  B4786 C1753	12193  B4787 C1754	13194  B4788 C1755	14195  B4789 C1756	15196  B4790 C1757
16197  B4791 C1758	17198 DSN Week 29  B4792 C1759	18199  B4793 C1760	19200  B4794 C1761	20201  B4795	21202  B4796 C1762	22203  B4797 C1763
20423 B4798 C1764	20524 B4799 C1765	25206 DSN Week 30  B4800 C1766	26207 Earth-Mars Solar Conjunction  B4801 C1767	27208  B4802 C1768	28209  B4803 C1769	29210  B4804 C1770

August 2017

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
		1213 DSN Week 31  Ls=41.2° B4807 C1773	2214  B4808 C1774	3215  B4809 C1775	4216  B4810 C1776	5217  B4811 C1777
6218 Curiosity landed 2012  B4812 C1778	7219 DSN Week 32  B4813 C1779	8220  B4814 C1780	9221  B4815 C1781	10222  C1782	11223  B4816 C1783	12224  B4817 C1784
13225  B4818 C1785	14226 DSN Week 33  B4819 C1786	15227  B4820 C1787	16228  B4821 C1788	17229  B4822 C1789	18230  B4823 C1790	19231  B4824 C1791
20232  B4825 C1792	21233 DSN Week 34  B4826 C1793	22234  B4827 C1794	23235  B4828 C1795	24236  B4829 C1796	25237  B4830 C1797	26238  B4831
27239  B4832 C1798	28240 DSN Week 35  B4833 C1799	29241  B4834 C1800	30242  B4835 C1801	31243  B4836 C1802		

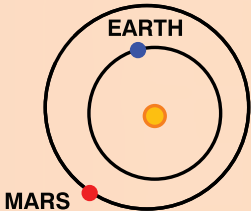




Marathon Valley  
North Wall

This field of view features part of the north wall of Marathon Valley, to the northwest of the Opportunity rover.

*This mosaic—with a field of view of approximately 30 degrees—was acquired with Opportunity's panoramic camera (Pancam) on Sol 4,087 (July 24, 2015). Pancam's 753nm, 535nm, and 432nm filters were used in making this mosaic. Image credit: NASA/JPL-Caltech/Cornell Univ./Arizona State Univ.*



