Rockets into the Aurora

A list of materials about this topic
By: Aldean Kilbourn

Internet Resources

Alaska Science Forum: the Aurora Index
<http://www.gi.alaska.edu/ScienceForum/aurora.html>
Articles written by a variety of Alaskans on the Aurora.

International Polar Foundation
<http://www.sciencepoles.org/index.php?s=2&rs=home&uid=919&lg=en>
"Auroras – Mysterious Lights in the Sky", Published on March 16 2007 in Articles, Antarctic, Arctic, Atmosphere & Space.

What is the Geomagnetic Field?! 2003. Hayanon.
<http://www.stelab.nagoya-u.ac.jp/ste-www1/pub/nanda/ste_geomag_e.pdf>
An online manga that shows what the geomagnetic field is and its relationship to the aurora.

What is the Solar Wind?! 2005. Hayanon.
<http://www.scostep.ucar.edu/comics/books/solarwind_e.pdf>
An online manga that shows what the solar wind is, how it affects the earth, and how it creates the aurora.

What is the Aurora?! 2004. Hayanon.
<http://www.stelab.nagoya-u.ac.jp/ste-www1/pub/nanda/ste_aurora_e.pdf>
Another online manga that explains exactly what the aurora is.

The Northern Lights
http://fairbanks-alaska.com/northern-lights-alaska.htm
Informational site about the aurora.

Poker Flats Research Range
http://www.pfrr.alaska.edu/
Located approximately 30 miles north of Fairbanks, Alaska, it is the world's only scientific rocket launching facility owned by a university and is operated by the University of Alaska's Geophysical Institute. Under sidebar, *Aurora Information* has many excellent links as does *Space Science WEB Links*.

UAF Newsroom
http://www.uaf.edu/news/index.html
Enter *aurora rockets* into "search the newsroom" box on the left side bar; 60+ articles to read

Websites

Asahi Aurora Classroom. Asahi Aurora. Geophysical Institute. 18 January 2009.
<http://asahi-classroom.gi.alaska.edu/index.htm>.

The Aurora. Francis Reddy. 2007. Astronomy Magazine. 18 January 2009.
<http://www.astronomy.com/asy/default.aspx?c=a&id=2088>.

The Aurora Page. Michael Dolan. 21 February 2006. Michigan Tech. 18 January 2009.
<http://www.geo.mtu.edu/weather/aurora/>.

Aurora Alerts. Geophysical Institute. 18 January 2009. <http://www.gi.alaska.edu/AuroraAlerts/>.

Aurora Alive. University of Alaska Geophysical Institute. Geophysical Institute. 18 January 2009. <http://auroraalive.com>.

Aurora Borealis. 2009. Pamela Joy. 18 January 2009. <http://pamelajoy.com/aurora.php>.

Aurora Borealis. 1999. Bruce McKibben. 18 January 2009. < http://www.barbeint.no/aurora/>.

Auroras: Paintings in the Sky. 19 June 2001. Mish Denlinger. University of California. 18 January 2009. <http://www.exploratorium.edu/learning_studio/auroras/>.

The Geophysical Institute Auroral Forecast Page. 1 August 2007. Geophysical Institute. 18 January 2009. <http://www.gedds.alaska.edu/AuroraForecast/>.

Northern Lights. May 30, 2008. Aurora Webmasters. 18 January 2009. <http://www.fairbanks-alaska.com/northern-lights-alaska.htm>.

Rocket Man. 27 November 2008. University Centre in Svalbard. 18 January 2009. <http://www.unis.no/60_NEWS/6040_Archive_2008/n_08_11_27_rocket/Rocket_Man_news_27112008.htm>

Science Daily. "Researcher Studies Aurora Borealis Secrets; Unmanned Rocket Gathers Data About Northern Lights." 3 March 2003. 18 January 2009. <http://www.sciencedaily.com/releases/2003/02/030228072616.htm>

Shooting the Aurora Borealis. Dick Hutchinson. 18 January 2009. < http://www.ptialaska.net/~hutch/aurora.html>.

