

STAR GAZERS' GAZETTE

NEWS AND OBSERVING TIPS FOR SKY CHALLENGER - GAMES FOR STAR GAZERS

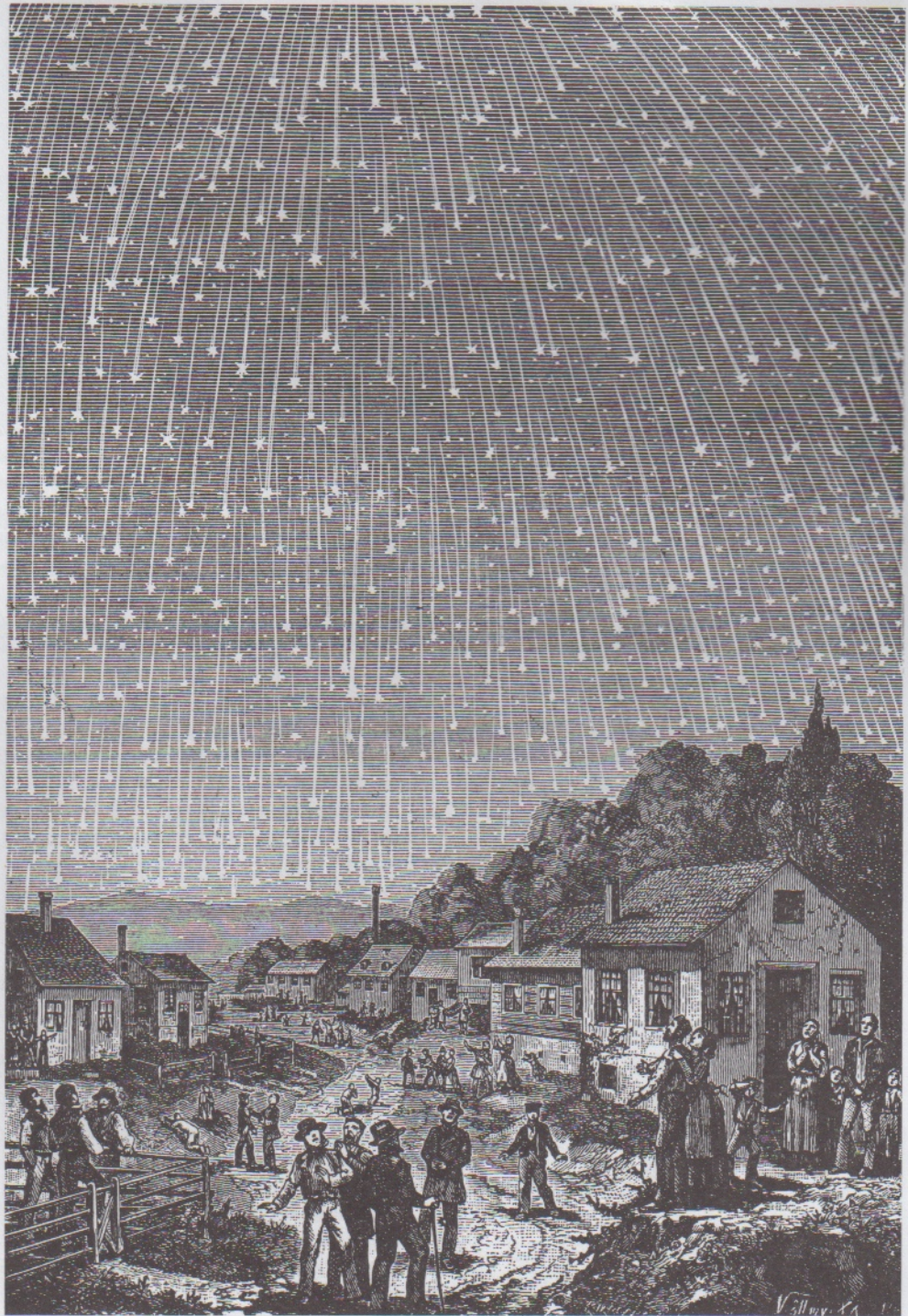
THE NIGHT IT RAINED STARS!

The date was November 13, 1833. Our planet Earth was on a collision course with the path of a comet, which had passed by ten months earlier. That night, just as we crossed through the comet's path, people all over North America witnessed the most spectacular meteor shower in recorded history. It was the "night that the heavens rained stars." 20,000 per hour could be seen falling from the sky! What were these falling "stars"? And, were they somehow connected with the comet?

