Snake River Skies

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President's Message

Last month's picnic turned out to be a great success! It has been a long time since we could just get together, talk and laugh. A big thanks to the cooks and everyone who brought the salads and deserts. All was delicious!

We were going to do a mirror cleaning demo using collodion but there just wasn't time. We may try to put together a mirror cleaning day where anyone with a dirty mirror can get it cleaned using the no-touch collodion method.

When would you like to reserve the Centennial Observatory just for members and friends? Besides viewing we can learn about the various cameras and how to become an operator and be able to reserve the observatory for yourself.

Our speaker for this month is Dr. Candace Wright, astronomy and physics teacher at the Twin Falls High School. The topic is "Exo-Planets", the planets discovered outside our own solar system. I wonder if she will mention anything about the shake up in our own solar system.

Editor's corner

Instead of our usual picture, we have an article by Chris Anderson about how to chose the best time to image any of the Messier objects.

This next meeting promises to be one of the most informative of all meetings this year. I hope I see you there!

Picking the Best Dates for Imaging Messier Objects

Chris Anderson, Coordinator
Centennial Observatory

Anyone who has spent much time doing long-exposure (or stacked, multi-exposure) astrophotography has probably asked themselves this question: On which night of the year will my target be above the horizon for the greatest number of nighttime hours? Having recently faced this problem myself, I thought it would be useful to compile a list of the dates on which targets are transiting (or at upper culmination in the case of circumpolar objects) at midnight, and what better target list to start with than the Messier catalog?

Now it's important to recognize that when I say "midnight," I don't mean when your watch reads 12:00am. Because of various factors like daylight saving time, distance from the central meridian of the Mountain Time Zone, and the equation of time (the amount that the sun runs fast or slow during various times of the year due to the Earth's tilted axis and elliptical orbit), the sun is actually *never* at its lowest point below our local horizon when your watch reads 12:00am. (As you'll see below, in south-central Idaho "midnight" never falls in the middle of the night!)

So step one was to figure out at what time local apparent midnight (LAM) occurs throughout the year. To do this, I used Software Bisque's "The Sky," and went through the year day by day (actually night by night). LAM on a given date was found by adjusting the time until the sun's hour angle (angle from the local meridian) was exactly 12 hours. The results appear in figure 1. Several features of this chart should be noted: 1) The wavy shape of the curve is due to the equation of time. Its jaggy appearance is because I was too lazy to record the time of LAM to the nearest second. 2) The big stair step jumps are due to daylight saving time. 3) The fact that LAM never falls at 12:00am is due to our westerly location within the Mountain Time Zone. 4) This chart was generated for 2006, but it should work fine for any year (including leap years) as long as you aren't trying to determine the time of LAM to the exact minute, and keeping in mind the dates that daylight saving time starts and ends change next year. For that matter, the "month" tic marks are spaced 30.4 days apart (the average length of a month), so the tic marks that indicate the start and end of months are only approximate.

Step two was to find when the Messier objects were transiting/upper culminating at the times in figure 1. The results are in tables 1 and 2. Table 1 lists the Messier objects in order, for those who have a particular target in mind and want to plan the best date to image it. Table 2 lists them chronologically, so if you're already planning a night of astrophotography but you haven't chosen a target yet, you can find the M-objects that will be in prime position for long exposure imaging.

