National Aeronautics and
Space Administration

Mars Exploration Rovers

2015 2016

One Martian Year • Two Earth Years

www.nasa.gov

Cover *An approximately true-color panoramic of "Wdowiak Ridge" created by images from NASA's Mars Exploration Rover Opportunity. A computer-generated image of Opportunity itself is overlain and scaled to its surroundings. The ridge stands prominently on the western rim of Endeavour crater, about 200 meters (or yards) west of the rim's main crest line.*

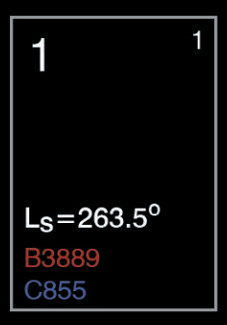
Cover image credit
Panoramic landscape: NASA/JPL-Caltech/Cornell. 3D rendering of Opportunity: NASA/JPL-Caltech/Dan Maas.

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 2015 marks the eleventh anniversary of the Opportunity's continuing exploration on the surface of Mars.

Visit mars.jpl.nasa.gov

How to Use the Calendar

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.

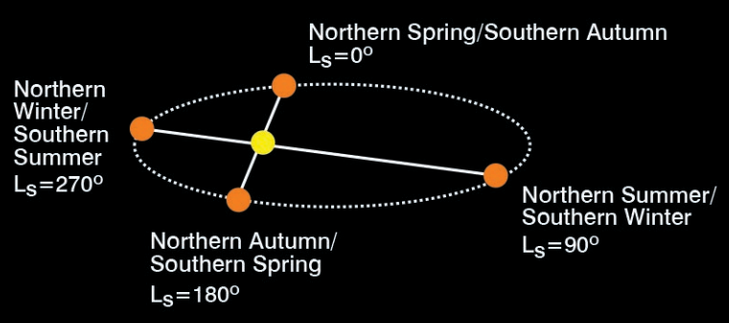


A Martian Day Mars rotates on its axis similarly to Earth, but a little more slowly, so a Mars day is a little longer than an Earth day. The Mars day, which we call a "sol," takes 24 hours, 39-1/2 minutes. The red and blue numbers in the calendar squares indicate how many sols have passed since Opportunity (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°, 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.

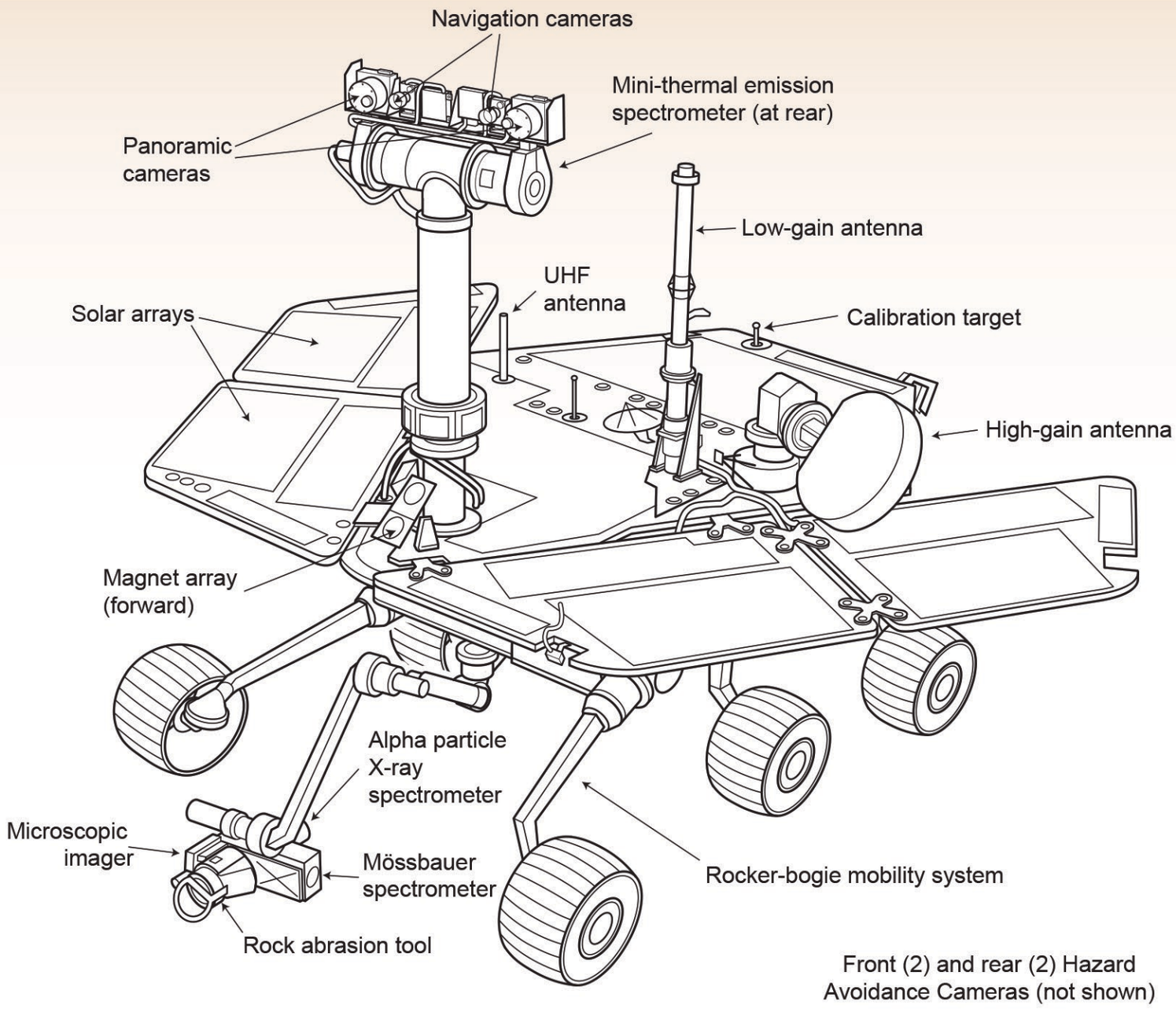
Contact Science Instruments

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

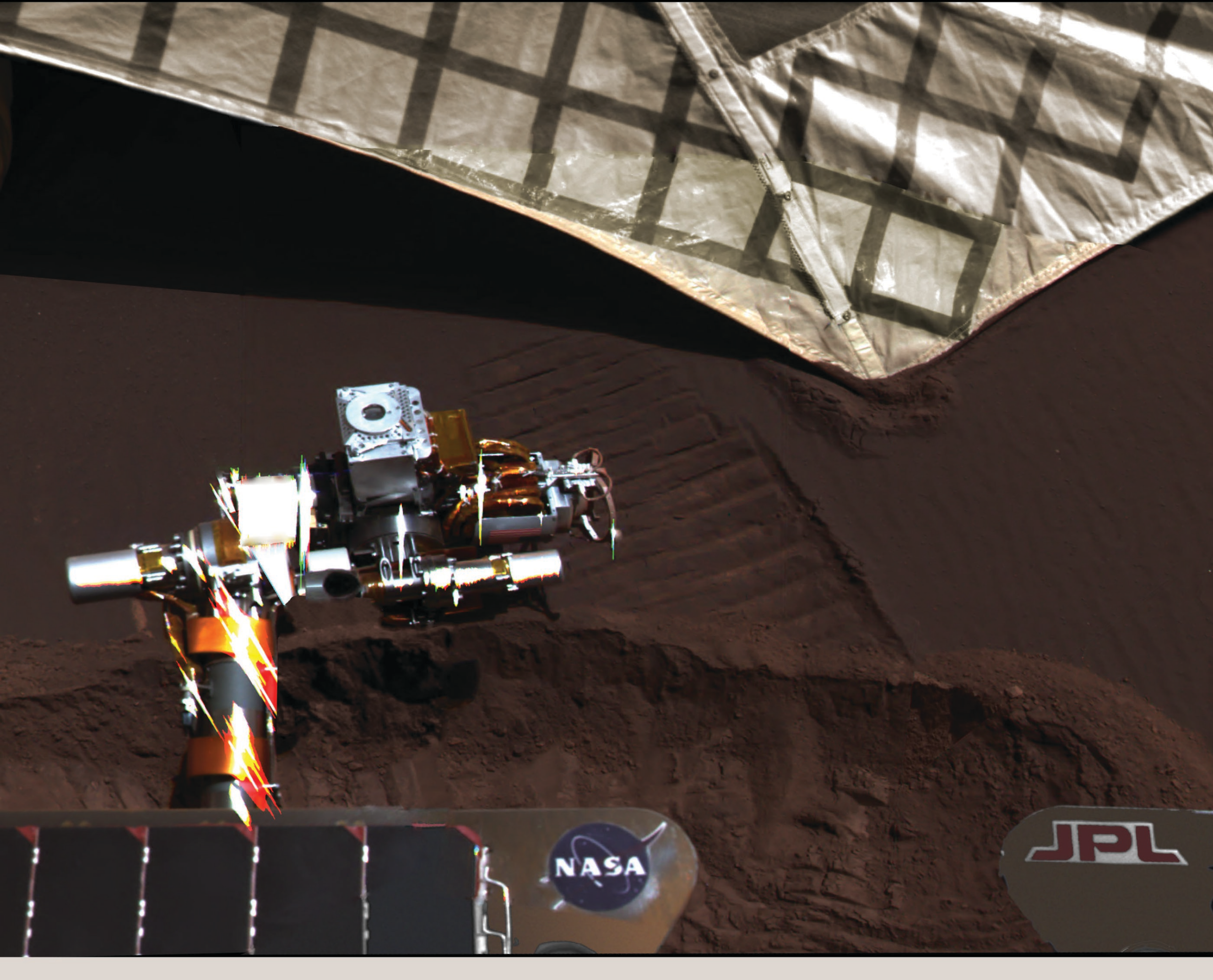
Alpha Particle X-ray Spectrometer (APXS) - Measures the chemical composition of Martian rocks and soils.