October 1, 2017

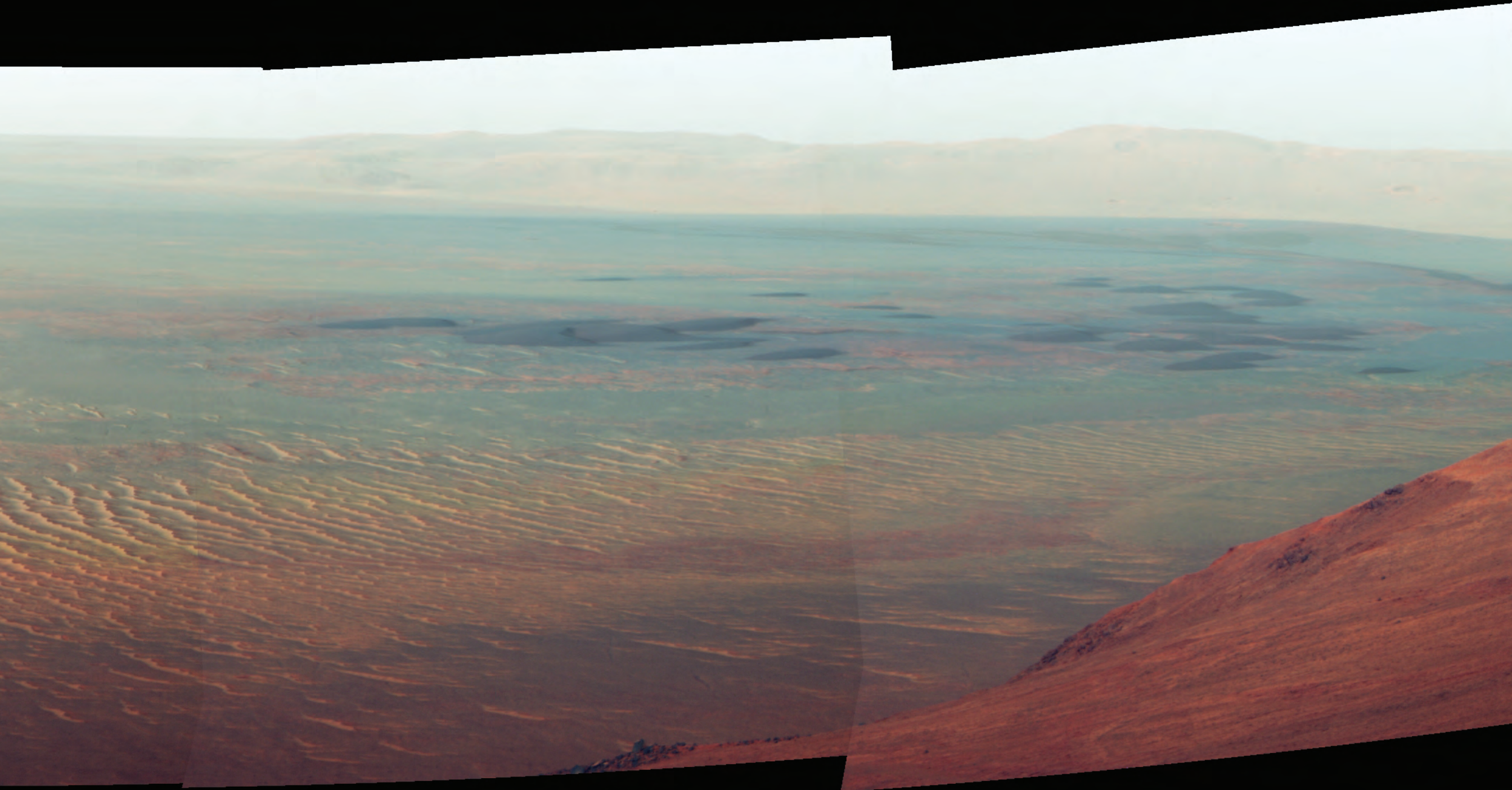
September 2017

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
					1244	2245
					L <sub>S</sub> =54.9° B4837 C1803	B4838 C1804
3246	4247 DSN Week 36	5248	6249	7250	8251	9252
B4839 C1805	B4840 C1806	B4841 C1807	B4842 C1808	B4843 C1809	B4844 C1810	B4845 C1811
10253	11254 DSN Week 37	12255	13256	14257	15258	16259
B4846 C1812	B4847 C1813	B4848 C1814	B4849 C1815	B4850 C1816	B4851 C1817	B4852 C1818
17260	18261 DSN Week 38	19262	20263	21264	22265	23266
C1819	B4853 C1820	B4854 C1821	B4855 C1822	B4856 C1823	B4857 C1824	B4858 C1825
24267	25268 DSN Week 39	26269	27270	28271	29272	30273
B4859 C1826	B4860 C1827	B4861 C1828	B4862 C1829	B4863 C1830	B4864 C1831	B4865 C1832

October 2017

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1274	2275 DSN Week 40	3276	4277	5278	6279	7280 Mars Aphelion
L <sub>S</sub> =68.1° B4866 C1833	B4867 C1834	B4868	B4869 C1835	B4870 C1836	B4871 C1837	B4872 C1838
8281	9282 DSN Week 41	10283	11284	12285	13286	14287
B4873 C1839	B4874 C1840	B4875 C1841	B4876 C1842	B4877 C1843	B4878 C1844	B4879 C1845
15288	16289 DSN Week 42	17290	18291	19292	20293	21294
B4880 C1846	B4881 C1847	B4882 C1848	B4883 C1849	B4884 C1850	B4885 C1851	B4886 C1852
22295	23296 DSN Week 43	24297	25298	26299	27300	28301
B4887 C1853	B4888 C1854	C1855	B4889 C1856	B4890 C1857	B4891 C1858	B4892 C1859
29302	30303 DSN Week 44	31304 JPL				
B4893 C1860	B4894 C1861	B4895 C1862				

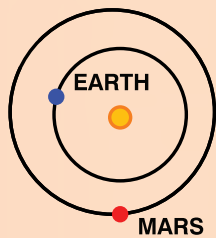




## Dunes in Endeavor Crater

While exploring through Marathon Valley, Opportunity captured this beautiful mosaic of the dunes in the valley of the Endeavour crater floor.

*This mosaic—with a field of view of approximately 73 degrees—was acquired with Opportunity's panoramic camera (Pancam) on Sol 4,142 (September 18, 2015). Pancam's 753nm, 535nm, and 432nm filters were used in making this mosaic. Image credit: NASA/JPL-Caltech/Cornell University/Arizona State University*



