Understanding Solar Cooking, Its History and Application for Today's World

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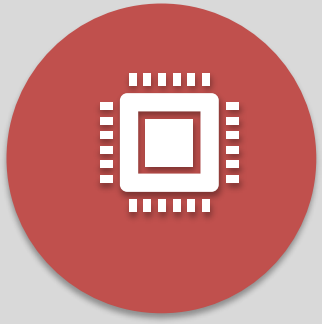
Solar Education Project

The Mission of Solar Education Project



SOLAR OVENS

STEM EDUCATION

WELLNESS

ECONOMIC EMPOWERMENT

ECOSYSTEM RECOVERY

Working to promote Solar Cookers as tools for STEM Education, Wellness, Economic Empowerment, and Ecosystem Recovery

Part 1
Solar Cookers

Part 2
A Brief History

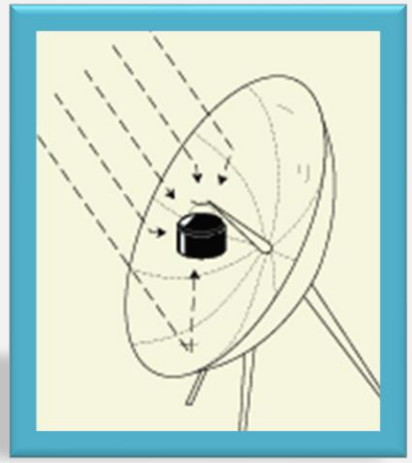
Part 3
Application

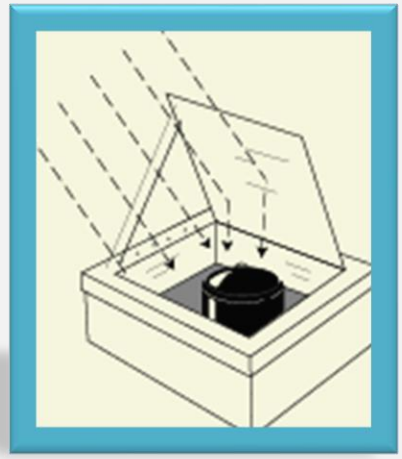
Part 1
Solar Cookers

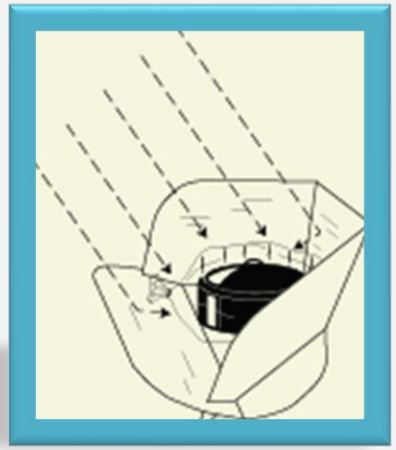
BASIC PRINCIPLES OF SOLAR COOKING

Sunlight is converted to heat energy that is retained for cooking.

Sunlight is the "fuel." A solar cooker needs an outdoor spot that is sunny for several hours and protected from strong wind, and where food will be safe. *Solar cookers don't work at night or on cloudy days.*







D.A.R.E. to cook with sunshine!

Use DARE to help you understand how solar cooking works.

Direct extra sunlight

Use one or more reflective surfaces to *direct* extra sunlight onto the cooking area. The more reflective area, themore light energy you will capture.

Absorb light and convert to heat

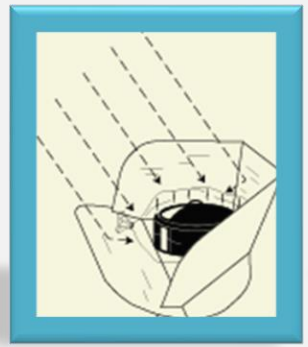
Use the color black to absorb all the wavelengths of visible light and transform the light energy to heat energy. Food cooks best in dark, shallow, thin metal pots with dark, tight-fitting lids to hold in heat and moisture.