Mössbauer Spectrometer (MB) - Measures iron-bearing minerology of rocks and soil.

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



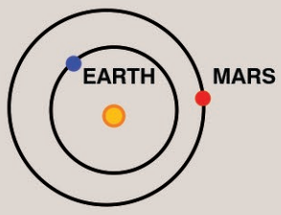
Front (2) and rear (2) Hazard Avoidance Cameras (not shown)



Lander Trench

Opportunity's wheels dug this trench into the sandy soils of Eagle crater to explore the nature of small wind ripples near the center of the crater. The trench cross-cuts the rover's first "footprint" wheel tracks. The white material at the top is the fabric ramp that the rover drove off of from the lander. The soil at the end of the ramp was compressed and disturbed by the weight of the rover as it drove down the ramp. The robotic arm instruments, glistening in the Martian sunlight, are preparing to make measurements inside the trench.

This is an approximate true color mosaic of images acquired by Opportunity's Navigation Camera and Panoramic Camera. The trench was dug on Sol 55 (March 20, 2004). Image credit: NASA/JPL/Cornell.



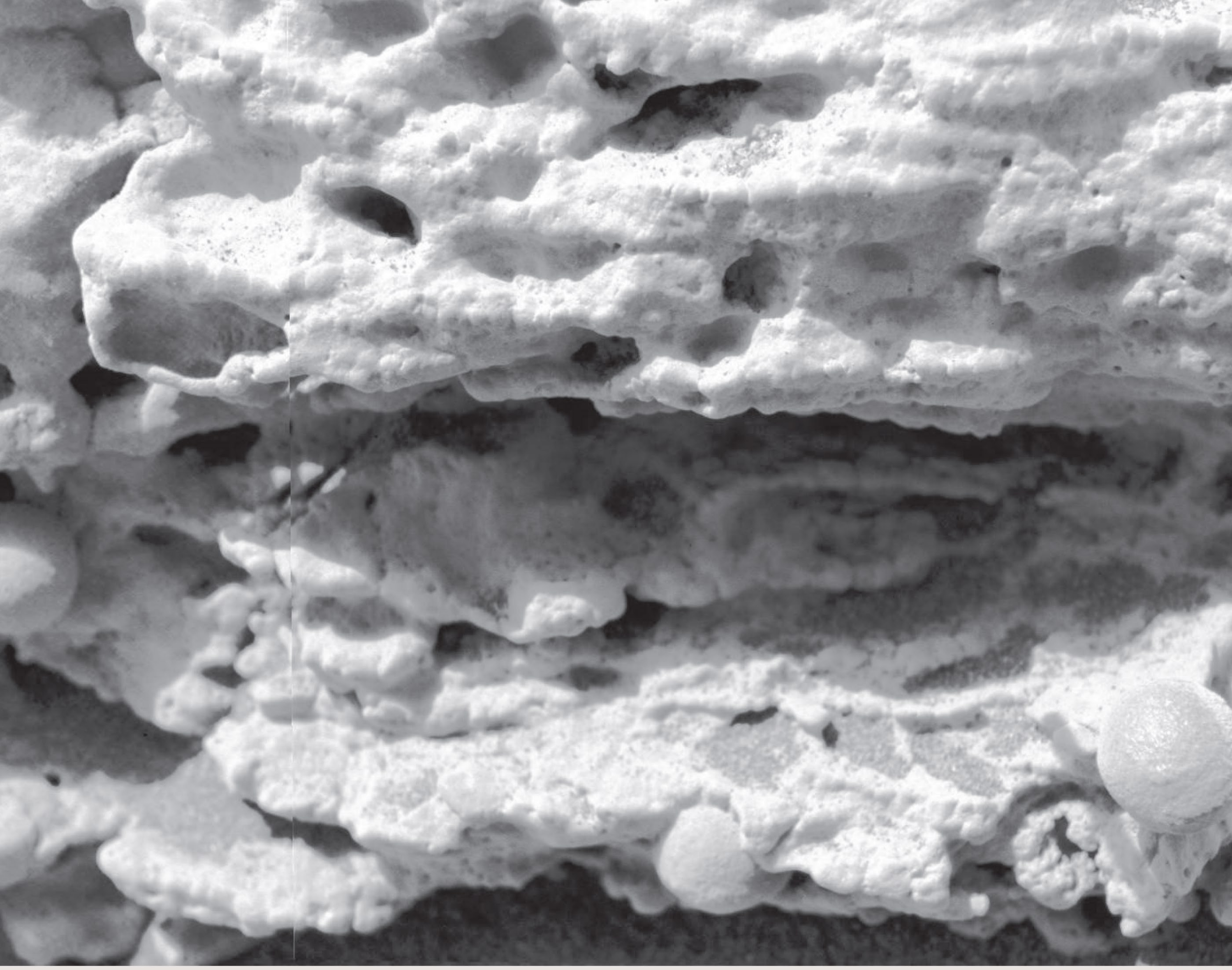
February 1, 2015

January 2015

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
				1 1 L_S=263.5° B3889 C855	2 2 B3890 C856	3 3 B3891 C857
4 4 Spirit Landed 2004 B3892 C858	5 5 DSN Week 2 B3893 C859	6 6 B3894 C860	7 7 B3895 C861	8 8 B3896 C862	9 9 B3897 C863	10 10 B3898 C864
11 11 Southern Summer Solstice B3899 C865	12 12 DSN Week 3 B3900 C866	13 13 B3901 C867	14 14 B3902 C868	15 15 B3903 C869	16 16 B3904 C870	17 17 B3905 C871
18 18 B3906 C872	19 19 DSN Week 4 C873	20 20 B3907 C874	21 21 B3908 C875	22 22 B3909 C876	23 23 B3910 C877	24 24 B3911 C878
25 25 Opportunity's 11th Earth Anniversary B3912 C879	26 26 DSN Week 5 B3913 C880	27 27 B3914 C881	28 28 B3915 C882	29 29 B3916 C883	30 30 B3917 C884	31 31 B3918 C885