December 1, 2017

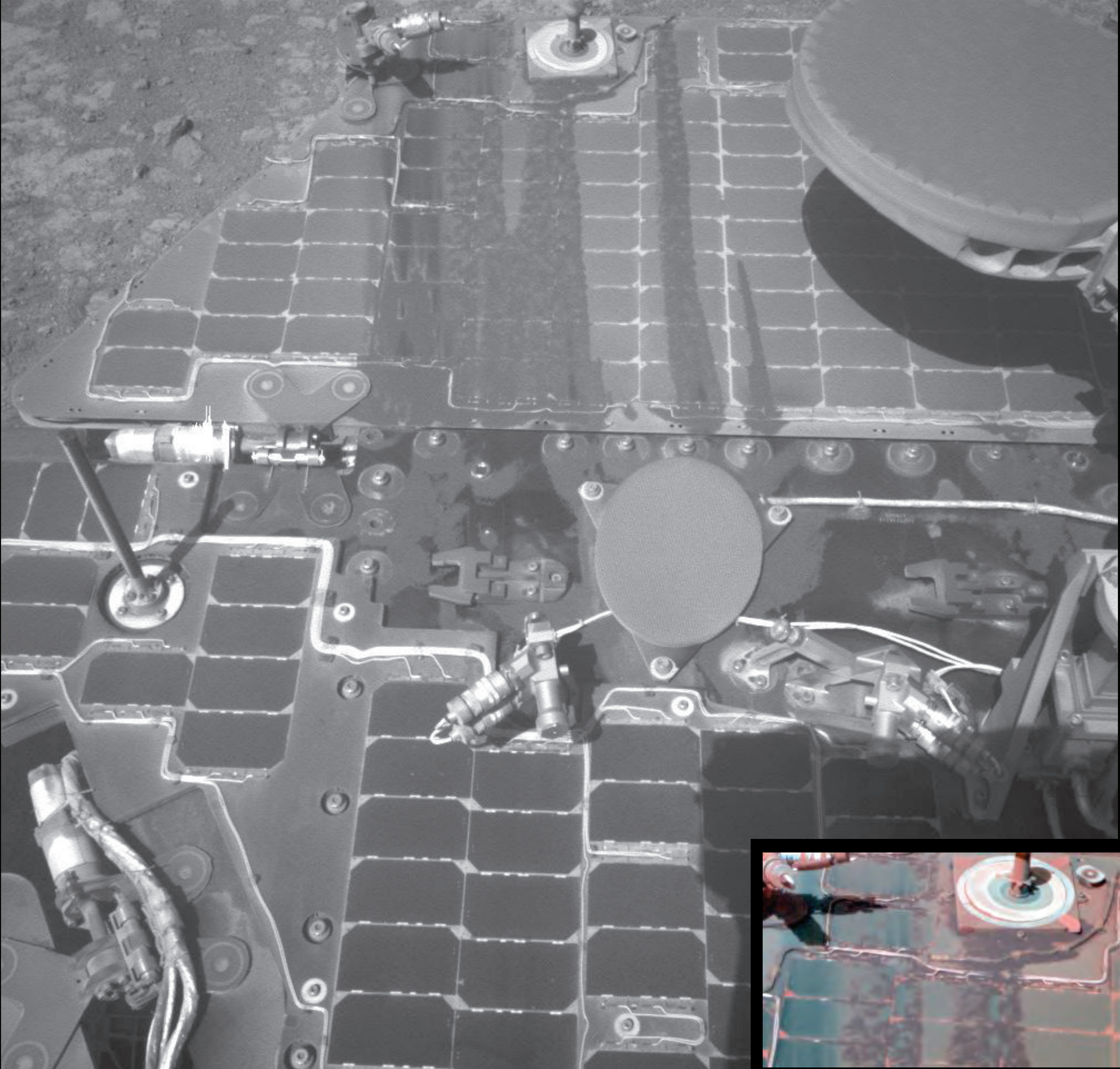
## November 2017

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			1305	2306	3307	4308
			L <sub>S</sub> =81.6° B4896 C1863	B4897 C1864	B4898 C1865	B4899 C1866
5309	6310 DSN Week 45	7311	8312	9313	10314	11315
B4900 C1867	B4901 C1868	B4902 C1869	B4903 C1870	B4904	B4905 C1871	B4906 C1872
12316	13317 DSN Week 46	14318	15319	16320	17321	18322
B4907 C1873	B4908 C1874	B4909 C1875	B4910 C1876	B4911 C1877	B4912 C1878	B4913 C1879
19323	20324 DSN Week 47  Southern Winter Solstice	21325	22326	23327	24328	25329
B4914 C1880	B4915 C1881	B4916 C1882	B4917 C1883	B4918 C1884	B4919 C1885	B4920 C1886
26330  Curiosity launched 2011	27331 DSN Week 48	28332	29333	30334		
B4921 C1887	B4922 C1888	B4923 C1889	B4924 C1890	B4924 C1891		

## December 2017

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
					1335	2336
					L <sub>S</sub> =94.8° C1892	B4926 C1893
3337	4338 DSN Week 49	5339	6340	7341	8342	9343
B4927 C1894	B4928 C1895	B4929 C1896	B4930 C1897	B4931 C1898	B4932 C1899	B4933 C1900
10344	11345 DSN Week 50	12346	13347	14348	15349	16350
B4934 C1901	B4935 C1902	B4936 C1903	B4937 C1904	B4938 C1905	B4939 C1906	B4940
17351	18352 DSN Week 51	19353	20354	21355	22356	23357
B4941 C1907	B4942 C1908	B4943 C1909	B4944 C1910	B4945 C1911	B4946 C1912	B4947 C1913
31358 B4955 C1921	24351 B4948 C1914 DSN Week 52	25359	26360	27361	28362	29363
31365	B4949 C1915	B4950 C1916	B4951 C1917	B4952 C1918	B4953 C1919	B4954 C1920

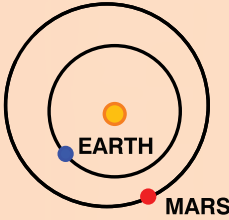




Dust Streaks on Solar Array

This image shows streaks of dust or sand on Opportunity's rear solar panel after a series of drives during which the rover was pointed steeply uphill. At the time this photo was taken, the rover was located on the north-facing slope of Knudsen Ridge, which forms part of the southern edge of Marathon Valley. During an earlier forward, uphill drive in this region, Opportunity's tilt reached 32 degrees, the steepest ever for any rover on Mars. While the rover was so steeply tilted, accumulated dust on its deck was affected by vibrations from wheels slipping against the ground. Tilt in the same direction continued with two downhill drives in reverse between that ascent and when this images was taken.

Opportunity captured this image from a navigation camera on the rover's mast on Sol 4,322 (March 21, 2016). The inset image was collected by the rover's panoramic camera (Pancam). Image credits: NASA/JPL-Caltech (navigational camera image) and NASA/JPL-Caltech/Cornell Univ./Arizona State Univ. (Pancam image)



