

Resource Guide for Canadian Aboriginal Astronomy (May 2010)

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A highly successful International Year of Astronomy (IYA2009) has come and gone and we are now living the experience of Beyond IYA, with time to process and integrate our understandings of the rich, diverse and multidisciplinary materials available. This Resource Guide has been compiled by Prune Harris as part of the work of the Canadian Aboriginal Working Group for IYA2009. The working group emerged by special request from the Canadian IYA National Steering Committee to Cape Breton University (CBU) because of the university's globally unique Integrative Science program that brings together Indigenous and Western scientific knowledges and ways of knowing and because of the university's dynamic Mi'kmaq College Institute (MCI).

Through discussions in various community programs run by the Integrative Science team, it became apparent that many educators feel overwhelmed when trying to access information on astronomy, and that this situation is exacerbated when looking for information on Canadian Aboriginal Astronomy. Thus was born this project to compile a Resource Guide. Its listings include both printed and web-based materials; as possible, I have also provided brief annotation. All the materials are nontechnical and therefore appropriate for students, educators, and others interested in Canadian Aboriginal Astronomy.

The Integrative Science team includes Mi'kmaq Elders and educators, Canada Research Chair Dr. Cheryl Bartlett, students, and Research Associates. "Integrative Science" is defined as "bringing together Indigenous and Western scientific knowledges and ways of knowing" and the team is pioneering praxis-based research using integrative, action, and participatory methodologies within a co-learning journey with, by, and for Aboriginal peoples and communities. It was conceived in the mid-1990s in collaboration with key Mi'kmaq individuals to bring radical innovation into the educational system to begin to address the under-participation by Aboriginal young people in university science programs and thus also in careers that require science education. Within this co-learning journey, Mi'kmaq Elder Albert Marshall has brought forward the guiding principle of "Two-Eyed Seeing" which emphasizes learning to see from one eye with the strengths in Indigenous knowledges and ways, and learning to see from the other eye with the strengths in Eurocentric (or Western, or mainstream) knowledges and ways. Elder Albert stresses that we humans must learn to use these two eyes together, for the benefit of all. In the effort to help educators work with the understandings offered by Two-Eyed Seeing, I have provided references in the section entitled "Two-Eyed Seeing Resources for Educators".

The Resource Guide is intended as a living document and thus is by no means exhaustive. Also, in that it is only a compilation of resources, it is not to be interpreted as an effort to verify the authenticity and/or accuracy of the information in the materials listed. We welcome comments, additions and suggestions to the list, as posted on the Integrative Science website at www.integrativescience.ca.

Two-Eyed Seeing Resources for Educators

Bartlett, C., Marshall, M., Marshall, A., and Iwama, M. *Integrative Science and Two-Eyed Seeing: Enriching the Discussion Framework for Healthy Communities*. In: Ecologically Emancipated Communities. Edited by: L. Hallstrom. UBC Press (forthcoming).

Bartlett, C.M. 2009. *Mother Earth, Grandfather Sun*. Green Teacher, 86: 29-32.

Hatcher, AM. and Bartlett, C. 2009. Traditional medicines: how much is enough? Green Teacher, 86: 11-13.

Harris, P., Bartlett, C.M., Marshall, M., and Marshall, A. *Mi'kmaq Night Sky Stories; patterns of interconnectiveness, vitality and nourishment*. Communicating Astronomy to the Public Journal (in press).

Hatcher, AM., Bartlett, C.M., Marshall, A., and Marshall, M. 2009. *Two-Eyed Seeing in the classroom environment: concepts, approach and challenges*. Canadian Journal of Science, Mathematics, and Technology Education, 9(3): 141-153.

Hatcher, A.M., and Bartlett, C. 2009. *MSIT: transdisciplinary, cross-cultural science*. Green Teacher, 86: 7-9.

Hatcher, A.M., Bartlett, C., Marshall, M., and Marshall, A. 2009. *Two-Eyed Seeing: a cross-cultural science journey*. Green Teacher, 86: 3-6.

Hatcher, A.M., Kavanagh, S., Bartlett, C. and Marshall, M. 2009. *Traditional legends: meanings on many levels*. Green Teacher, 86: 14-17.

Iwama, M., Marshall, M., Marshall, A. and Bartlett, C. *Two-Eyed Seeing and the language of healing in community-based research*. Canadian Journal of Native Education (in press).

Website for Integrative Science: www.integrativescience.ca

Aboriginal Sky Stories

Bruchac, Joseph. 1989. *Return of the Sun: Native American Tales from the Northeast Woodlands*. The Crossing Press.