February 2015

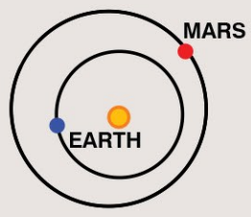
SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1 32 L_S=282.9° B3919 C886	2 33 DSN Week 6 B3920 C887	3 34 B3921 C888	4 35 B3922	5 36 B3923 C889	6 37 B3924 C890	7 38 B3925 C891
8 39 B3926 C892	9 40 DSN Week 7 B3927 C893	10 41 B3928 C894	11 42 B3929 C895	12 43 B3930 C896	13 44 B3931 C897	14 45 B3932 C898
15 46 B3933 C899	16 47 DSN Week 8 B3934 C900	17 48 B3935 C901	18 49 B3936 C902	19 50 B3937 C903	20 51 B3938 C904	21 52 B3939 C905
22 53 B3940 C906	23 54 DSN Week 9 B3941 C907	24 55 B3942 C908	25 56 C909	26 57 B3943 C910	27 58 B3944 C911	28 59 B3945 C912



A Layered Story

Opportunity investigated this target rock, named “Last Chance,” in the Meridiani Planum region of Mars. The area covered in the view is about 5 centimeters (2 inches) across. Not only does the rock include a couple of Mars’ famous “blueberries,” but it also holds other hints of a wet Martian past. Notably, it displays a kind of layering referred to as cross-stratification. On Earth, this kind of deposit only forms in areas with flowing water.

Opportunity acquired the images for this mosaic using its Microscopic Imager on Sol 39 (March 3, 2004). Credit: NASA/JPL-Caltech/Cornell Univ./USGS



April 1, 2015

March 2015

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1 60 L_S=300.0° B3946 C913	2 61 DSN Week 10 B3947 C914	3 62 B3948 C915	4 63 B3949 C916	5 64 B3950 C917	6 65 B3951 C918	7 66 B3952 C919
8 67 B3953 C920	9 68 DSN Week 11 B3954 C921	10 69 B3955 C922	11 70 B3956 C923	12 71 B3957 C924	13 72 B3958	14 73 B3959 C925
15 74 B3960 C926	16 75 DSN Week 12 B3961 C927	17 76 B3962 C928	18 77 B3963 C929	19 78 B3964 C930	20 79 B3965 C931	21 80 B3966 C932
22 81 Spirit ceased operation 2010 B3967 C933	23 82 DSN Week 13 B3968 C934	24 83 B3969 C935	25 84 B3970 C936	26 85 B3971 C937	27 86 B3972 C938	28 87 B3973 C939
29 88 B3974 C940	30 89 DSN Week 14 B3975 C941	31 90 B3976 C942				

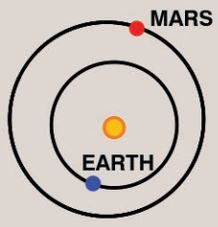
April 2015

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			1 91 L_S=318.1° B3977 C943	2 92 B3978 C944	3 93 B3979 C945	4 94 C946
5 95 B3980 C947	6 96 DSN Week 15 B3981 C948	7 97 B3982 C949	8 98 B3983 C950	9 99 B3984 C951	10 100 B3985 C952	11 101 B3986 C953
12 102 B3987 C954	13 103 DSN Week 16 B3988 C955	14 104 B3989 C956	15 105 B3990 C957	16 106 B3991 C958	17 107 B3992 C959	18 108 B3993 C960
19 109 B3994 C961	20 110 DSN Week 17 B3995	21 111 B3996 C962	22 112 B3997 C963	23 113 B3998 C964	24 114 B3999 C965	25 115 B4000 C966
26 116 B4001 C967	27 117 DSN Week 18 B4002 C968	28 118 B4003 C969	29 119 B4004 C970	30 120 B4005 C971		

A “Blueberry” Bonanza

Rich in the mineral hematite, these Martian spherules are nicknamed “blueberries” due to their blue appearance in false-color images. A cross-section view of a spherule provides a fortuitous glimpse into its interior. The average diameter of a blueberry is only about 4 millimeters (less than 0.2 inches). While their origin remains uncertain, their inclusion in sulfate evaporite deposits and hematite’s association with liquid water puts these objects on the growing list of evidence for liquid water on the surface of Mars long ago.

Image created by data from Opportunity’s Microscopic Imager and Panoramic Camera from Sol 84 (April, 19, 2004). NASA/JPL-Caltech/USGS/Cornell



June 1, 2015

May 2015

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
					1 121 L_S=334.8° B4006 C972	2 122 B4007 C973
3 123 B4008 C974	4 124 DSN Week 19 B4009 C975	5 125 B4010 C976	6 126 B4011 C977	7 127 B4012 C978	8 128 B4013 C979	9 129 Opportunity 6th Martian Anniversary B4014 C980
10 130 B4015 C981	11 131 DSN Week 20 C982	12 132 B4016 C983	13 133 B4017 C984	14 134 B4018 C985	15 135 B4019 C986	16 136 B4020 C987
17 137 B4021 C988	18 138 DSN Week 21 B4022 C989	19 139 B4023 C990	20 140 B4024 C991	21 141 B4025 C992	22 142 B4026 C993	23 143 B4027 C994
144 24 B4028 C995 B4035 C1001 31 151	25 145 DSN Week 22 B4029 C996	26 146 B4030 C997	27 147 B4031	28 148 B4032 C998	29 149 B4033 C999	30 150 B4034 C1000

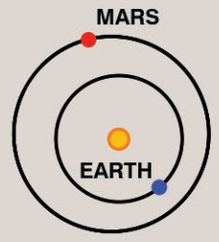
June 2015

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	1 152 DSN Week 23 L_S=351.1° B4036 C1002	2 153 B4037 C1003	3 154 B4038 C1004	4 155 B4039 C1005	5 156 B4040 C1006	6 157 B4041 C1007
7 158 B4042 C1008	8 159 DSN Week 24 B4043 C1009	9 160 B4044 C1010	10 161 Spirit launched 2003 B4045 C1011	11 162 B4046 C1012	12 163 B4047 C1013	13 164 B4048 C1014
14 165 Earth Mars Solar Conjunction B4049 C1015	15 166 DSN Week 25 B4050 C1016	16 167 B4051 C1017	17 168 B4052 C1018	18 169 Southern Autumnal Equinox C1019	19 170 B4053 C1020	20 171 B4054 C1021
21 172 B4055 C1022	22 173 DSN Week 26 B4056 C1023	23 174 B4057 C1024	24 175 B4058 C1025	25 176 B4059 C1026	26 177 B4060 C1027	27 178 B4061 C1028
28 179 B4062 C1029	29 180 DSN Week 27 B4063 C1030	30 181 B4064 C1031				

Impressive Impact

Just over 11 months after arriving at Mars, Opportunity investigated the site where its heat shield (2.65m dia.), ejected during the landing sequence, and hit the ground south of "Endurance crater." On the left, the main heat shield piece is inverted and reveals its metallic insulation layer, glinting in the sunlight near a second piece of debris in the center. The circular feature on the right side of the image is the crater made by the heat shield's impact. The impact excavated a large amount of reddish subsurface material. Darker materials cover part of the crater's flat floor and have formed a streak or jet of material pointing toward the two largest heat shield fragments.

Components for this approximately true-color mosaic were taken by Opportunity's Panoramic Camera on Sol 330 (December 28th, 2004). Image Credit: NASA/JPL-Caltech/Cornell.