Falling "stars," which can be seen on any dark night of the year (several per hour) are nothing more than chunks of cosmic rock or dirt that happen to bump into our atmosphere. They crash through the air at tremendous speeds and burn up due to friction, producing starlike flashes of light, called meteors. Most fragments are usually smaller than a pea and disintegrate before they reach the ground, so don't worry about wearing a helmet. Very rarely, a chunk larger than a house has crashed into the earth's surface and blasted out a crater such as the famous one in Arizona. You can see dozens of similar craters if you look through your binoculars at the moon. Best viewing is during a crescent moon.

Now what do shooting stars have to do with comets? Scientists believe that comets, which are loosely compacted balls of frozen gas and particles, leave a trail of debris behind as they circle around the sun. (See also the article on Halley's Comet.) When we pass through this trail of litter, we see a sky show of falling "stars." Not all meteor showers are associated with known comets, but those that aren't might be caused by swarms of particles left from comets that broke up long ago.

The next great event like the night of 1833 won't be until November, 1999. But you can still enjoy the lesser meteor showers several times each year on the nights listed below. On a clear dark night away from city lights, after midnight, you can expect to see between 20 and 50 meteors per hour shooting through the sky. And if you're lucky, there might even be a surprise performance of hundreds.



Great Meteor Shower of 1833

Try drawing on one of your SKY CHALLENGER star wheels the path of each shooting star you see. After a while you'll find that many appear to radiate from the same region of the sky. For example, the Perseid shower on August 12 seems to radiate from the constellation Perseus. Then lie back, make yourself comfortable, and enjoy the show!

Meteor shower dates are approximate. Check the magazines listed on page 4 for details.

January 3	Quadrantids
May 5	Aquarids
July 29	Aquarids
August 12	Perseids
October 21	Orionids
November 4	Taurids
December 14	Geminids

Total Solar Eclipses (1991–2013)

Date	Max. Duration (minutes:seconds)	Max. Width (miles)	Path of Totality
1991 JULY 11	6:53	160	Hawaii, Mexico, Central America, Colombia, Brazil
1992 JUNE 30	5:20	182	South Atlantic Ocean
1994 NOV. 3	4:23	117	Peru, Bolivia, Paraguay, Brazil
1995 OCT. 24	2:09	48	Iran, India, Southeast Asia
1997 MARCH 9	2:50	221	Mongolia, Siberia
1998 FEB. 26	4:08	94	Galapagos Islands, Panama, Colombia, Venezuela, Guadeloupe, Montserrat, Antigua
1999 AUG. 11	2:22	69	Europe, Middle East, India
2001 JUNE 21	4:56	124	Atlantic Ocean, Southern Africa
2002 DEC. 4	2:03	54	Southern Africa, Indian Ocean, Australia
2003 NOV. 23	1:57	308	Antarctica
2005 APRIL 8*	0:42	16	South Pacific Ocean
2006 MARCH 29	4:06	114	Africa, Turkey, Soviet Union
2008 AUG. 1	2:27	147	Greenland, Soviet Union, China
2009 JULY 22	6:38	160	India, China, Pacific Ocean
2010 JULY 11	5:20	160	S. Pacific Ocean, southern tip of S. America
2012 NOV. 13	4:02	111	Australia, Pacific Ocean
2013 NOV. 3*	1:39	35	Atlantic Ocean, central Africa

* Annular-total eclipse
Eclipses shown in bold are in the same *saros* series that includes July 11, 1991

From: *Eclipse* by Bryan Brewer, 2nd Ed., 1991,
Earth View Inc., 6514 18th Ave. N.E., Seattle, WA 98115

What Is a Solar Eclipse?

Imagine your head is the Earth. Stand in front of a light bulb that represents the sun. Hold up a ball in front of you so it blocks the light of the sun.

The ball represents the moon, and you are in its shadow. You are viewing an eclipse of the "sun!" A friend looking at you would see a shadow on your face, just like the moon's shadow on the Earth during a solar eclipse.



Binoculars Make Great Telescope!

If you thought you needed a telescope to enjoy astronomy, you'll be happy to know that there may already be one sitting right at home. Your binoculars are in fact a double telescope, with the light paths folded up inside the tubes using prisms to make things more compact.

Although binoculars usually magnify less than regular telescopes, this is not as great a problem as you may think. For astronomy, it is more important to magnify the amount of light than the size of objects. A 50 mm diameter binocular will capture almost as much light as a 60mm diameter telescope, the size usually sold by department stores and hobby shops. And of course, you'll have both eyes working for you for more comfortable viewing.

For viewing planets you need the size magnification of regular telescopes. But for some other sights, lower magnification binoculars win first prize because they show a wider section of sky. For scanning the detail of the Milky Way, viewing the Pleiades star cluster, or on a very dark night seeing the faint outer reaches of the Andromeda Galaxy, binoculars are superior! For objects such as wide double stars or some of the open clusters, it's a toss up.

