



THE ROYAL ASTRONOMICAL
SOCIETY OF CANADA

2020

OBSERVER'S CALENDAR





JANUARY

THE WHIRLPOOL GALAXY (MESSIER 51) resembles its namesake both in images such as this and visually where from dark sites a view of its spiral arms is stunning with a large telescope. Appearing face on, it provides a wealth of detail for imagers from its multiple spiral arms and nearby NGC 5195. IMAGE BY RÉMI LECASSE.

SUNDAY

MONDAY

TUESDAY

WEDNESDAY

THURSDAY

FRIDAY

SATURDAY

THE PLANETS THIS MONTH

- Mercury** very low in WSW in evening twilight, late this month with difficulty
- Venus** low in SW in evening twilight, sets near 8 pm
- Mars** rises in SE after 4 am, in ESE near dawn
- Jupiter** very low in SE in morning twilight by month end
- Saturn** not observable this month

Times in the upper half of the daily boxes are in the 24-hour clock; times in the lower half are given in the 12-hour clock.

Eastern time is used, except for rise and set events and changes to/from Daylight Saving Time, which are given in local time.

Times for events involving planetary satellites refer to the start time.

Detailed instructions on adjusting times for location are given in the back pages.

Please see back pages for photo details and additional information about this Calendar.

1

Rise 11:28 11:38
Set 23:07 23:00

NEW YEAR'S DAY
Moon at apogee

2

Rise 11:53 11:56
Set — —

First Quarter 23:46

Lunar X near crater Werner visible in E of N. America 4 pm

3

Rise 0:04 0:04
Set 12:17 12:14

Lunar Straight Wall this evening
Lost City meteorite, first one recovered by a camera network, fell 50 years ago.

4

Rise 1:02 1:09
Set 12:43 12:32
Sunrise 7:22 7:58
Sunset 16:48 16:12

Quadrantid meteors (ZHR=120) 3 am, best seen in early morning hours

5

Rise 13:10 12:53
Set 2:02 2:16

Earth at perihelion (147,091,144 km) 02:47 ET
Follow Arcturus unaided into daylight this week

6

Rise 13:41 13:17
Set 3:03 3:24

7

Rise 14:17 13:46
Set 4:06 4:35

8

Rise 15:00 14:24
Set 5:10 5:45

NEW YEAR'S DAY
Moon at apogee

9

Rise 15:52 15:12
Set 6:14 6:53

10

Rise 16:52 16:13
Set 7:14 7:54

Full Moon 14:21

Penumbral lunar eclipse, visible E hemisphere, NOT visible from N. America
Mercury at superior conjunction
Today's full Moon is the Ninene Moon (Child)

11

Rise 17:22 17:24
Set 16:54 16:20
Sunrise 7:22 7:56
Sunset 16:54 16:20

Uranus stationary

12

Rise 19:12 18:43
Set 8:56 9:27

Royal Astronomical Society was founded 200 years ago.

13

Rise 20:25 20:05
Set 9:37 10:00

Moon at perigee, large tides
Saturn in conjunction
Francois F. Tisserand, who studied Sun's capture of periodic comets, was born 175 years ago.

14

Rise 21:38 21:26
Set 10:13 10:28

Arthur Code first detected free hydrogen atoms in a comet 50 years ago.

15

Rise 22:49 22:46
Set 10:45 10:52

511 Davida at opposition (m=9.6)

16

Rise 23:59 —
Set 11:16 11:14

17

Rise 0:05 —
Set 11:46 11:36

Last Quarter 7:59

Mars 5° above Antares this morning

18

Rise 1:23 1:23
Set 17:58 17:27
Sunrise 7:19 7:51
Sunset 17:02 16:31

19

Rise 2:40 2:26
Set 2:18 12:52

20

Rise 3:25 3:56
Set 3:30 12:58

MARTIN LUTHER KING JR. DAY (USA)
Moon 2° above right of Mars this morning, best in western N. America

21

Rise 4:31 5:07
Set 4:14 13:37

5 Astraea at opposition (m=8.9)

22

Rise 5:32 6:12
Set 5:04 14:24

23

Rise 6:27 7:07
Set 6:27 15:59

24

Rise 7:15 7:53
Set 7:15 16:58

New Moon 16:42

25

Rise 8:29 8:29
Set 17:58 17:27
Sunrise 7:15 7:43
Sunset 17:10 16:42

CHINESE NEW YEAR (RAT)

26

Rise 8:32 8:58
Set 18:58 18:34

27

Rise 9:02 9:22
Set 19:58 19:41

Venus 0.1° west of Neptune this evening

28

Rise 9:30 9:43
Set 20:56 20:46

29

Rise 10:01 10:01
Set 21:54 21:51

Moon at apogee

30

Rise 10:18 10:18
Set 22:51 22:55

31

Rise 10:36 —
Set 23:49 —

DEC	S	M	T	W	T	F	S
	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
	29	30	31				
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	2	3	4	5	6	7	8
	9	10	11	12	13	14	15
	16	17	18	19	20	21	22
	23	24	25	26	27	28	29



FEBRUARY

TOTAL LUNAR ECLIPSE – On 2019 January 20/21, the Moon slipped through the shadow of Earth, turning red in colour for those lucky to be under clear skies to see it. At the time, it was near the edge of the winter Milky Way, providing a rich star field to provide a stunning backdrop to the eclipsed Moon. IMAGE BY GODFREY BOOTH.

SUNDAY

MONDAY

TUESDAY

WEDNESDAY

THURSDAY

FRIDAY

SATURDAY

THE PLANETS THIS MONTH

Mercury	very low in WSW in evening twilight, lost after mid-month
Venus	in W in evening twilight, sets near 9 pm
Mars	rises in SE near 4 am, in ESE near dawn
Jupiter	very low in SE in morning twilight this month
Saturn	very low in SE in morning twilight by month end

JAN	S	M	T	W	T	F	S
			1	2	3	4	
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	19	20	21	22	23	24	25
	26	27	28	29	30	31	

MAR	S	M	T	W	T	F	S
	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
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	22	23	24	25	26	27	28
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1

40°N 50°N
 Set — 0:00
 Rise 11:10 10:55
 Sunrise 7:09 7:34
 Sunset 17:19 16:54

First Quarter
 20:42

2

40°N 50°N
 Set 0:48 1:07
 Rise 11:38 11:17

GROUNDHOG DAY
 Lunar Straight Wall this evening
 Edmund Halley was appointed Astronomer Royal 300 years ago.

3

40°N 50°N
 Set 1:49 2:15
 Rise 12:11 11:43

4

40°N 50°N
 Set 2:52 3:24
 Rise 12:50 12:16

5

40°N 50°N
 Set 3:55 4:32
 Rise 13:36 12:58

6

40°N 50°N
 Set 4:56 5:36
 Rise 14:32 13:52

7

40°N 50°N
 Set 5:54 6:32
 Rise 15:36 14:58

8

40°N 50°N
 Set 6:45 7:19
 Rise 16:47 16:15
 Sunrise 7:02 7:24
 Sunset 17:27 17:06

9

40°N 50°N
 Set 7:30 7:57
 Rise 18:02 17:38

Full Moon
 2:33

Today's full Moon is the Wexes Moon (Frog)

10

40°N 50°N
 Set 8:09 8:28
 Rise 19:18 19:03

Mercury at greatest elongation (18° E) this evening (m=-0.4). Best evening apparition of the year
 Moon at perigee, large tides
 First supernova discovered by Canadians with a Canadian telescope in Canada 25 years ago.

11

40°N 50°N
 Set 8:44 8:54
 Rise 20:33 20:27

Zodiacal Light readily visible from a dark site in W after evening twilight for the next 2 weeks.

12

40°N 50°N
 Set 9:16 9:17
 Rise 21:47 21:50

13

40°N 50°N
 Set 9:47 9:40
 Rise 22:59 23:11

14

40°N 50°N
 Set 10:19 10:04

VALENTINE'S DAY
 NEAR was first spacecraft to orbit an asteroid, Eros, 20 years ago.

15

40°N 50°N
 Rise 0:09 0:30
 Set 10:53 10:29
 Sunrise 6:54 7:12
 Sunset 17:35 17:18

Last Quarter
 17:17

NATIONAL FLAG OF CANADA DAY

16

40°N 50°N
 Rise 1:18 1:47
 Set 11:30 11:00

Mercury stationary

17

40°N 50°N
 Rise 2:25 3:00
 Set 12:12 11:36

LOUIS RIEL DAY (MB)
FAMILY DAY (AB, NB, ON, SK, BC)
HERITAGE DAY (NS)
ISLANDER DAY (PE)
PRESIDENTS' DAY (USA)
 Winter Star Party, Florida Keys, www.scas.org/Home/WinterStarParty (through Feb 23)

18

40°N 50°N
 Rise 3:27 4:06
 Set 13:00 12:20

Moon 0.8° above Mars this morning

19

40°N 50°N
 Rise 4:23 5:04
 Set 13:53 13:13

20

40°N 50°N
 Rise 5:13 5:51
 Set 14:50 14:12

Moon 2.0° below right of Saturn this morning, best in western N. America

21

40°N 50°N
 Rise 6:06 6:30
 Set 15:49 15:16

22

40°N 50°N
 Rise 6:32 7:01
 Set 16:49 16:23
 Sunrise 6:44 6:58
 Sunset 17:43 17:30

23

40°N 50°N
 Rise 7:04 7:26
 Set 17:49 17:29

New Moon
 10:32

24

40°N 50°N
 Rise 7:32 7:47
 Set 18:48 18:35

25

40°N 50°N
 Rise 7:58 8:06
 Set 19:45 19:40

SHROVE TUESDAY

26

40°N 50°N
 Rise 8:22 8:24
 Set 20:43 20:45

ASH WEDNESDAY (BEGINNING OF LENT)
 Moon at apogee
 Mercury at inferior conjunction

27

40°N 50°N
 Rise 8:46 8:41
 Set 21:40 21:50

Moon 6° left of Venus this evening

28

40°N 50°N
 Rise 9:11 8:59
 Set 22:39 22:55
































HERITAGE DAY (YK)