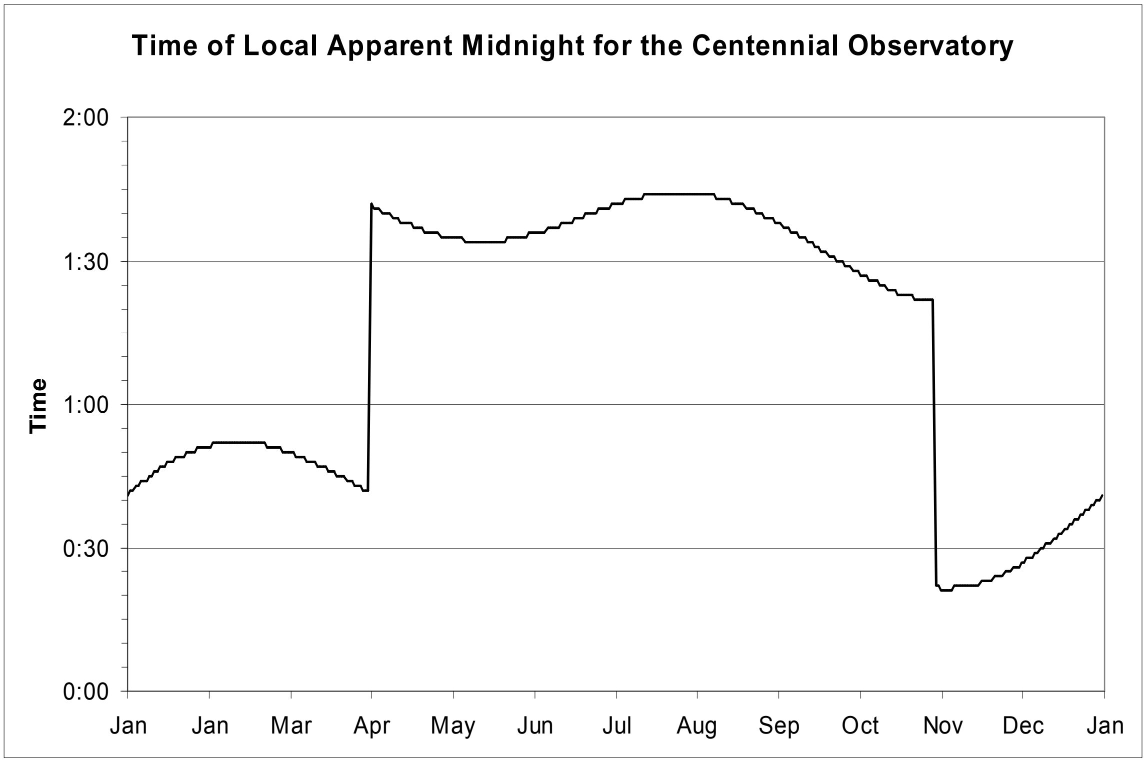


Figure 1. The time that a clock reads at Local Apparent Midnight as seen from the Centennial Observatory.

If you have a non-moving (i.e. non-solar system) target in mind that isn't a Messier object, then refer back to Table 2. It also lists the local sidereal time (LST) at LAM throughout the year. Simply find the date on which the LST at LAM is closest to your target's Right Ascension, and that's the date it will spend the most time above the horizon in darkness. You can use the blank space to write in your favorite NGC/IC, Caldwell object, etc. (provided the space isn't already occupied by M-numbers). Just don't forget to take the Moon phase into account when planning your imaging session.

Now there may be a few astrophotographers among us who have a particular quarry in mind and want to know when is the best time to pursue it for a full night of long-exposure imaging. But I suspect that these tables will be more useful for those who have a night planned to do some imaging, but haven't really thought much about which target they want to go after. In that case, Table 2 can "suggest" one or more. Enjoy!

Table 1: Dates when the Messier Objects Transit or Upper Culminate at Local Apparent Midnight

M-obj	Date	LAM		M-obj	Date	LAM		M-obj	Date	LAM
M1	16-Dec	0:33		M38	15-Dec	0:33		M75	22-Jul	1:44
M2	14-Aug	1:43		M39	13-Aug	1:43		M76	21-Oct	1:23
M3	17-Apr	1:38		M40	27-Mar	0:43		M77	5-Nov	0:21
M4	29-May	1:35		M41	1-Jan	0:41		M78	19-Dec	0:35
M5	13-May	1:34		M42	16-Dec	0:33		M79	14-Dec	0:32
M6	16-Jun	1:38		M43	16-Dec	0:33		M80	27-May	1:35
M7	20-Jun	1:39		M44	27-Jan	0:51		M81	15-Feb	0:52
M8	22-Jun	1:40		M45	21-Nov	0:24		M82	15-Feb	0:52
M9	11-Jun	1:37		M46	13-Jan	0:47		M83	16-Apr	1:38
M10	6-Jun	1:36		M47	12-Jan	0:46		M84	27-Mar	0:43
M11	4-Jul	1:42		M48	21-Jan	0:49		M85	27-Mar	0:43
M12	4-Jun	1:36		M49	29-Mar	0:43		M86	28-Mar	0:43
M13	2-Jun	1:36		M50	5-Jan	0:43		M87	29-Mar	0:43
M14	16-Jun	1:38		M51	14-Apr	1:38		M88	29-Mar	0:43
M15	13-Aug	1:43		M52	13-Sep	1:34		M89	30-Mar	0:42
M16	26-Jun	1:41		M53	9-Apr	1:40		M90	31-Mar	0:42
M17	26-Jun	1:41		M54	4-Jul	1:42		M91	30-Mar	0:42
M18	26-Jun	1:41		M55	15-Jul	1:44		M92	11-Jun	1:37
M19	7-Jun	1:37		M56	10-Jul	1:43		M93	14-Jan	0:47
M20	22-Jun	1:40		M57	4-Jul	1:42		M94	3-Apr	1:41
M21	22-Jun	1:40		M58	31-Mar	0:42		M95	28-Feb	0:50
M22	30-Jun	1:41		M59	1-Apr	0:42		M96	1-Mar	0:50
M23	20-Jun	1:39		M60	1-Apr	0:42		M97	8-Mar	0:49
M24	26-Jun	1:41		M61	26-Mar	0:44		M98	24-Mar	0:44
M25	29-Jun	1:41		M62	7-Jun	1:37		M99	26-Mar	0:44
M26	2-Jul	1:42		M63	10-Apr	1:39		M100	27-Mar	0:43
M27	20-Jul	1:44		M64	5-Apr	1:41		M101	23-Apr	1:36
M28	27-Jun	1:41		M65	9-Mar	0:48		M102	10-May	1:34
M29	26-Jul	1:44		M66	10-Mar	0:48		M103	18-Oct	1:23
M30	16-Aug	1:42		M67	30-Jan	0:51		M104	31-Mar	0:42
M31	5-Oct	1:26		M68	31-Mar	0:42		M105	1-Mar	0:50
M32	5-Oct	1:26		M69	29-Jun	1:41		M106	26-Mar	0:44
M33	19-Oct	1:23		M70	2-Jul	1:42		M107	31-May	1:36
M34	5-Nov	0:21		M71	19-Jul	1:44		M108	7-Mar	0:49
M35	24-Dec	0:37		M72	3-Aug	1:44		M109	20-Mar	0:45
M36	16-Dec	0:33		M73	5-Aug	1:44		M110	4-Oct	1:27
M37	20-Dec	0:35		M74	19-Oct	1:23				

Table 2: Dates when the Messier Objects Transit or Upper Culminate at Local Apparent Midnight, Chronological Order