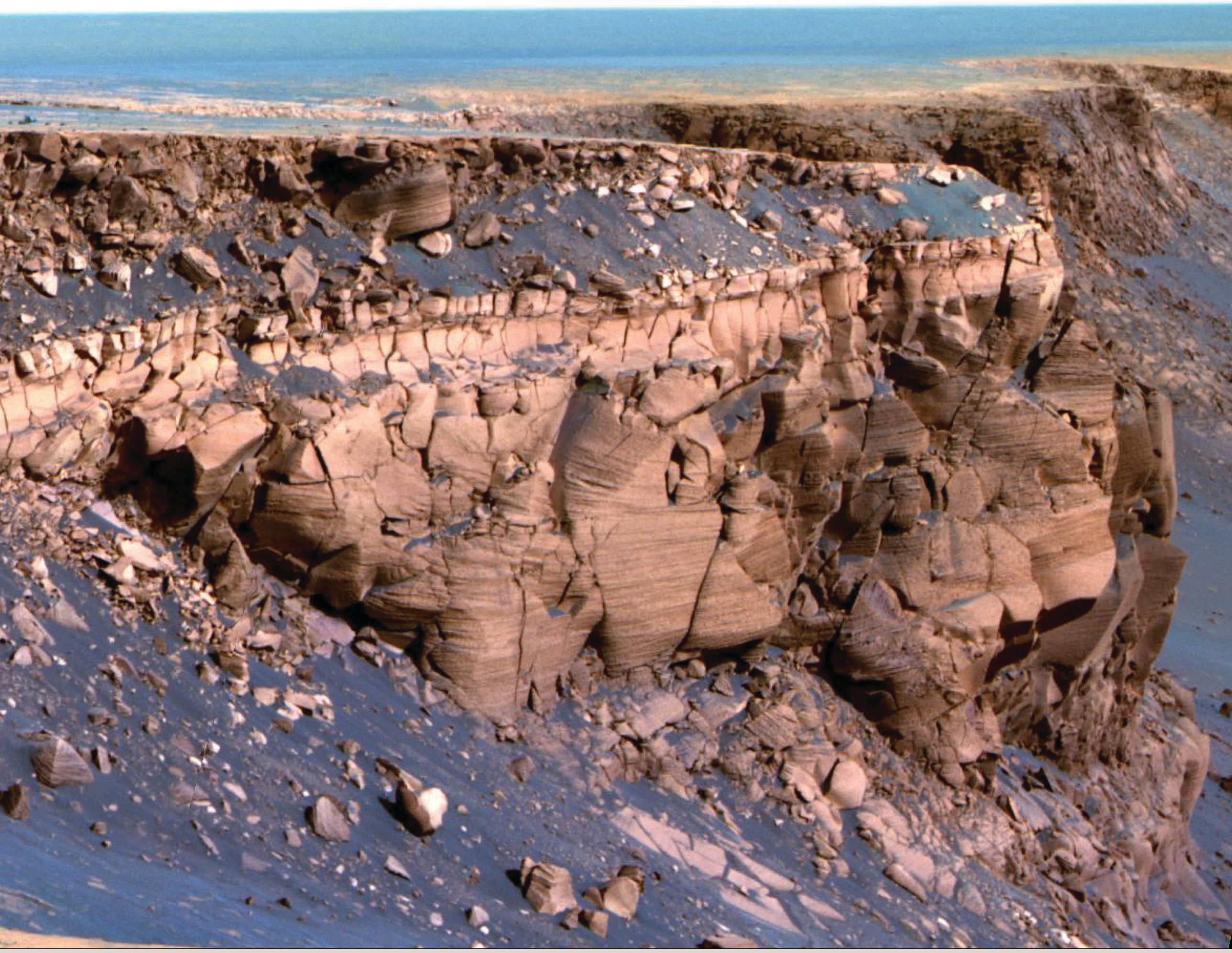
August 1, 2015

July 2015

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			1 182 L_S=6.2° B4065 C1032	2 183 B4066 C1033	3 184 B4067	4 185 Mars Pathfinder/ Sojourner landed 1997 B4068 C1034
5 186 B4069 C1035	6 187 DSN Week 28 B4070 C1036	7 188 Opportunity launched 2003 B4071 C1037	8 189 B4072 C1038	9 190 B4073 C1039	10 191 B4074 C1040	11 192 B4075 C1041
12 193 B4076 C1042	13 194 DSN Week 29 B4077 C1043	14 195 B4078 C1044	15 196 B4079 C1045	16 197 B4080 C1046	17 198 B4081 C1047	18 199 B4082 C1048
19 200 B4083 C1049	20 201 DSN Week 30 B4084 C1050	21 202 B4085 C1051	22 203 B4086 C1052	23 204 B4087 C1053	24 205 B4088 C1054	25 206 C1055
26 207 B4089 C1056	27 208 DSN Week 31 B4090 C1057	28 209 B4091 C1058	29 210 B4092 C1059	30 211 B4093 C1060	31 212 B4094 C1061	

August 2015

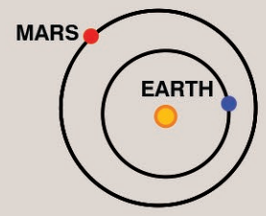
SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
						1 213 L_S=21.0° B4095 C1062
2 214 B4096 C1063	3 215 DSN Week 32 B4097 C1064	4 216 B4098 C1065	5 217 B4099 C1066	6 218 Curiosity landed 2012 B4100 C1067	7 219 B4101 C1068	8 220 B4102 C1069
9 221 B4103 C1070	10 222 DSN Week 33 B4104	11 223 B4105 C1071	12 224 B4106 C1072	13 225 B4107 C1073	14 226 B4108 C1074	15 227 B4109 C1075
16 228 B4110 C1076	17 229 DSN Week 34 B4111 C1077	18 230 B4112 C1078	19 231 B4113 C1079	20 232 B4114 C1080	21 233 B4115 C1081	22 234 B4116 C1082
23 235 B4117 C1083 B4124 C1090	24 236 B4118 C1084 C1091	25 237 B4119 C1085	26 238 B4120 C1086	27 239 B4121 C1087	28 240 B4122 C1088	29 241 B4123 C1089
30 242	31 243					



Layering It On

NASA's Mars Exploration Rover Opportunity captured this image showing "Cape St. Vincent," one of many promontories that jut out from the walls of Victoria crater. The material at the top consists of loose, jumbled rock. A bit further down into the crater, an abrupt transition to solid bedrock is marked by a bright band of rock, visible around the entire crater. Scientists think this bright band represents what used to be the surface of Mars just before an impact formed Victoria crater.

Component false-color images for this mosaic taken by Opportunity's Panoramic Camera on Sol 1,167 (May 6, 2007) to accentuate differences in surface materials. NASA/JPL-Caltech/Cornell



October 1, 2015

September 2015

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
		1 244 L_S=35.3° B4125 C1092	2 245 B4126 C1093	3 246 B4127 C1094	4 247 B4128 C1095	5 248 B4129 C1096
6 249 B4130 C1097	7 250 DSN Week 37 B4131 C1098	8 251 B4132 C1099	9 252 B4133 C1100	10 253 B4134 C1101	11 254 B4135 C1102	12 255 B4136 C1103
13 256 B4137 C1104	14 257 DSN Week 38 B4138 C1105	15 258 B4139 C1106	16 259 B4140	17 260 B4141 C1107	18 261 B4142 C1108	19 262 B4143 C1109
20 263 B4144 C1110	21 264 DSN Week 39 B4145 C1111	22 265 B4146 C1112	23 266 B4147 C1113	24 267 B4148 C1114	25 268 B4149 C1115	26 269 B4150 C1116
27 270 B4151 C1117	28 271 DSN Week 40 B4152 C1118	29 272 B4153 C1119	30 273 B4154 C1120			

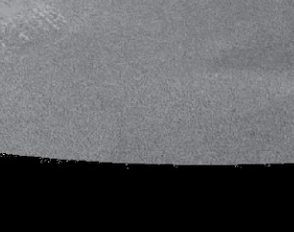
October 2015

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
				1 274 L_S=48.7° B4155 C1121	2 275 B4156 C1122	3 276 B4157 C1123
4 277 B4138 C1124	5 278 DSN Week 41 B4159 C1125	6 279 B4160 C1126	7 280 B4161 C1127	8 281 C1128	9 282 B4162 C1129	10 283 B4163 C1130
11 284 B4164 C1131	12 285 DSN Week 42 B4165 C1132	13 286 B4166 C1133	14 287 B4167 C1134	15 288 B4168 C1135	16 289 B4169 C1136	17 290 B4170 C1137
18 291 B4171 C1138	19 292 DSN Week 43 B4172 C1139	20 293 B4173 C1140	21 294 B4174 C1141	22 295 B4175 C1142	23 296 B4176 C1143	24 297 B4177
25 298 B4178 C1144	26 299 DSN Week 44 B4179 C1145	27 300 B4180 C1146	28 301 B4181 C1147	29 302 B4182 C1148	30 303 B4183 C1149	31 304 B4184 C1150

Foreshadowing Discoveries

NASA's Mars Exploration Rover Opportunity captured this shadowy view from the western rim of "Santa Maria" crater. The crater is about 90 meters (295 feet) in diameter. During the “down time” of solar conjunction (when Earth and Mars are on opposite sides of the Sun and communication is blocked), Opportunity paused to study hydrated sulfates here, on its way to the much larger Endeavor Crater. Hydrated sulfates form in wet conditions, giving scientists clues to whether Mars had environmental conditions favorable to microbial life in its ancient past.

