

Solar History

Student Objective

The student:

- will be able to identify major events in the history of solar energy
- will work cooperatively to create a poster that communicates information.

Key Words:

passive solar
photovoltaic
solar collector
solar furnace
solar still
time line

Materials:

- presentation materials
- time line information

Time:

1 - 2 class periods

Procedure

1. Divide the class into groups of three or four students.
2. Explain to the class that they will be creating a presentation on a part of the time line of solar history, and then presenting to the class.
3. Assign a period of history to each group.
4. Assist the groups as necessary while they are working on their presentations.
5. Have each group present their portion of solar history to the class

Related Research:

1. What are the future trends in solar energy? Research what the ‘experts’ think will be the trends in solar energy in the future.
2. Research important scientists in the history of solar energy.
3. Have the students produce skits about their time period.
4. Prepare a presentation to give to parents, a partner class or the school in general for Earth Day on the history and current applications of solar energy.

Related Reading

- *A Golden Thread: 2500 Years of Solar Architecture and Technology* by Ken Butti & John Perlin (Cheshire Books, 1980)
A Golden Thread provides a historical perspective of the influence of solar energy on society throughout the ages. The book provides information relating to the scientific, societal and economic influences contributing to the development of solar technology, as well as explanations of how the various forms of solar technology function.

- ***From Space to Earth: The Story of Solar Electricity*** by John Perlin (Aatec Publications, 1999)
John Perlin surveys the fascinating evolution of photovoltaics from its problematic and controversial nineteenth century beginnings to its indispensable and versatile role as a power source for contemporary daily life. More than the story of a technology, *From Space To Earth* is also a chronicle of the individuals who persevered, took chances, bucked authority, innovated, invented, and crusaded to provide humanity with renewable energy.
- ***The Return of the Solar Cat*** by Jim Augustyn (Patty Paw Press, 2003)
"A cat sunning itself in the doorway of a barn knows all about solar energy. Why can't man learn?" (E.B.White). *The Return of the Solar Cat* book decisively answers this question. Jim Augustyne takes the Suessian approach to showing the reader our myopia when it comes to the nature of renewable energy, politics, and economics through the fun-house mirror of technologically advanced felines and their 'natural' instincts and behavior which are optimized for solar utilization. Augustyne has developed an alternate universe of whimsy and pointy satire where kitties rule and our human foibles and blindness to the advantages of solar energy are entertainingly exposed.

Internet Sites:

<http://inventors.about.com/library/inventors/blsolar2.htm>

Time line of photovoltaics

http://www.solarenergy.com/info_history.html

Solar Energy Inc. site on the history of solar thermal to generate electricity.

<http://www.californiasolarcenter.org/history.html>

California Solar Center and John Perlin summarize the history of photovoltaics, solar thermal and passive solar

EnergyWhiz

Be an EnergyWhiz artist! Submit your presentation, photos or scanned files to **<http://energywhiz.com/>**. See your part of history on the internet!

Solar History

Benchmark SC.B.1.4.1 - The student understands how knowledge of energy is fundamental to all the scientific disciplines.

Benchmark SC.B.1.4.5 - The student knows that each source of energy presents advantages and disadvantages to its use in society.

Benchmark SC.D.2.4.1 - The student understands the interconnectedness of the systems on Earth and the quality of life.

Benchmark SC.H.1.4.1 - The student knows that from time to time, major shifts occur in the scientific view of how the world works, but that more often the changes that take place in the body of scientific knowledge are small modifications of prior knowledge.

Benchmark SC.H.1.4.5 - The student understands that new ideas in science are limited by the context in which they are conceived, are often rejected by the scientific establishment, sometimes spring from unexpected findings, and usually grow slowly from many contributors.

Benchmark SC.H.3.4.3 - The student knows that scientists can bring information, insights, and analytical skills to matters of public concern and help people understand the possible causes and effects of events.

Benchmark SC.H.3.4.5 - The student knows that the value of a technology may differ for different people and at different times.

Benchmark SC.H.3.4.6 - The student knows that scientific knowledge is used by those who engage in design and technology to solve practical problems, taking human values and limitations into account.

Benchmark SS.A.1.4.2 - The student identifies and understands themes in history that cross scientific, economic, and cultural boundaries.

Benchmark LA.C.3.4.3 - The student uses details, illustrations, analogies, and visual aids to make oral presentations that inform, persuade, or entertain.

Benchmark AL.3.4.4 - The student applies oral communication skills to interviews, group presentations, formal presentations, and impromptu situations.

Solar History

passive solar - construction technique of using structural elements to bring in heat when needed and deflect or vent heat when it is not desired.

photovoltaic - the effect of producing electric current using light from the sun

solar collector - a device that collects solar energy

solar furnace - a device that uses solar energy to heat , burn or melt

solar still - a device that uses solar energy to distill a liquid

Solar History Time Line

4.5 billion years ago

- Solar energy reaches the earth

600 - 700 B.C.E.