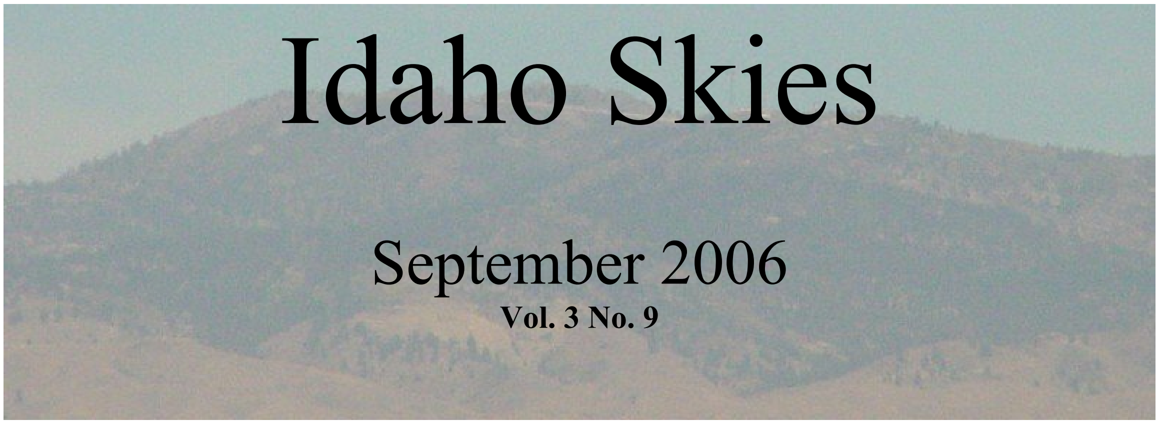
Date	LAM	LST	Messier Objects
1-Jan	0:41	6:46	M41
2-Jan	0:42	6:51	
3-Jan	0:42	6:55	
4-Jan	0:43	7:00	
5-Jan	0:43	7:04	M50
6-Jan	0:44	7:09	
7-Jan	0:44	7:13	
8-Jan	0:44	7:17	
9-Jan	0:45	7:22	
10-Jan	0:45	7:26	
11-Jan	0:46	7:31	
12-Jan	0:46	7:35	M47
13-Jan	0:47	7:40	M46
14-Jan	0:47	7:44	M93
15-Jan	0:47	7:48	
16-Jan	0:48	7:53	
17-Jan	0:48	7:57	
18-Jan	0:48	8:00	
19-Jan	0:49	8:05	
20-Jan	0:49	8:09	
21-Jan	0:49	8:13	M48
22-Jan	0:49	8:17	
23-Jan	0:50	8:22	
24-Jan	0:50	8:26	
25-Jan	0:50	8:30	
26-Jan	0:50	8:34	
27-Jan	0:51	8:39	M44
28-Jan	0:51	8:43	
29-Jan	0:51	8:47	
30-Jan	0:51	8:51	M67
31-Jan	0:51	8:55	
1-Feb	0:51	8:59	
2-Feb	0:52	9:04	
3-Feb	0:52	9:08	
4-Feb	0:52	9:11	
5-Feb	0:52	9:15	
6-Feb	0:52	9:19	
7-Feb	0:52	9:23	
8-Feb	0:52	9:27	
9-Feb	0:52	9:31	
10-Feb	0:52	9:35	
11-Feb	0:52	9:39	
12-Feb	0:52	9:43	
13-Feb	0:52	9:47	
14-Feb	0:52	9:51	
15-Feb	0:52	9:55	M81, M82
16-Feb	0:52	9:59	
17-Feb	0:52	10:03	
18-Feb	0:52	10:07	
19-Feb	0:52	10:11	
20-Feb	0:52	10:15	
21-Feb	0:52	10:19	
22-Feb	0:51	10:21	
23-Feb	0:51	10:25	
24-Feb	0:51	10:29	
25-Feb	0:51	10:33	
26-Feb	0:51	10:37	
27-Feb	0:51	10:41	
28-Feb	0:50	10:44	M95
1-Mar	0:50	10:48	M96, M105
2-Mar	0:50	10:52	
3-Mar	0:50	10:56	
4-Mar	0:50	11:00	
5-Mar	0:49	11:03	
6-Mar	0:49	11:07	
7-Mar	0:49	11:11	M108
8-Mar	0:49	11:15	M97
9-Mar	0:48	11:18	M65
10-Mar	0:48	11:22	M66
11-Mar	0:48	11:25	
12-Mar	0:48	11:29	
13-Mar	0:47	11:32	
14-Mar	0:47	11:36	
15-Mar	0:47	11:40	
16-Mar	0:47	11:44	
17-Mar	0:46	11:47	
18-Mar	0:46	11:51	
19-Mar	0:46	11:55	
20-Mar	0:45	11:58	M109
21-Mar	0:45	12:02	
22-Mar	0:45	12:06	
23-Mar	0:45	12:10	
24-Mar	0:44	12:13	M98
25-Mar	0:44	12:17	
26-Mar	0:44	12:21	M61, M99, M106
27-Mar	0:43	12:24	M40, M84, M85, M100
28-Mar	0:43	12:27	M86
29-Mar	0:43	12:31	M49, M87, M88
30-Mar	0:42	12:34	M89, M91
31-Mar	0:42	12:38	M58, M68, M90, M104
1-Apr	0:42	12:42	M59, M60
2-Apr	1:42	12:46	
3-Apr	1:41	12:49	M94
4-Apr	1:41	12:53	
5-Apr	1:41	12:57	M64
6-Apr	1:40	13:00	
7-Apr	1:40	13:04	
8-Apr	1:40	13:08	