Cylindrical projection of image taken by Opportunity’s Navigation Camera on Sol 2,454 (Dec. 19, 2010). NASA/JPL-Caltech



December 1, 2015

November 2015

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1 305 L_S=62.4° B4185 C1151	2 306 DSN Week 45 B4186 C1152	3 307 B4187 C1153	4 308 B4188 C1154	5 309 B4189 C1155	6 310 B4190 C1156	7 311 B4191 C1157
8 312 B4192 C1158	9 313 DSN Week 46 B4193 C1159	10 314 B4194 C1160	11 315 B4195 C1161	12 316 B4196 C1162	13 317 B4197 C1163	14 318 B4198 C1164
15 319 B4198 C1165	16 320 DSN Week 47 B4199 C1166	17 321 B4200 C1167	18 322 B4201 C1168	19 323 B4202 C1169	20 324 Mars Aphelion B4203 C1170	21 325 B4204 C1171
22 326 B4205 C1172	23 327 DSN Week 48 B4206 C1173	24 328 B4207 C1174	25 329 B4208 C1175	26 330 Curiosity launched 2011 B4209 C1176	27 331 B4210 C1177	28 332 B4211 C1178
29 333 B4212 C1179	30 334 DSN Week 49 B4213					

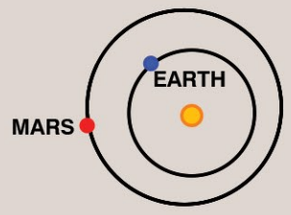
December 2015

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
		1 335 L_S=75.5° B4214 C1180	2 336 B4215 C1181	3 337 B4216 C1182	4 338 B4217 C1183	5 339 B4218 C1184
6 340 B4219 C1185	7 341 DSN Week 50 B4220 C1186	8 342 B4221 C1187	9 343 B4222 C1188	10 344 B4223 C1189	11 345 B4224 C1190	12 346 B4225 C1191
13 347 B4226 C1192	14 348 DSN Week 51 B4227 C1193	15 349 B4228 C1194	16 350 B4229 C1195	17 351 B4230 C1196	18 352 B4231 C1197	19 353 B4232 C1198
20 354 B4233 C1199	21 355 DSN Week 52 C1200	22 356 B4234 C1201	23 357 B4235 C1202	24 358 B4236 C1203	25 359 B4237 C1204	26 360 B4238 C1205
27 361 B4239 C1206	28 362 DSN Week 53 B4240 C1207	29 363 B4241 C1208	30 364 B4242 C1209	31 365 B4243 C1210		

A Winter's Rest

During the Martian winter in late 2011 and early 2012, NASA's Mars Exploration Rover Opportunity spent four months on a northward sloped outcrop, "Greeley Haven," which angled the rover's solar panels toward the Sun low in the northern sky. This break didn't stop it from using its Panoramic Camera to take the 817 component images to make this portion of the breathtaking, 360º false-color panorama, though. North is at the center of the image. Opportunity's tracks can be seen extending from the south, with a turn-in-place and other maneuvers evident from activities to position the rover at the outcrop.

Taken by Opportunity's Panoramic Camera between the 2,811th sol (December 21, 2011) and Sol 2,947 (May 8, 2012). Image Credit: NASA/JPL-Caltech/Cornell/Arizona State Univ.



February 1, 2016

January 2016

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
					1 1 L_S=89.1º B4244 C1211	2 2 B4245 C1212
3 3 Southern Winter Solstice B4246 C1213	4 4 DSN Week 1 Spirit landed 2004 B4247 C1214	5 5 B4248 C1215	6 6 B4249	7 7 B4250 C1216	8 8 B4251 C1217	9 9 B4252 C1218
10 10 B4253 C1219	11 11 DSN Week 2 B4254 C1220	12 12 B4255 C1221	13 13 B4256 C1222	14 14 B4257 C1223	15 15 B4258 C1224	16 16 B4259 C1225
17 17 B4260 C1226	18 18 DSN Week 3 B4261 C1227	19 19 B4262 C1228	20 20 B4263 C1229	21 21 B4264 C1230	22 22 B4265 C1231	23 23 B4266 C1232
24 24 B4267 C1233 B4273 C1240 31 31	25 25 DSN Week 4 Opportunity 12th Earth An6versary B4208 C1234	26 26 B4269 C1235	27 27 B4270 C1236	28 28 C1237	29 29 B4271 C1238	30 30 B4272 C1239

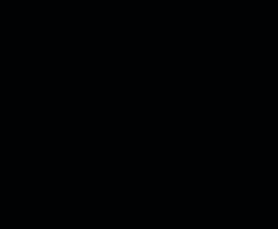
February 2016

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	1 32 DSN Week 5 L_S=102.9º B4274 C1241	2 33 B4275 C1242	3 34 B4276 C1243	4 35 B4277 C1244	5 36 B4278 C1245	6 37 B4279 C1246
7 38 B4280 C1247	8 39 DSN Week 6 B4281 C1248	9 40 B4282 C1249	10 41 B4283 C1250	11 42 B4284 C1251	12 43 B4285 C1252	13 44 B4286
14 45 B4287 C1253	15 46 DSN Week 7 B4288 C1254	16 47 B4289 C1255	17 48 B4290 C1256	18 49 B4291 C1257	19 50 B4292 C1258	20 51 B4293 C1259
21 52 B4294 C1260	22 53 DSN Week 8 B4295 C1261	23 54 B4296 C1262	24 55 B4297 C1263	25 56 B4298 C1264	26 57 B4299 C1265	27 58 B4300 C1266
28 59 B4301 C1267	29 60 DSN Week 9 B4302 C1268					

Playing with Clays

Nearing the ninth anniversary of its landing on Mars, Mars Exploration Rover Opportunity explored “Matijevic Hill.” This area lies within the "Cape York" segment of Endeavour crater's rim, where orbiters previously detected clay minerals known to form in water and to preserve signs of organics, the chemical building blocks of life. The rover studied two features: the dark outcrop "Copper Cliff" (left center), and the bright outcrop "Whitewater Lake" (far right).

Component false-color images for this mosaic taken by Opportunity's Panoramic Camera from the mission's 3,137th sol (Nov. 19, 2012) through Sol 3150 (Dec. 3, 2012). NASA/JPL-Caltech/Cornell/ASU