February 1, 2018

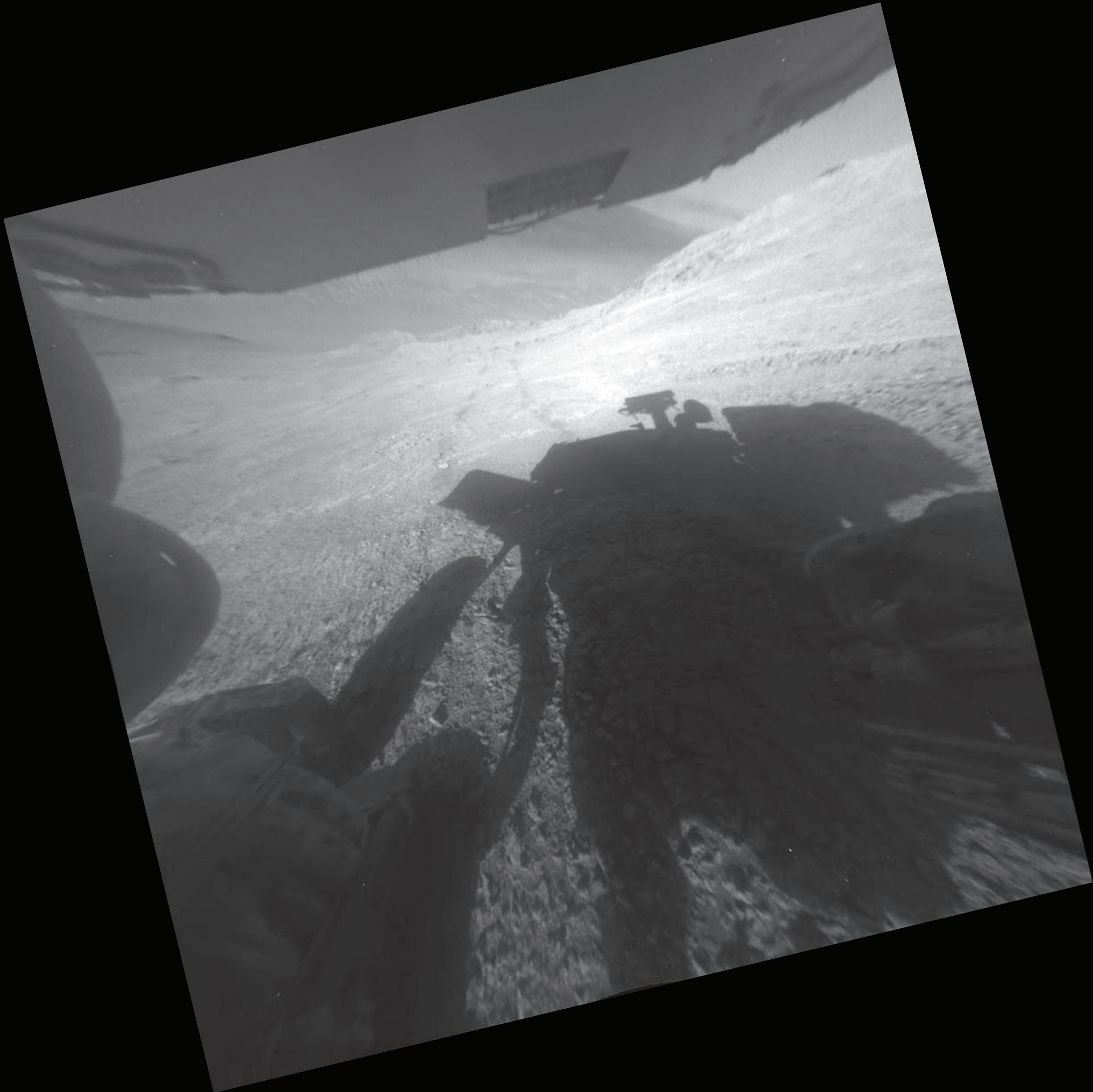
January 2018

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	11 DSN Week 1  Ls=108.8° B4956 C1922	22 B4957 C1923	33 B4958 C1924	44 Spirit landed 2004 B4959 C1925	55 B4960 C1926	66 B4961 C1927
77 C1928	88 DSN Week 2 B4962 C1929	99 B4963 C1930	1010 B4964 C1931	1111 B4965 C1932	1212 B4966 C1933	1313 B4967 C1934
1414 B4968 C1935	1515 DSN Week 3 B4969 C1936	1616 B4970 C1937	1717 B4971 C1938	1818 B4972 C1939	1919 B4973 C1940	2020 B4974 C1941
2121 B4975 C1942	2222 DSN Week 4 B4976 C1943	2323 B4977	2424 B4978 C1944	2525 Opportunity 14th Earth Anniversary B4979 C1945	2626 B4980 C1946	2727 B4981 C1947
2828 B4982 C1948	2929 DSN Week 5 B4983 C1949	3030 B4984 C1950	3131 B4985 C1951			

February 2018

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
				132 Ls=123.1° B4986 C1952	233 B4987 C1953	334 B4988 C1954
435 B4989 C1955	536 DSN Week 6 B4990 C1956	637 B4991 C1957	738 B4992 C1958	839 B4993 C1959	940 B4994 C1960	1041 B4995 C1961
1142 B4996 C1962	1243 DSN Week 7 B4997 C1963	1344 C1964	1445 B4998 C1965	1546 B4999 C1966	1647 B5000 C1967	1748 B5001 C1968
1849 B5002 C1969	1950 DSN Week 8 B5003 C1970	2051 B5004 C1971	2152 B5005 C1972	2253 B5006 C1973	2354 B5007 C1974	2455 B5008 C1975
2556 B5009 C1976	2657 DSN Week 9 B5010 C1977	2758 B5011 C1978	2859 B5012 C1979			

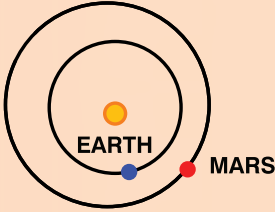




Shadows and Tracks

Opportunity's shadow and wheel tracks appear in this image, taken just after a drive on a slope above Endeavour crater. The upper portion of the wide-angle image shows the underside of Opportunity's solar array. On the day this image was captured, Opportunity drove westward about 40 feet (12 meters) along the ridge forming the southern edge of Marathon Valley, which cuts east-west through the western rim of Endeavour crater. In this image, the slope descends to the left into Marathon Valley, and the broad floor of Endeavour crater can be glimpsed just beneath the underside of the solar array.

