SCOPE
On the skies

Discovering the Leonids

Wood engraving of the 1833 Leonid meteor storm by Adolf Vollmy

During the early winter months of A.D. 902, Chinese astronomers recorded what were probably the first written accounts of a meteor shower. This event was described as a time when the stars fell like rain. Centuries later, in November 1799, the stars again fell like rain during a spectacular display witnessed across the colonies by North American astronomers. The shower activity was also recorded by the famous German scientist and geographer Alexander von Humboldt while he was on an expedition in Venezuela. During one intense period, witnesses described seeing as many shooting stars as actual stars. Approximately 33 years later (November 12–13, 1833), the skies over eastern North America were streaked with so many meteors that during a nine-hour period, observers calculated the Zenith Hourly Rate (ZHR) to be a few thousand, totaling to about 240,000 meteors.

Following the 1833 meteor storm, interest in and study of meteors increased tremendously. By studying records, astronomers noted that meteors originate from a specific area of the sky within a certain constellation; hence the Leonids, Perseids, and so on. (For more information on meteor showers, see the Scope on the Skies column in the January 1998 issue of *Science Scope*.) Sky viewers also noted that as the night wore on and Leo "moved" westward, the shower's point of origin stayed with the constellation. Thirty years later, after much study, Yale astronomer Hubert Newton pieced together a history of the Leonid meteor storms.

The Leonid meteor storms (periods during a meteor shower of intense meteor activity) have been recorded approximately every 33 years dating as far back as the A.D. 902 shower observed by Chinese astronomers. Hubert Newton and other renowned astronomers predicted that another meteor storm would occur during November of 1866 or 1867, 33 years after the recorded meteor activity in 1833.

Coincidentally, in 1865–66, two astronomers working independently, Ernest Tempel and Horace Tuttle, discovered a faint comet, the source of Leonid activity, which was named Comet 1866I (now referred to as Comet 55P/Tempel-Tuttle). Comet Tempel-Tuttle's orbital period around the Sun was determined to be about the same as that of the Leonids, 33 years.

True blue?

The Leonid shower's spectacular peak nights during November of 1866 and 1867 validated the two astronomers' prediction. (Different portions of the Earth may encounter Comet Tempel-Tuttle's meteor trail in two consecutive years because of the Earth's changing position.) In 1866, sky observers in Europe noted that the shower's intensity reached an average of 5,000 meteors per hour; in 1867, observers in North America counted an average of 1,000 meteors per hour. Because Tempel and Tuttle had so accurately predicted the source of the 1866/1867 Leonid meteor storm, the storm of 1899 was much anticipated and promoted by the astronomical community. Unfortunately, the Leonids did not display spectacularly that year. As a result, public interest in the storm waned tremendously. Ironically, the following year, 1900, brought storm displays with peak ZHRs of 1,000. During November 1901, the Leonids averaged about 2,000 meteors per hour.

The Leonids' return in the 1930s was also disappointing. Astronomers were concerned because the source comet had not been sighted since its 1866 passage. This suggested that perhaps the comet had broken apart and that the meteor cloud would no longer be refreshed. However, peak night averages during the 1930s were still impressive with hourly averages in the hundreds.

During the early 1960s, the Leonid meteor showers started showing an increase in the hourly rate, similar to the intensity of the showers during the 1800s. In 1965 Comet Tempel-Tuttle was rediscovered. That year the shower's intensity climbed to over 100 meteors per hour. One year later on November 17, 1966, the most intense meteor storm recorded in history occurred over the midwestern United States—its average intensity was several thousand per hour, and at one point the storm rates were estimated at more than 100,000 meteors during a 20-minute period.

Upcoming showers

So here it is 1998, 33 years later. The comet has already reached its closest

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approach to the Sun this past February, so the clouds of comet debris should be freshly replenished for the shower. The Leonids are usually active for about one week, which astronomers predict will be the week of November 14–21 this year. Moonlight will not interfere with viewing the storm, as the new moon phase will occur on November 18. Astronomers predict a noticeable increase in the shower's ZHR for the next few years.