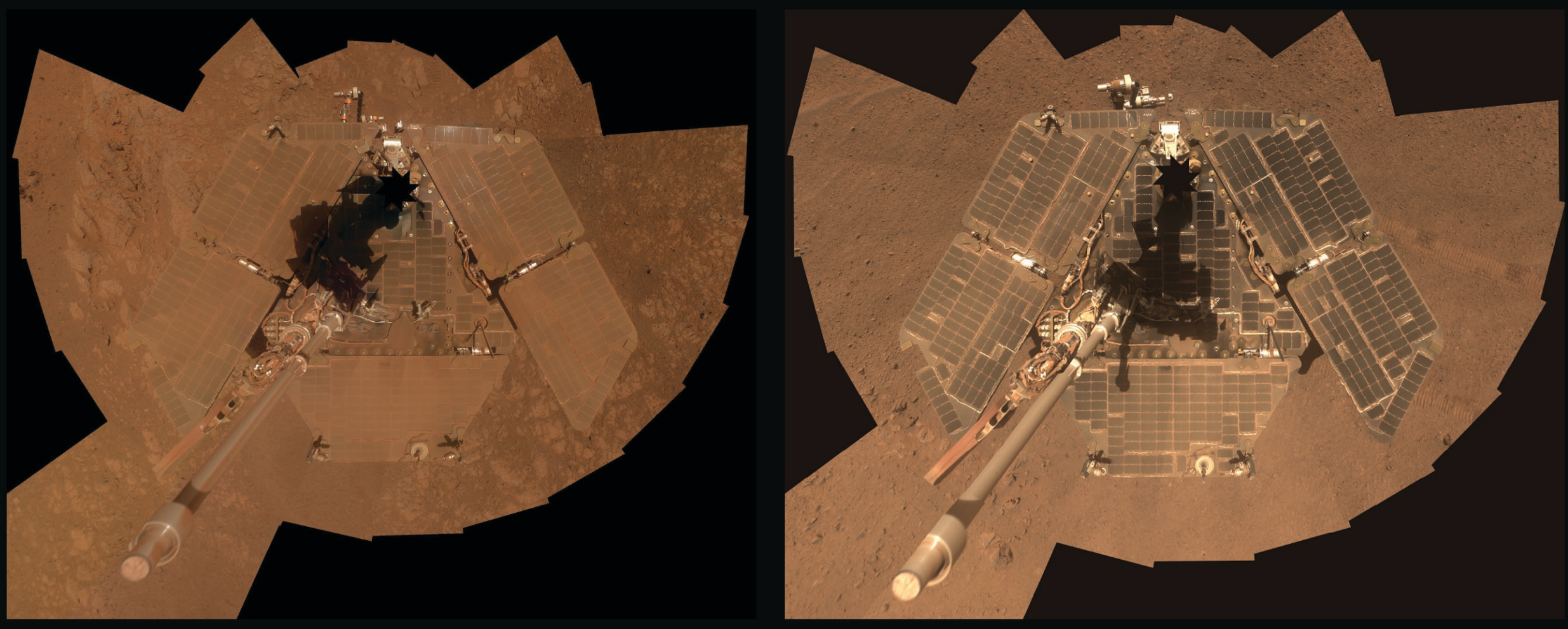
April 1, 2016

March 2016

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
		1 61 L_S=116.1° B4303 C1269	2 62 B4304 C1270	3 63 B4305 C1271	4 64 B4306 C1272	5 65 C1273
6 66 B4307 C1274	7 67 DSN Week 10 B4308 C1275	8 68 B4309 C1276	9 69 B4310 C1277	10 70 B4311 C1278	11 71 B4312 C1279	12 72 B4313 C1280
13 73 B4314 C1281	14 74 DSN Week 11 B4315 C1282	15 75 B4316 C1283	16 76 B4317 C1284	17 77 B4318 C1285	18 78 B4319 C1286	19 79 B4320 C1287
20 80 B4321 C1288	21 81 DSN Week 12 B4322	22 82 Spirit ceased operation 2010 B4323 C1289	23 83 B4324 C1290	24 84 B4325 C1291	25 85 B4326 C1292	26 86 B4327 C1293
27 87 B4328 C1294	28 88 DSN Week 13 B4329 C1295	29 89 B4330 C1296	30 90 B4331 C1297	31 91 B4332 C1298		

April 2016

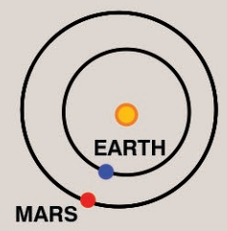
SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
					1 92 L_S=130.7° B4333 C1299	2 93 B4334 C1300
3 94 B4335 C1301	4 95 DSN Week 14 B4336 C1302	5 96 B4337 C1303	6 97 B4338 C1304	7 98 B4339 C1305	8 99 B4340 C1306	9 100 B4341 C1307
10 101 B4342 C1308	11 102 DSN Week 15 B4343 C1309	12 103 C1310	13 104 B4344 C1311	14 105 B4345 C1312	15 106 B4346 C1313	16 107 B4347 C1314
17 108 B4348 C1315	18 109 DSN Week 16 B4349 C1316	19 110 B4350 C1317	20 111 B4351 C1318	21 112 B4352 C1319	22 113 B4353 C1320	23 114 B4354 C1321
24 115 B4355 C1322	25 116 DSN Week 17 B4356 C1323	26 117 B4357 C1324	27 118 B4358	28 119 B4359 C1325	29 120 B4360 C1326	30 121 B4361 C1327



Dirty and Clean Selfies

These two self-portraits of NASA's Mars Exploration Rover Opportunity show dust on its solar panels before and after a “cleaning event,” when the Martian wind removes dust build up. Cleaner panels give the rover a longer lifespan by increasing available power. Prior to this dust removal in its sixth Martian winter, engineers needed to place the rover on an extreme northward tilt to provide necessary power for the rover to operate. With this cleaning event, Opportunity regained power levels only seen years before, allowing it to expand its discoveries about wet environments on ancient Mars.

Taken by Opportunity’s Panoramic Camera on Sols 3,535 - 3,538 (January 3-6, 2014; left) and Sols 3,611 - 3613 (March 22-24, 2014; right). NASA/JPL-Caltech/Cornell/ASU