- Magnifying glass used to concentrate sun's rays to make fire

200 - 300 B.C.E.

- Greeks and Romans use "burning mirrors" to focus sunlight as weapons of war to ignite fires and burn sails of enemy war ships

1 - 500 A.D.

- **20 A.D.** - Chinese document use of burning mirrors to light torches for religious purposes
- **100 A.D.** - Italian historian Pliny the Younger builds passive solar home using glass for the first time to keep heat in and cold out
- Roman baths built with large windows facing south to let sunlight for heat

600s

- Justinian Code enacted to protect sunrooms on houses and public buildings so that shadows will not interfere with the sun used for heat and light

1300s

- Ancestors of Pueblo people called Anasazi, in North America live in south-facing cliff dwellings that capture the winter sun

1600s

- Educated people accept the idea that the sun and stars are the same
- **1643-1715** - Reign of French King Louis XIV, ("Sun King"), is an era of solar experiments
- **1695** - French Georges Buffon concentrates sunlight using mirrors to ignite wood and melt lead

1700s

- European aristocracy use walls to store solar heat for ripening fruit (fruit walls)
- England and Holland lead development of greenhouses with sloping glass walls facing south
- Frenchman Antoine Lavoisier builds solar furnace to melt platinum
- **1767** - Swiss scientist Horace de Saussure invents first solar collector (solar hot box)

1800s

- Wealthy Europeans build and use solar-heated greenhouses and conservatories

- French scientist uses heat from solar collector to make steam to power a steam engine
- **1830s** - Astronomer Sir John Herschel uses solar cooker to cook food for his expedition to South Africa
- **1839** - French scientist Edmund Becquerel observes photovoltaic effect
- **1860s** - Post Civil War U.S. development of solar energy; pioneers find that water left in black pans in the sunlight gets hot
- **1861** - French scientist Augustin Mouchot patents solar engine
- **1870s** - Augustin Mouchot uses solar cookers, solar water pumps for irrigation, and solar stills for wine and water distillation (most widespread use of solar energy)
- **1880s** - Engineer John Ericsson, "first American Solar Scientist," develops solar-driven engines for ships;
- Solar-powered printing press working in France
- **1891** - Baltimore inventor Clarence Kemp, ("real father of solar energy in the U.S."), patents first commercial Climax Solar Water Heater
- **1892** - Inventor Aubrey Eneas founds Solar Motor Company of Boston to build solar-powered motors to replace steam engines powered by coal or wood
- **1897** - Kemp's water heaters used in 30% of homes in Pasadena, CA

1900s

- **1908** - Los Angeles: Carnegie Steel Company invents modern type of roof solar collector
- **1920s** - Solar Industry focus moves from California to Florida
- **1936** - American astrophysicist Charles Greeley Abbott invents solar boiler
- **1940s** - Great demand for solar homes, both active and passive, creates Your Solar House, a book of house plans by 49 great solar architects
- **1941** - Approximately 60,000 solar water heaters in use in Florida
- **1950s** - Architect Frank Bridgers designs world's first solar-heated office building
- Low-cost natural gas becomes primary heating fuel
- **1954** - Photovoltaics reach 10% efficiency; becomes the 'birth' of photovoltaics
- **Late 1950s** - Extensive use of solar cells in space industry for satellites
- **1960s** - Some U.S. solar companies manufacturing solar cells or solar hot water heaters; U.S. oil imports surpass 50 percent
- **1970s** - Department of Energy established; national solar research labs established
- **1973** - Energy shortages/oil embargo; indifference about solar energy begins to decline
- **1974** - Florida Solar Energy Center (FSEC), largest state solar center, is established
- **1977** - President Jimmy Carter installs solar panels on the White House and promotes incentives for solar energy systems
- **1979** - Second U.S. oil embargo; Solar trade association (Solar Energy Industries Association) established in Washington, DC
- **1980** - Energy Security Act virtually shuts down national solar research programs; States begin establishing solar research facilities
- **1980s** - U.S. government and private industry assist several thousand Navaho and

Hopi Indians in Arizona and New Mexico supplement their passive solar homes with photovoltaic power

- **1983** - Wisconsin enacts solar access law to protect the "right to light" for urban gardens, soon enacted in Arizona and Michigan
- **1990s** - Tokyo has approximately 1.5 million buildings with solar water heaters (more than in the entire U.S.); Israel uses solar water heating for approximately 30 percent of their buildings and all new homes are required to install solar water heating systems; Greece, Australia and several additional countries are ahead of the U.S. in solar energy usage