

Timeline of Aurora Events

Overview:

Students build a timeline to help them review important dates in history that pertain to aurora research.

Objectives:

The student will:

- review historical events related to aurora research;
- determine that history is a record of human experiences linking the past to the present and future;
- identify a chronological framework for organizing historical ideas, institutions, people and events within time sequences;
- conclude many individuals have contributed to the traditions of science. Studying some of these individuals provides further understanding of scientific inquiry, science as a human endeavor, the nature of science, and the relationships between science and society;
- determine that society, culture, history, and environment affect the development of scientific knowledge; and
- learn that scientific discovery is often a combination of an accidental happening and observation by a knowledgeable person with an open mind.

Materials:

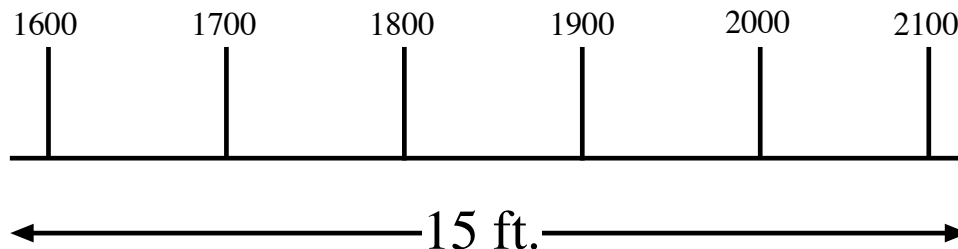
- Scissors
- Clothesline or heavy string
- Clothespins
- STUDENT INFORMATION SHEET: “Timeline Information”
- STUDENT WORKSHEET: “Match a Date with an Event”



Timeline of Aurora Events

Activity Procedure:

1. Explain that people from around the world have contributed to aurora research.
2. Describe a timeline as a chart that organizes events in the order in which they occurred.
3. Ask students to cut STUDENT INFORMATION SHEET: “Timeline Information” pages into strips so that they can be attached to a clothesline stretched across the room.
4. Measure the total distance of the clothesline so that a scale can be established. The timeline will start at the year 1600 and end at the year 2100. For example, if the classroom clothesline extends 15 feet, then 3 foot sections should be marked for every 100 years (15 feet / 5).



5. Distribute Timeline Information strips and ask students to pin the events up at the correct place on the timeline. Point out that the timeline’s last entry is TODAY since scientists are still making new discoveries.
6. Ask students to generate a list of satellites that are monitoring Earth and the sun. Students may use the Internet to research the dates these satellites were launched, and to write a brief description of what the satellites are monitoring. Add these satellite descriptions to the timeline in the appropriate order. Examples of satellites include: SOHO, POLAR, IMAGE, WIND, HESSI and YONKOH.
7. Instruct students to complete the STUDENT WORKSHEET: “Match a Date with an Event.”

Answers to Student Worksheet:

1. 1600: Gilbert shows Earth is a giant magnet
2. 1970: Aurora television camera developed
3. 1957: Sputnik 1, the first satellite, was launched
4. 1958: International Geophysical Year, when scientists worldwide studied the aurora, rockets, satellites, and many other geophysical phenomena
5. 1998: POES Satellite (NOAA-15) launched
6. 1994: Geophysical Institute Professor Charles Deehr begins making aurora predictions for the public
7. 1860: Elias Loomis identifies the aurora zone
8. 1931: First modern theory of the aurora formed by Chapman and Ferraro
9. 1964: Aurora substorm discovered by Dr. Akasofu of the Geophysical Institute

Name: _____

Match a Date with an Event

Directions: Match the events to the years they occurred by writing the correct year on the line beside the event.

Years

1994 1958 1860 1970 1600
1957 1998 1964 1931

Events

1. _____ Gilbert shows Earth is a giant magnet
2. _____ Aurora television camera developed
3. _____ Sputnik I, the first satellite, was launched
4. _____ International Geophysical Year, when scientists worldwide studied the aurora, rockets, satellites, and many other geophysical phenomenon
5. _____ POES Satellite (NOAA-15) launched
6. _____ Geophysical Institute Professor Charles Deehr begins making aurora predictions for the public
7. _____ Elias Loomis identifies the aurora zone
8. _____ First modern theory of the aurora formed by Chapman and Ferraro
9. _____ Aurora substorm discovered by Dr. Akasofu of the Geophysical Institute

Timeline Information

Today

New observation techniques and theoretical work continue to increase understanding of the processes that produce the beautiful aurora.

