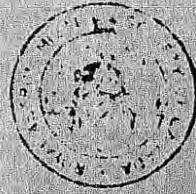


THE ROYAL ASTRONOMICAL SOCIETY OF CANADA



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NEWSLETTER



CLOUD NEGATIVELY
CHART

LIGHTNING

by David Pristupa

Lightning is a familiar sight in the warmer parts of our globe and is taken for granted in many cases. However, in the cooler regions this phenomena is less frequent and is noticed more. In Canada lightning is not as common as in the continental U.S.A., however, the Canadian prairies have some of the most violent storms in Canada.

It is unfortunate that so many people get the wrong impression of lightning and its affects. For instance, one old tale states that lightning never strikes twice in one place, this is untrue. Lightning has struck the empire state building in the same spot many times in one storm. Many people are deadly afraid of lightning and run and hide under the bed while others are brave enough to stand outside during a storm and watch. Both of these type of people are going to extremes. If you take the necessary precautions you can be safe during a thunderstorm. During a storm it is advised to take shelter and avoid high places such as trees because they make good lightning rods. Trees have been known to explode due to the sap boiling from the heat of a lightning stroke hitting the tree. On the other hand it is not necessary to go to the other extreme and run into a closet and hide.

Lightning has attracted man's attention ever since he walked the earth and each civilization had a different attitude towards it. Although each had their own theory and meaning for it, it was certain that everyone looked on it with fear. Before modern science, gods were created for many things and thunder and lightning had a god to represent it. In certain lands lightning was an indication that the gods were angry and when a thunderstorm came the people knew what they had done wrong. In some lands where lightning struck was considered a sacred place and if a building was destroyed it not allowed to be rebuilt or repaired. It was not until great scientific minds pondered

it that the truth about lightning appeared. Many experiments were done into lightning but it was not until the famous experiment of Benjamin Franklin that we found out what this phenomenon really was. Franklin and his assistant sent up a kite during a thunderstorm and on the string was attached a metal key. When touched, the key gave an electric shock and it was then known that lightning was an electrical phenomenon. It was also discovered through tragedy that lightning can be very dangerous if not dealt with carefully. In Europe a professor was killed while experimenting with lightning. Nowadays it is understood how lightning is caused but there are still many questions to be answered and only now is true research being done.

Lightning is a complicated thing to explain with any great deal of accuracy, but can still be explained by simple principles, here it is: A lightning discharge is brought about by unlike electrical charges within a thundercloud or between cloud and earth. Updrafts of moist warm air rising into cold air cause small cumulus clouds to grow into larger cumulonimbus clouds which we usually associate with thunderstorms. A thundercloud is a big puffy cloud that is topped with an anvil shaped formation, often called a "thunderhead". These turbulent cloud systems tower above all other clouds and dominate the atmospheric circulation and electrical field over a large area. The growth of a small cloud to a huge, electrified thunderhead can occur in under a half-hour at times. As a thunderstorm develops, the interaction of external charged particles, internal electrical fields, and complex energy exchanges produces a large electrical field within the cloud. No completely acceptable theory explaining thunderstorm electrification has yet been presented, but it is believed to be closely linked with precipitation.

The distribution of electricity in a thundercloud usually takes the form of a concentration of positive charges in the frozen upper layers and a large negative charge around a positive lower area in the cloud. The earth is usually negatively charged with respect to the atmosphere. When a storm

passes over the ground, the negative charge in the cloud base produces a positive charge on the ground for a few miles around. The ground charge follows the storm and the negative charge increases. The attraction between positive and negative makes the positive ground charge flow up trees and other higher objects in an attempt to establish a flow of current. Air is a poor conductor of electricity and it holds back a flow of electricity until a large enough charge is produced. When the charge is large enough to overcome the air resistance, a conductive path is established and the current can flow. These charges run on the order of 100 million volts. In a lightning stroke the current usually flows from negative to positive and may jump from cloud to cloud or cloud to ground. The typical cloud to ground stroke which is most often seen often starts as a pilot leader too faint to be seen. This leader advances down from the cloud and sets up the initial portion of the stroke path. A surge of electricity called a step leader follows the pilot moving 100 feet or more each surge toward the ground, stopping, then repeating the sequence until the conductive path of ionized particles is near the ground. At this point, discharge streamers from the ground meet the leader and a complete conductive path between the cloud and ground is made. When the path is complete, a return stroke leaps upward at speeds approaching that of light, illuminating the branches of descending leader track. Because these tracks point downward, the stroke appears to come from the cloud. The bright light is produced by the ionized air atoms.