Spaceweather.com Presents: Auroral Galleries. 2007. Tony Phillips. 18 January 2009. <http://www.spaceweather.com/aurora/gallery.html>.

The Sun: Man's Friend and Foe – Aurora. 1998. Elizabeth Beckett, Holly Bernitt, and Vishwa Chandra. 18 January 2009. <http://library.thinkquest.org/15215/Science/aurora.html>.

Book Resources

Akasofu, Syun-Ichi. ***Secrets of the Aurora Borealis***. Alaska Geographic Society, 2002.
Concisely explains the phenomena of the aurora, tracks its historical evolution, and presents indigenous peoples' reactions to and fears of the lights. Many photos, woodcuts, explanatory charts, and diagrams to help reveal the complex physics involved when the lights are seen in the sky.

Akasofu, Syun-Ichi. ***Exploring the Secrets of the Aurora***.
Kluwer Academic Publishers, 2002.
Offers young researchers insights into how scientists learn to proceed during periods of controversy or struggle generated by new phenomena or facts which do not support the prevailing ideas or theories of the time

Akasofu, Syun-Ichi. ***Exploring the Secrets of the Aurora, 2nd Ed***.
Springer, 2007.
Covers the author's own experiences as a scientist and details progress made in the study of the aurora and magnetospheric physics. Many examples given of struggles, the controversies, eventual acceptance of ideas, and success through the past many years.

Bone, Neil. ***Aurora: observing and recording nature's spectacular light show.*** Springer, 2007.
Offers an explanation of the aurora's causes, how the occurrence of major events may now be predicted, and how amateur observers can go about recording displays; professional studies of auroral/geomagnetic phenomena are discussed, to put

amateur work in context.

Bone, Neil. ***The Aurora: Sun-Earth interactions***. Ellis Horwood, 1991.
The historical context of and early scientific investigations of aurora are found in the first three chapters. Some information in later chapters is outdated due to more current findings.

Esbensen, Barbara Juster. ***The Night Rainbow***. Scholastic. 2001
A poem regarding legends of the aurora.

Davis, T. Neil. ***The Aurora Watcher's Handbook***. University of Alaska Press, 1992.
The handbook begins with matters of immediate concern to someone who hopes to see an auroral display, what causes the aurora, when it is most often seen, and how best to capture it on film. Later sections provide a review of all aspects of auroral science. May be somewhat dated.

Hall, Calvin, D. Pederson, G. Bryson. ***Northern Lights: the science, myth, and wonder of aurora borealis***. Seattle: Sasquatch Books, 2001.
Reknown photographers and a scientist join to produce a photographic image of the aurora but also describe the myths, legends, and science that surround this polar phenomenon.

Hawkins, Isabel and Ruth Paglierani. ***Auroras! Mysterious Lights in the Sky***. La Jolla, CA's Sun-Earth Connection Education Forum and CalSpace, 2002.
For grades K-4, looks at both Northern and Southern auroras.

Jago, Lucy. ***The Northern Lights***. New York: Knopf, 2001.
Historical blending of biography on Kristian Birkeland and events involved in explaining the Northern Lights.

Sandholt, Per Even, H. C. Carlson & A. Egeland. ***Dayside and Polar Cap Aurora***. Kluwer Academic Publishers, 2002.
Explanations of the ground-based remote-sensing techniques, current abilities to monitor continuously the variations in the signatures of aurorae, using in-situ satellite and rocket measurements. Points out how dramatically changing is the understanding of the physical processes taking place at the interface of the atmospheres of the Earth and the Sun.

Savage, Candace. ***Aurora: The mysterious Northern Lights***. Sierra Club Books, 1994.
The text is supplemented with old illustrations, impressive photos of auroreal displays, and numerous sidebars on related topics.

Souza, D. M. ***Northern Lights***. Carolrhoda Books, 1994.
Easy reader that explains about aurora.