*The Opportunity rover captured this image with a rear hazard avoidance camera (hazcam) on Sol 4,323 (March 22, 2016). The image has been rotated 13.5 degrees to adjust for the tilt of the rover on a hillside. This version has also been geometrically linearized to straighten curves that are an effect of the fisheye lens in the raw image.*  
*Image Credit: NASA/JPL-Caltech*



April 1, 2018

March 2018

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
				160	261	362
				L <sub>S</sub> =136.6° B5013	B5014 C1980	B5015 C1981
463	564 DSN Week 10	665	766	867	968	1069
B5016 C1982	B5017 C1983	B5018 C1984	B5019 C1985	B5020 C1986	B5021 C1987	B5022 C1988
1170	1271 DSN Week 11	1372	1473	1574	1675	1776
B5023 C1989	B5024 C1990	B5025 C1991	B5026 C1992	B5027 C1993	B5028 C1994	B5029 C1995
1877	1978 DSN Week 12	2079	2180	2281 Spirit ceased operation 2010	2382	2483
B5030 C1996	B5031 C1997	B5032 C1998	B5033 C1999	B5034 C2000	C2001	B5035 C2002
2584	2685 DSN Week 13	2786	2887	2988	3089	3190
B5036 C2003	B5037 C2004	B5038 C2005	B5039 C2006	B5040 C2007	B5041 C2008	B5042 C2009

April 2018

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
191	292 DSN Week 14	393	494	595	696	797
L <sub>S</sub> =152.2° B5043 C2010	B5044 C2011	B5045 C2012	B5046 C2013	B5047 C2014	B5048 C2015	B5049 C2016
898	999 DSN Week 15	10100	11101	12102	13103	14104
B5050	B5051 C2017	B5052 C2018	B5053 C2019	B5054 C2020	B5055 C2021	B5056 C2022
15105	16106 DSN Week 16	17107	18108	19109	20110	21111
B5057 C2023	B5058 C2024	B5059 C2025	B5060 C2026	B5061 C2027	B5062 C2028	B5063 C2029
22112	23113 DSN Week 17	24114	25115	26116	27117	28118
B5064 C2030	B5065 C2031	B5066 C2032	B5067 C2033	B5068 C2034	B5069 C2035	B5070 C2036
29119	30120 DSN Week 18					
C2037	B5071 C2038					

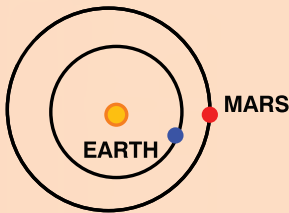




### Private Joseph Field

This image shows a target called Private Joseph Field that is within the Marathon Valley area of the western rim of Endeavour crater. The mosaic shows an area spanning about 2 inches (5 centimeters). Geochemical data indicate the presence of magnesium and iron sulfates at this location, most likely corresponding to the white pebble visible near the center of the image. These sulfates may have formed from the interaction of acidic fluids with the rocks along the rim of Endeavour crater.

*This image is a combination of four frames from the microscopic imager on the robotic arm of the Opportunity rover, with enhanced color information added from the rover's panoramic camera. The component images were captured on Sol 4,389 (May 29, 2016). Image Credit: NASA/JPL-Caltech/Cornell Univ./USGS/Arizona State Univ.*