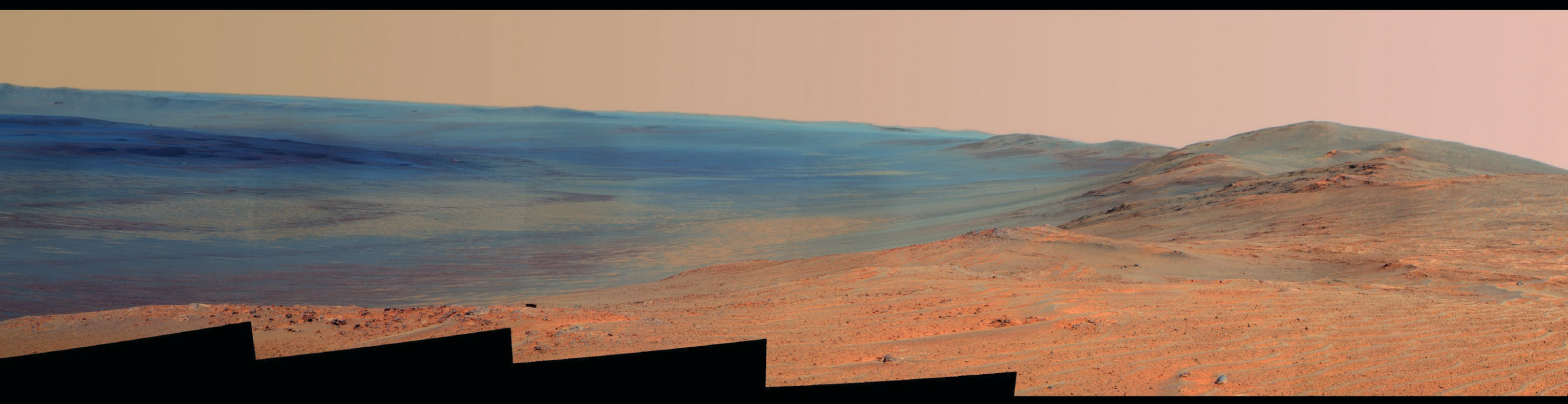
June 1, 2016

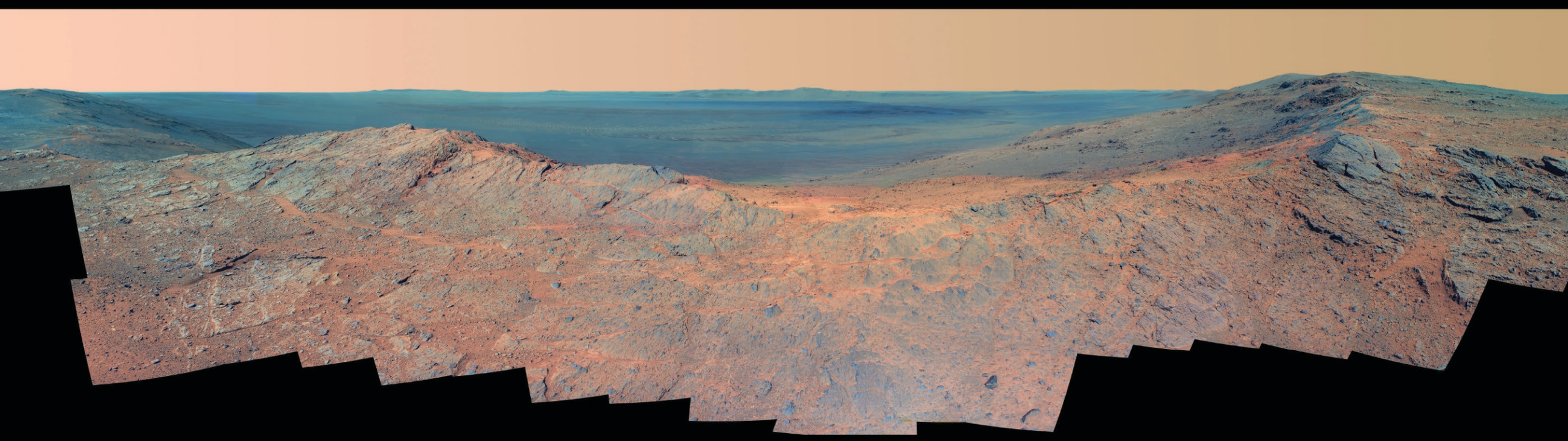
May 2016

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
1 122 L_S=145.5° B4362 C1328	2 123 DSN Week 18 B4363 C1329	3 124 B4364 C1330	4 125 B4365 C1331	5 126 B4366 C1332	6 127 B4367 C1333	7 128 B4368 C1334
8 129 B4369 C1335	9 130 DSN Week 19 B4370 C1336	10 131 B4371 C1337	11 132 B4372 C1338	12 133 B4373 C1339	13 134 B4374 C1340	14 135 B4375 C1341
15 136 B4376 C1342	16 137 DSN Week 20 B4377 C1343	17 138 B4378 C1344	18 139 B4379 C1345	19 140 C1346	20 141 B4380 C1347	21 142 B4381 C1348
22 143 Earth Mars Opposition B4382 C1349	23 144 DSN Week 21 B4383 C1350	24 145 B4384 C1351	25 146 B4385 C1352	26 147 B4386 C1353	27 148 B4387 C1354	28 149 B4388 C1355
29 150 B4389 C1356	30 151 DSN Week 22 B4390 C1357	31 152 B4391 C1358				

June 2016

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
			1 153 L_S=161.6° B4392 C1299	2 154 B4393 C1300	3 155 B4394 C1301	4 156 B4395
5 157 B4396 C1359	6 158 DSN Week 23 B4397 C1360	7 159 B4398 C1361	8 160 B4399 C1362	9 161 B4400 C1363	10 162 Spirit launched 2003 B4401 C1364	11 163 B4402 C1365
12 164 B4403 C1366	13 165 DSN Week 24 B4404 C1367	14 166 B4405 C1368	15 167 B4406 C1369	16 168 B4407 C1370	17 169 B4408 C1371	18 170 B4409 C1372
19 171 B4410 C1373	20 172 DSN Week 25 B4411 C1374	21 173 B4412 C1375	22 174 B4413 C1376	23 175 B4414 C1377	24 176 B4415 C1378	25 177 C1379
26 178 B4416 C1380	27 179 DSN Week 26 B4417 C1381	28 180 B4418 C1382	29 181 B4419 C1383	30 182 B4420 C1384		





Stunning Vistas!

NASA's Mars Exploration Rover Opportunity captured these stunning vistas from the western rim of Endeavour crater. The top view is from the southern end of "Murray Ridge"—the rover's home for its sixth Martian winter. The lower image provides a view of "Pillinger Point"—a destination for Opportunity because observations from orbit indicated the presence of a clay mineral named montmorillonite. This mineral forms under wet conditions and may be a clue to whether Mars once had conditions for microbial life in its ancient past.

Component false-color images for these mosaics taken by Opportunity's Panoramic Camera. Top image taken on Sol 3637 (April 18, 2014), and bottom image on Sol 3,663 (May 14, 2014).
NASA/JPL-Caltech/Cornell/ASU

August 1, 2016

July 2016

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
					1 183 L_S=177.9° B4421 C1388	2 184 B4422 C1389
3 185 B4423 C1390	4 186 DSN Week 27 Southern Spring Equinox B4424 C1391	5 187 B4425 C1392	6 188 B4426 C1393	7 189 Opportunity launched 2003 B4427 C1394	8 190 B4428 C1395	9 191 B4429 C1396
10 192 B4430 C1397	11 193 DSN Week 28 B4431	12 194 B4432 C1398	13 195 B4433 C1399	14 196 B4434 C1400	15 197 B4435 C1401	16 198 B4436 C1402
17 199 B4437 C1403	18 200 DSN Week 29 B4438 C1404	19 201 B4439 C1405	20 202 B4440 C1406	21 203 B4441 C1407	22 204 B4442 C1408	23 205 B4443 C1409
206 24 B4444 C1410 B4451 C1417	25 207 DSN Week 30 B4445 C1411	26 208 B4446 C1412	27 209 B4447 C1413	28 210 B4448 C1414	29 211 B4449 C1415	30 212 B4450 C1416
31 213						

August 2016

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
	1 214 DSN Week 31 L_S=195.8° B4452 C1418	2 215 B4419 C1419	3 216 B4453 C1420	4 217 B4454 C1421	5 218 B4455 C1422	6 219 Curiosity landed 2012 B4456 C1423
7 220 B4457 C1424	8 221 DSN Week 32 B4458 C1425	9 222 B4459 C1426	10 223 B4460 C1427	11 224 B4461 C1428	12 225 B4462 C1429	13 226 B4463 C1430
14 227 B4464 C1431	15 228 DSN Week 33 B4465 C1432	16 229 B4466 C1433	17 230 B4467 C1434	18 231 B4468	19 232 B4469 C1435	20 233 B4470 C1436
21 234 B4471 C1437	22 235 DSN Week 34 B4472 C1438	23 236 B4473 C1439	24 237 B4474 C1440	25 238 B4475 C1441	26 239 B4476 C1442	27 240 B4477 C1443
28 241 B4478 C1444	29 242 DSN Week 35 B4479 C1445	30 243 B4480 C1446	31 244 B4481 C1447			

Tracking Our Progress

NASA's Mars Exploration Rover Opportunity looked back toward the west rim of Endeavour crater, where the rover drove, heading southward during the summer of 2014. The high point on the rim (left half of the image) is the southern end of "Murray Ridge." Tracks from drives from mid-July 2014 are faintly visible near there; tracks from subsequent drives advance to the foreground. The most distant visible tracks are from nearly half a mile prior to Opportunity's arrival here.

Component false-color images for this mosaic taken by Opportunity's Panoramic Camera on Sol 3,754 (August 15, 2014) to enhance the visibility of the wheel tracks. NASA/JPL-Caltech/Cornell/ASU