So next time you're planning a trip to a place that has dark clear nights, take along your two-eyed telescope. And

don't forget your SKY CHALLENGER Binocular Treasure Hunt Wheel to help you find what's hidden in the sky.

Ask Galileo

Q. On a clear dark night in New Orleans, I still can't see the fainter stars on some of my star wheels. Why not?

A. There is no such thing as a dark night in a city. Glare from millions of lights reflecting off the atmosphere is obscuring your view. It's best to get out of town. A bright moon is bad news, too.

Q. How can I illuminate my star wheels? A regular flashlight blinds my night vision.

A. Fasten a piece of brown paper bag over the end of your flashlight with rubber bands to dim the light.

Q. I can't find the North Star—isn't it supposed to be the brightest star of all?

A. Not so! There are about 50 stars that are brighter as seen from Earth. To help you search, notice how two stars of the Big Dipper point to the North Star.

SUN & MOON PLAY SHADOW TRICKS

Watch the full moon on special nights, and what a strange sight you will see. A dark reddish shadow will creep slowly across the moon's surface. After about an hour, the entire ball may have vanished from the sky. Then suddenly, a narrow sliver of light will reappear. Watch it grow larger and larger until you can again see a full moon.

This mysterious trick is all done with shadows. It's easy to explain using a lamp, your head and a grapefruit. To represent the sun, place a bare light bulb or lantern in the center of a dark area. Your head will be the earth which moves in a circle around the sun—walk around the lamp at a distance of about 10 feet. A grapefruit can be the moon—hold it in your hand about a foot from your head and move it around your head. Notice how the side of the grapefruit facing you changes phases, just like the moon. Now watch what happens just as the grapefruit enters the shadow of your head—an eclipse of the moon! The real moon enters the shadow of the earth a couple of times each year.

Another shadow trick that you won't want to miss is an eclipse of the sun. The daytime sky will slowly darken, and birds and other animals will start to bed down for the evening, although it may



Eclipse of the moon (composite photograph by Paul W. Davis)

be only 2:00 in the afternoon! A portion of the sun will slowly disappear until only a crescent shape remains. During a total eclipse, the sun will be completely blocked from the sky.

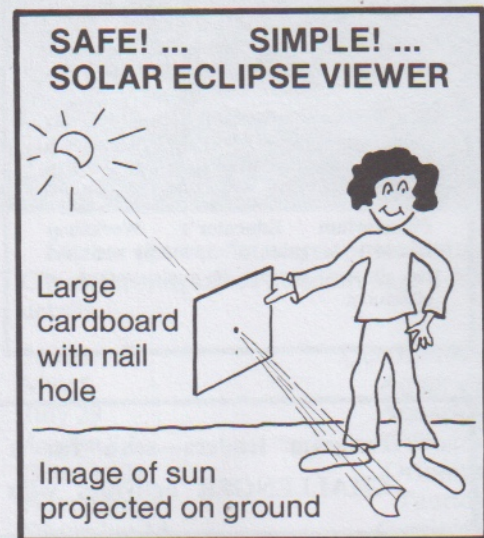
At this moment you will catch a rare glimpse of the sun's atmosphere—a glowing halo of hot gasses peeking out from behind a central black disc. The black disc is just the moon passing be-

tween us and the sun. See if you can create an "eclipse of the sun" using a lamp, your head and the grapefruit described earlier.

Predicting eclipses is an ancient art. The secret is that they repeat every 18 years 11-1/3 days. If you keep a record of all eclipses for the next 18 years, then you can predict when they will occur during the following 18 years. Actually it's a little more complicated than that, as the early Chinese astronomers Ho and Hi would certainly agree. According to legend, they were put to death for failing to predict an eclipse of the sun in 2136 B.C.

Watch your local paper or astronomy magazines for news of upcoming eclipses.

NEVER LOOK DIRECTLY AT THE SUN! TRY THIS INSTEAD—



Q. I took my SKY CHALLENGER wheels to Brazil last month, but the stars were all different. What happened?

A. From the northern and southern halves of the earth you see different parts of the heavens. Your SKY CHALLENGER wheels show stars seen from the mid-northern latitudes (United States and much of Europe and Asia).

Q. How do I know which direction I'm facing when using my SKY CHALLENGER star wheels?

A. Look for the North Star (see Introductory Wheel). When facing north, south is behind you, east is to your right and west is to your left.