1998

Launch of POES

California, U.S.A.

NOAA-15, the most recent Polar Orbiting Operational Environment Satellite (POES), is launched to monitor Earth's atmosphere.

1997

Launch of ACE

Florida, U.S.A.

ACE, the Advanced Composition Explorer satellite, is launched to study particles from the sun that come near Earth.

1996

Launch of FAST

California, U.S.A.

FAST, the Fast Auroral Snapshot satellite, is launched to study the detailed plasma physics of the aurora.

Timeline Information

1995

New Aurora Footage

Alaska, U.S.A.

Scientists record the aurora with an all-sky camera all night long, and compress the footage into a video that is the most complete continuous data set of the aurora ever made.

1994

Aurora Forecasts

Alaska, U.S.A.

Geophysical Institute Professor Emeritus Charles Deehr begins making aurora predictions for the public.

1990

Aurora on Jupiter Photographed

The Hubble Space Telescope photographs Jupiter's aurora for the first time.

1974

Electric Fields

Scientists observe evidence that electric fields exist parallel to the magnetic field.

Timeline Information

1970

Aurora Television Camera

Alaska, U.S.A.

Geophysical Institute Professor Tom Hallinan and others develop a special television camera that photographs the aurora in detailed color.

1968

Poker Flat Research Range

Alaska, U.S.A.

Poker Flat Research Range is created by the Geophysical Institute and becomes the only university-owned rocket range in the world.

Rockets are launched to study the aurora.

1967

Auroras at North and South Poles

Alaska, U.S.A.

Scientists at the Geophysical Institute show Earth's northern and southern auroras come from the same source, and are mirror images of each other in the north and south polar regions.

1964

Aurora Substorm Discovered

Alaska, U.S.A.

Information gathered during the International Geophysical Year (IGY) helps International Arctic Research Center Director Syun-Ichi Akasofu and Geophysical Institute scientists to identify the aurora substorm.

Timeline Information

1958

International Geophysical Year

During the IGY (which began in 1957), scientists around the world study the aurora, rockets, satellites, and many other geophysical phenomenon.

1957

Sputnik 1

Russia (Soviet Union)

The first satellite, Sputnik 1, is launched to orbit Earth.

and

All Sky Camera

The first all sky camera is developed, which permits the simultaneous recording of aurora displays from horizon to horizon.

1946

Geophysical Institute

Alaska, U.S.A.

By an act of Congress, the Geophysical Institute is created, in part, to figure out why the aurora interfered with radio communication during World War II.

Timeline Information

1939

World War II

World War II intensifies research on how the aurora affects communication, navigation, and detection systems.

1931

First Modern Theory

England

Sydney Chapman and Vincent Ferraro form the first modern theory of the aurora. They describe how Earth's magnetic field guides particles from the sun into Earth's upper atmosphere. The collision between particles from the sun and gas particles in Earth's atmosphere produces light.

1938

Veryl Fuller

Alaska, U.S.A.

Veryl Fuller's measurements confirm auroras occur at the same altitudes throughout the northern aurora zone.

1925

Ionosphere Discovered

Washington D.C., U.S.A.

Merle Tuve and others announce the discovery of the ionosphere, an electrically conducting layer of the high atmosphere (starting roughly at 50 miles above the ground).

Timeline Information

1910

Carl Stormer

Norway

Carl Stormer uses triangulation to measure auroral heights.

1868

Anders Jonas Angstrom

Norway

Anders Jonas Angstrom uses a prism to show that aurora light differs from sunlight.

1860

Elias Loomis

U.S.A.

Elias Loomis identifies the aurora zone.

1733

Jean-Jacques d'Ortous de Mairan

France

Jean-Jacques d'Ortous de Mairan relates aurora displays to solar activity.

Timeline Information

1600

William Gilbert

England

English physician William Gilbert shows that Earth is a giant magnet.

1596-1650

Rene Descartes

Rene Descartes develops the first scientific method.

Pre-recorded History

People observe the aurora around the world. Legends to explain the aurora are passed orally from generation to generation.