29

40°N 50°N
 Rise 9:38 9:19
 Set 23:38 —
 Sunrise 6:34 6:44
 Sunset 17:51 17:41

MARCH

MESSIER 13, the Hercules Globular Cluster is the best globular cluster of the northern sky in the constellation of Hercules at a distance of 22,200 ly. At 143 ly across, it is estimated to contain several hundred thousand stars and appears to observers roughly 2/3 the size of the full Moon at magnitude 5.8, making it visible to the unaided eye from dark locations. IMAGE BY KATHY WALKER.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY																																																																																																									
 <p>40°N 50°N Set — 0:01 Rise 10:08 9:43</p> <p>1</p> <p>Lunar X near crater Werner visible in all of N. America 8 pm Spot Capella unaided before sunset this week</p>	 <p>40°N 50°N Set 0:39 1:09 Rise 10:43 10:12</p> <p>2</p> <p>First Quarter 14:57 Lunar Straight Wall this evening</p>	 <p>40°N 50°N Set 1:40 2:16 Rise 11:25 10:48</p> <p>3</p>	 <p>40°N 50°N Set 2:41 3:20 Rise 12:15 11:35</p> <p>4</p>	 <p>40°N 50°N Set 3:38 4:19 Rise 13:14 12:34</p> <p>5</p>	 <p>40°N 50°N Set 4:31 5:09 Rise 14:21 13:45</p> <p>6</p>	 <p>40°N 50°N Set 5:19 5:50 Rise 15:33 15:05 Sunrise 6:24 6:30 Sunset 17:59 17:53</p> <p>7</p>																																																																																																									
 <p>40°N 50°N Set 7:00 7:23 Rise 17:49 17:29</p> <p>8</p> <p>Daylight Saving Time begins 2 am Neptune in conjunction</p>	 <p>40°N 50°N Set 7:37 7:52 Rise 19:06 18:56</p> <p>9</p> <p>Full Moon 13:47 Mercury stationary Today's full Moon is the Pexsisen Moon (Blossoming Out)</p>	 <p>40°N 50°N Set 8:11 8:17 Rise 20:23 20:22</p> <p>10</p> <p>Moon at perigee</p>	 <p>40°N 50°N Set 8:43 8:40 Rise 21:38 21:47</p> <p>11</p> <p>Zodiacal Light readily visible from a dark site in W after evening twilight for the next 2 weeks.</p>	 <p>40°N 50°N Set 9:16 9:04 Rise 22:53 23:10</p> <p>12</p>	 <p>40°N 50°N Set 9:50 9:29 Rise — —</p> <p>13</p>	 <p>40°N 50°N Rise 6:07 6:31 Set 10:27 9:59 Sunrise 7:12 7:15 Sunset 19:06 19:04</p> <p>14</p> <p>27 Euterpe at opposition (m=9.4)</p>																																																																																																									
 <p>40°N 50°N Rise 1:15 1:49 Set 11:09 10:34</p> <p>15</p>	 <p>40°N 50°N Rise 2:21 3:00 Set 11:56 11:16</p> <p>16</p> <p>Last Quarter 5:34 ST. PATRICK'S DAY (NL)</p>	 <p>40°N 50°N Rise 3:20 4:01 Set 12:48 12:07</p> <p>17</p> <p>ST. PATRICK'S DAY</p>	 <p>40°N 50°N Rise 4:12 4:52 Set 13:44 13:05</p> <p>18</p> <p>Moon, Mars, and Jupiter form large triangle in morning twilight Two shadows on Jupiter visible in Atlantic Canada 5:33 am</p>	 <p>40°N 50°N Rise 4:57 5:33 Set 14:43 14:08</p> <p>19</p> <p>Spring equinox 11:50 ET</p>	 <p>40°N 50°N Rise 5:35 6:05 Set 15:43 15:14</p> <p>20</p> <p>BAHÁ'Í NEW YEAR (BEGINS AT SUNSET THE PREVIOUS EVENING) Mars 0.7° south of Jupiter this morning</p>	 <p>40°N 50°N Rise 6:07 6:31 Set 16:42 16:20 Sunrise 7:01 7:00 Sunset 19:14 19:15</p> <p>21</p>																																																																																																									
 <p>40°N 50°N Rise 6:36 6:53 Set 17:41 17:26</p> <p>22</p>	 <p>40°N 50°N Rise 7:02 7:12 Set 18:39 18:31</p> <p>23</p>	 <p>40°N 50°N Rise 7:26 7:30 Set 19:36 19:36</p> <p>24</p> <p>New Moon 5:28 Venus at greatest elongation (46° E) this evening Mercury at greatest elongation (28° W) this morning. Poor apparition (m=0.1) Moon at apogee Furthest Lunar Apogee of the year ~406688 km</p>	 <p>40°N 50°N Rise 7:50 7:47 Set 20:34 20:41</p> <p>25</p> <p>Jupiter, Mars and Saturn form large triangle in morning twilight Two shadows on Jupiter visible in E of N. America 4:06 am</p>	 <p>40°N 50°N Rise 8:15 8:05 Set 21:32 21:47</p> <p>26</p>	 <p>40°N 50°N Rise 8:41 8:24 Set 22:31 22:53</p> <p>27</p>	 <p>40°N 50°N Rise 9:09 8:45 Set 23:31 0:00 Sunrise 6:50 6:44 Sunset 19:21 19:27</p> <p>28</p> <p>Earth Hour (8:30–9:30 pm local) www.earthhour.org Moon 8° left of Venus this evening</p>																																																																																																									
 <p>40°N 50°N Rise 9:42 9:12 Set — —</p> <p>29</p> <p>Spot Sirius unaided before sunset this week Follow Vega unaided into daylight this week</p>	 <p>40°N 50°N Set 0:32 1:07 Rise 10:20 9:44</p> <p>30</p>	 <p>40°N 50°N Set 1:32 2:11 Rise 11:06 10:26</p> <p>31</p> <p>Mars 1° below of Saturn this morning</p>	<p>THE PLANETS THIS MONTH</p> <p>Mercury extremely low in ESE in morning twilight, early this month with extreme difficulty</p> <p>Venus in W in evening twilight, sets near 11 pm</p> <p>Mars rises in SE after 4 am, in SE near dawn</p> <p>Jupiter rises in SE near 5 am, in SE near dawn</p> <p>Saturn rises in ESE after 5 am, in SE near dawn</p>				<table border="1"> <thead> <tr> <th>FEB</th> <th>S</th> <th>M</th> <th>T</th> <th>W</th> <th>T</th> <th>F</th> <th>S</th> </tr> </thead> <tbody> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td></tr> <tr><td></td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr> <tr><td></td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td></tr> <tr><td></td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td></tr> <tr><td></td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td></tr> </tbody> </table> <table border="1"> <thead> <tr> <th>MAY</th> <th>S</th> <th>M</th> <th>T</th> <th>W</th> <th>T</th> <th>F</th> <th>S</th> </tr> </thead> <tbody> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>1</td></tr> <tr><td></td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr> <tr><td></td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td></tr> <tr><td></td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td></tr> <tr><td></td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td></tr> <tr><td></td><td>31</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table> <p>Times in the upper half of the daily boxes are in the 24-hour clock; times in the lower half are given in the 12-hour clock. Eastern time is used, except for rise and set events and changes to/from Daylight Saving Time, which are given in local time. Times for events involving planetary satellites refer to the start time. Detailed instructions on adjusting times for location are given in the back pages. <i>Please see back pages for photo details and additional information about this Calendar.</i></p>	FEB	S	M	T	W	T	F	S								1		2	3	4	5	6	7	8		9	10	11	12	13	14	15		16	17	18	19	20	21	22		23	24	25	26	27	28	29	MAY	S	M	T	W	T	F	S								1		3	4	5	6	7	8	9		10	11	12	13	14	15	16		17	18	19	20	21	22	23		24	25	26	27	28	29	30		31						
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APRIL

LION'S HEAD NEBULA – A very faint emission nebula in Cepheus is an elusive target for imagers and can be glimpsed visually under the darkest of skies. Its source of energy is suspected Wolf–Rayet star 153ab. IMAGE BY MARC RICARD.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY																																																																																																																																																																																																																																																																																																																
<p>THE PLANETS THIS MONTH</p> <p>Mercury with difficulty, in the eastern twilight</p> <p>Venus in W in evening twilight, sets near midnight</p> <p>Mars rises in ESE near 4 am, in SE near dawn</p> <p>Jupiter rises in ESE near 3 am, in SE near dawn</p> <p>Saturn rises in ESE near 3 am, in SE near dawn</p>		<p>Times in the upper half of the daily boxes are in the 24-hour clock; times in the lower half are given in the 12-hour clock.</p> <p>Eastern time is used, except for rise and set events and changes to/from Daylight Saving Time, which are given in local time.</p> <p>Times for events involving planetary satellites refer to the start time.</p> <p>Detailed instructions on adjusting times for location are given in the back pages.</p> <p><i>Please see back pages for photo details and additional information about this Calendar.</i></p>	<p>40°N 50°N 1</p> <p>Set 2:29 3:10 Rise 11:59 11:19</p> <p>First Quarter 6:21</p> <p>Lunar Straight Wall this evening</p> <p>Two shadows on Jupiter visible in extreme W of N. America 7:54 am</p> <p>3 Juno at opposition (m=9.6)</p>	<p>40°N 50°N 2</p> <p>Set 3:23 4:02 Rise 13:01 12:22</p> <p><i>Fizeau and Foucault obtain 1st successful sunspot photograph by daguerreotype 175 years ago.</i></p> <p>6 Hebe at opposition (m=9.9)</p>	<p>40°N 50°N 3</p> <p>Set 4:11 4:45 Rise 14:09 13:36</p>	<p>40°N 50°N 4</p> <p>Set 4:53 5:21 Rise 15:22 14:57 Sunrise 6:39 6:29 Sunset 19:28 19:38</p>																																																																																																																																																																																																																																																																																																																
<p>40°N 50°N 5</p> <p>Set 5:31 5:50 Rise 16:37 16:21</p>	<p>40°N 50°N 6</p> <p>Set 6:05 6:16 Rise 17:53 17:47</p>	<p>40°N 50°N 7</p> <p>Set 6:38 6:39 Rise 19:10 19:13</p> <p>Full Moon 22:35</p> <p>Closest Lunar Perigee of the year ~356908 km</p> <p>Moon at perigee</p> <p>Today's full Moon is the Sxanel Moon (Bullhead)</p>	<p>40°N 50°N 8</p> <p>Set 7:10 7:02 Rise 20:26 20:39</p>	<p>40°N 50°N 9</p> <p>Set 7:43 7:27 Rise 21:42 22:05</p> <p>FIRST DAY OF PASSOVER (BEGINS AT SUNSET THE PREVIOUS EVENING)</p>	<p>40°N 50°N 10</p> <p>Set 8:20 7:55 Rise 22:57 23:27</p> <p>GOOD FRIDAY</p>	<p>40°N 50°N 11</p> <p>Set 9:01 8:28 Sunrise 6:28 6:14 Sunset 19:35 19:48</p>																																																																																																																																																																																																																																																																																																																
<p>40°N 50°N 12</p> <p>Rise 0:07 0:45 Set 9:47 9:08</p> <p>EASTER SUNDAY</p>	<p>40°N 50°N 13</p> <p>Rise 1:12 1:53 Set 10:39 9:57</p>	<p>40°N 50°N 14</p> <p>Rise 2:08 2:50 Set 11:35 10:54</p> <p>Last Quarter 18:56</p>	<p>40°N 50°N 15</p> <p>Rise 2:56 3:35 Set 12:35 11:57</p> <p>Moon 2.5° below Saturn this morning</p>	<p>40°N 50°N 16</p> <p>Rise 3:37 4:10 Set 13:35 13:04</p> <p>Moon 3.7° below Mars this morning</p>	<p>40°N 50°N 17</p> <p>Rise 4:11 4:38 Set 14:35 14:11</p>	<p>40°N 50°N 18</p> <p>Rise 4:40 5:00 Set 15:34 15:17 Sunrise 6:17 6:00 Sunset 19:42 19:59</p>																																																																																																																																																																																																																																																																																																																
<p>40°N 50°N 19</p> <p>Rise 5:07 5:20 Set 16:33 16:23</p>	<p>40°N 50°N 20</p> <p>Rise 5:31 5:37 Set 17:30 17:27</p> <p>ST. GEORGE'S DAY (NL) Moon at apogee</p>	<p>40°N 50°N 21</p> <p>Rise 5:55 5:54 Set 18:28 18:32</p>	<p>40°N 50°N 22</p> <p>Rise 6:19 6:11 Set 19:26 19:38</p> <p>New Moon 22:26</p> <p>Lyrid meteors (ZHR=18) 3 am, best seen in predawn hours today</p> <p>Mercury at superior conjunction</p>	<p>40°N 50°N 23</p> <p>Rise 6:44 6:29 Set 20:25 20:45</p> <p>40 Harmonia at opposition (m=9.8)</p> <p>Young crescent Moon, 21 hours after new in E, 25 hours after new in W, soon after sunset</p> <p><i>Hubble Space Telescope was launched 30 years ago.</i></p>	<p>40°N 50°N 24</p> <p>Rise 7:12 6:50 Set 21:25 21:52</p>	<p>40°N 50°N 25</p> <p>Rise 7:43 7:15 Set 22:26 23:00 Sunrise 6:07 5:47 Sunset 19:49 20:10</p>																																																																																																																																																																																																																																																																																																																
<p>40°N 50°N 26</p> <p>Rise 8:20 7:45 Set 23:27 —</p> <p>Uranus in conjunction</p> <p><i>Debate on the Scale of the Universe by Harlow Shapley and Heber D. Curtis was held 100 years ago.</i></p>	<p>40°N 50°N 27</p> <p>Set — 0:05 Rise 9:03 8:23</p> <p>International Astronomy Week (Spring) (through May 3)</p>	<p>40°N 50°N 28</p> <p>Set 0:25 1:06 Rise 9:53 9:11</p>	<p>40°N 50°N 29</p> <p>Set 1:19 2:00 Rise 10:51 10:10</p> <p>Lunar X near crater Werner visible in all of N. America 10 pm</p>	<p>40°N 50°N 30</p> <p>Set 2:08 2:45 Rise 11:55 11:19</p> <p>First Quarter 16:38</p> <p>Lunar Straight Wall this evening</p>	<table border="1"> <tr> <th>MAR</th> <th>S</th> <th>M</th> <th>T</th> <th>W</th> <th>T</th> <th>F</th> <th>S</th> </tr> <tr> <td></td> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> </tr> <tr> <td></td> <td>8</td> <td>9</td> <td>10</td> <td>11</td> <td>12</td> <td>13</td> <td>14</td> </tr> <tr> <td></td> <td>15</td> <td>16</td> <td>17</td> <td>18</td> <td>19</td> <td>20</td> <td>21</td> </tr> <tr> <td></td> <td>22</td> <td>23</td> <td>24</td> <td>25</td> <td>26</td> <td>27</td> <td>28</td> </tr> <tr> <td></td> <td>29</td> <td>30</td> <td>31</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th>MAY</th> <th>S</th> <th>M</th> <th>T</th> <th>W</th> <th>T</th> <th>F</th> <th>S</th> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>1</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>2</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>3</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>4</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>5</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>6</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>7</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>8</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>9</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>10</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>11</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>12</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>13</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>14</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>15</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>16</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>17</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>18</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>19</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>20</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>21</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>22</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>23</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>24</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>25</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>26</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>27</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>28</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>29</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>30</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>31</td> </tr> </table>		MAR	S	M	T	W	T	F	S		1	2	3	4	5	6	7		8	9	10	11	12	13	14		15	16	17	18	19	20	21		22	23	24	25	26	27	28		29	30	31					MAY	S	M	T	W	T	F	S								1								2								3								4								5								6								7								8								9								10								11								12								13								14								15								16								17								18								19								20								21								22								23								24								25								26								27								28								29								30								31
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MAY

