The Lunar 100

Finding Messier objects is something that telescope users do quite often but this is really a winter occupation because summer skies, certainly as far north as Inverness, are so light at night. However, one object that is easily visible at night throughout the year is the Moon.

Many amateurs are able to find the most conspicuous features on the Moon but to really appreciate our nearest neighbour it would help to have a guide that identifies many of the smaller and less well-known features as well.

The Lunar 100 is a list compiled by Charles Wood writing in the Sky and Telescope magazine that attempts to provide a selection of 100 of the most interesting telescopic sights. This list will hopefully awaken interest in, and enhance the understanding of, these various lunar features.

The objects in the Lunar 100 are arranged from the easiest to see to the most difficult. It is not possible to view all the features in a single night or even over a single month. Some lunar sights can be observed only with grazing solar illumination, while others have to be seen during the full Moon. Other features are positioned close to the lunar limb and need a favourable libration to bring them into view.

The first few objects should also be visible with binoculars. Most can be seen with a 3" telescope but a few will require a 6" or 8" telescope. At this point, those of you who wish to continue searching for these more difficult objects should contact either someone with a larger telescope, or ask a member of the Committee for the use of the Society telescope.

Craters are different sizes because the meteors and comets that form them are of different sizes. The smaller craters are simple bowl shaped depressions, e.g. Mosting (**L61**). As they grow in size the crater wall often collapses and a central peak is produced. Large craters appear as concentric circles and the central peak becomes a series of complex mountains, e.g. Copernicus (**L5**). Debris can often be seen after it has been thrown out of these craters perhaps forming rays, e.g. Tycho (**L6**), Linne (**L82**) or the pit-peppered surface east of Copernicus (**L5**).

The largest craters are known as impact basins and some of the arcuate mountains are simply the rims of these impact basins, e.g. the Apennine (**L4**), Altai (**L7**) and Leibnitz (**L96**) mountains. The most prominent of a series of radial fractures and secondary crater chains found around many basins, are the Alpine Valley (**L19**) and Rheita Valley (**L58**). Many craters overlie others, destroying part of the older crater in the process, e.g. the ruined craters of Boscovich and Julius Caesar (**L63**) also J. Herschel, Babbage and W. Bond (**L76**).

Basin forming impacts created fractures, which allowed magma to escape and fill them. The weight of the lavas caused the basin floors to subside, particularly at the edges, thus forming concentric rilles such as those near Hippalus crater (**L54**). Compressional forces folded some lava flows producing mare ridges, e.g. the Serpentine Ridge (**L33**).
A rille is a linear or curvilinear surface depression. Sinuous rilles are characterised as meandering channels of small width and sloping sides. Arcuate rilles have flat floors between steep sided walls and occur in parallel sets.

Lavas erupted over hundreds of millions of years in some basins so their chemical compositions varied over time and this can even be seen in the colour of some of the lava flows, e.g. the dark lava around south-eastern Serenitatis (**L18**).

As magma rose to the surface, it tilted and cracked some crater floors, e.g. Gassendi (**L13**), Posidonius (**L20**) and Taruntius (**L31**). Other craters were completely filled by mare lavas, e.g. Archimedes (**L27**). Some lavas flowed for a hundred kilometres (**L98**) and those flowing downhill produced snakelike channels, e.g. the Hadley Rille (**L66**) and the rilles north of Prinz (**L86**).

In some regions, lava erupted slowly onto the surface and cooled without flowing far, thus forming circular mounds or domes which appear to be concentrated in certain areas, e.g. near crater Hortensius (**L65**), Arago (**L32**) and west of the crater Marius (**L42**).

The Apollo 14 astronauts landed in the Fra Mauro region (**L67**). The Apollo 15 landing site was in the region of the Hadley Rille (**L66**)

Completing the L100 will introduce the viewer to a wide range of geological features found on the Moon's surface, many of which have parallels on Earth. You should find this exercise an enjoyable and rewarding experience.

Summarised from the Lunar 100 article in Sky and Telescope April 2004.