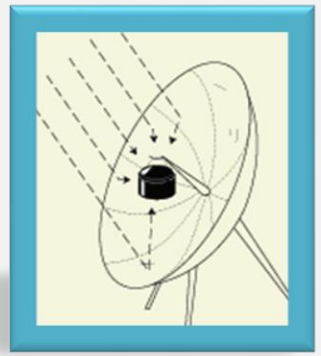
Retain heat

Retain the heat inside the cooking space with a heat trap or insulation. By retaining the heat, you can cook food!

Eat and enjoy your solar cooked food.

Eat and enjoy healthy and nutritious food cooked with the cleanest fuel there is. Don't stop there! Experiment, Explore, Extend, Educate…





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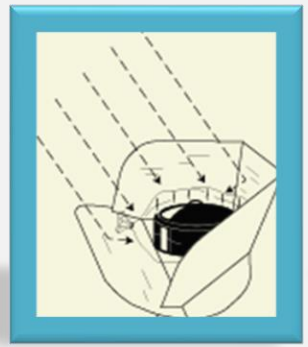

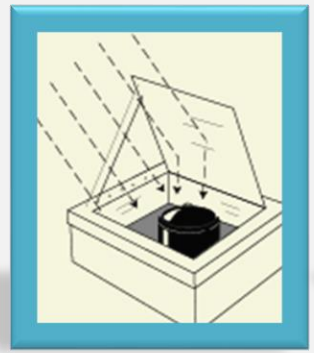

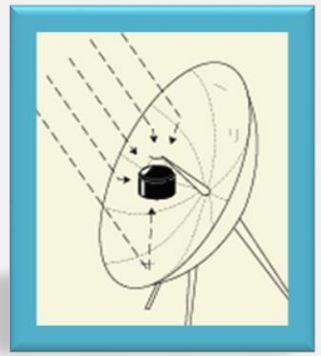

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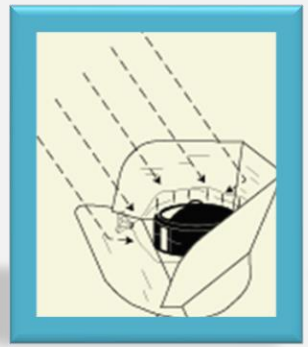

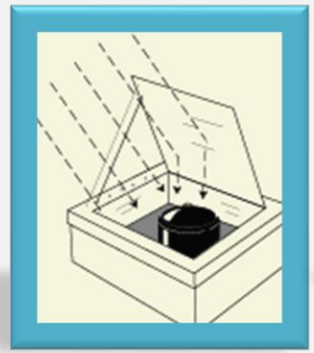

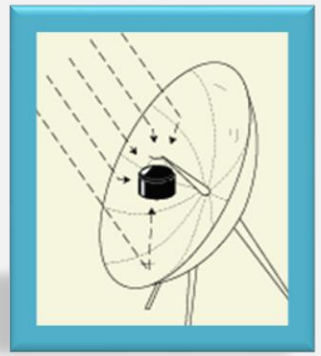

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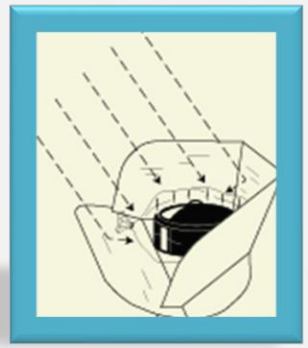

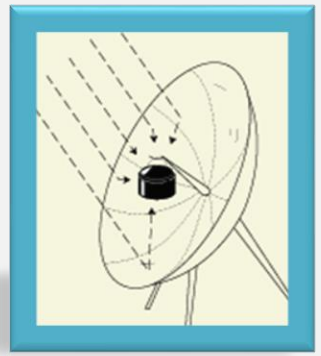

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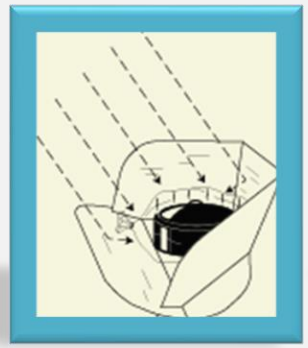