When the channel has been made and the return stroke is ended, dart leaders from the cloud initiate secondary returns until the charges weaken or the channel is broken by air motion.

Thunder always follows a lightning discharge and is simply caused by the explosive expansion of air caused by the heat of the stroke. When the lightning is close, a sharp crack is heard, and if it is distant a rumbling sound is heard. You can find the distance of a thunderstorm by counting the

time between the lightning flash and the thunder. When you see the flash and the thunder occurs 5 seconds later, the lightning is a mile away, 10 seconds, two miles, and so on.

There are many types of lightning. Streak lightning is the normal cloud to ground flash, forked shows a conductive channel. Sheet lightning, also called heat lightning, a shapeless flash seen in a cloud, is caused by the reflection of lightning beyond the horizon off of the clouds. Many people have reported seeing luminous balls of all colors and shapes during thunderstorms (and sometimes not). These have been termed ball lightning, although its actual existence has not been proven.

Lightning has done a good deal of harm, such as taking lives, destroying generators and transformers, causing fires, and knocking broadcast stations off the air, but recent evidence has proven that lightning is necessary in many respects of maintaining the balance of nature.

I have tried to give a brief account of lightning and hope you have learned something. Although not too closely linked with astronomy, lightning is associated with meteorology which is related to astronomy. If the subject of lightning has interested you, you should read several books on the topic. In the main library there are at least half a dozen books on the topic. Most I have read and found very interesting. For an easy account of lightning I highly recommend a book entitled The Lightning Book by Peter Viemeister. It covers the whole topic in depth and is easily understood by any high school student.

Lightning Safety Rules

- 1.) Stay indoors and do not go outside unless absolutely necessary.
- 2.) Stay away from windows and open doors, stoves, radiators, fireplaces, sinks, metal pipes and plug-in appliances.
- 3.) Do not use plug in electrical appliances such as razors, hair dryers, tooth brushes, etc.

- 4.) Do not use the telephone during a storm as the telephone lines outside may be struck.
- 5.) Don't take laundry off of the clothesline.
- 6.) Do not work on fences, telephone or power lines, structural steel fabrication or pipelines.
- 7.) Don't use metal objects such as golf clubs or fishing rods. Many golfers wearing cleated shoes have made good lightning rods.
- 8.) Stop all tractor work, especially if you are pulling metal equipment. Dismount as tractors and equipment are good targets.
- 9.) Get out of small boats and out of the water.
- 10.) Stay in your automobile if you are in it. Cars offer excellent lightning protection.
- 11.) Seek shelter in buildings. If no buildings are around, seek protection in caves, ditches, or canyons.
- 12.) When there is no shelter in the area, avoid the highest objects. If isolated trees are nearby, crouch in the open, keeping at least twice as far away from the trees as they are high.
- 13.) Avoid hilltops, wire fences, open spaces, metal clothes lines, and any electrically conductive elevated objects.
- 14.) If you feel an electrical charge - if your hair stands on end or your skin tingles, lightning may be about to strike you. Drop to the ground immediately.

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HONORARY DEGREE GIVEN TO DR. B.W. CURRIE

The University of Saskatchewan will confer honorary doctor of laws degrees on three distinguished Canadians at the 61st annual spring Convocation in Saskatoon, Thursday and Friday, May 15 and 16, in the Centennial Auditorium. One of the recipients will be Dr. B.W. Currie, of Saskatoon, the Saskatoon Centre's Honorary President. Dr. Currie is research advisor to the president of the University and an internationally recognized authority on the upper atmosphere.