FLY ME TO THE MOON – Just 3 hours prior to the Total Lunar Eclipse on 2019 January 20, the ISS transited the lunar disk as seen from Oakville, Ontario. Placing oneself in the correct location to record such transits can be rewarding with images such as this. IMAGE BY KEVIN WATSON.

SUNDAY

MONDAY

TUESDAY

WEDNESDAY

THURSDAY

FRIDAY

SATURDAY

THE PLANETS THIS MONTH

- Mercury** very low in WNW in evening twilight, after mid-month
- Venus** low in WNW in evening twilight, lost by month end
- Mars** rises in ESE near 3 am, in SE near dawn
- Jupiter** rises in ESE near 1 am, in S near near dawn
- Saturn** rises in ESE after 1 am, in S near dawn

40°N 50°N **1**
 Set 2:51 3:22
 Rise 13:04 12:35

40°N 50°N **2**
 Set 3:29 3:52
 Rise 14:15 13:55
 Sunrise 5:58 5:34
 Sunset 19:56 20:21

International Astronomy Day (Spring)
www.astroleague.org/al/astroday/astrodayform.html

40°N 50°N **3**
 Set 4:03 4:17
 Rise 15:29 15:17

40°N 50°N **4**
 Set 4:34 4:40
 Rise 16:43 16:41

40°N 50°N **5**
 Set 5:05 5:03
 Rise 17:58 18:06

40°N 50°N **6**
 Set 5:37 5:25
 Rise 19:14 19:31

40°N 50°N **7**
 Set 6:12 5:51
 Rise 20:30 20:57

40°N 50°N **8**
 Set 6:50 6:21
 Rise 21:44 22:19

40°N 50°N **9**
 Set 7:34 6:58
 Rise 22:54 23:35
 Sunrise 5:50 5:22
 Sunset 20:03 20:32

Eta Aquariid meteors (ZHR=50) 5 pm, best seen in predawn hours today or tomorrow
 Moon at perigee

FIRST DAY OF RAMADAN (BEGINS AT SUNSET THE PREVIOUS EVENING)

Today's full Moon is the Penawen Moon (Camas Harvest)

40°N 50°N **10**
 Set 8:25 7:44
 Rise 23:57 —

40°N 50°N **11**
 Rise — 0:39
 Set 9:21 8:39

40°N 50°N **12**
 Rise 0:50 1:31
 Set 10:22 9:42

40°N 50°N **13**
 Rise 1:35 2:11
 Set 11:23 10:49

40°N 50°N **14**
 Rise 2:12 2:42
 Set 12:25 11:58

40°N 50°N **15**
 Rise 2:44 3:06
 Set 13:25 13:05

40°N 50°N **16**
 Rise 3:11 3:27
 Set 14:24 14:12
 Sunrise 5:44 5:12
 Sunset 20:10 20:42

MOTHER'S DAY

Saturn stationary

Moon, Jupiter and Saturn form large triangle this morning

Venus stationary

Jupiter with only one satellite visible in E of N. America 02:09 am
 Jupiter stationary

Moon 4° below left of Mars this morning

40°N 50°N **17**
 Rise 3:36 3:45
 Set 15:22 15:17

40°N 50°N **18**
 Rise 4:00 4:02
 Set 16:20 16:22

40°N 50°N **19**
 Rise 4:23 4:18
 Set 17:18 17:27

40°N 50°N **20**
 Rise 4:48 4:36
 Set 18:17 18:34

40°N 50°N **21**
 Rise 5:15 4:55
 Set 19:17 19:42

40°N 50°N **22**
 Rise 5:45 5:18
 Set 20:19 20:50

40°N 50°N **23**
 Rise 6:19 5:46
 Set 21:20 21:58
 Sunrise 5:38 5:04
 Sunset 20:16 20:51

Texas Star Party, Fort Davis, TX, www.texasstarparty.org (through May 24)

VICTORIA DAY (CANADA)
 Moon at apogee

Jupiter with only one satellite visible in all of N. America except E 4:23 am

New Moon 13:39
 Mercury 1.7° left of Venus this evening
 Thomas Gold, who proposed steady-state theory of Universe with Hermann Bondi, was born 100 years ago.

40°N 50°N **24**
 Rise 7:00 6:22
 Set 22:20 23:01

40°N 50°N **25**
 Rise 7:49 7:07
 Set 23:17 23:58

40°N 50°N **26**
 Rise 8:45 8:03
 Set — —

40°N 50°N **27**
 Set 0:07 0:46
 Rise 9:47 9:09

40°N 50°N **28**
 Set 0:52 1:25
 Rise 10:54 10:23

40°N 50°N **29**
 Set 1:30 1:56
 Rise 12:04 11:40

40°N 50°N **30**
 Set 2:04 2:22
 Rise 13:14 13:00
 Sunrise 5:34 4:57
 Sunset 20:22 20:59

40°N 50°N **31**
 Set 2:36 2:45
 Rise 14:26 14:20

MEMORIAL DAY (USA)
 CASCA, Toronto, Ontario (through May 28)

Jupiter with only one satellite visible in W of N. America 06:45 am
 Jupiter with only one satellite visible in W of N. America 09:11 am

First Quarter 23:30

Lunar Straight Wall this evening

APR	S	M	T	W	T	F	S
			1	2	3	4	
	5	6	7	8	9	10	11
	12	13	14	15	16	17	18
	19	20	21	22	23	24	25
	26	27	28	29	30		

JUN	S	M	T	W	T	F	S
	1	2	3	4	5	6	
	7	8	9	10	11	12	13
	14	15	16	17	18	19	20
	21	22	23	24	25	26	27
	28	29	30				

Times in the upper half of the daily boxes are in the 24-hour clock; times in the lower half are given in the 12-hour clock.

Eastern time is used, except for rise and set events and changes to/from Daylight Saving Time, which are given in local time.

Times for events involving planetary satellites refer to the start time.

Detailed instructions on adjusting times for location are given in the back pages.

Please see back pages for photo details and additional information about this Calendar.



JUNE

RARE APPEARANCE. During June 2019 noctilucent clouds made record appearances further south than observed before at mid-latitudes. Here seen from Peggys Cove, Nova Scotia, just below 45 N. IMAGE BY BARRY R BURGESS.