Date	LAM	LST	Messier Objects		Date	LAM	LST	Messier Objects
9-Apr	1:40	13:12	M53		31-May	1:36	16:33	M107
10-Apr	1:39	13:15	M63		1-Jun	1:36	16:37	
11-Apr	1:39	13:19			2-Jun	1:36	16:41	M13
12-Apr	1:39	13:23			3-Jun	1:36	16:45	
13-Apr	1:38	13:26			4-Jun	1:36	16:49	M12
14-Apr	1:38	13:29	M51		5-Jun	1:36	16:52	
15-Apr	1:38	13:33			6-Jun	1:36	16:56	M10
16-Apr	1:38	13:37	M83		7-Jun	1:37	17:01	M19, M62
17-Apr	1:38	13:41	M3		8-Jun	1:37	17:05	
18-Apr	1:37	13:44			9-Jun	1:37	17:09	
19-Apr	1:37	13:48			10-Jun	1:37	17:13	
20-Apr	1:37	13:52			11-Jun	1:37	17:17	M9, M92
21-Apr	1:37	13:56			12-Jun	1:38	17:22	
22-Apr	1:36	13:59			13-Jun	1:38	17:26	
23-Apr	1:36	14:03	M101		14-Jun	1:38	17:30	
24-Apr	1:36	14:07			15-Jun	1:38	17:34	
25-Apr	1:36	14:11			16-Jun	1:38	17:38	M6, M14
26-Apr	1:36	14:15			17-Jun	1:39	17:43	
27-Apr	1:36	14:19			18-Jun	1:39	17:47	
28-Apr	1:35	14:22			19-Jun	1:39	17:51	
29-Apr	1:35	14:26			20-Jun	1:39	17:55	M7, M23
30-Apr	1:35	14:30			21-Jun	1:40	18:00	
1-May	1:35	14:34			22-Jun	1:40	18:04	M8, M20, M21
2-May	1:35	14:37			23-Jun	1:40	18:07	
3-May	1:35	14:41			24-Jun	1:40	18:11	
4-May	1:35	14:45			25-Jun	1:40	18:15	
5-May	1:35	14:49			26-Jun	1:41	18:20	M16, M17, M18, M24
6-May	1:35	14:53			27-Jun	1:41	18:24	M28
7-May	1:34	14:56			28-Jun	1:41	18:28	
8-May	1:34	15:00			29-Jun	1:41	18:32	M25, M69
9-May	1:34	15:04			30-Jun	1:41	18:36	M22
10-May	1:34	15:08	M102		1-Jul	1:42	18:41	
11-May	1:34	15:12			2-Jul	1:42	18:45	M26, M70
12-May	1:34	15:16			3-Jul	1:42	18:49	
13-May	1:34	15:20	M5		4-Jul	1:42	18:53	M11, M54, M57
14-May	1:34	15:24			5-Jul	1:42	18:57	
15-May	1:34	15:28			6-Jul	1:43	19:02	
16-May	1:34	15:32			7-Jul	1:43	19:06	
17-May	1:34	15:36			8-Jul	1:43	19:10	
18-May	1:34	15:40			9-Jul	1:43	19:14	
19-May	1:34	15:43			10-Jul	1:43	19:18	M56
20-May	1:34	15:47			11-Jul	1:43	19:21	
21-May	1:34	15:51			12-Jul	1:43	19:25	
22-May	1:34	15:55			13-Jul	1:44	19:30	
23-May	1:35	16:00			14-Jul	1:44	19:34	
24-May	1:35	16:04			15-Jul	1:44	19:38	M55
25-May	1:35	16:08			16-Jul	1:44	19:42	
26-May	1:35	16:12			17-Jul	1:44	19:46	
27-May	1:35	16:16	M80		18-Jul	1:44	19:50	
28-May	1:35	16:20			19-Jul	1:44	19:54	M71
29-May	1:35	16:24	M4		20-Jul	1:44	19:58	M27
30-May	1:35	16:28			21-Jul	1:44	20:02	

Date	LAM	LST	Messier Objects
22-Jul	1:44	20:06	M75
23-Jul	1:44	20:10	
24-Jul	1:44	20:14	
25-Jul	1:44	20:18	
26-Jul	1:44	20:22	M29
27-Jul	1:44	20:26	
28-Jul	1:44	20:29	
29-Jul	1:44	20:33	
30-Jul	1:44	20:37	
31-Jul	1:44	20:41	
1-Aug	1:44	20:45	
2-Aug	1:44	20:49	
3-Aug	1:44	20:53	M72
4-Aug	1:44	20:57	
5-Aug	1:44	21:01	M73
6-Aug	1:44	21:05	
7-Aug	1:44	21:09	
8-Aug	1:44	21:13	
9-Aug	1:43	21:16	
10-Aug	1:43	21:20	
11-Aug	1:43	21:24	
12-Aug	1:43	21:18	
13-Aug	1:43	21:32	M15, M39
14-Aug	1:43	21:36	M2
15-Aug	1:42	21:38	
16-Aug	1:42	21:42	M30
17-Aug	1:42	21:46	
18-Aug	1:42	21:50	
19-Aug	1:42	21:54	
20-Aug	1:41	21:57	
21-Aug	1:41	22:01	
22-Aug	1:41	22:05	
23-Aug	1:41	22:09	
24-Aug	1:40	22:12	
25-Aug	1:40	22:16	
26-Aug	1:40	22:20	
27-Aug	1:39	22:23	
28-Aug	1:39	22:27	
29-Aug	1:39	22:31	
30-Aug	1:39	22:35	
31-Aug	1:38	22:38	
1-Sep	1:38	22:41	
2-Sep	1:38	22:45	
3-Sep	1:37	22:48	
4-Sep	1:37	22:52	
5-Sep	1:37	22:56	
6-Sep	1:36	22:59	
7-Sep	1:36	23:03	
8-Sep	1:36	23:07	
9-Sep	1:35	23:10	
10-Sep	1:35	23:14	
11-Sep	1:35	23:18	