- Grade 4 and up. Almost all these stories came, at least in part, from living oral tradition and many are here translated from their original languages. There is great variety, including “The return of the Sun” (Onondaga), which tells how the Sun came to be fastened up into the sky so that it can give light and life to the people.

Buck, Wilfred. 2009. *Atchakosuk: Ininewuk Stories of the Stars*. First Nations Perspectives, 2, 1 (2009), 71-83.

- http://www.mfnrc.org/index.php?option=com_content&task=view&id=224&Itemid=0

- The article explores atchakosuk - the spirit lights up above. Ininewuk (Cree) mythology posits that constellations and stars that are prominent in the northern skies are understood through perspectives that are unique to the Ininewuk. For First Nations students and Ininewuk students in particular, it is important that the ancestral worldviews related to the natural world are reflected in First Nations education, as most cultures have their own interpretations and understandings of constellations and the stories associated with them. The Knowledge Keepers, Medicine People, and honoured Elders that have graced us with these understandings are from many nations as far away as South America and as close as our home communities. The author has chosen to deal specifically with Ininewuk perspectives of astronomy for this is where his path began. The subject matter is intended to provide students and educators associated with First Nations education with an introduction to Ininewuk perspectives. In this article, the Ininewuk language is in the Swampy Cree dialect.

Chandra, Nalini and Percy, John. 2001. *Using Multicultural Dimensions to Teach Astronomy*.

- <http://www.astrosociety.org/education/publications/tnl/53/multicultural1.html>
- The authors are educators at the University of Toronto; Chandra is also an experienced elementary school teacher.

Clark, Ella E. 1953. *Indian Legends of the Pacific Northwest*. University of California Press.

- Grade 7 - Adult. This classic collection of takes from the many peoples of the Northwest includes eight stories about the Sun and the Stars. Most stories have appended notes telling how the story was collected, or how it was told, or what variations exist in other tribes in other areas. Its format will be difficult for younger readers as it is in small print and pages are crowded, but the selection of legends on every topic is excellent, and illuminates the lives and concerns of the Northwest people.

Dempsey, Frank. 2008. *Aboriginal Sky Lore of the Big Dipper in North America*. Journal of the Royal Astronomical Society of Canada, 102: 59-61.

Can be found online at <http://www.rasc.ca/journal/pdfs/2008-04-lr.pdf>

- Frank Dempsey, an Ojibway and member of Dokis First Nation, is an atmospheric scientist and amateur astronomer who collects Sky Lore 'on cloudy nights'. (See below for other publications).

Dempsey, Frank. 2009. *Aboriginal Sky Lore of the Pleiades Star Group in North America*. Journal of the Royal Astronomical Society of Canada, 103: 233-235 .

Dempsey, Frank. 2009. *Aboriginal Sky Lore of the Constellation Orion in North America*. Journal of the Royal Astronomical Society of Canada, 103,65-67.

<http://www.rasc.ca/journal/pdfs/2009-04-hr.pdf>

Erdoes, Richard and Alfonso Ortiz. 1984. *American Indian Myths and Legends*. Pantheon.

- Grade 7-Adult. This encyclopaedic collection of Native American stories includes a section of 19 takes of the Sun, Moon and Stars, representing many native cultures and regions. Stories include Grandmother Spider steals the Sun (Cherokee), the Trickster Coyote puts the stars in the places (Wasco), a young couple who do not follow tradition

are put up into the sky to become stars (Tewa), and many others. This collection is a must for anyone interested in Native American astronomy.

<http://www.ewebtribe.com/NACulture/articles/aurora.html>

- This site has good visuals for the Aurora Borealis as well as a large collection of stories.

<http://www.firstpeople.us>

- Several hundred stories from across North America.

Jiles, Paulette. 1996. *North Spirit: Travels among the Cree and Ojibway Nation's and their Star Maps*. Doubleday Canada.

- A nice book on Cree Ojibway star maps and life in the North. Jiles spent seven years in the North working for the CBC. The central figure of the Cree Ojibway cosmography is the Stern Paddler (Orion). The Bow Paddler is Polaris, and the entire sky is a canoe. Cree language is not gender-based; rather, it recognizes living and non-living things. Living things include stars, canoes and stones.

<http://www.kstrom.net/isk/stars/starmenu.html>

- This site is a rich resource for Lakota star stories, constellation names, etc. It also includes the Bighorn Medicine Wheel and Moose Mountain Medicine Wheel.

Lavitt, Edward and McDowell, Robert. 1990. *Nihancan`s Feast of Beaver : Animal Tales of the North American Indians*. Museum of New Mexico Press.