June 1, 2018

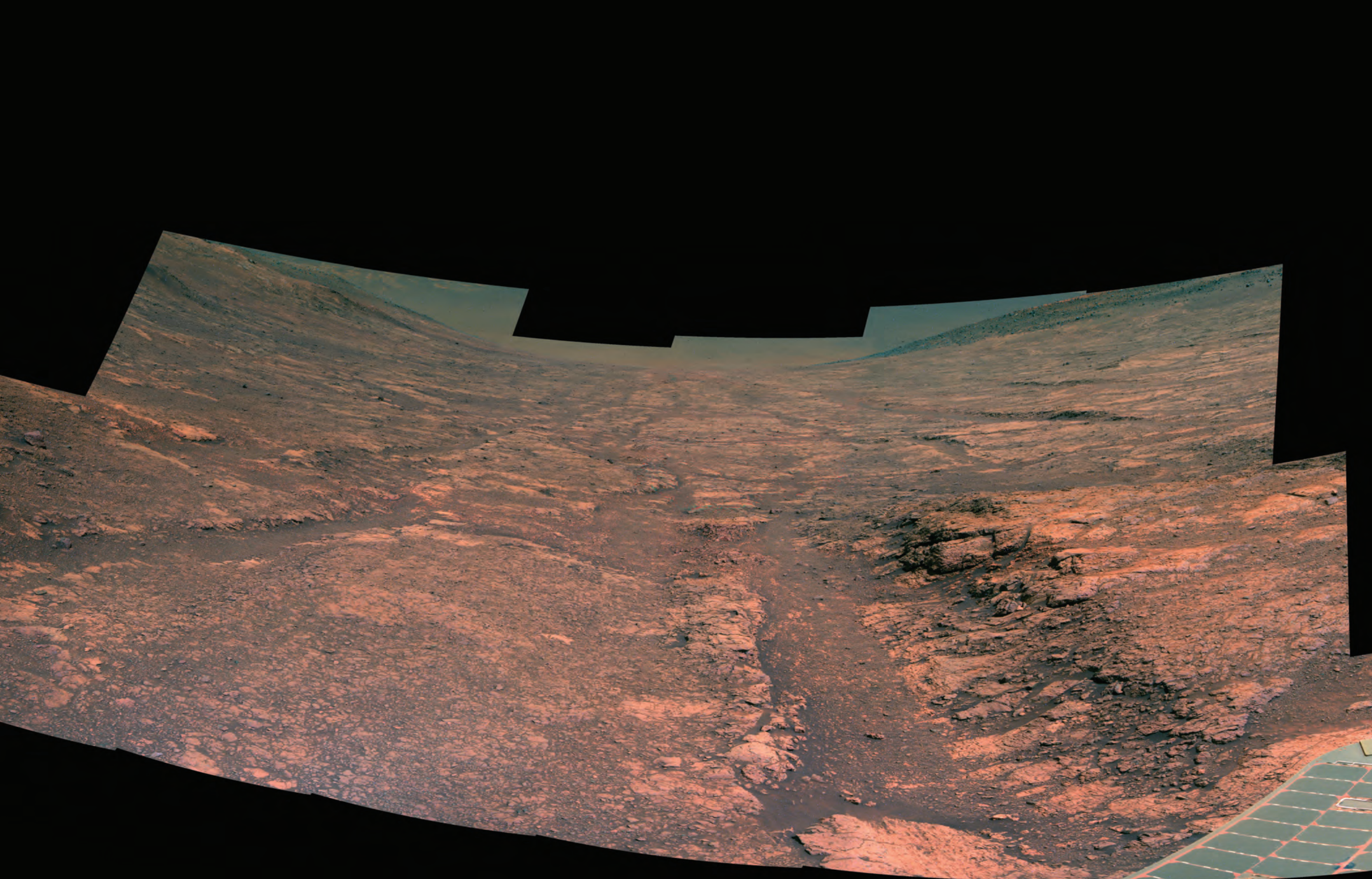
## May 2018

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
		1121	2122	3123	4124	5125
		L <sub>S</sub> =168.0° B5072 C2039	B5073 C2040	B5074 C2041	B5075 C2042	B5076 C2043
6126	7127 DSN Week 19	8128	9129	10130	11131	12132
B5077 C2044	B5078 C2045	B5079 C2046	B5080 C2047	B5081 C2048	B5082 C2049	B5083 C2050
13133	14134 DSN Week 20	15135	16136	17137	18138	19139
B5084 C2051	B5085 C2052	B5086	B5087 C2053	B5088 C2054	B5089 C2055	B5090 C2056
20140	21141 DSN Week 21	22142 Southern Spring Equinox	23143	24144	25145	26146
B5091 C2057	B5092 C2058	B5093 C2059	B5094 C2060	B5095 C2061	B5096 C2062	B5097 C2063
27147	28148 DSN Week 22	29149	30150	31151		
B5098 C2064	B5099 C2065	B5100 C2066	B5101 C2067	B5102 C2068		

## June 2018

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
					1152	2153
					L <sub>S</sub> =185.3° B5103 C2069	B5104 C2070
3154	4155 DSN Week 23	5156	6157	7158	8159	9160
B5105 C2071	B5106 C2072	C2073	B5107 C2074	B5108 C2075	B5109 C2076	B5110 C2077
10161	11162 DSN Week 24	12163	13164	14165	15166	16167
Spirit launched 2003 B5111 C2078	B5112 C2079	B5113 C2080	B5114 C2081	B5115 C2082	B5116 C2083	B5117 C2084
17168	18169 DSN Week 25	19170	20171	21172	22173	23174
B5118 C2085	B5119 C2086	B5120 C2087	B5121 C2088	B5122	B5123 C2089	B5124 C2090
24175	25176 DSN Week 26	26177	27178	28179	29180	30181
B5125 C2091	B5126 C2092	B5127 C2093	B5128 C2094	B5129 C2095	B5130 C2096	B5131 C2097

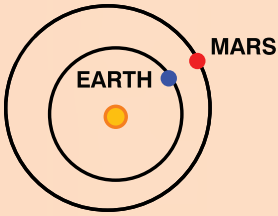




## Marathon Valley Grooves

These grooves were found by Opportunity along the side of Endeavour crater’s rim, near Marathon Valley. Opportunity investigated these features to help the science team better understand if they were shaped by wind or by water. The groove on the right side of the image is approximately one meter wide from rim to rim.

Component images were captured with Opportunity's panoramic camera (Pancam) from Sols 4,461 to 4,467 (August 11, 2016 to August 17, 2016). Pancam's 753nm, 535nm, and 432nm filters were used in making this mosaic. Image credit: NASA/JPL-Caltech/Cornell Univ./Arizona State Univ.