The Lunar 100

No.	Feature Name	Significance	✓
1	Moon	Large satellite	
2	Earthshine	Twice reflected sunlight	
3	Mare/highland dichotomy	Two materials with distinct compositions	
4	Apennines	Imbrium basin rim	
5	Copernicus	Archetypal large complex crater	
6	Tycho	Large rayed crater with impact melts	
7	Altai Scarp	Nectaris basin rim	
8	Theophilus, Cyrillus, Catharina	Crater sequence illustrating stages of degradation	
9	Clavius	Lacks basin features in spite of its size	
10	Mare Crisium	Mare contained in large circular basin	
11	Aristarchus	Very bright crater with dark bands on its walls	
12	Proclus	Oblique-impact rays	
13	Gassendi	Floor-fractured crater	
14	Sinus Iriuum	Very large crater with missing rim	
15	Straight Wall	Best example of a lunar fault	
16	Petavius	Crater with domed and fractured floor	
17	Schroter's Valley	Giant sinuous rille	
18	Mare Serenitatis dark edges	Distinct mare areas with different compositions	
19	Alpine Valley	Lunar graben	
20	Posidonius	Floor-fractured crater	
21	Fracastorius	Crater with subsided and fractured floor	
22	Aristarchus Plateau	Mysterious uplifted region mantled with pyroclastics	
23	Pico	Isolated Imbrium basin-ring fragment	
24	Hyginus Rille	Rille containing rimless collapse pits	
25	Messier and Messier A	Oblique ricochet-impact pair	
26	Mare Frigoris	Arcuate mare of uncertain origin	
27	Archimedes	Large crater lacking central peak	
28	Hipparchus	Subject of first drawing of a single crater	
29	Aridaeus Rille	Long, linear graben	
30	Schiller	Possible oblique impact	
31	Taruntius	Young floor-fractured crater	
32	Arago Alpha and Beta	Volcanic domes	
33	Serpentine Ridge	Basin inner-ring segment	
34	Lacus Mortis Triesnecker Rilles	Strange crater with rille and ridge	
35	Triesnecker Rilles	Rille family	
36	Grimaldi basin	A small two-ring basin	
37	Bailly	Barely discernible basin	
38	Sabine and Ritter	Possible twin impacts	
39	Schickard	Crater floor with Orientale basin ejecta stripe	
40	Janssen Rille	Rare example of a highland rille	
41	Bessel ray	Ray of uncertain origin near Bessel	
42	Marius Hills	Complex of volcanic domes and hills	
43	Wargentin	A crater filled to the rim with lava or ejecta	
44	Mersenius	Domed floor cut by secondary craters	
45	Maurolycus	Region of saturation cratering	
46	Regiomontanus central peak	Possible volcanic peak	
47	Alphonsus dark spots	Dark-halo eruptions on crater floor	
48	Cauchy region	Fault, rilles and domes	
49	Gruithuisen Delta and Gamma	Volcanic domes formed with viscous lavas	
50	Cayley Plains	Light, smooth plains of uncertain origin	

No.	Feature Name	Significance	✓
51	Davy crater chain	Result of comet-fragment impacts	
52	Cruger	Possible volcanic caldera	
53	Lamont	Possible buried basin	
54	Hippalus Rilles	Rilles concentric to Humorum basin	
55	Baco	Unusually smooth crater floor and surrounding plains	
56	Mare Australe	A partially flooded ancient basin	
57	Reiner Gamma	Conspicuous swirl and magnetic anomaly	
58	Rheita Valley	Basin secondary-crater chain	
59	Schiller-Zucchius basin	Badly degraded overlooked basin	
60	Kies Pi	Volcanic dome	
61	Mosting A	Simple crater close to centre of lunar near side	
62	Rumker Hills	Large volcanic dome	
63	Imbrium sculpture	Basin ejecta near and overlying Boscovich and Julius Caesar	
64	Descartes	Apollo 16 landing site; putative region of highland volcanism	
65	Hortensius domes	Dome field north of Hortensius	
66	Hadley Rille	Lava channel near Apollo 15 landing site	
67	Fra Mauro formation	Apollo 14 landing site on Imbrium ejecta	
68	Flamsteed P	Proposed young volcanic crater; Surveyor 1 landing site	
69	Copernicus secondary craters	Rays and craterlets near Pytheas	
70	Humboldtianum basin	Multi-ring impact basin	
71	Sulpicius Gallus dark mantle	Ash eruptions northwest of crater	
72	Atlas dark-halo craters	Explosive pits on the floor of Atlas	
73	Smythii basin	Difficult-to-observe basin scarp and mare	
74	Copernicus H	Dark-halo impact crater	
75	Ptolemaeus B	Saucerlike depression on the floor of Ptolemaeus	
76	W. Bond	Large crater degraded by Imbrium ejecta	
77	Sirsalis Rille	Procellarum basin radial rilles	
78	Lambert R	A buried “ghost” crater	
79	Sinus Aestuum	Eastern dark-mantle volcanic deposit	
80	Orientale basin	Youngest large impact basin	
81	Hesiodus A	Concentric crater	
82	Linne	Small crater once thought to have disappeared	
83	Plato craterlets	Crater pits at limits of detection	
84	Pitatus	Crater with concentric rilles	
85	Langrenus rays	Aged ray system	
86	Prinz Rilles	Rille system near the Prinz	
87	Humboldt	Crater with central peaks and dark spots	
88	Peary	Difficult-to-observe polar crater	
89	Valentine Dome	Volcanic dome	
90	Armstrong, Aldrin and Collins	Small craters near the Apollo 11 landing site	
91	De Gasparis Rilles	Area with many rilles	
92	Gylden Valley	Part of Imbrium radial sculpture	
93	Dionysius rays	Unusual and rare dark rays	
94	Drygalski	Large south-pole region crater	
95	Procellarum basin	The Moon’s biggest basin?	
96	Leibnitz Mountains	Rim of South Pole-Aitken basin	
97	Inghirami Valley	Orientale basin ejecta	
98	Imbrium lava flows	Mare lave-flow boundaries	
99	Ina caldera	D-shaped young volcanic caldera	
100	Mare Marginis swirls	Possible magnetic-field deposits	

A map with all 100 objects described in these sheets is available in PDF format on www.spacegazer.com/library.asp in the “Astronomy Projects” folder