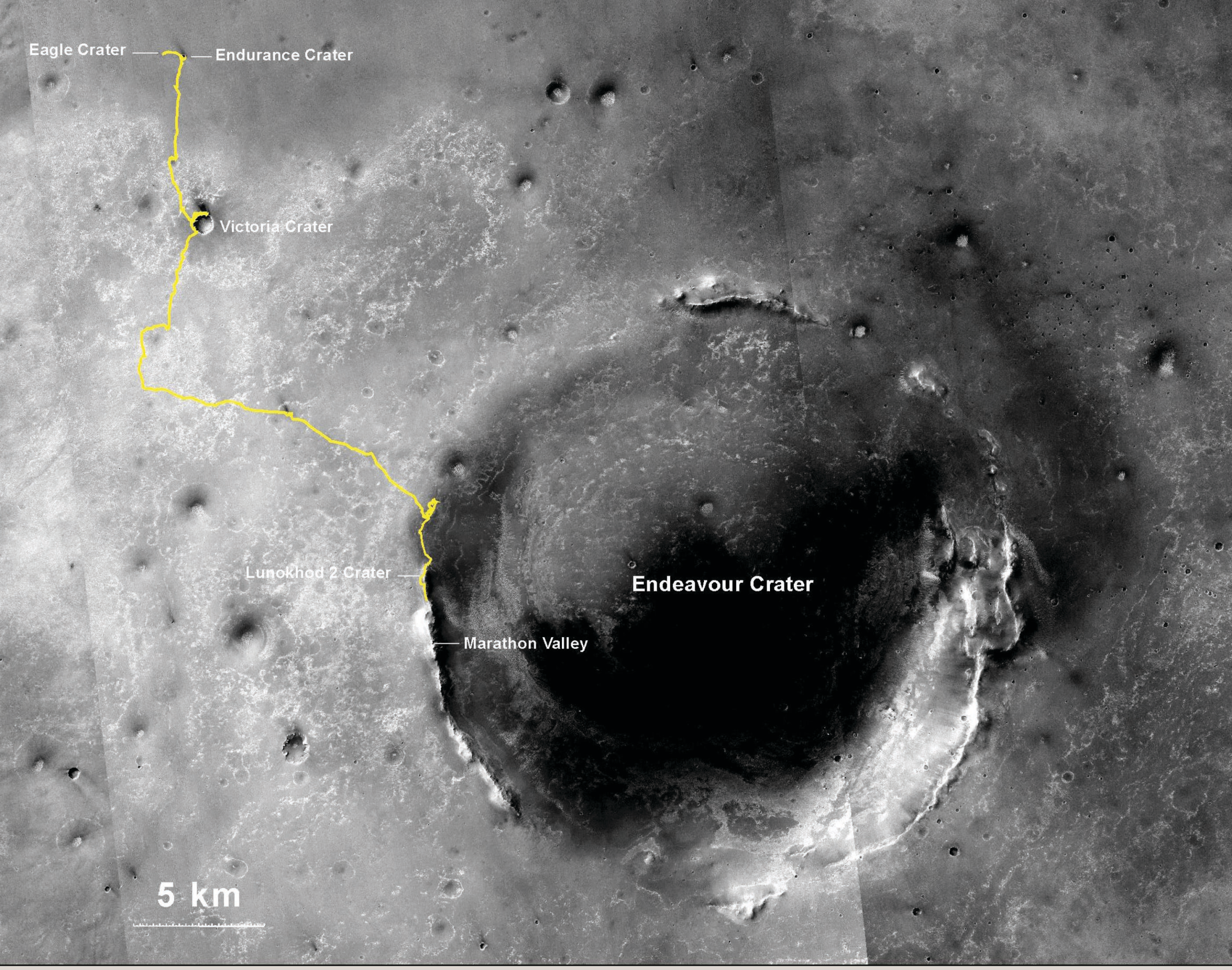
October 1, 2016

September 2016

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
				1 245 L_S=214.4° B4482 C1448	2 246 B4483 C1449	3 247 B4484 C1450
4 248 B4485 C1451	5 249 DSN Week 36 B4486 C1452	6 250 B4487 C1453	7 251 B4488 C1454	8 252 C1455	9 253 B4489 C1456	10 254 B4490 C1457
11 255 B4491 C1458	12 256 DSN Week 37 B4492 C1459	13 257 B4493 C1460	14 258 B4494 C1461	15 259 B4495 C1462	16 260 B4496 C1463	17 261 B4497 C1464
18 262 B4498 C1465	19 263 DSN Week 38 B4499 C1466	20 264 B4500 C1467	21 265 B4501 C1468	22 266 B4502 C1469	23 267 B4503 C1470	24 268 B4504
25 269 B4505 C1471	26 270 DSN Week 39 B4506 C1472	27 271 B4507 C1473	28 272 B4508 C1474	29 273 B4509 C1475	30 274 B4510 C1476	

October 2016

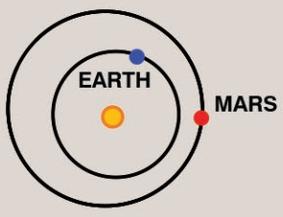
SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
						1 275 L_S=233.1° B4511 C1477
2 276 B4512 C1478	3 277 DSN Week 40 B4513 C1479	4 278 B4514 C1480	5 279 B4515 C1481	6 280 B4516 C1482	7 281 B4517 C1483	8 282 B4518 C1484
9 283 B4519 C1485	10 284 DSN Week 41 B4520 C1486	11 285 B4521 C1487	12 286 B4522 C1488	13 287 B4523 C1489	14 288 B4524 C1490	15 289 C1491
16 290 B4525 C1492	17 291 DSN Week 42 B4526 C1493	18 292 B4527 C1494	19 293 B4528 C1495	20 294 B4529 C1496	21 295 B4530 C1497	22 296 B4531 C1498
23 297 B4532 C1499 B4539 C1506	24 298 B4533 C1500 B4540	25 299 DSN Week 43 B4534 C1501	26 300 B4535 C1502	27 301 B4536 C1503	28 302 B4537 C1504	29 303 Mars Perihelion B4538 C1505
30 304	31 305					



Record-Breaking Drive!

NASA's Mars Exploration Rover Opportunity now holds our solar system's distance record for off-Earth driving! On its 3,735th Martian sol (July 27, 2014). the rover drove 157 feet, bringing its total odometry to 40.25 kilometers (25.01 miles). The previous record holder was the Soviet Union's Lunokhod 2 rover, which landed on Earth's moon on Jan. 15, 1973 and drove about 39 kilometers (24.2 miles) in less than five months. The gold line shows Opportunity's route from its landing site inside Eagle Crater (upper left) to its location after the Sol 3,735 drive. The rover has been investigating the western rim of Endeavour Crater since August, 2011.

Traverse map of Opportunity's journey on Mars; base map: Context Imager on Mars Reconnaissance Orbiter. NASA/JPL-Caltech/MSSS/New Mexico Museum of Natural History & Science



December 1, 2016

November 2016

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
		1 306 L_S=252.7° B4541 C1507	2 307 B4542 C1508	3 308 B4543 C1509	4 309 B4544 C1510	5 310 B4545 C1511
6 311 B4546 C1512	7 312 DSN Week 45 B4547 C1513	8 313 B4548 C1514	9 314 B4549 C1515	10 315 B4550 C1516	11 316 B4551 C1517	12 317 B4552 C1518
13 318 B4553 C1519	14 319 DSN Week 46 B4554 C1520	15 320 B4555 C1521	16 321 B4556 C1522	17 322 B4557 C1523	18 323 B4558 C1524	19 324 B4559 C1525
20 325 B4560 C1526	21 326 DSN Week 47 B4561 C1527	22 327 C1528	23 328 B4562 C1529	24 329 B4563 C1530	25 330 B4564 C1531	26 331 Curiosity launched 2011 B4565 C1532
27 332 B4566 C1533	28 333 DSN Week 48 Southern Summer Solstice B4567 C1534	29 334 B4568 C1535	30 335 B4569 C1536			

December 2016

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
				1 336 L_S=271.7° B4570 C1537	2 337 B4571 C1538	3 338 B4572 C1539
4 339 B4573 C1540	5 340 DSN Week 49 B4574 C1541	6 341 B4575 C1542	7 342 B4576 C1543	8 343 B4577	9 344 B4578 C1544	10 345 B4579 C1545
11 346 B4580 C1546	12 347 DSN Week 50 B4581 C1547	13 348 B4582 C1548	14 349 B4583 C1549	15 350 B4584 C1550	16 351 B4585 C1551	17 352 B4586 C1552
18 353 B4587 C1553	19 354 DSN Week 51 B4588 C1554	20 355 B4589 C1555	21 356 B4590 C1556	22 357 B4591 C1557	23 358 B4592 C1558	24 359 B4593 C1559
25 360 B4594 C1560	26 361 DSN Week 52 B4595 C1561	27 362 B4596 C1562	28 363 B4597 C1563	29 364 C1564	30 365 B4598 C1565	31 366 B4599 C1566

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 - 41+ kilometers (25+ miles)
Images Sent to Earth	Spirit - 125,000 Opportunity - 186,000+

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

JPL 400-0000 12/14

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