Underwood, Deborah. ***Northern Lights.*** KidHaven Press/Thomson Gale, 2004.
Includes interesting myths from cultures around the world in combination with scientific explanations of the aurora.

Salat, Todd, Susan Dixon. ***Alaska's Spectacular Aurora.*** Todd Salat Shots, 2002.
Photographs of the aurora taken in various locations throughout Alaska.

Shepherd, Donna Walsh. ***Auroras: Light Shows in the Night Sky.*** Franklin Watts, 1995.
Explains what the aurora is, where it can be found, and how auroras occur, and information about rocket launches at Poker Flat Research Range. Easy reader.

Video and Electronic Resources

Bjornsson, Arnold, J. Isberg; S. H. Stefnisson; S. Grimsson, A. Andrees, G. Holst; Aurora Experience (Firm); Scottish National Orchestra; NASA Earth Observatory Team. ***Aurora Borealis: the***

magnificent lights of the northern sky. Kopavogur: Aurora Experience, 2005.
Footage of northern lights, combined with interesting scientific anecdotes and associated legends, folklore and superstitions.

Nielsen, Hans. ***Science for Alaska Public Lecture Series: Mirror Images: Exploring Auroras at Each of the Poles***. Fairbanks: Geophysical Institute, University of Alaska Fairbanks, 2006.
Part of the annual, six-week set of public lectures sponsored and hosted by the Geophysical Institute at UAF, with additional support form BP and ConocoPhillips.

Physics of the Aurora: Earth Systems. University Corporation for Atmospheric Research, National Center for Atmospheric Research (US), High Altitude Observatory, Cooperative Program for Operational Meteorology, Education, and Training (COMET), United States National Weather Service. University Corporation for Atmospheric Research, 2005.
An integrated multimedia module designed for teachers and undergraduate science students. Set up as a tri-level presentation, there are short narrative overviews for a general audience, connected to more detailed and technical level content and interactive exercises for science majors, followed by "in-depth" mini-lessons which explore theoretical underpinnings and include mathematical derivations and physical laws.

Teacher Resources

Aurora -fabled glowing lights of the Sun-Earth connection. National Aeronautics and Space Administration, 2002. (poster)
Back side has FAQs with answers, a map, and lesson plan (grades 5-8).

Aurora Alive: Classroom Lessons. University of Alaska Fairbanks, Geophysical Institute, 2000.
(spiral notebook)Older version with same and different student activity descriptions from newer version.

Aurora Alive: An Interactive, Multimedia Educational Guide to the Northern Lights. University of Alaska Fairbanks, Geophysical Institute, and US Department of Education, 2007. (DVD)
Includes aurora movies and photos, Alaska Native legends of the aurora, interactive science activities.

Aurora alive: a teacher's manual of hands-on activities. Introductory curriculum. University of Alaska Fairbanks, Geophysical Institute, 2007. (spiral notebook)

Aurora alive: a teacher's manual of hands-on activities: Advanced curriculum. University of Alaska Fairbanks, Geophysical Institute, 2007. (spiral notebook)

Energetic Aurora Science Kit for Teachers. University of Alaska, Museum of the North.
Kit targeted for 6-8th graders covering math and aurora borealis through presentations, activities, and lesson plans; available for checkout for two week period; refundable deposit required.

Odenwald, Sten F. ***Exploring the Sun-Earth Connection***. Columbia University Press, 2000.
On the back of each lithograph is an essay describing each of the ten elements of the Sun-Earth system, including auroras, as well as a 'Science Nuggets' list of recent NASA mission discoveries relating to each of the elements. There is a short description of the relevant education standards that each lithograph addresses, along with a sample question that can be answered by reading the short essay.

Live From the Aurora: Educators guide. National Aeronautics and Space Administration, 2003.
Inquiry-based activities designed to encourage student questions related to the existence of the Sun-Earth Connection. Seems designed for K-2 and 3-5 grade levels.