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
<p>Times in the upper half of the daily boxes are in the 24-hour clock; times in the lower half are given in the 12-hour clock.</p> <p>Eastern time is used, except for rise and set events and changes to/from Daylight Saving Time, which are given in local time.</p> <p>Times for events involving planetary satellites refer to the start time.</p> <p>Detailed instructions on adjusting times for location are given in the back pages.</p> <p>Please see back pages for photo details and additional information about this Calendar.</p>	<p>40°N 50°N Set 3:05 3:06 Rise 15:38 15:41</p> <p>1</p> <p>Watch for noctilucent clouds in N sky during twilight this month. Best N of 50° latitude</p>	<p>40°N 50°N Set 3:36 3:28 Rise 16:51 17:04</p> <p>2</p>	<p>40°N 50°N Set 4:07 3:51 Rise 18:05 18:28</p> <p>3</p> <p>Moon at perigee Venus at inferior conjunction</p>	<p>40°N 50°N Set 4:43 4:18 Rise 19:20 19:51</p> <p>4</p> <p>Mercury at greatest elongation (24° E) this evening. (m=0.5) Two shadows on Jupiter visible in extreme E of N. America during twilight 8:29 pm</p>	<p>40°N 50°N Set 5:23 4:50 Rise 20:32 21:10</p> <p>5</p> <p>Full Moon 15:12 Penumbral lunar eclipse, visible E hemisphere, NOT visible from N. America Today's full Moon is the Centeki Moon (Sockeye)</p>	<p>40°N 50°N Set 6:11 5:31 Rise 21:39 22:21 Sunrise 5:32 4:53 Sunset 20:26 21:05</p> <p>6</p> <p>Jupiter with only one satellite visible in all of N. America 02:17 am</p>
<p>40°N 50°N Set 7:05 6:22 Rise 22:38 23:20</p> <p>7</p> <p>Jupiter with only one satellite visible in extreme E of N. America 11:14 pm</p>	<p>40°N 50°N Set 8:04 7:23 Rise 23:28 —</p> <p>8</p>	<p>40°N 50°N Rise 0:06 Set 9:07 8:30</p> <p>9</p> <p>Moon, Jupiter and Saturn form large triangle</p>	<p>40°N 50°N Rise 0:09 0:42 Set 10:11 9:40</p> <p>10</p>	<p>40°N 50°N Rise 0:44 1:10 Set 11:13 10:49</p> <p>11</p> <p>Mars 1.7° south of Neptune next two nights Two shadows on Jupiter visible 11:33 pm</p>	<p>40°N 50°N Rise 1:13 1:32 Set 12:13 11:57</p> <p>12</p>	<p>40°N 50°N Rise 4:57 4:20 Set 20:11 20:51 Sunrise 5:31 4:51 Sunset 20:30 21:10</p> <p>13</p> <p>Last Quarter 2:24</p>
<p>40°N 50°N Rise 2:04 2:08 Set 14:10 14:09</p> <p>14</p> <p>Moon at apogee</p>	<p>40°N 50°N Rise 2:27 2:24 Set 15:08 15:14</p> <p>15</p> <p>Jupiter with only one satellite visible in E of N. America 12:41 am Charles Messier discovered Lexell's Comet 250 years ago.</p>	<p>40°N 50°N Rise 2:51 2:41 Set 16:06 16:20</p> <p>16</p>	<p>40°N 50°N Rise 3:17 3:00 Set 17:06 17:27</p> <p>17</p> <p>Mercury stationary</p>	<p>40°N 50°N Rise 3:45 3:21 Set 18:07 18:36</p> <p>18</p>	<p>40°N 50°N Rise 4:18 3:47 Set 19:10 19:45</p> <p>19</p> <p>Moon 0.7° left of Venus this morning</p>	<p>40°N 50°N Rise 4:57 4:20 Set 20:11 20:51 Sunrise 5:31 4:51 Sunset 20:32 21:13</p> <p>20</p> <p>Summer solstice 17:44 ET</p>
<p>40°N 50°N Rise 5:43 5:02 Set 21:10 21:52</p> <p>21</p> <p>New Moon 2:42 FATHER'S DAY NATIONAL ABORIGINAL DAY Annular solar eclipse visible from East Africa, India and China Young crescent Moon, 18 hours after new in E, 22 hours after new in W, a difficult challenge just after sunset</p>	<p>40°N 50°N Rise 6:37 5:55 Set 22:04 22:44</p> <p>22</p> <p>DISCOVERY DAY (NL)</p>	<p>40°N 50°N Rise 7:39 6:59 Set 22:51 23:26</p> <p>23</p> <p>Neptune stationary</p>	<p>40°N 50°N Rise 8:45 8:12 Set 23:32 —</p> <p>24</p> <p>LA FÊTE NATIONALE (QC) Venus stationary</p>	<p>40°N 50°N Set 9:55 9:29</p> <p>25</p>	<p>40°N 50°N Set 0:07 0:28 Rise 11:06 10:48</p> <p>26</p>	<p>40°N 50°N Set 1:39 1:51 Rise 12:16 12:08 Sunrise 5:34 4:53 Sunset 20:33 21:13</p> <p>27</p> <p>Lunar X near crater Werner visible in all of N. America 8 pm</p>
<p>40°N 50°N Set 1:09 1:13 Rise 13:27 13:27</p> <p>28</p> <p>First Quarter 4:16 Lunar Straight Wall this evening 7 Iris at opposition (m=8.8)</p>	<p>40°N 50°N Set 1:38 1:33 Rise 14:38 14:47</p> <p>29</p> <p>Moon at perigee</p>	<p>40°N 50°N Set 2:08 1:55 Rise 15:50 16:08</p> <p>30</p> <p>Jupiter with only one satellite visible in E of N. America 11:06 pm Mercury at inferior conjunction</p>	<p>THE PLANETS THIS MONTH</p> <p>Mercury very low in WNW in evening twilight, lost after mid-month</p> <p>Venus very low in ENE near month end, with difficulty</p> <p>Mars rises in E after 1 am, in SE near dawn</p> <p>Jupiter rises in ESE near 11 pm, transits in S near 4 am</p> <p>Saturn rises in ESE after 11 pm, transits in S near 4 am</p>			

MAY	S	M	T	W	T	F	S
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	19	20	21	22	23	24	25
	26	27	28	29	30	31	



JULY

WHO ARE YOU – The star cluster NGC 457 is a rich open cluster of about 150 stars in the constellation of Cassiopeia. Viewed easily with a telescope, it is a good showpiece for public star nights, where people can try to pick out what they see, as some of its common names call it the Owl, ET, or Dragon Fly Cluster. IMAGE BY RICHARD SEAWARDS.

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<p>THE PLANETS THIS MONTH</p> <p>Mercury very low in ENE in morning twilight with difficulty, after mid-month</p> <p>Venus very low in E in morning twilight</p> <p>Mars rises in E after midnight, high in SE near dawn</p> <p>Jupiter in SE after dusk, transits near 1 am, low in SW near dawn</p> <p>Saturn in SE at dusk, transits after 1 am, low in SW near dawn</p>			<p>Times in the upper half of the daily boxes are in the 24-hour clock; times in the lower half are given in the 12-hour clock.</p> <p>Eastern time is used, except for rise and set events and changes to/from Daylight Saving Time, which are given in local time.</p> <p>Times for events involving planetary satellites refer to the start time.</p> <p>Detailed instructions on adjusting times for location are given in the back pages.</p> <p><i>Please see back pages for photo details and additional information about this Calendar.</i></p>	<p>1</p> <p>40°N 50°N Set 2:41 2:19 Rise 17:02 17:29</p> <p>CANADA DAY Watch for noctilucent clouds in N sky during twilight this month. Best N of 50° latitude</p>	<p>2</p> <p>40°N 50°N Set 3:18 2:48 Rise 18:14 18:49</p> <p>532 Herculina at opposition (m=9.4)</p>	<p>3</p> <p>40°N 50°N Set 4:01 3:24 Rise 19:22 20:03</p>	<p>4</p> <p>40°N 50°N Set 4:51 4:10 Rise 20:24 21:07 Sunrise 5:37 4:58 Sunset 20:32 21:11</p> <p>INDEPENDENCE DAY (USA) Earth at aphelion (152,095,295 km) 07:34 ET</p>																																																																																																							
<p>5</p> <p>40°N 50°N Set 5:48 5:06 Rise 21:18 21:59</p> <p>Full Moon 0:44</p> <p>Penumbral lunar eclipse, visible in E. of N. America</p> <p>Moon, Jupiter and Saturn form large triangle</p> <p>Today's full Moon is the Cenhehen Moon (Humpback Salmon)</p> <p>Spot Arcturus unaided before sunset this week</p>	<p>6</p> <p>40°N 50°N Set 6:50 6:11 Rise 22:03 22:39</p>	<p>7</p> <p>40°N 50°N Set 7:54 7:20 Rise 22:41 23:10</p>	<p>8</p> <p>40°N 50°N Set 8:58 8:31 Rise 23:13 23:35</p> <p>Christiaan Huygens, who discovered the laws of centrifugal force, died 325 years ago.</p>	<p>9</p> <p>40°N 50°N Set 10:00 9:41 Rise 23:41 23:55</p> <p>NUNAVUT DAY George H. Darwin, 1st to systematically study tides and origin of Solar System, was born 175 years ago.</p>	<p>10</p> <p>40°N 50°N Set 11:00 10:49 Rise — —</p>	<p>11</p> <p>40°N 50°N Rise 0:06 0:13 Set 11:59 11:55 Sunrise 5:42 5:04 Sunset 20:30 21:07</p>																																																																																																								
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AUGUST

FLASHES IN THE NIGHT – A sporadic bright meteor lights up the clouds and water, stealing the show from the beacon of the Cape Forchu Lighthouse near Yarmouth, Nova Scotia. The Southern Milky Way only competes with lights on the horizon from the large fish processing ships offshore. IMAGE BY BRENDA LEVY TATE.

SUNDAY

MONDAY

TUESDAY

WEDNESDAY

THURSDAY

FRIDAY

SATURDAY

THE PLANETS THIS MONTH

- Mercury** very low in ENE in morning twilight with difficulty, early this month
- Venus** low in E in morning twilight
- Mars** rises in E near 11 pm, high in S near dawn
- Jupiter** in SSE at dusk, transits in S near 11 pm, sets in WSW after 3 am
- Saturn** in SSE at dusk, transits in S after 11 pm, sets in WSW after 4 am

40°N 50°N **1**
 Set 3:38 2:55
 Rise 19:10 19:52
 Sunrise 5:59 5:30
 Sunset 20:13 20:41

Moon, Jupiter and Saturn form large triangle

40°N 50°N **2**
 Set 4:37 3:56
 Rise 19:58 20:36

40°N 50°N **3**
 Set 5:40 5:03
 Rise 20:38 21:10
 Full Moon
 11:59

CIVIC HOLIDAY (AB,BC,MB,NB,NS,NT,NU,ON,PE,SK)

Today's full Moon is the Centawen Moon (Coho Salmon)

40°N 50°N **4**
 Set 6:44 6:14
 Rise 21:12 21:37

40°N 50°N **5**
 Set 7:47 7:24
 Rise 21:41 21:59

40°N 50°N **6**
 Set 8:48 8:33
 Rise 22:07 22:18

40°N 50°N **7**
 Set 9:48 9:41
 Rise 22:32 22:35

40°N 50°N **8**
 Set 10:46 10:47
 Rise 22:55 22:51
 Sunrise 6:06 5:40
 Sunset 20:05 20:30

40°N 50°N **9**
 Set 11:44 11:52
 Rise 23:19 23:08

Moon at apogee
 Moon 1° below Mars this morning

40°N 50°N **10**
 Set 12:42 12:58
 Rise 23:45 23:27

Robert H. Goddard, father of modern rocketry, died 75 years ago.

40°N 50°N **11**
 Set 13:41 14:04
 Rise — 23:48
 Last Quarter
 12:45

40°N 50°N **12**
 Rise 0:13 —
 Set 14:42 15:12

Lunar Curtiss X visible in extreme W of N. America 9am
 Perseid meteors (ZHR=110) 10 am, best seen in predawn hours today

40°N 50°N **13**
 Rise 0:46 0:15
 Set 15:43 16:19

Stellafane Convention, Springfield, VT (through Aug 16)
 Venus at greatest elongation (46° W) this morning

40°N 50°N **14**
 Rise 1:26 0:48
 Set 16:43 17:24

40°N 50°N **15**
 Rise 2:13 1:31
 Set 17:41 18:23
 Sunrise 6:12 5:51
 Sunset 19:56 20:17

Mount Kobau Star Party, Osoyoos, BC (through Aug 23)
 Moon 4° above left of Venus this morning
 Uranus stationary

40°N 50°N **16**
 Rise 3:08 2:26
 Set 18:35 19:14

Sir Joseph Norman Lockyer, who first connected spectrum and temperature, died 100 years ago.