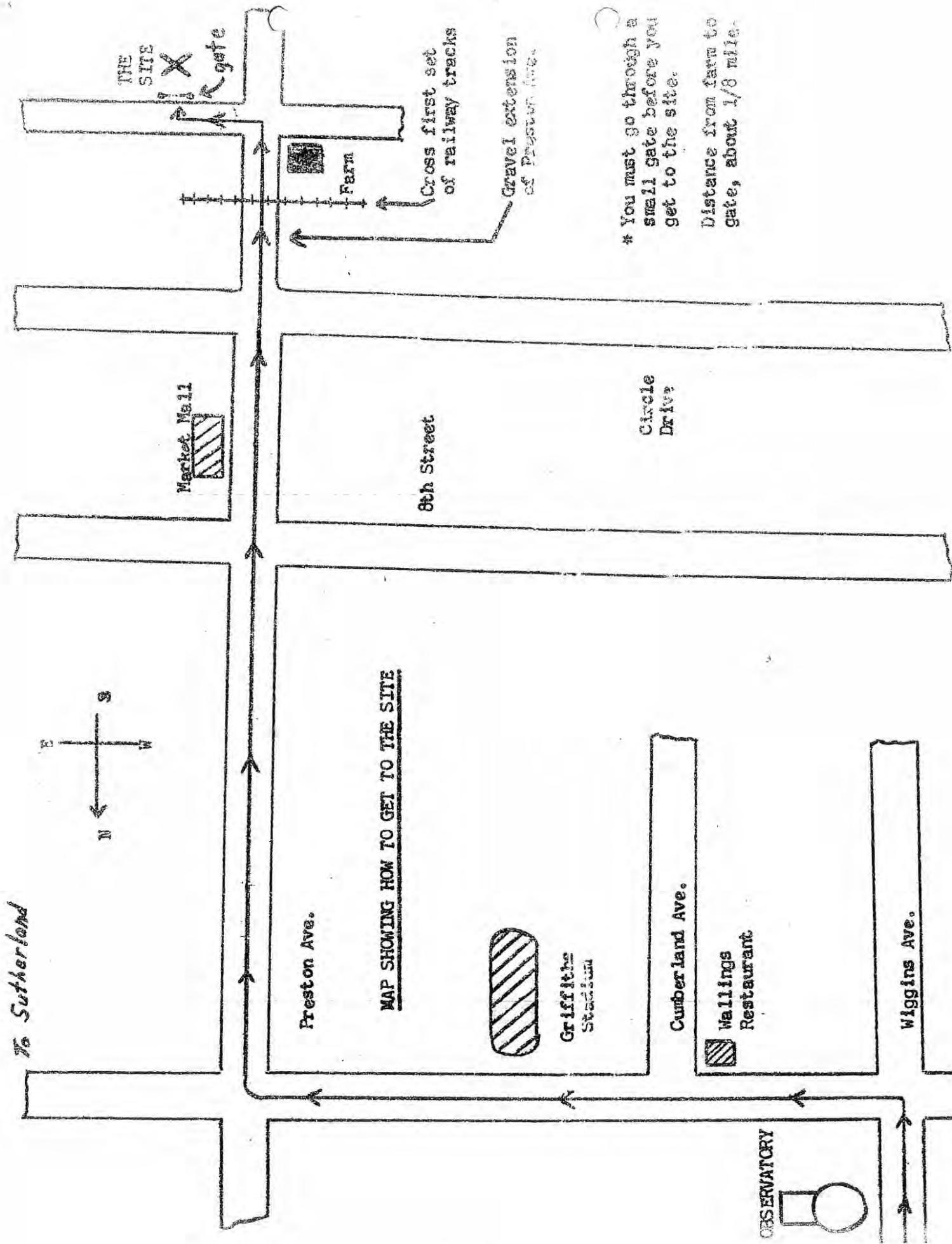
* * NOTICE TO ALL MEMBERS CONCERNING FIELD ACTIVITIES * *

The executive has decided that during the warmer months (beginning on 3 May, 1975), the Astrophotography group, run by Mr. Gordon Patterson and presently meeting at his residence, and the Observers group, run by Mr. Wendel Frenzel and meeting at the observatory, will collaborate for field activities.

EVERY CLEAR AND SUITABLE SATURDAY EVENING, ALL INTERESTED MEMBERS AND GUESTS WILL MEET AT THE OBSERVATORY AT 8:00 p.m. From there we will then proceed to our observing site south of Saskatoon (see map on following page). Rides will be supplied to those without transportation to the site.