Date	LAM	LST	Messier Objects
12-Sep	1:34	23:21	
13-Sep	1:34	23:25	M52
14-Sep	1:34	23:29	
15-Sep	1:33	23:32	
16-Sep	1:33	23:36	
17-Sep	1:32	23:39	
18-Sep	1:32	23:42	
19-Sep	1:32	23:46	
20-Sep	1:31	23:49	
21-Sep	1:31	23:53	
22-Sep	1:31	23:57	
23-Sep	1:30	0:00	
24-Sep	1:30	0:04	
25-Sep	1:30	0:08	
26-Sep	1:29	0:11	
27-Sep	1:29	0:15	
28-Sep	1:29	0:19	
29-Sep	1:28	0:22	
30-Sep	1:28	0:26	
1-Oct	1:28	0:30	
2-Oct	1:27	0:33	
3-Oct	1:27	0:37	
4-Oct	1:27	0:41	M110
5-Oct	1:26	0:43	M31, M32
6-Oct	1:26	0:47	
7-Oct	1:26	0:51	
8-Oct	1:26	0:55	
9-Oct	1:25	0:58	
10-Oct	1:25	1:02	
11-Oct	1:25	1:06	
12-Oct	1:24	1:09	
13-Oct	1:24	1:13	
14-Oct	1:24	1:17	
15-Oct	1:24	1:21	
16-Oct	1:23	1:24	
17-Oct	1:23	1:28	
18-Oct	1:23	1:32	M103
19-Oct	1:23	1:36	M33, M74
20-Oct	1:23	1:40	
21-Oct	1:23	1:44	M76
22-Oct	1:22	1:46	
23-Oct	1:22	1:50	
24-Oct	1:22	1:54	
25-Oct	1:22	1:58	
26-Oct	1:22	2:02	
27-Oct	1:22	2:06	
28-Oct	1:22	2:10	
29-Oct	1:22	2:14	
30-Oct	0:22	2:18	
31-Oct	0:22	2:22	
1-Nov	0:21	2:25	
2-Nov	0:21	2:29	

Date	LAM	LST	Messier Objects		Date	LAM	LST	Messier Objects
3-Nov	0:21	2:33			3-Dec	0:28	4:38	
4-Nov	0:21	2:37			4-Dec	0:28	4:42	
5-Nov	0:21	2:41	M34, M77		5-Dec	0:28	4:46	
6-Nov	0:22	2:46			6-Dec	0:29	4:51	
7-Nov	0:22	2:50			7-Dec	0:29	4:55	
8-Nov	0:22	2:54			8-Dec	0:30	5:00	
9-Nov	0:22	2:57			9-Dec	0:30	5:04	
10-Nov	0:22	3:01			10-Dec	0:31	5:09	
11-Nov	0:22	3:05			11-Dec	0:31	5:13	
12-Nov	0:22	3:09			12-Dec	0:31	5:17	
13-Nov	0:22	3:13			13-Dec	0:32	5:22	
14-Nov	0:22	3:17			14-Dec	0:32	5:25	M79
15-Nov	0:22	3:21			15-Dec	0:33	5:30	M38
16-Nov	0:23	3:26			16-Dec	0:33	5:34	M1, M36, M42, M43
17-Nov	0:23	3:30			17-Dec	0:34	5:39	
18-Nov	0:23	3:34			18-Dec	0:34	5:43	
19-Nov	0:23	3:38			19-Dec	0:35	5:48	M78
20-Nov	0:23	3:42			20-Dec	0:35	5:52	M37
21-Nov	0:24	3:47	M45		21-Dec	0:36	5:57	
22-Nov	0:24	3:51			22-Dec	0:36	6:01	
23-Nov	0:24	3:55			23-Dec	0:37	6:06	
24-Nov	0:24	3:59			24-Dec	0:37	6:10	M35
25-Nov	0:25	4:04			25-Dec	0:38	6:15	
26-Nov	0:25	4:07			26-Dec	0:38	6:19	
27-Nov	0:25	4:11			27-Dec	0:39	6:24	
28-Nov	0:26	4:16			28-Dec	0:39	6:28	
29-Nov	0:26	4:20			29-Dec	0:40	6:33	
30-Nov	0:26	4:24			30-Dec	0:40	6:37	
1-Dec	0:27	4:29			31-Dec	0:41	6:42	
2-Dec	0:27	4:33						



Idaho Skies

September 2006

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Idaho Skies is a column for beginning amateur astronomers and those interested in astronomy. Suggestions about the column are gladly accepted by the columnist, at paul.verhage@boiseschools.org

This month look for the star Albireo in the constellation of Cygnus the Swan. Albireo is known to astronomers as Beta Cygni, or the second star of Cygnus (but it's not the second brightest). Albireo is a reasonably bright star located at the southern end of the constellation, where it represents the beak of the swan.