40°N 50°N **17**
 Rise 4:12 3:33
 Set 19:22 19:56

DISCOVERY DAY (YT)
 Mercury at superior conjunction

40°N 50°N **18**
 Rise 5:22 4:50
 Set 20:03 20:30
 New Moon
 22:42

40°N 50°N **19**
 Rise 6:36 6:12
 Set 20:39 20:58

Saskatchewan Summer Star Party, Cypress Hills, SK (through Aug 24)
 Young crescent Moon, 21 hours after new in E, 25 hours after new in W, a difficult challenge just after sunset

40°N 50°N **20**
 Rise 7:50 7:35
 Set 21:12 21:21

ISLAMIC NEW YEAR (BEGINS AT SUNSET THE PREVIOUS EVENING)

40°N 50°N **21**
 Rise 9:04 8:59
 Set 21:42 21:43

Nova East, Smileys Provincial Park, NS halifax.rasc.ca/ne (through Aug 23)
 Moon at perigee

40°N 50°N **22**
 Rise 10:17 10:22
 Set 22:13 22:04
 Sunrise 6:19 6:01
 Sunset 19:46 20:03

40°N 50°N **23**
 Rise 11:30 11:44
 Set 22:44 22:27

40°N 50°N **24**
 Rise 12:43 13:06
 Set 23:18 22:53

40°N 50°N **25**
 Rise 13:55 14:26
 Set 23:57 23:24
 First Quarter
 13:58

40°N 50°N **26**
 Rise 15:04 15:42
 Set — —

Lunar Straight Wall this evening
 Zurich daily sunspot number is 317, highest value in 19th century and record until 1957, 150 years ago.

40°N 50°N **27**
 Rise 16:08 16:50
 Set 0:41 0:02

40°N 50°N **28**
 Rise 1:32 0:50
 Set 17:06 17:48

Moon 2° below Jupiter tonight, Saturn nearby
 1 Ceres at opposition (m=7.7)
 20 Massalia at opposition (m=9.6)

40°N 50°N **29**
 Set 2:29 1:47
 Rise 17:55 18:35
 Sunrise 6:26 6:12
 Sunset 19:35 19:49

40°N 50°N **30**
 Set 3:30 2:52
 Rise 18:37 19:11

40°N 50°N **31**
 Set 4:33 4:01
 Rise 19:13 19:40

JULY	S	M	T	W	T	F	S
			1	2	3	4	
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19	20	21	22	23	24	25	
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SEPT	S	M	T	W	T	F	S
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SEPTEMBER

THE NORTHERN LIGHTS filled the sky and lit the ground green on this night. The northerly location is evident from the view of Ursa Major in its late summer position yet still high in altitude. IMAGE BY ALAN DYER.

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<p>THE PLANETS THIS MONTH</p> <p>Mercury extremely low in WSW in evening twilight, this month with difficulty</p> <p>Venus low in E in morning twilight</p> <p>Mars rises in E near 9 pm, transits after 3 am, high in SW near dawn</p> <p>Jupiter in S at dusk, sets in SW after 1 am</p> <p>Saturn in S at dusk, sets in SW near 2 am</p>		<p> 40°N 50°N Set 5:36 5:11 Rise 19:43 20:03 1</p>	<p> 40°N 50°N Set 6:38 6:20 Rise 20:10 20:22 2</p> <p>Full Moon 1:22</p> <p>Today's full Moon is the Cenquolew Moon (Dog Salmon)</p>	<p> 40°N 50°N Set 7:38 7:28 Rise 20:34 20:40 3</p>	<p> 40°N 50°N Set 8:37 8:35 Rise 20:58 20:56 4</p>	<p> 40°N 50°N Set 9:35 9:40 Rise 21:21 21:13 Sunrise 6:32 6:22 Sunset 19:24 19:34 5</p>																																																																																															
<p> 40°N 50°N Set 10:33 10:46 Rise 21:46 21:30 6</p> <p>Moon at apogee Moon 0.5° below Mars tonight</p>	<p> 40°N 50°N Set 11:31 11:52 Rise 22:13 21:50 7</p> <p>LABOUR DAY</p>	<p> 40°N 50°N Set 12:31 12:58 Rise 22:44 22:14 8</p>	<p> 40°N 50°N Set 13:31 14:05 Rise 23:20 22:44 9</p> <p>Mars stationary</p>	<p> 40°N 50°N Set 14:31 15:10 Rise — 23:22 10</p> <p>Last Quarter 5:26</p>	<p> 40°N 50°N Rise 0:02 — Set 15:29 16:11 11</p> <p>Neptune at opposition (m=7.8) 19 Fortuna at opposition (m=9.2)</p>	<p> 40°N 50°N Rise 0:53 0:10 Set 16:23 17:05 Sunrise 6:39 6:32 Sunset 19:13 19:19 12</p>																																																																																															
<p> 40°N 50°N Rise 1:52 1:11 Set 17:12 17:50 13</p> <p>Jupiter stationary Follow Capella unaided into daylight this week</p>	<p> 40°N 50°N Rise 2:58 2:22 Set 17:56 18:26 14</p> <p>Moon 4.5° left of Venus this morning</p>	<p> 40°N 50°N Rise 4:10 3:41 Set 18:34 18:56 15</p> <p>Zodiacal Light readily visible from a dark site in E before morning twilight for the next two weeks. Northern Prairie Star Party, AB, edmontonrasc.com/northern-prairie-star-party (through Sep 20)</p>	<p> 40°N 50°N Rise 5:25 5:05 Set 19:08 19:22 16</p>	<p> 40°N 50°N Rise 6:40 6:30 Set 19:40 19:44 17</p> <p>New Moon 7:00</p> <p>Spruce Woods Star Party, Spruce Woods Park, MB (through Sep 20)</p>	<p> 40°N 50°N Rise 7:56 7:56 Set 20:10 20:06 18</p> <p>Alberta Star Party, Starland, AB calgary.rasc.ca/asp.htm (through Sep 20) Try to spot Uranus (m=5.7) unaided this weekend Moon at perigee</p>	<p> 40°N 50°N Rise 9:12 9:22 Set 20:42 20:28 Sunrise 6:45 6:43 Sunset 19:01 19:03 19</p> <p>ROSH HASHANAH (BEGINS AT SUNSET THE PREVIOUS EVENING)</p>																																																																																															
<p> 40°N 50°N Rise 10:28 10:47 Set 21:16 20:53 20</p>	<p> 40°N 50°N Rise 11:42 12:11 Set 21:54 21:23 21</p>	<p> 40°N 50°N Rise 12:55 13:31 Set 22:37 21:59 22</p> <p>Fall equinox 09:31 ET Pioneer 10 achieves 50 AU distance from Sun, 30 years ago.</p>	<p> 40°N 50°N Rise 14:02 14:44 Set 23:27 22:45 23</p> <p>First Quarter 21:55</p>	<p> 40°N 50°N Rise 15:03 15:46 Set — 23:40 24</p> <p>Moon, Jupiter and Saturn form large triangle</p>	<p> 40°N 50°N Set 0:23 — Rise 15:55 16:36 25</p> <p>Lunar Straight Wall this evening Moon, Jupiter and Saturn form large triangle</p>	<p> 40°N 50°N Set 1:23 0:43 Rise 16:39 17:15 Sunrise 6:52 6:53 Sunset 18:50 18:48 26</p>																																																																																															
<p> 40°N 50°N Set 2:26 1:51 Rise 17:15 17:45 27</p> <p>Follow Sirius unaided into daylight this week</p>	<p> 40°N 50°N Set 3:28 3:01 Rise 17:47 18:09 28</p> <p>YOM KIPPUR (BEGINS AT SUNSET THE PREVIOUS EVENING)</p>	<p> 40°N 50°N Set 4:30 4:10 Rise 18:14 18:29 29</p> <p>Saturn stationary</p>	<p> 40°N 50°N Set 5:30 5:18 Rise 18:39 18:46 30</p> <p>68 Leto at opposition (m=9.5)</p>	<table border="1"> <tr> <th>AUG</th> <th>S</th> <th>M</th> <th>T</th> <th>W</th> <th>T</th> <th>F</th> <th>S</th> </tr> <tr> <td></td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> </tr> <tr> <td></td> <td>9</td> <td>10</td> <td>11</td> <td>12</td> <td>13</td> <td>14</td> <td>15</td> </tr> <tr> <td></td> <td>16</td> <td>17</td> <td>18</td> <td>19</td> <td>20</td> <td>21</td> <td>22</td> </tr> <tr> <td></td> <td>23</td> <td>24</td> <td>25</td> <td>26</td> <td>27</td> <td>28</td> <td>29</td> </tr> <tr> <td></td> <td>30</td> <td>31</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <th>OCT</th> <th>S</th> <th>M</th> <th>T</th> <th>W</th> <th>T</th> <th>F</th> <th>S</th> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>1</td> <td>2</td> <td>3</td> </tr> <tr> <td></td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> <td>10</td> </tr> <tr> <td></td> <td>11</td> <td>12</td> <td>13</td> <td>14</td> <td>15</td> <td>16</td> <td>17</td> </tr> <tr> <td></td> <td>18</td> <td>19</td> <td>20</td> <td>21</td> <td>22</td> <td>23</td> <td>24</td> </tr> <tr> <td></td> <td>25</td> <td>26</td> <td>27</td> <td>28</td> <td>29</td> <td>30</td> <td>31</td> </tr> </table> <p>Times in the upper half of the daily boxes are in the 24-hour clock; times in the lower half are given in the 12-hour clock. Eastern time is used, except for rise and set events and changes to/from Daylight Saving Time, which are given in local time. Times for events involving planetary satellites refer to the start time. Detailed instructions on adjusting times for location are given in the back pages. Please see back pages for photo details and additional information about this Calendar.</p>		AUG	S	M	T	W	T	F	S		2	3	4	5	6	7	8		9	10	11	12	13	14	15		16	17	18	19	20	21	22		23	24	25	26	27	28	29		30	31						OCT	S	M	T	W	T	F	S						1	2	3		4	5	6	7	8	9	10		11	12	13	14	15	16	17		18	19	20	21	22	23	24		25	26	27	28	29	30	31
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OCTOBER

RISING MILKY WAY – Some of the best views of the southern Milky Way from Canada are made from the Atlantic Provinces, thanks to the vast ocean lacking light pollution to their south. Nova Scotia with its rugged shoreline provides beautiful landscapes to image and watch the skies from. IMAGE BY BARRY R. BURGESS.