This year's meteor storm should peak on November 17 and last for about eight hours, with areas of best visibility along the western Pacific regions. Peak activity is estimated for 1700 Universal Time. In general, Leo rises across the United States between two and three o'clock A.M. local time, well after Leo has risen. While the peak is predicted during our daytime hours, there are two good predawn opportunities for viewing a spectacular display of meteors radiating outward from the backwards-question-mark-shaped constellation.

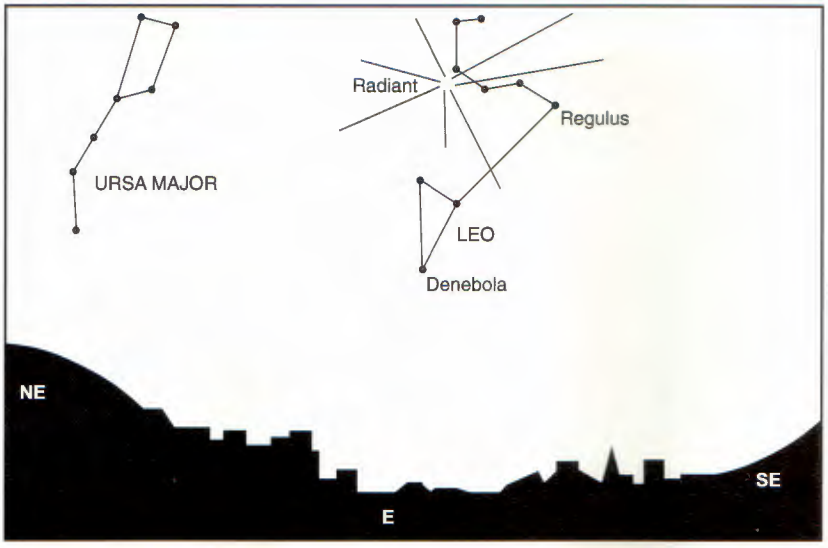
Moon phases

November
Full Moon - November 3
Last Quarter - November 10
New Moon - November 18
First Quarter - November 26

December
Full Moon - December 3
Last Quarter - December 10
New Moon - December 18
First Quarter - December 26

Visible planets

Mars: Rises around midnight and is visible over the southwestern horizon at sunrise.
Jupiter: Over the southern horizon at sunset and sets around midnight.
Saturn: Rises after sunset and is visible all night.



Online resources

- American Meteor Society, Ltd.—*www.serve.com/meteors/*
- Leonid Meteor Outburst Page—*web99.arc.nasa.gov/~leonid/*
- The Leonids: King of the Meteor Showers—*www.skypub.com/meteors/leoking.html*
- Observing Hints for the 1998 Leonid Return—www.imo.net/news/leohints.html

Table 1. This year's meteor showers[1]

Date	Shower Name	Brightness predictions* 1	2	3	4
Jan 3–4	Quadrantids	5	10	25	120
Apr 21–22	April Lyrids	4	7	15	15
May 4–5	Eta Aquarids	4	6	10	40
Jul 28–29	Delta Aquarids	4	7	15	20
Aug 12–13	Perseids	10	20	40	120
Oct 21–22	Orionids	5	10	25	25
Nov 3–13	Taurids	4	6	10	10
Nov 16–17	Leonids	5	10	15	15
Dec 13–14	Geminids	18	35	85	85
Dec 21–22	Ursids	3	5	10	20

[1]American Meteor Society, Ltd. *FAQ About Meteors and Meteor Showers.* Author:Geneseo, N.Y. 1997; *http://www.serve.com/meteors/faq1.html*

*Key
1. city or rural sky with full moon
2. suburban or rural sky with quarter moon
3. rural sky and moonless
4. calculated Zenith Hourly Rate (ZHR)