- Grade 4 and up. This accessible, attractive collection is arranged by tribe, with a small insert map for each indicating the tribe's territory. The collection includes the Wintu story of the First Dawn and the Haida story of How Raven Stole the Sun, as well as many others from across North America. The stories are short and each is prefaced by an introductory note about the tribe whose story it is.

MacDonald, John. 1998, 2000. *The Arctic Sky: Inuit Astronomy, Star Lore, and Legend*. Nunavut Research Institute.

Martin, Fran. 1975. *Raven-Who-Sets-Things-Right: Indian Tales of the Northwest Coast*. Harper and Row.

- Grade 4 and up. Raven, the Trickster, sometime creator, sometime changer, is a culture hero of Northwest Coast peoples. Among the other stories is the account of how Raven stole back the Sun, Moon and Stars from the Old-One-At-The-Source-Of-The-River and released them for the use of humans and animals. The lively style makes for delightful reading aloud or telling. These are favourites with listeners of all ages.

Mayo, Gretchen. 1987. *Star Tales: North American Indian Stories about the Stars*. Walker & Co.

- Grade 5 and up. Stories about various stars, constellations, and the Milky Way, with introductory paragraphs to each explaining something about the beliefs of the people whose story it is and something about the way other tribes have viewed the same star or

constellation. All are inviting to younger readers and some contain irresistible humour. Good for reading aloud.

Miller, Dorcas. 1997. *Stars of the First People: Native American Star Myths and Constellations*. Pruett.

McLeary, Timothy. 1997. *The Stars We Know: Crow Indian Astronomy and Lifeways*. Waveland.

Monroe, Jean Guard and Williamson, Ray. 1987. *They Dance in the Sky: Native American Star Myths*.

- Grade 5 and up. This collection of well chosen and easily readable stories brings together tales from all regions about the Pleiades, the Big Dipper, and other stars and constellations. Native American star patterns are listed, their European-named equivalents are given and the beliefs of many Native groups about the stars are discussed.

Morgan, J. 1974. *When the morning stars sang together*. The Book Society of Canada: Toronto.

http://www.northern-stars.com/Native_American_Sky_Legends.pdf

- A great teacher's resource for either night sky or for story telling, by Margaret Grenier (Cree, Gitksan). Three Sky Stories from Wsanec moon calendar, Gitksan origin story and Tlingit aurora borealis story.

Reid, Bill and Bringhurst, Robert. 1984. *The Raven steals the Light*. Douglas and MacIntyre: Vancouver & Toronto.

Ridpath, I. 1988. *Star Tales*. Universe Books.

Savard, Remi and Germain, Catherine. 2006. *First Spring*. Simply Read Books: www.simplyreadbooks.com

Snowder, Brad. <http://www.wwu.edu/depts/skywise/legends.html>

- Collection of brief stories concerning Pleiades, Hyades, Sun, Moon, Big Dipper, Milky Way, Earth, Aries, Canis Major, Arturcus, Casseiopeia, Cygnus, Corona Borealis, Hercules, Orion, Sirius, Meteor, Sagittarius, Procyon, Scorpius, Venus, Auriga. Also listing of moon names and constellation Names. Also info on Greek mythology and the constellations. Author requests stories emailed to him at planetarium.wwu@edu (Western Washington University).

Stsepekwlem E. 1993. *Coyote as the sun and other stories*. Seceswepemc Cultural Education Society: Kamloops, B.C.

Ed. Chamberlain, V.D, Carlson, John B. and Young, Jane. 2005. *Songs from the Sky: Indigenous Astronomical and Cosmological Traditions of the World*. Ocarina Books.

Williamson, R. and Monroe, J. 2007. *They Dance in the Sky: Native American Star Myths*. Sandpiper.

Astronomy Resources for Educators

These first four URL's are good, general Canadian websites for astronomy education.

Canadian Astronomical Society: <http://www.cascaeducation.ca>

Canadian Space Agency: <http://www.asc-csa.gc.ca/eng/educators/default.asp>

Canadian International Year of Astronomy: <http://www.astronomy2009.ca>

National Research Council of Canada:

<http://www.nrc-cnrc.gc.ca/eng/education/astronomy/index.html>

The Astronomy of Many Cultures: a Resource Guide. Alaska, Midwest, Plains

<http://www.astronomy.pomona.edu/archo/namerica/namerica.html>

<http://cse.ssl.berkeley.edu/archo/index.html>.

- Although not specifically Canadian, this resource is excellent in providing deeper context for Indigenous Astronomy. It includes Guaman Poma's account of Sky Watcher, a Knowledge Holder that each village would have had. Also an anonymous document called the Huarochiri manuscript, written in Quechua and claims that every village had an astronomy specialist.