SUNDAY

MONDAY

TUESDAY

WEDNESDAY

THURSDAY

FRIDAY

SATURDAY

THE PLANETS THIS MONTH

Mercury	with difficulty, in the western twilight
Venus	low in E in morning twilight
Mars	in E in evening twilight, transits near 1 am, low in W near dawn
Jupiter	in S at dusk, sets in WSW after 11 pm
Saturn	in S at dusk, sets in WSW near 12 am

SEPT	S	M	T	W	T	F	S
		1	2	3	4	5	
	6	7	8	9	10	11	12
	13	14	15	16	17	18	19
	20	21	22	23	24	25	26
	27	28	29	30			
NOV	S	M	T	W	T	F	S
	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	16	17	18	19	20	21
	22	23	24	25	26	27	28
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4
 40°N 50°N
 Set 9:24 9:42
 Rise 20:15 19:54
 Venus 0.3° above Regulus this morning, best in western N. America
 Spot Vega unaided before sunset this week

5
 40°N 50°N
 Set 10:23 10:49
 Rise 20:44 20:16

6
 40°N 50°N
 Set 11:23 11:55
 Rise 21:17 20:43
 Mars closest approach

7
 40°N 50°N
 Set 12:22 13:01
 Rise 21:57 21:17

8
 40°N 50°N
 Set 13:20 14:03
 Rise 22:43 22:00
 Full Moon 17:05
 Mercury at greatest elongation (26° E) this evening. (m=0.0)
 Today's full Moon is the Pekelanew Moon (Turns Leaves White)

9
 40°N 50°N
 Set 14:15 14:58
 Rise 23:37 22:54
 Last Quarter 20:40
 Moon 1° below Mars tonight

10
 40°N 50°N
 Rise — 0:00
 Set 15:05 15:45
 Sunrise 7:06 7:15
 Sunset 18:27 18:18
 Lunar Curtiss X visible in extreme W of N. America 9am
 S Taurid meteors (ZHR=5)

11
 40°N 50°N
 Rise 0:39 —
 Set 15:49 16:24
 Venus 0.3° above Regulus this morning, best in western N. America
 Spot Vega unaided before sunset this week

12
 40°N 50°N
 Rise 1:46 1:14
 Set 16:28 16:55
 THANKSGIVING DAY (CANADA)
 COLUMBUS DAY (USA)

13
 40°N 50°N
 Rise 2:58 2:34
 Set 17:03 17:22
 Mars at opposition (m=-2.6)
 Two shadows on Jupiter visible, difficult in evening twilight 7:53 pm

14
 40°N 50°N
 Rise 4:12 3:57
 Set 17:35 17:45
 Zodiacal Light readily visible from a dark site in E before morning twilight for the next two weeks.
 Moon 6° below left of Venus this morning
 Mercury stationary

15
 40°N 50°N
 Rise 5:27 5:22
 Set 18:06 18:06
 Full Moon 17:05
 Mercury at greatest elongation (26° E) this evening. (m=0.0)
 Today's full Moon is the Pekelanew Moon (Turns Leaves White)

16
 40°N 50°N
 Rise 6:44 6:48
 Set 18:37 18:28
 New Moon 15:31
 Try to spot Uranus (m=5.7) unaided this weekend
 Moon at perigee
 New Moon – Gegendeschein visible from a very dark site – highest in S at midnight.

17
 40°N 50°N
 Rise 8:01 8:16
 Set 19:10 18:52
 Sunrise 7:13 7:26
 Sunset 18:17 18:04
 Lunar Curtiss X visible in extreme W of N. America 9am
 S Taurid meteors (ZHR=5)

18
 40°N 50°N
 Rise 9:19 9:44
 Set 19:47 19:19

19
 40°N 50°N
 Rise 10:36 11:10
 Set 20:29 19:53

20
 40°N 50°N
 Rise 11:49 12:30
 Set 21:18 20:36
 Two shadows on Jupiter visible in extreme W of N. America during twilight 9:47 pm
 Royal Cape Observatory was established 200 years ago.

21
 40°N 50°N
 Rise 12:55 13:39
 Set 22:14 21:29
 Orionid meteors (ZHR=15) 1 am, best seen in predawn hours today

22
 40°N 50°N
 Rise 13:52 14:35
 Set 23:14 22:32
 Moon, Jupiter and Saturn form large triangle

23
 40°N 50°N
 Rise 14:39 15:18
 Set — 23:40
 First Quarter 9:23
 Lunar X near crater Werner visible in all of N. America 7 pm
 11 Parthenope at opposition (m=9.4)

24
 40°N 50°N
 Set 0:17 —
 Rise 15:18 15:50
 Sunrise 7:21 7:38
 Sunset 18:07 17:50
 Lunar Straight Wall this evening

25
 40°N 50°N
 Set 1:21 0:50
 Rise 15:51 16:16
 Mercury at inferior conjunction

26
 40°N 50°N
 Set 2:23 2:00
 Rise 16:19 16:37

27
 40°N 50°N
 Set 3:23 3:09
 Rise 16:44 16:54
 471 Papagena at opposition (m=9.5)

28
 40°N 50°N
 Set 4:23 4:15
 Rise 17:07 17:10





























29
 40°N 50°N
 Set 5:21 5:21
 Rise 17:30 17:26

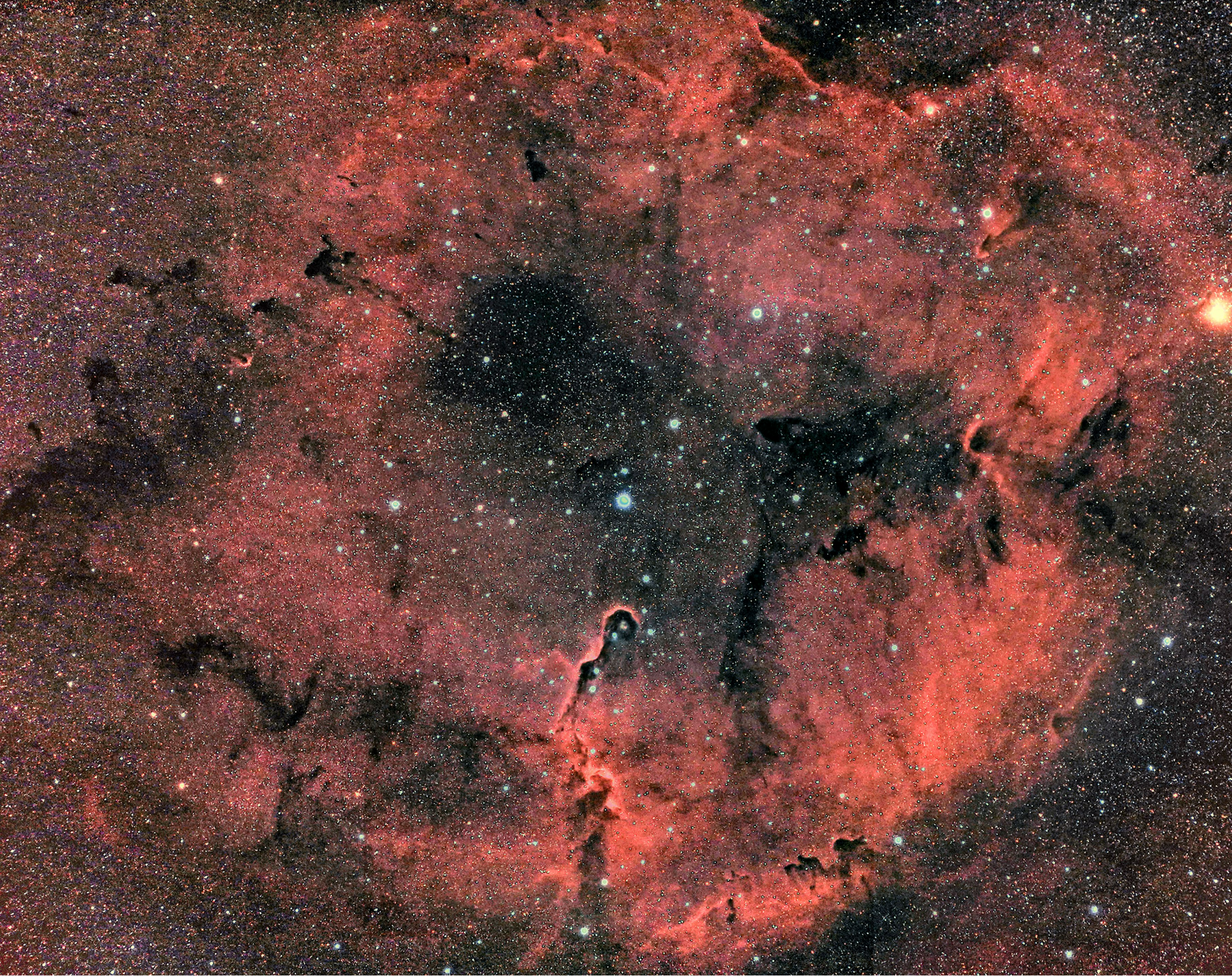
30
 40°N 50°N
 Set 6:19 6:27
 Rise 17:54 17:42
 Moon at apogee

31
 40°N 50°N
 Set 7:17 7:33
 Rise 18:19 18:00
 Sunrise 7:29 7:49
 Sunset 17:58 17:37
 Full Moon 10:49
 HALLOWE'EN
 Uranus at opposition (m=5.7)
 Today's full Moon is the Weselanelow Moon (Shaker Leaves)

NOVEMBER

THE CRAB NEBULA (Messier 1) is a supernova remnant in the constellation of Taurus. It is the remnant of the bright supernova of 1054 CE that was observed by Chinese astronomers. At a distance of 6,500 ly, the supernova appeared about -4 magnitude and was visible for about two years. IMAGE BY RÉMI LECASSE.