In Greek mythology, Cygnus represents the swan that the god Zeus turned himself into so he could seduce Leda, the wife of Tyndareus. Leda (who was a human) laid an egg from this "affair". Boy don't those Greeks have some kind of imagination? From the egg hatched Helen (of Troy), and the twins, Caster and Pollux (the Gemini twins). Cygnus is also called the Northern Cross and has represented the true cross for a Christianized version of the constellations.

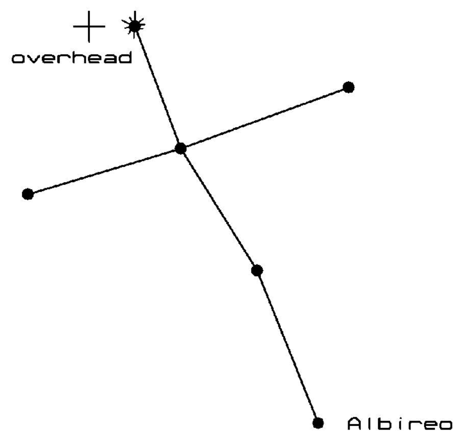
Cygnus is located in the center of the Milky Way. This places Cygnus in a rich star field that is perfect for warm late summer nights. Just lie back on a blanket and scan the stars overhead with your binoculars.

Albireo is a fun star if you have at least a small telescope. To the naked eye, the star appears as a non-descript white point of light. But in a telescope, even at low power, it splits into two stars, each star distinctly tinted. I see them as golden-yellow and cyan. Others I've asked seen more green in the bluish star.

Stars can have subtle colors, but most are too faint for us to make out their color. It takes the light gathering ability of a telescope to bring out a star's color (if it has any). In the case of Albireo, the close proximity between the stars lets our eyes and brain exaggerate their subtle hues. The colors of the two stars are easier to detect if the telescope is slightly out of focus.

The light you see from Albireo left 380 years ago, or in the year 1626. At that distance, the stars are immensely far a part for stars that are orbiting around each other. So there's a possibility that the Albireo pair are a chance alignment and not a true binary where the stars are in orbit around each other. If they are orbiting each other, then they're orbital period is on the order of 75,000 years.

Look for Cygnus and Albireo overhead during September. The swan is flying to the south, perhaps in preparation for the oncoming winter.



September Overview

- This month's full moon is the largest full moon this year.
- The Zodiacal Light is visible beginning the 21st.
- Autumn begins on the 22nd.

September 1 – 7

The SMART-1 spacecraft is targeted for a lunar impact on the third. SMART-1 is a European space mission designed to explore the moon from orbit. It used solar electric ion propulsion to reach the moon. In doing so it achieved a moon orbit with less fuel than a traditional spacecraft. Now that its mission is over, it's being deliberately sent to impact the moon.

The third is the 30th anniversary of the landing of Viking 2. Like its twin, Viking 1, Viking 2 landed on Mars. They were the first successful spacecraft to land on this world, a world that has been pretty hostile to other spacecraft (angry Mars, anyone?). The Viking spacecraft consisted of two parts, an orbiter and a lander. Part of the success of the Vikings can be attributed to their two part nature which allowed the Jet Propulsion

Laboratory to identify safe landing sites before sending the landers down. Viking 2 spent 11 months traveling to Mars and waited one month in orbit. The lander set down on Mars at Utopia Planitia, or the Plains of Utopia. Both Viking landers carried a suite of life detecting experiments and their results indicated that life is improbable on the surface of the planet. Viking 2 continued to transmit data until April 1980 when it was accidentally commanded to point it communication antenna to the ground rather than at earth.

The moon is full on the 7th. What makes this month's full moon special is that the moon is near perigee or its closest distance to earth this month. This means September's full moon larger than any full moon in 2006. If you have a camera with telephoto lens or can photograph through your telescope, than get a photograph of this full moon. Later you can compare the image size to another picture of a smaller full moon next year. However, be sure to use the same camera and lens so you don't change the magnification between images.

Besides seeing a large full moon, if you live on the coast you'll see a larger than average high and smaller than average low tide. The closeness of the moon strengthens its gravitational pull and therefore, the difference in the force of lunar gravity between the near and far sides of the earth. The difference in gravity between the near and far side of the earth is called a tidal force. Tidal forces are responsible from raising tides and not the absolute strength of the moon's gravitational pull. If the moon's gravity was the same on opposite sides of earth, we would experience no tides. This is why the massive planet Jupiter cannot raise a significant tide on earth.

September 8 – 14

Hey! Star Trek is 40 years old on the 8th. In the fall of 1966, Americans were treated to television's first adult science fiction. Star Trek, created by Gene Roddenberry, depicted a futuristic human society that had solved most of its problems and were bolding exploring the galaxy. By placing topics on strange new worlds, Roddenberry could address science and social issues of the day in a non-threatening manner. It was a good way to get controversial subjects past network censors. Star Trek is the most famous science fiction and probably the most profitable franchise in television history. You can learn more about this pop phenomenon at the Memory Alpha website, which is the website at this end of this month's column.