Centre for Archeoastronomy

http://www.wam.umd.edu/~tlaloc/archastro/cfaar_as.html

- Co-produced the book 'Songs from the Sky'.
- Online newsletter: Archaeoastronomy & Ethnoastronomy News, and Archeoastronomy Journal

www.galileoteachers.org

- This is the URL for the International Year of Astronomy Galileo Teacher Training Program. The Canadian contacts for this program are John Percy (john.percy@utoronto.ca) for English, and Julie Bulduc-Duval (jbolducduval@cegepth.qc.ca) for French.

Harvard-Smithsonian Private Universe Teachers' Lab

- A survey for teachers about misconceptions related to astronomy. For example, phases of the moon: http://www.learner.org/teacherslab/pup/act_sunmoonintro.html

Kalchman, Mindy and Brown, Lorne. *The Story of Astronomy*

- <http://www.astrosociety.org/education/publications/tnl/42/42.html>

- Kalchman is a math educator; Brown is a retired school principal; both are storytellers. They explain how to incorporate storytelling into the elementary school classroom, and how it can contribute to effective, engaged learning.

Aveni, A. 1993. *Ancient Astronomers*. St. Remy Press and Smithsonian Institution.

Bennett, Jeffrey, Donahue, Megan, Schneider, Nicholas, and Voit, Mark. 2008. *The Essential Cosmic Perspective*. 5th ed. Pearson Education Inc.

Beyer, S. 1986. *The Star Guide*. Brown & Co.

Bruchac, J., and London, J. 1992. *Thirteen Moons on a Turtle's Back: a native American year of moons*. Philomel Books/Putnam and Gosset.

Caduto, Michael J. and Bruchac, Joseph. 1994. *Keepers of the Night: Native American Stories and Nocturnal Activities for Children*. Fulcrum .

- An excellent book of stories; a sequel to *Keepers of the Earth*.

Caduto, Michael J. and Bruchac, Joseph. 1989. *Keepers of the Earth: Native American Stories and Environmental Activities for Children*. Fulcrum.

- Designed for adults to use with children, each story is accompanied by suggestions for activities related to the theme or the subject matter of the story. “How Coyote was the Moon”, includes activities demonstrating the phases of the Moon and lunar eclipses: “How Fisher Went to the Skyland: the Origin of the Big Dipper” has information and activities about the Solar System. Many suggestions for teachers are included in this very useful collection whose 24 stories are beautifully written and irresistible for reading aloud or telling.

Claxton, E. and Elliott, J. (also the illustrator). *The Saanich Year*. 1993.

- This information is available as a printed book (ISBN 1-55036-336-2) and can also be viewed on line at:
<http://www.racerocks.com/racerock/firstnations/13moons/13moons.htm>.
- An excellent resource offering curriculum for introducing and using the 13 moons of the Saanich Year, an activity designed for Grades 4-7. The hands-on interdisciplinary approach of the activity has been designed to provoke a healthy curiosity and appreciation for universal concepts, the similarities and differences between cultures, and the value of our environment. Teachers are encouraged to take, change and play with the ideas in order to meet the diverse needs of their students and teaching situations.

Cuff, K., DeVore, E., Erickson, J., Gould, A., Hewitt, J., Luntz, S., Seltzer, J., Sneider, C., Steerman, G., and Colby, Andrea. 2003. *Planetarium Activities for Student Success*. Vol . 11, “Astronomy of the Americas”. Includes:

- Hupa Calendar Stones: The moon stone, The universe stone, The year Stone (Northern California) “ To keep their lives attuned to the natural world and to know

- the seasons of fishing, hunting and harvesting, the Hupa developed a precise calendar system based on the Sun, Moon and stars” (p.14)
- World Walkers or Cosmic Net Weavers watch the position of sunrise along the eastern horizon to establish the beginning of the year.
 - Big Horn Medicine Mountain, Medicine Wheel: Sacred for the Northern Cheyenne, Lakota, Dakota, Nakota, Crow, Arapahoe, and other Northern Plains People; the stone circle is a religious site, an altar on the top of a sacred mountain.
 - Vision Seeking (at one time the cairns were higher with simple roofs that formed an enclosure for the individual seeking a vision.
 - Anasazi. Chaco Canyon, New Mexico. A petroglyph on a rock wall marks the precise place for Sun Watcher to stand to observe the summer solstice sunrise. At Chaco canyon there are 13 prehistoric towns and hundreds of minor ruins carefully constructed to align with the four cardinal directions and the four solstice directions of sunrise and sunset. Anasazi figure of Moon Rabbit.
 - Story and petroglyphs re Crab Nebula explosion 900 years ago , was visible for 23 days and shown in various nations petroglyphs (Northern Arizona, California, New Mexico, Baja California, Mimbres).
 - Aztec Calendar: Record of the Aztec creation story, as well as a complex 52 year calendar. Accurately predict solar eclipses. Chichen Itza observatory (Caracol). Importance of Venus to the Mayans. Day Keepers wrote records to record the exact position of Venus and other celestial events.
 - Popol Vuh (creation story) involving the Sun, the Moon, and Venus. Venus has a 584 day cycle between reappearances of Venus as the Morning Star. 5 Venus cycles = 8 Solar Years.