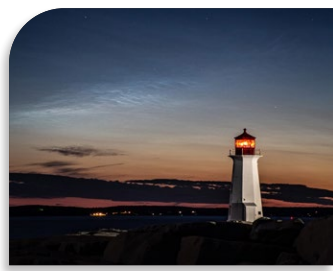
SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY																																																																																														
 <p>40°N 50°N Set 7:17 7:40 Rise 17:46 17:21</p> <p>1</p> <p>Daylight Saving Time ends 2 am 8 Flora at opposition (m=8.0)</p>	 <p>40°N 50°N Set 8:17 8:47 Rise 18:18 17:45</p> <p>2</p>	 <p>40°N 50°N Set 9:17 9:54 Rise 18:55 18:17</p> <p>3</p> <p>Mercury stationary</p>	 <p>40°N 50°N Set 10:15 10:57 Rise 19:39 18:56</p> <p>4</p> <p>George Ritchey, co-inventor of Ritchey-Chrétien reflector, died 75 years ago.</p>	 <p>40°N 50°N Set 11:11 11:55 Rise 20:30 19:46</p> <p>5</p>	 <p>40°N 50°N Set 12:02 12:44 Rise 21:28 20:46</p> <p>6</p>	 <p>40°N 50°N Set 12:47 13:24 Rise 22:32 21:56 Sunrise 6:37 7:01 Sunset 16:50 16:26</p> <p>7</p> <p>A meteorite hits house and breaks roof beam in China, 350 years ago.</p>																																																																																														
 <p>40°N 50°N Set 13:26 13:57 Rise 23:39 23:11</p> <p>8</p> <p>Last Quarter 8:46</p> <p>Lunar Curtiss X visible in Extreme E of N. America 11 pm Wilhelm C. Roentgen discovered X-rays, 125 years ago.</p>	 <p>40°N 50°N Set 14:01 14:24 Rise — —</p> <p>9</p>	 <p>40°N 50°N Rise 0:50 0:30 Set 14:33 14:47</p> <p>10</p> <p>Mercury at greatest elongation (19° W) this morning (m=-0.6). Best morning apparition of the year</p>	 <p>40°N 50°N Rise 2:02 1:52 Set 15:03 15:08</p> <p>11</p> <p>REMEMBRANCE DAY (CANADA) VETERANS DAY (USA)</p>	 <p>40°N 50°N Rise 3:15 3:15 Set 15:32 15:28</p> <p>12</p> <p>N Taurid meteors (ZHR=5) 12 am</p>	 <p>40°N 50°N Rise 4:31 4:40 Set 16:03 15:50</p> <p>13</p> <p>Try to spot Uranus (m=5.7) unaided this weekend Alan Sandage, known for early calculation of universe's age, died 10 years ago.</p>	 <p>40°N 50°N Rise 5:48 6:08 Set 16:38 16:15 Sunrise 6:45 7:12 Sunset 16:44 16:16</p> <p>14</p> <p>Old crescent Moon, 18 hours before new in E, 14 hours before new in W, a difficult challenge just before sunrise Moon at perigee</p>																																																																																														
 <p>40°N 50°N Rise 7:07 7:36 Set 17:17 16:45</p> <p>15</p> <p>New Moon 0:07</p> <p>New Moon – Gegenschein visible from a very dark site – highest in S at midnight. Mars stationary</p>	 <p>40°N 50°N Rise 8:24 9:02 Set 18:04 17:24</p> <p>16</p>	 <p>40°N 50°N Rise 9:36 10:20 Set 18:58 18:14</p> <p>17</p> <p>Leonid meteors (ZHR=20) 6 am, best seen in predawn hours today</p>	 <p>40°N 50°N Rise 10:40 11:25 Set 19:58 19:14</p> <p>18</p>	 <p>40°N 50°N Rise 11:33 12:15 Set 21:03 20:23</p> <p>19</p> <p>Moon, Jupiter and Saturn form large triangle this evening</p>	 <p>40°N 50°N Rise 12:17 12:52 Set 22:09 21:35</p> <p>20</p> <p>Penumbral lunar eclipse, visible in all of N. America</p>	 <p>40°N 50°N Rise 12:53 1:21 Set 23:13 22:47 Sunrise 6:53 7:23 Sunset 16:39 16:08</p> <p>21</p> <p>First Quarter 23:45</p>																																																																																														
 <p>40°N 50°N Rise 13:23 13:43 Set — 23:57</p> <p>22</p>	 <p>40°N 50°N Set 0:15 — Rise 13:49 14:02</p> <p>23</p> <p>Lunar Straight Wall this evening</p>	 <p>40°N 50°N Set 1:15 1:05 Rise 14:13 14:18</p> <p>24</p>	 <p>40°N 50°N Set 2:13 2:11 Rise 14:35 14:34</p> <p>25</p>	 <p>40°N 50°N Set 3:11 3:17 Rise 14:58 14:50</p> <p>26</p> <p>THANKSGIVING DAY (USA) Moon at apogee</p>	 <p>40°N 50°N Set 4:10 4:23 Rise 15:22 15:06</p> <p>27</p>	 <p>40°N 50°N Set 5:09 5:29 Rise 15:49 15:26 Sunrise 7:00 7:34 Sunset 16:36 16:02</p> <p>28</p>																																																																																														
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IC 1396 – A massive triple-star system in the centre of the image ionizes and shapes this region with UV radiation and strong stellar winds. The dark Elephant Trunk globule shaped by these forces appears to extend inward from the bottom. IMAGE BY KLAUS BRASCH.

DECEMBER

SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY																																																																																										
<p>THE PLANETS THIS MONTH</p> <p>Mercury not observable this month</p> <p>Venus very low in SE in morning twilight, lost by month-end</p> <p>Mars in SE at dusk, transits near 8 pm, sets in W after 2 am</p> <p>Jupiter low in WSW at dusk, sets in WSW near 7 pm</p> <p>Saturn low in WSW at dusk, sets in WSW after 7 pm</p>																																																																																																
<p>6</p> <p>40°N 50°N Set 12:03 12:29 Rise 22:38 22:15</p> <p>Margaret Mayall, known for variable-star research, died 25 years ago.</p>	<p>7</p> <p>40°N 50°N Set 12:35 12:52 Rise 23:47 23:33</p> <p>Last Quarter 19:37</p> <p>16 Psyche at opposition (m=9.4)</p>	<p>8</p> <p>40°N 50°N Set 13:04 13:13 Rise — —</p>	<p>9</p> <p>40°N 50°N Set 9:07 9:51 Rise 18:25 17:42</p>	<p>10</p> <p>40°N 50°N Set 10:00 10:43 Rise 19:22 18:39</p>	<p>11</p> <p>40°N 50°N Set 10:47 11:26 Rise 20:24 19:45</p> <p>79 Euryome at opposition (m=9.9)</p>	<p>5</p> <p>40°N 50°N Set 11:28 12:01 Rise 21:29 20:58 Sunrise 7:07 7:43 Sunset 16:35 15:59</p> <p>Moon at perigee Moon 4° above Venus this morning</p>																																																																																										
<p>13</p> <p>40°N 50°N Rise 5:55 6:28 Set 15:50 15:14</p> <p>Geminid meteors (ZHR=150) 8 pm, best seen in predawn hours today or tomorrow</p>	<p>14</p> <p>40°N 50°N Rise 7:10 7:51 Set 16:39 15:57</p> <p>New Moon 11:17</p> <p>Total solar eclipse visible from S. Pacific, S. America, Chile and Argentina, S. Atlantic</p> <p>New Moon – Gegenschein visible from a very dark site – highest in S at midnight.</p>	<p>15</p> <p>40°N 50°N Rise 8:19 9:04 Set 17:38 16:53</p>	<p>16</p> <p>40°N 50°N Rise 9:20 10:03 Set 18:42 17:59</p>	<p>17</p> <p>40°N 50°N Rise 10:09 10:48 Set 19:49 19:12</p>	<p>18</p> <p>40°N 50°N Rise 10:50 11:21 Set 20:57 20:27</p>	<p>12</p> <p>40°N 50°N Rise 4:38 5:02 Set 15:08 14:41 Sunrise 7:13 7:50 Sunset 16:37 16:00</p>																																																																																										
<p>20</p> <p>40°N 50°N Rise 11:51 12:07 Set 23:04 22:50</p> <p>Mercury at superior conjunction</p>	<p>21</p> <p>40°N 50°N Rise 12:16 12:25 Set — 23:58</p> <p>First Quarter 18:41</p> <p>Lunar X near crater Werner visible in W of N. America 11 pm</p> <p>Jupiter 0.1° below Saturn this evening</p> <p>39 Laetitia at opposition (m=9.9)</p> <p>Winter solstice 05:02 ET</p>	<p>22</p> <p>40°N 50°N Set 0:03 — Rise 12:39 12:41</p> <p>Ursid meteors (ZHR=10) 4 am, best seen in predawn hours today</p> <p>Charles A. Young discovered flash spectrum during total solar eclipse, 150 years ago.</p>	<p>23</p> <p>40°N 50°N Set 1:02 1:04 Rise 13:02 12:56</p> <p>Lunar Straight Wall this evening</p>	<p>24</p> <p>40°N 50°N Set 2:00 2:10 Rise 13:26 13:12</p> <p>Moon at apogee</p>	<p>25</p> <p>40°N 50°N Set 2:59 3:17 Rise 13:51 13:31</p> <p>CHRISTMAS DAY</p>	<p>26</p> <p>40°N 50°N Set 3:58 4:24 Rise 14:20 13:52 Sunrise 7:21 7:58 Sunset 16:41 16:04</p> <p>BOXING DAY (CANADA)</p>																																																																																										
<p>27</p> <p>40°N 50°N Set 4:59 5:32 Rise 14:53 14:19</p>	<p>28</p> <p>40°N 50°N Set 6:00 6:38 Rise 15:33 14:53</p>	<p>29</p> <p>40°N 50°N Set 6:59 7:42 Rise 16:20 15:36</p> <p>Full Moon 22:28</p> <p>Today's full Moon is the Sis,et Moon (Elder)</p>	<p>30</p> <p>40°N 50°N Set 7:54 8:38 Rise 17:14 16:31</p>	<p>31</p> <p>40°N 50°N Set 8:44 9:25 Rise 18:16 17:36</p> <p>NEW YEAR'S EVE</p>	<p>NOV</p> <table border="1"> <tr><th>S</th><th>M</th><th>T</th><th>W</th><th>T</th><th>F</th><th>S</th></tr> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr> <tr><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td></tr> <tr><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td></tr> <tr><td>22</td><td>23</td><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td></tr> <tr><td>29</td><td>30</td><td></td><td></td><td></td><td></td><td></td></tr> </table> <p>JAN</p> <table border="1"> <tr><th>S</th><th>M</th><th>T</th><th>W</th><th>T</th><th>F</th><th>S</th></tr> <tr><td></td><td></td><td></td><td></td><td></td><td>1</td><td>2</td></tr> <tr><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr> <tr><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td></tr> <tr><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td><td>23</td></tr> <tr><td>24</td><td>25</td><td>26</td><td>27</td><td>28</td><td>29</td><td>30</td></tr> <tr><td>31</td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table> <p>Times in the upper half of the daily boxes are in the 24-hour clock; times in the lower half are given in the 12-hour clock.</p> <p>Eastern time is used, except for rise and set events and changes to/from Daylight Saving Time, which are given in local time.</p> <p>Times for events involving planetary satellites refer to the start time.</p> <p>Detailed instructions on adjusting times for location are given in the back pages.</p> <p>Please see back pages for photo details and additional information about this Calendar.</p>	S	M	T	W	T	F	S	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30						S	M	T	W	T	F	S						1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31						
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January — An image made from 12 x 10-min R, 12 x 10-min B, 12 x 10-min G, and 20 x 5-min L for a total exposure of 7.6 hours. Image was acquired with a 12.5-inch RCOS telescope at f/9 and a SBIG STX 16803 camera mounted on a Paramount ME II. Processed with Pixinsight and Photoshop. Imaged from the MIRABILIS Observatory in the Laurentians, North of Montréal, Québec, by Rémi Lecasse.

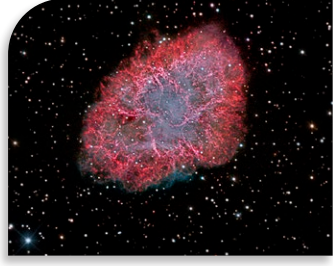
February — A composite image made from 6 x 10s during eclipse and 4 x 1-min of same part of sky when the Moon was not in sky. Image was acquired with a Sky-Watcher 80-mm ED at f/7.5 and a Canon T5 DSLR camera at ISO 6400 mounted on a Celestron CGEM mount. Processed with Pixinsight and Photoshop. Image by Godfrey Booth.

March — An image made from 8 x 5-min and 24 x 2-min for a total exposure of 1 hour 28 min. Image was taken with an Atik 383L+ camera, Astrodon LRGB filters, and an Orion 200-mm f/4 Newtonian astrograph on an iOptron CEM60 mount. All pre-processing and processing in Pixinsight. Imaged from Hall's Harbour, Nova Scotia, by Kathy Walker.

April — An image made from 29x 20-min H α , 29x 20-min OIII, and 66 x 5-min RGB for a total exposure of 24 hours 50 min. Image was taken with a Takahashi FSQ-106 ED XII and a QSI 683 camera. All pre-processing was done in Astropixelprocessor and processing in Pixinsight. Imaged by Marc Ricard.