Q. What would you recommend for star gazing in a very cold place? How about a motor home that has sky-lights?

A. No matter where you are, star gazing is best done outdoors where you can see at least 2/3 of the sky. Glass or plastic windows restrict your view. If it's cold, wear warm clothes, and bundle up in blankets or sleeping bags.

Q. I can't hold my binoculars steady enough to enjoy sky treasure hunting. What should I do?

A. Simplest method is make yourself comfortable to eliminate fatigue. Lie back on a lawn chair or a sleeping bag. Or you can buy a tripod and binocular mounting adapter at a camera shop.

Q. During daylight savings time do I add or subtract an hour when setting my SKY CHALLENGER star wheels?

A. Neither. Your star wheels are set for half way between standard time and daylight savings. The difference is very small so you don't have to worry about time changes.

Q. I can see a lot of stars, but I'm having a hard time matching them to the SKY CHALLENGER wheels. Help!

A. Try looking for the brightest constellations—like the Big Dipper or Orion—and use them to guide you to nearby fainter constellations. It's hard sometimes to go from that small wheel to the big sky all around you.

SKY JUMBLE

HOW MANY MISTAKES CAN YOU FIND IN THIS ARTIST'S PICTURE OF THE SKY?



1. Stars never appear inside moon's crescent.
2. Comet's tail should point away from sun.
3. Orion and Big Dipper too close together.
4. Double star in Big Dipper is in wrong place.
5. Illuminated side of moon should face sun.
6. Saturn is never found near Big Dipper.

The Darkest Night

I had never seen such a night. The sky itself was of a ruddy, powerful, nameless, changing colour, dark and glossy like a serpent's back. The stars, by innumerable millions, stuck boldly forth like lamps. The milky way was bright, like a moonlit cloud; half heaven seemed milky way. The greater luminaries shone each more clearly than a winter's moon. Their light was dyed in every sort of colour—red, like fire; blue, like steel; green, like the tracks of sunset...all the hollow of heaven was one chaos of contesting luminaries—a hurly-burly of stars.

—Robert Louis Stevenson, from the *Silverado Squatters*, 1892.

Star Clock Tips

Telling time by stars is older than clocks themselves. The time reading that you get from the stars will differ slightly from regular clocks, depending on location and your ability to match the sky with the star clock. Here's how to make your star clock work its best.

Take several practice readings as accurately as you possibly can. Notice if your reading is always fast or slow and by how much. Then simply add or subtract this same amount of time whenever you use the star clock after that.

Example: If your star clock says 9:15 when it's really 10:00, you will know to always add about 45 minutes to get the correct time.

If you change location by more than 100 miles or switch between standard time and daylight savings, repeat the above procedure.

Books to Read

- Find the Constellations*, by H. A. Rey, Houghton Mifflin Co., Boston.
- Summer Star Gazer*, by R. Claiborne, Coward McCann & Geoghegan, Inc., N.Y.
- Seasonal Star Charts, A Complete Guide to the Stars*, Hubbard Scientific Co. Northbrook, Illinois.
- Telescopes for Skygazing*, by H. Paul, Sky Publishing Corp., Cambridge, Mass.
- Whitney's Star Finder*, by C. Whitney, Alfred A. Knopf Co., N.Y.
- Highlights in Astronomy*, by Fred Hoyle, W.H. Freeman & Co., S.F.
- The People—Sky Lore of the American Indian*, by Mark Littmann, Hansen Planetarium, Salt Lake City, Utah.

What's Happening?

Here's how you can find out what's happening with astronomy in your local area and in your sky:

Phone your local planetarium or science museum for upcoming shows and events. Planetariums vary in size and types of programs offered—visit several.

Watch your local newspaper for announcements of meteor showers, comets and eclipses, as well as planetarium shows, lectures, films, and club meetings.

Try a subscription to magazines such as:

- Astronomy Magazine*
411 E. Mañon St. 6th floor
Milwaukee, Wisconsin 53202
- Mercury*
Astronomical Society of the Pacific
1290 24th Avenue
San Francisco, Calif. 94122
- Sky and Telescope*
49 Bay State Road
Cambridge, Mass. 02138

Join your local amateur astronomy club.

Join the Astronomical Society of the Pacific, address listed above. (Membership open to amateurs and professionals throughout the world.)

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Other astronomy materials available from the Lawrence Hall of Science:

Star Maker Planetarium Kit — turns any room into a mini-planetarium. Includes a build-it-yourself star projector and a 6 foot diameter dome.

Planetarium Educator's Workshop Guide — a guide to astronomy activities for all ages, for use in a planetarium or classroom.

Program leaders—send for a FREE guide on using SKY CHALLENGER activities with groups.