Four days later it's the 40th anniversary of the launch of Gemini 11. On September 12th, 1966, astronauts Charles Conrad and Richard Gordon were launched into orbit onboard the two-man Gemini. The goals of Gemini 11 were to dock with a second spacecraft and practice spacewalking. Their docking went well, but space walking was more difficult than NASA anticipated. The Gemini space suits were not nearly flexible enough when pressurized. And the environmental controls inside the suit were primitive compared to the Space Shuttle suits. The astronauts worked up a sweat trying to move around and the suits couldn't keep them cool enough. Because of the coldness of space, the visors of their space helmets fogged up from their perspiration, making it difficult to see. The crew of Gemini 11 spent less than three days making 44 orbits around earth before returning home.

The moon is at last quarter on the 14th at 5:15 AM (4:15 in Oregon and 6:15 in the Midwest). Therefore the moon is only visible after midnight and it sets by noon.

September 15 – 21

Starting on the 21st the Zodiacal light is visible for the next two weeks. This is because the moon is new tomorrow and it's no longer present in the morning sky where its light will wash out the Zodiacal Light's delicate glow. The Zodiacal Light is created by sunlight reflecting off dust in orbit around the sun. In dark skies it appears as a tall triangle of light that's as bright as the beginning of twilight. But unlike twilight, the Zodiacal Light doesn't hug the horizon. Look to the east more than an hour before sunrise to see the Zodiacal light. Since the sun rises at 7:30, you should be out before 6:30 AM. You'll need dark adapted eyes for your best views, so plan to spend at least 15 minutes outside (you can see it before then, but not as well). Look for a triangular shaped pillar of faint light rising out of the east. In dark skies it can reach half way to the zenith (overhead) and it will have a tilt to the south.

The moon is at apogee on the 21st at 10:00 PM (9:00 in Oregon and 11:00 in the Midwest). Its distance, the greatest for this month, is 252,587 miles. That's a lot compared to distances on earth. But compared to the rest of the solar system, it's peanuts. Why the suns 368 times farther away than that. But if I had to walk the distance to the moon, it would take me until May 30, 2016 to get there. Just imagine how many tennis shoes I would wear out in that time.

September 22 – 30

It's autumn on the 22nd at 10:03 PM (9:03 in Oregon and 11:03 in the Midwest). The moment autumn begins, earth is at the autumnal equinox, or that point in its orbit that positions the sun directly over the equator. Equinox means equal night and refers to the fact that the day and night are equally long. This is true for every location on earth at the equinox. Technically though, refraction by the atmosphere will make the sun rise a few minutes earlier and set a few minutes later. If you saw earth from deep space, most of the year the terminator, or boundary between day and night, would never travel across the earth's poles. Instead the terminator would be tilted, giving one hemisphere more than 12 hours of sunlight and the opposite hemisphere less than 12 hours of sunlight. Only at the equator would there always be 12 hours of sunlight. But on the day of the equinox, the terminator runs from pole to pole. This only occurs when earth's rotation axis is tipped neither towards nor away from the sun. And those two days mark the beginning of spring and autumn.

The planet Neptune was discovered 160 years ago on the 23rd. Neptune was the first planet astronomers intentionally searched for. In the early 19th century, astronomers were noticing that the planet Uranus was not located exactly where Newton's laws of motion and gravity predicted it should be. So either the measurements of Uranus were in error, Newton's laws failed at the vast distances to Uranus, or something was pulling Uranus out of its predicted orbit. Two mathematicians, Leverrier in France and Adams in England, began analyzing the motions of Uranus to discover where a new planet might be located. By assuming a radius for the orbit of Planet X based on the Bode-Titus Law, both Leverrier and Adams came up with similar positions. The young Adams could not convince English astronomers to look for a new planet, but Leverrier did convince astronomer Galle in Berlin to look. Using a new star chart, Galle and his assistant d'Arrest began checking off the stars they could see in their telescope. They didn't have to look long to find an uncharted star that turned out to be a new planet. The discovery of Neptune was as much luck as mathematics. The calculation of the planet's position was correct for 1846, but would have been seriously in error had it been made decades earlier or later.

Thirty-five years ago on the 28th, the Soviet Union launched Luna 19. Luna 19 was an unmanned space probe sent into orbit around the moon. It carried no cameras and only measured the lunar magnetic field, radiation in the vicinity of the moon, and micro-meteoroids. Basically the space probe was sent to make sure it was safe for humans to visit the moon. But seeing how the Soviets were never able to send cosmonauts to the moon, it's rather a moot point.

The moon is at first quarter on the 30th at 4:04 AM (3:04 in Oregon and 5:04 in the Midwest). So the end of the month and beginning of October will be great times to go moon watching. It doesn't take much optical magnification to enjoy the features of the moon. If you decide to use a pair of binoculars, then steady them with tree, wall, or other stationary object. Your views will be better with a little more magnification, but as little as 45 power is plenty. With too much magnification the rotation of earth is magnified so much that the moon drifts out of the telescope's too fast.

This Month's Topic

Surveyor

In the early 1960's the surface of the moon was an unknown. Before the goal of landing American astronauts on this celestial world could become a reality, America needed reliable information about its surface. The spacecraft designed to discover the nature of the lunar surface was a project of the Jet Propulsion Laboratory (JPL) in Pasadena, California and built by the Hughes Aircraft company (the aircraft company started by Howard Hughes). Its name was Surveyor.