May — An image made from 31 frames captured using HD video (1920 x 1080 @ 24fps) at 1/3200-second at ISO 200. Image was taken with a 150-mm f/5 Celestron reflector and a Nikon D7000 DSLR mounted on a Celestron CG-4 mount. Processed using ImagesPlus and composited in Photoshop. Imaged from Oakville, Ontario, on 2019 January 20, by Kevin Watson.

June — A single 8-second exposure with a 70-210-mm Tamron lens at f/5.6, ISO 800 on a Canon 6D. Image taken 2019 July 7, over Peggys Cove, Nova Scotia, by Barry R. Burgess.



July — An image made from 17 x 2-min frames for a total exposure of 34 minutes. Image acquired with a 200-mm Astrotech RC, with Nikon D7000 at ISO 1600 on a Sky-Watcher HEQ5 mount. Imaged from the Toronto Centre CARR observatory by Richard Seawards.

August — A single image of 20s with a Sigma 20-mm f/1.4 DG HSM Art lens at f/2 on a Canon 6D at ISO 1600. Processed in Photoshop CC. Image captured near Outer False Harbour near Cape Forchu lighthouse, Yarmouth County, Nova Scotia, 2019 July 2, by Brenda Levy Tate.

September — A single image of 2.5s with a Venus Optics 15-mm lens at f/2 on a Sony a7RIII at ISO 3200. Image captured near Tibbitt Lake on the Ingraham Trail east of Yellowknife, Northwest Territory, 2018 September 8/9, by Alan Dyer.

October — A single 30-second exposure with a 20-mm Rokinon f/1.8 lens at f/2.5, ISO 5000 on a Canon 6D. Image taken 2019 May 25, over Lockeport, Nova Scotia, by Barry R. Burgess.

November — An image made from multiple exposures in LRGB and H α for a total exposure of 12.2 hours. Image was acquired with a 12.5-inch RCOS telescope at f/9 and a SBIG STX 16803 camera mounted on a Paramount ME II. Processed with Pixinsight and Photoshop. Imaged from the MIRABILIS Observatory in the Laurentians, North of Montréal, Québec, by Rémi Lecasse.

December — A mosaic image made from several frames for a total exposure of 1 hour. Image acquired with a Hutech modified Canon 6D Mark II DSLR and a Astro Physics 155 Starfire EDF refractor at f/5.2 and ISO 6400. Image was stacked and processed in Photoshop. Imaged from Flagstaff, Arizona, by Klaus Brasch.

Most of the data appearing in the monthly grid was generated using custom software written by David Lane, Alister Ling, and Larry McNish. The Moon images were created using custom software written by Alister Ling. The Moon names were researched and provided by Cathy LeBlanc (Mi'kmaq First Nation) and David Chapman.

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The Royal Astronomical Society of Canada

Since it was founded in 1868, the RASC has filled a special role in both amateur and professional astronomy. Today, it has over 5000 members worldwide who share a passion for the night sky and make contributions to astronomy in many ways.

The RASC has a long tradition of high-quality, volunteer-produced publications. The *Observer's Handbook* has been published since 1907 and is recognized worldwide as the leading

handbook of its type. The *Journal*, also published since 1907, contains articles of interest to amateur astronomers. The *Observer's Calendar* is a forum for astrophotography by amateur astronomers, and *Skyways* (available in French as *Explorons l'Astronomie*) is an astronomy teacher's guide. The RASC now owns and publishes *SkyNews*, Canada's only adult science magazine.

For information on joining the Society, or to order an RASC publication, visit www.rasc.ca or contact the Society Office at:

www.rasc.ca



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How to Use this Calendar

A graphical representation of the Moon's appearance in the late evening is given in each daily box. In addition to the varying phase, the depicted size of the Moon varies, reflecting the change in the apparent size of the Moon in the sky as it moves closer to or farther from Earth. The depicted face of the Moon also changes slightly to reflect lunar libration, the rocking motion of the Moon, which means that over time approximately 59% of the lunar surface can be seen from Earth. A small dot of size proportional to the amount of libration appears near the lunar limb that is librated.

This year's moon names are those of the Wsanec First Nation (Saanich), indigenous to the north coast of the Gulf and San Juan Islands, southern Vancouver Island and the southern edge of Lower Mainland in British Columbia.

Daily Moon and weekly Sun rise and set times, and the times of Moon phases, are shown in the top portion of the boxes. If no Moon rise or set time is given, this event occurs the next day.

A summary of the naked-eye visibility and position of the planets is given each month. Descriptions are for approximate latitude 45° and, unless otherwise stated, apply to midmonth; rise and set times at the beginning or end of the month may vary by an hour or more from those given. Times and compass directions may also differ somewhat from the given ones at other latitudes.

Special astronomical events are given at the bottom of the daily boxes. Events observable in some part of Canada or the continental United States are listed. Days on which particularly interesting phenomena or events occur are highlighted with a green corner under the date. Detailed information on all events, including their visibility from particular locations, may be determined by consulting the *Observer's Handbook*, which is published annually by the RASC.

Adjustments for Actual Location

When it is in effect, times are adjusted for Daylight Saving Time. Moon phases and special events are given in Eastern time. The user's local time for events other than Moon and Sun rise and set may be determined by converting the given time to the user's time zone (e.g. Pacific time is Eastern time minus 3 hours). For occultations, a further adjustment of an hour or more may be needed for any particular geographical location because of parallax effects. Parallax also means that actual angular separations for

events involving the Moon may vary by close to 1° from those given. Also, the Moon's rapid movement of approximately 0.5° per hour means that separations may be considerably larger at a time that is even a few hours away from the given time.

Two sets of rise and set times are given to accommodate North American observers in midnorthern latitudes. Times are displayed for locations 40°N latitude and 75°W longitude and for 50°N, 75°W. The actual times for a given location must be calculated using the tables at the right.

The tables give (longitude) corrections in minutes to the tabulated rise and set times for selected Canadian and U.S. cities. In the column labelled **Correction**, an entry such as 50°N + 25 means add 25 minutes to the displayed 50°N time. This computed time is an approximation. In the column labelled **Accuracy**, the approximate maximum error in minutes for Moon rise and set using this method is indicated. The error for Sun rise and set is less. These errors can be substantially reduced by interpolating according to latitude, as explained in the following section. Note that the rise and set times calculated using the above method will be local times. It is not necessary to adjust them for time zone.

Other Locations, and Improving Accuracy

For locations not listed in the tables at right, the user should calculate a correction factor. This amount is +4 minutes for each degree that the user's location is west of the central meridian of the user's time zone or -4 minutes for each degree that it is east. This correction factor should be added to the displayed 50°N or 40°N time for the location whose latitude is nearest that of the user's site. The accuracy in minutes for Moon rise and set can be calculated by multiplying the difference between the user's latitude and 50°N/40°N respectively by 4.5, and then adding 0.2 times the difference between the user's longitude and 75°W.

Improvement in accuracy may be obtained for many sites by interpolating or extrapolating the 50°N and 40°N times depending on the user's latitude. For example, the latitude of Ottawa is approximately midway between 50°N and 40°N. An observer in Ottawa can improve accuracy to better than 5 minutes by averaging the given 50°N and 40°N times and then adding the correction factor for Ottawa, which is 3 minutes. Western observers may gain additional accuracy by adding about 10% of the difference between the listed time and the next day's time.

Canadian Locations

City	Correction	Accuracy	Latitude
Calgary	50°N + 36	15	51
Charlottetown	40°N + 12	20	46
Edmonton	50°N + 34	25	54
Halifax	40°N + 14	25	45
Hamilton	40°N + 20	15	43
Kelowna	50°N - 3	10	50
Kingston	40°N + 6	20	44
Kitchener	40°N + 22	15	43
London	40°N + 25	15	43
Moncton	40°N + 19	20	46
Montréal	50°N - 6	20	46
Niagara	40°N + 16	15	43
Ottawa	50°N + 3	20	45
Prince George	50°N + 11	25	54
Québec	50°N - 15	15	47
Regina	50°N + 58*	10	50
St. John's	50°N + 1	20	48
Sarnia	40°N + 30	15	43
Saskatoon	50°N + 67*	15	52
Thunder Bay	50°N + 57	10	48
Toronto	40°N + 18	20	44
Vancouver	50°N + 12	15	49
Victoria	50°N + 13	20	49
Whitehorse	50°N + 60	60	61
Windsor	40°N + 32	15	42
Winnipeg	50°N + 29	5	50

U.S. Locations

City	Correction	Accuracy	Latitude
Atlanta	40°N + 37	30	34
Boston	40°N - 16	10	42
Chicago	40°N - 10	15	42
Cincinnati	40°N + 38	10	39
Denver	40°N + 0	10	40
Flagstaff	40°N + 27*	30	35
Kansas City	40°N + 18	10	39
Los Angeles	40°N - 7	35	34
Minneapolis	40°N + 13	25	45
New York	40°N - 4	5	41
San Francisco	40°N + 10	20	38
Seattle	50°N + 9	20	48
Tucson	40°N + 24*	40	32
Washington	40°N + 8	5	39

*Subtract 60 minutes in the summer.

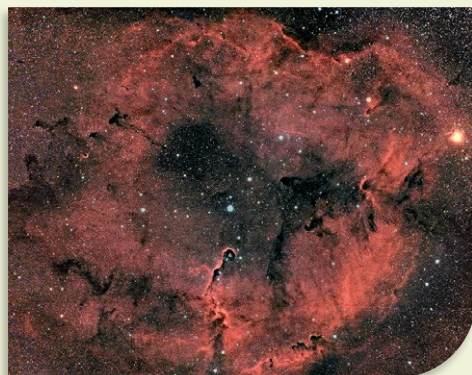
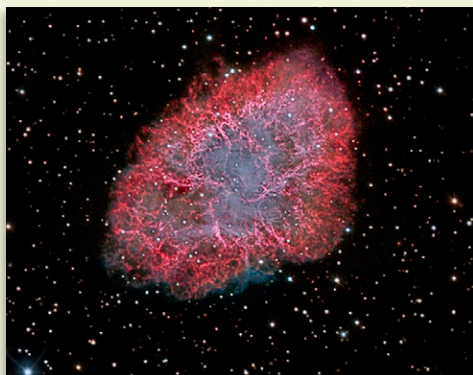
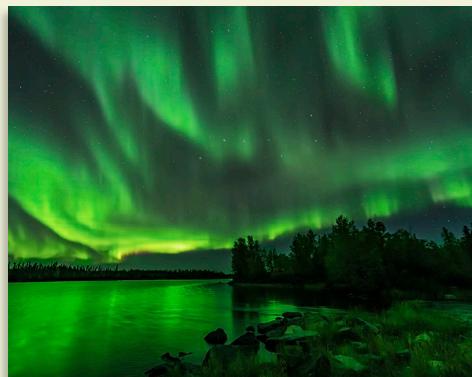
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New Moon dates (UT) are displayed in blue.

2021

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The Royal Astronomical Society of Canada
Observer's Calendar 2020

All photos in this unique Calendar were taken by members of The Royal Astronomical Society of Canada (RASC) who are astronomy enthusiasts. It was produced by volunteer members of The Royal Astronomical Society of Canada.

This Calendar includes comprehensive listings of astronomical data, such as lunar and planetary conjunctions, Sun and Moon rise and set times, eclipses, meteor showers, and Moon phases.

Editor
Paul Gray

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