August 1, 2018

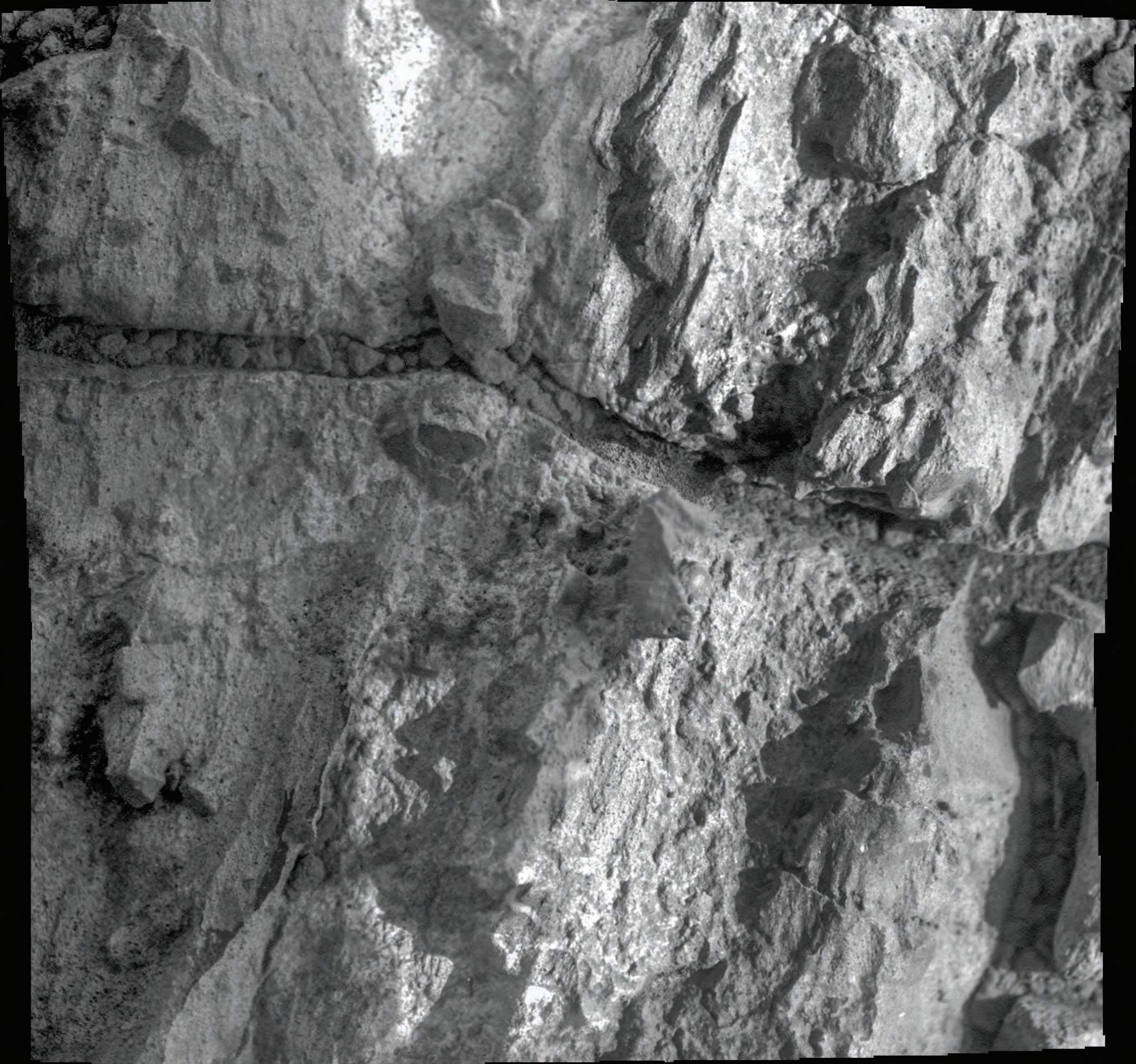
## July 2018

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1182	2183	3184	4185	5186	6187	7188
	DSN Week 27		Mars Pathfinder/ Sojourner landed 1997			Opportunity launched 2003
L <sub>S</sub> =202.9° B5132 C2098	B5133 C2099	B5134 C2100	B5135 C2101	B5136 C2102	B5137 C2103	B5138 C2104
8189	9190	10191	11192	12193	13194	14195
	DSN Week 28					
B5139 C2105	B5140 C2106	B5141 C2107	B5142 C2108	B5143 C2109	C2110	B5144 C2111
15196	16197	17198	18199	19200	20201	21202
	DSN Week 29					
B5145 C2112	B5146 C2113	B5147 C2114	B5148 C2115	B5149 C2116	B5150 C2117	B5151 C2118
22203	23204	25205	25207	26207	27208	28209
	DSN Week 30				Earth-Mars Opposition	
B5152 C2119	B5153 C2120	B5154 C2121	B5155 C2122	B5156 C2123	B5157 C2124	B5158 C2125
29210	30211	31212				
	DSN Week 31					
B5159	B5160 C2126	B5161 C2127				

## August 2018

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			1213	2214	3215	4216
			L <sub>S</sub> =221.8° B5162 C2128	B5163 C2129	B5164 C2130	B5165 C2131
5217	6218	7219	8220	9221	10222	11223
	DSN Week 32 Curiosity landed 2012					
B5166 C2132	B5167 C2133	B5168 C2134	B5169 C2135	B5170 C2136	B5171 C2137	B5172 C2138
12224	13225	14226	15227	16228	17229	18230
	DSN Week 33					
B5173 C2139	B5174 C2140	B5175 C2141	B5176 C2142	B5177 C2143	B5178 C2144	B5179 C2145
19231	20232	21233	22234	23235	24236	25237
	DSN Week 34					
C2146	B5180 C2147	B5181 C2148	B5182 C2149	B5183 C2150	B5184 C2151	B5185 C2152
26238	27239	28240	29241	30242	31243	
	DSN Week 35					
B5186 C2153	B5187 C2154	B5188 C2155	B5189 C2156	B5190 C2157	B5191 C2158	

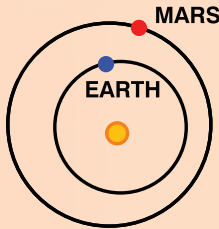




Inspecting Gasconade

This relatively bright outcropping of rock, dubbed "Gasconade," was investigated while the Opportunity rover was perched on Spirit Mound at the western edge of Mars' Endeavour crater. The view covers an area about 2 inches (5 centimeters) wide. Opportunity's inspection found Gasconade to be a wind-etched outcrop with angular bits of darker rock within a lighter matrix, which may have been formed from fallout of the same impact event that excavated the crater.

*This image is a mosaic of four frames captured by the microscopic imager on the robotic arm of the Opportunity rover. The component images were captured on Sol 4,512 (October 2, 2016). Image credit: NASA/-JPL-Caltech/Cornell Univ.*



October 1, 2018

September 2018

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
						1244  L <sub>S</sub> =241.3° B5192 C2159
2245  B5193 C2160	3246 DSN Week 36  B5194 C2161	4247  B5195	5248  B5196 C2162	6249  B5197 C2163	7250  B5198 C2164	8251  B5199 C2165
9252  B5200 C2166	10253 DSN Week 37  B5201 C2167	11254  B5202 C2168	12255  B5203 C2169	13256  B5204 C2170	14257  B5205 C2171	15258  B5206 C2172
16259  Mars Perihelion B5207 C2173	17260 DSN Week 38  B5208 C2174	18261  B5209 C2175	19262  B5210 C2176	20263  B5211 C2177	21264  B5212 C2178	22265  B5213 C2179
266 B5214 C2180 B5220 C2187 30273	23267 DSN Week 39  B5215 C2181	25268  B5216 C2182	26269  C2183	27270  B5217 C2184	28271  B5218 C2185	29272  B5219 C2186