If you are in doubt as to whether there will be an outing or not, phone the observatory between 8:00 and 8:15 p.m. If there is no answer, we do not go.

The activities will include the following: planetary, lunar and deep sky observing, as well as general sky and meteor observing. Those who attend are asked to bring the following:
telescopes and/or binoculars, their star charts and books, food (if preferred), cameras, suitable clothing, anyone else interested in astronomy.



Lunar Eclipse to be Visible Over Saskatchewan

Weather permitting, the best lunar eclipse of the 1970's will be visible over all of North America on the night of Saturday, May 24, 1975. The eclipse will be total - the first visible from Canada in over three years.

An eclipse of the moon occurs only at full moon, and only when the sun, earth, and moon are exactly aligned. At such times, the moon becomes engulfed in the earth's shadow; it does not completely black out the moon, but does cut our satellite's brilliance to less than one percent of the normal full moon brightness. The visible eclipse begins at 10:00 pm (Saskatoon time) when the lower left edge of the moon will dim as it slowly enters the earth's shadow.

The shadow, usually a copper hue, will seem to sweep over the moon during the following hour. An hour later the moon will be totally eclipsed and appear deep rust in colour, an effect caused by the bending of sunlight through the earth's atmosphere. The moon then moves out of the earth's shadow to return to normal brilliance 3 1/2 hours after the eclipse began.

The University Observatory will be open to the public throughout the eclipse. Saskatonians are invited to drop in and view the eclipse through the University's 7" refractor telescope as well as through a number of smaller telescopes which will be set up in the area. Open House activities are operated jointly by the Physics Department, University of Saskatchewan and by members of the Saskatoon Centre, Royal Astronomical Society of Canada.

submitted by Ron Waldron,
Observatory Assistant

GENERAL MEETING

DATE: Tuesday, 20 May, 1975

TIME: 8:00 pm

PLACE: Room B111, Health Sciences Building, U of S
(across from observatory)

PROGRAM: Regular Business, followed by an interesting talk on "Meteors and Infrasonics" by guest speaker Dr. M. Watson from Ottawa.

Astrophotography Group members and all other interested members please take note that the Astrophotography Exam will be corrected in the observatory on Saturday, May 17 at 8:00 pm rather than on Tuesday, May 20 as is specified on the exam paper.

Minutes of the Executive Meeting
 R.A.S.C. Saskatoon Centre
 Sunday April 6, 1975 1:00 p.m.
 Held in the Observatory

Present:	Halyna Kornuta Melodie Andrews Jim Young Wendel Frenzel	President Secretary VP/PR Activities	Dr. Holden Greg Towstego Hugh Hunter Merlyn Melby Doug Beck	Programming Editor Librarian Sub-Councillor Sub-Councillor
Absent:	Alan Blackwell	Treasurer		

Item	Detail	Action
86.	The meeting was opened at 1:45.	
87.	The Practical Observing classes will be moved to Saturdays. Starting April 19th, (if the weather is clear.)	
88.	A film has been found for the April General meeting.	Doug Beck
89.	Meeting adjourned	Wendel Frenzel Carried

Minutes of the General Meeting
 R.A.S.C. Saskatoon Centre
 Tuesday April 15, 1975 8:00 p.m.
 Held in Rm B110 Health-Sciences

Present:	Halyna Kornuta Melodie Andrews Jim Young Wendel Frenzel	President Secretary VP/PR Activities	Dr. Holden Greg Towstego Hugh Hunter Merlyn Melby Doug Beck	Programming Editor Librarian Sub-Councillor Sub-Councillor
Absent:	Alan Blackwell	Treasurer		

Item	Detail	Action
90.	The meeting was opened at 8:00 p.m.	
91.	Adoption of February and March minutes.	D. McDonald B. Peterson Carried
92.	Fundamental classes will be cancelled the beginning of next year (due to lack of new membership). It has been suggested the Observing class be run on Saturdays 8:00 p.m. If the weather is warm the observing site will be used.	
93.	Correcting of the Astrophotography exam will take place in the observatory Saturday May 17, 8:00 p.m.	
94.	The film "Universal Gravitation" and "To the Edge of the Universe" were shown.	
95.	Motion for adjournment.	Jim Young Gordon Patterson Carried