Surveyor was unique. Instead of running a preplanned sequence of operations, the Surveyor landers were commanded in real time from earth. The Surveyor landers were built around a four sided triangular metal framework. A central mast rose from their tops to a height of ten feet. On top of this mast were two flat plates, one a radiator to keep the lander's electronics cool and the other a directional antenna for communication with earth. At the bottom three corners of each lander were legs with crushable footpads that folded up for the trip to the moon. When their legs were unfolded the Surveyors were 14 feet across. On earth the Surveyor landers weighed at least 600 pounds, but only 100 pounds on the moon.

Each Surveyor carried a large retro rocket motor in their base to provide most of the thrust they needed to slow down. At 37,000 feet above the lunar surface the motor was ejected and the landers continued their descent on three smaller steerable motors and radar. At an altitude of 14 feet above the surface the engines were shut down and the landers fell to the surface. In the moon's 1/6 g gravity, this was like falling about two feet.

Seven Surveyors were launched to the moon and five successfully landed. The first to land was Surveyor 1. Surveyor 1 was launched on May 30, 1966 and landed on June 2, 1966. It was designed to test the ability of the Surveyors to fly to the moon and land. It carried television cameras and sensors to measure the strain on the craft during its mission. During the two week lunar days in June and July, Surveyor 1 transmitted television images and engineering data. Images from the lunar surface showed granular lunar dust around the lander's foot pad and rocks near the horizon. Around 11,000 images of the lunar surface were transmitted by Surveyor 1. Surveyor 1's successful mission indicated that the lunar surface was firm enough to support the weight of a spacecraft and that the technology to land on the moon could be developed. The last transmission from the lander was received in January 1967.

The remaining Surveyors were the block two Surveyors and were more advanced than Surveyor 1. This second block of four Surveyors landers returned over 90,000 images of the lunar surface.

The lunar surface confused the radar of Surveyor 3, preventing its engines from shutting down at the proper altitude. As a result the lander bounced three times before coming to a halt on the surface. The robotic arm of Surveyor 3 dug four long trenches in the regolith. The trenches reached a depth of seven inches and a distance of 4-1/2 feet from lander. Regolith in the arm's scoop was dumped where the lander's cameras could transit images of it. This digging up of the lunar surface was something a child would do in her sandbox, but vital to understanding the structure of the lunar surface.

After spending 2-1/2 years on the moon, Surveyor 3 received a visitor when the astronauts of Apollo 12 landed only 600 feet away. The crew of Apollo 12 walked to Surveyor 3 and removed several pieces for return to earth. At NASA they were looked over to discover how the sun's light and radiation affected materials in space. The discovery of living earth bacteria in the insulation of one of the cameras initially caused a stir. But later analysis determined that the camera in question was accidentally contaminated after it returned from the moon, and not before its trip.

The alpha scattering sensor of Surveyor 5, 6, and 7 measured the alpha rays scattered from the regolith when bombarded by an alpha ray source (Curium 252). This instrument led to the discovery that the lunar surface was made of basalt, or the lava rock so prevalent in the Snake River plain. That's an indication that the moon was at one time molten and that volcanoes and fissures erupted on the lunar surface.

After analyzing the lunar surface, Surveyor 6 was commanded to fire its landing engines a second time. This carried Surveyor 6 a distance of eight feet where it made additional measurements of the moon.

The last Surveyor, number 7, was sent to a location not on the Apollo landing sites list. It soft landed near the crater Tycho and transmitted data until February 21, 1968.

Originally a third block of Surveyors was planned. This block would carry the Surveyor rover. But the Surveyor program was cancelled before testing was complete on the rovers.

September's Website

This month check out the website, Memory Alpha, the online encyclopedia for Star Trek fans. Run like a Wiki, Memory Alpha was started in 2003 and is a collaboration of Trekkers (not Trekkies) to document everything about the Star Trek universe. The articles in Memory Alpha read almost like a history of humanity. There's a lot in the website, so if you want to know anything about Star Trek, this is the place.

The most important part of the website runs down the center. At the top you'll find a number of "did you know" pieces and articles of the week. Below that is a massive number of links to articles on everything about Star Trek. Some articles are arranged by topic, like everything about the Borg, time travel in Star Trek, and the mysterious Q (man, doesn't that character drive you crazy?).

Below this is the encyclopedia proper. The topic links include, Episodes and Movies, Other Media, People, Society and Culture, Science and Technology, Trek and Culture, Around the Universe, and Other Features. At the bottom of the encyclopedia homepage are a series of links about writing articles for Memory Alpha, questions and answers about the Memory Alpha project, and links to pages written in other languages (there's an Esperanto version of the encyclopedia but not Klingon one).

Under the Episodes and Movies link is information on every plot line, notable quote, and footnotes. There have been six Star Trek television shows and ten movies to date. Now there's talk about an 11th movie and you can read about it here.

Under the Other Media link you'll discover the Star Trek collectibles have been produced, including novels and comics.

The People link is not just about the regular actors, but also about guest characters on Star Trek and the people behind the scenes.

The Society and Culture link has everything from the games people play on Star Trek planets to their laws, history, food, art, and recreation.

The Science the Technology link explains some of the technology seen in the television shows and movies. It's a shame that warp drive is make believe, I'd really like to read how they work.

Under Trek and Culture is a series of articles about how we have responded to Star Trek. For instance, do you consider yourself a Trekkie or a Trekker? You can read some parodies of Star Trek and discover just how many television shows have slipped Star Trek references into the story lines.

It's all here and you can spend days reading its over 19,000 articles. You'll find Memory Alpha at, http://memory-alpha.org/en/wiki/Main_Page

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