October 2018

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1274  L <sub>S</sub> =260.3° B5221 C2188	2275 DSN Week 40  B5222 C2189	3276  B5223 C2190	4277  B5224 C2191	5278  B5225 C2192	6279  B5226 C2193	7280  B5227 C2194
8281  B5228 C2195	9282 DSN Week 41  B5229 C2196	10283  B5230 C2197	11284  B5231	12285  B5232 C2198	13286  B5233 C2199	14287  B5234 C2200
15288  B5235 C2201	16289 DSN Week 42 Southern Summer Solstice B5236 C2202	17290  B5237 C2203	18291  B5238 C2204	19292  B5239 C2205	20293  B5240 C2206	21294  B5241 C2207
22295  B5242 C2208	22296 DSN Week 43  B5243 C2209	22297  B5244 C2210	25298  B5245 C2211	26299  B5246 C2212	27300  B5247 C2213	28301  B5248 C2214
29302  B5249 C2215	30303 DSN Week 44  B5250 C2216	31304  JPL B5251 C2217				

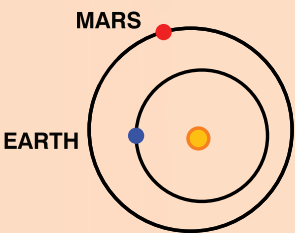




## Martian Dust Devil

From its perch high on the rim of Endeavour crater, Opportunity recorded this image of a Martian dust devil twisting through the crater floor below. The view looks back at the rover's tracks leading up the north-facing slope of Knudsen Ridge, which forms part of the southern edge of Marathon Valley. Just as on Earth, a dust devil is created by a rising, rotating column of hot air. When the column whirls fast enough, it picks up tiny grains of dust from the ground, making the vortex visible. Dust devils were a common sight for Opportunity's twin rover, Spirit, in its outpost at Gusev crater. However, dust devil sightings—like this one—have been rare for Opportunity.

*Opportunity captured this image using its navigation camera on Sol 4,332 (March 31, 2016). Image Credit: NASA/JPL-Caltech*



December 1, 2018

# November 2018

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
				1305	2306	3307
				L <sub>S</sub> =279.8° B5252 C2218	C2219	B5253 C2220
4308	5309 DSN Week 45	6310	7311	8312	9313	10314
B5254 C2221	B5255 C2222	B5256 C2223	B5257 C2224	B5258 C2225	B5259 C2226	B5260 C2227
11315 DSN Week 46	12316	13317	14318	15319	16320	17321
B5261 C2228	B5262 C2229	B5263 C2230	B5264 C2231	B5265 C2232	B5266 C2233	B5267 C2234
18322 DSN Week 47	19323	20324	21325	22326	23327	24328
B5268	B5269 C2235	B5270 C2236	B5271 C2237	B5272 C2238	B5273 C2239	B5274 C2240
25329 DSN Week 48 Curiosity launched 2011	26330	27331	28332	29333	30334	
B5275 C2241	B5276 C2242	B5277 C2243	B5278 C2244	B5279 C2245	B5280 C2246	

# December 2018

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
						1335
						L <sub>S</sub> =298.2° B5281 C2247
2336	3337 DSN Week 49	4338	5339	6340	7341	8342
B5282 C2248	B5283 C2249	B5284 C2250	B5285 C2251	B5286 C2252	B5287 C2253	B5288 C2254
9343	10344 DSN Week 50	11345	12346	13347	14348	15349
C2255	B5289 C2256	B5290 C2257	B5291 C2258	B5292 C2259	B5293 C2260	B5294 C2261
16350	17351 DSN Week 51	18352	19353	20354	21355	22356
B5295 C2262	B5296 C2263	B5297 C2264	B5298 C2265	B5299 C2266	B5300 C2267	B5301 C2268
357 B5302 C2269	358 DSN Week 52 B5303 C2270	25359	26360	27361	28362	29363
B5309 C2275	B5310 C2276					
30364	31365	B5304	B5305 C2271	B5306 C2272	B5307 C2273	B5308 C2274



# QUICK FACTS

## Mars Exploration Rovers

Mission Objective	To determine the climatic and geologic history of two sites on Mars with evidence of past, persistent water activity that may have supported microbial life.
Primary Mission	90 Martian days (sols)
Primary/Extended Mission	Spirit - 6 years    Opportunity - Over a decade
Launch Vehicle	Boeing Delta II
Launch	Spirit - June 10, 2003 (UTC); Opportunity - July 7, 2003 (UTC)
Landing	Spirit - January 4, 2004 (UTC) at Gusev Crater (14.57°S, 175.47°E) Opportunity - January 25, 2004 (UTC) at Eagle Crater on Meridiani Planum (1.95°S, 354.47°E)
Landing Technology	Atmospheric entry aeroshell, backshell with parachute and retro rockets, and airbags to cushion landing.
Size	1.6 meters high, 1.5 meters long, 2.2 meters wide (5.2 feet high, 4.9 feet long, 7.2 feet wide)
Arm Reach	0.7 meters (~2.3 feet)
Wheel Diameter	25 centimeters (~10 inches)
Mass	180 kilograms (~400 pounds)
Total Distance	Spirit - 7.7 kilometers (4.8 miles) Opportunity - 43.5 kilometers (27+ miles)
Images Sent to Earth	Spirit - 125,000    Opportunity - 200,000+

The Jet Propulsion Laboratory in Pasadena, California, designed and built the rovers Spirit and Opportunity. JPL also manages the Mars Exploration Rover Project for NASA's Science Mission Directorate in Washington, D.C.

National Aeronautics and Space Administration

Jet Propulsion Laboratory  
California Institute of Technology  
Pasadena, California

www.nasa.gov



The aeroshell protects the rover from fiery temperatures as it enters the Martian atmosphere.  
(Artist's rendering)