Hagar, S. 1900. *The Celestial Bear*. Journal of American Folklore, Vol 13, No.49, Apr.-Jun.,1900. University of Illinois Press on behalf of American Folklore Society.

Krupp, E. C. 1978. *In Search of Ancient Astronomies*. Doubleday and Company, Inc.

Krupp, Edwin C. 1983. *Echoes of the Ancient Skies: The Astronomy of Lost Civilizations*. Harpers and Row Publishers, New York.

Krupp, Edwin. 1991. *Beyond the Blue Horizon*. Harper Collins Publishing, New York.

- Grade 9 and up. This exploration of sky stories and mythology encompasses the human view of the sky worldwide. Krupp includes many Native American ideas in his survey. It is a well written and generously illustrated book that includes basic astronomical concepts to illuminate the stories and myths.

Lesson plans for an entire Astronomy unit: Percy, J. & Caswell, B. 2002. *Teaching Grade 6 Astronomy*. <http://www.erin.utoronto.ca/~astro/intro.htm>

Sky Challenger

- A set of star charts, one of which is a Native American constellation star wheel. Available from Eureka! At Lawrence Hall of Science, University of California, Berkeley, CA 94720. Tel 510-642-1016. www.lhs.berkeley.edu

Umeeek Atleo, Richard E. 2004. *Tsawalk: a nuu-chah-nulth worldview*. UBC Press: Vancouver, BC

Chamberlain Von Del. 1982. *When Stars Came Down to Earth: Cosmology of the Skidi Pawnee Indians of North America*. Ballena Press.

Weiss, M. 1982. *Sky Watchers of Ages Past*. Houghton Mifflin Co.

Williamson, Ray A. 1984. *Living the Sky*. University of Oklahoma, Norman,

- Grade 9 and up. Williamson brings the viewpoint of Native Americans to the reader through his exploration of several sites and cultures throughout the Americas. He portrays carefully the understanding and relationship between Native Americans and the natural world- including the cosmos. This book is a delight to read, with gracefully written text and appropriate line-drawn illustrations. For parents and teachers seeking information, this may be considered a companion volume for *They Dance in the Sky: Native American Star Myths*.

Upgreen, Arthur. 1998. *Night has a Thousand Eyes: A Naked-Eye Guide to the Sky, Its Science, and Lore*. Plenum Press.

Canadian Planetaria

Some facilities offer portable planetaria that can be set up in a school, community hall etc. These are noted below. Please see their website for more information. To find out more about portable planetaria, go to the [STARLAB website](#).

Alberta

- [Telus World of Science, Calgary](#): Discovery Dome Theatre
- [Telus World of Science, Edmonton](#): Margaret Zeidler Star Theatre

British Columbia

- [Centre of the Universe](#) (Herzberg Institute of Astrophysics, Victoria)
- [H.R. MacMillan Space Centre](#) (Vancouver)

Manitoba

- [The Lockhart Planetarium](#) (University of Manitoba, Winnipeg)
- [Manitoba Planetarium](#) (also has portable planetariums) (Winnipeg)

Newfoundland

- [Newfoundland Science Centre](#) - portable planetarium (St. John's)
- [Marine Institute Planetarium](#) (St. John's)

Nova Scotia

- [Discovery Centre](#) (Halifax)
- [The Halifax Planetarium](#) (Halifax)

Ontario

- [Doran Planetarium](#) (Laurentian University, Sudbury)
- [Ontario Science Centre](#) (Toronto)
- [Royal Ontario Museum](#) - Mobile Planetariums for programs at the museum and in the community (Toronto)
- [Science North](#) - permanent and portable planetarium (Sudbury)
- Solar Wind Portable Planetarium - to email [click here](#) (Toronto)
- [W.J. McCallion Planetarium](#) (McMaster University, Hamilton)

Québec

- [Planétarium de Montréal](#) (Montréal)

Yukon Territory

- [Northern Lights Centre](#) (Watson Lake)