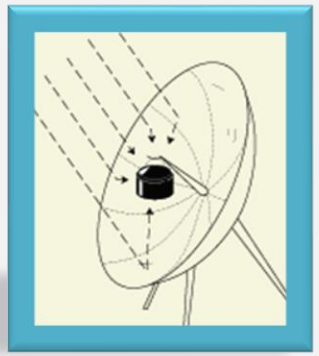

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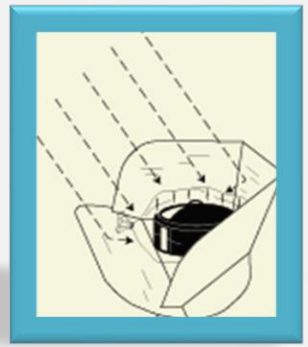
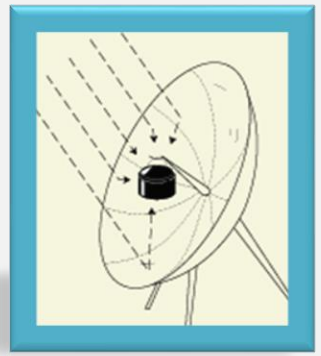




SolarCooking.org

BOX OVEN

- Box ovens use reflectors to direct sunlight into the cooking space.
- The oven interior includes one or more black walls. Black cookware is best.
- The oven is well insulated to retain heat.

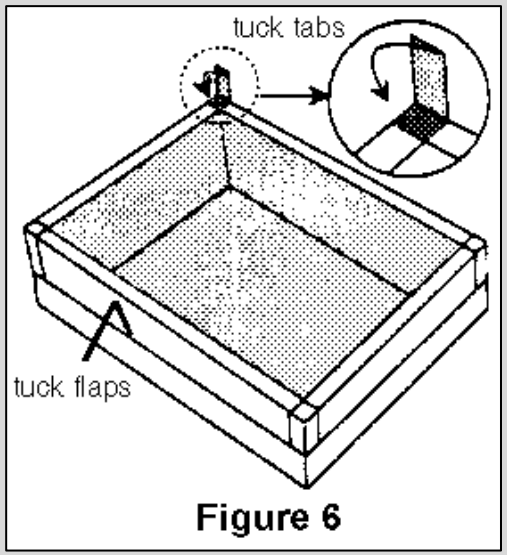


Figure 6

Photo Credits: M Buchenic

BOX OVEN

Chocolate Cake, Mary Buchenic, U.S.

PANEL OVEN

- Panel ovens use reflective material to direct sunlight into a cooking space.
- The cooking space holds a black cooking pan that absorbs sunlight and converts it to heat.
- Heat is retained by using a transparent enclosure such as an oven bag or inverted pyrex bowls.


Haines 1 Panel Oven

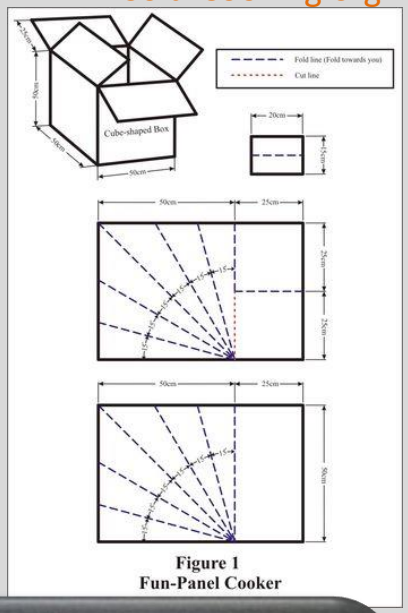


Figure 1
Fun-Panel Cooker


Copenhagen Solar Cooker


All Season Solar Cooker

Photo Credits: M Buchenic, Sharon Clausson

PANEL OVEN

Risotto - Stewart Maclachlan, U.K.

EVACUATED TUBE OVEN

- Evacuated tubes are double layers of glass with no air in between.
- Food is placed inside the tube.
- The dark interior part of the tube absorbs the light and converts it to heat.
- The insulating properties of the evacuated space between the glass layers prevent heat loss.

Photo Credits: B Mueller, J Gasser, M Buchenic

EVACUATED TUBE

Chicken

Mary Buchenic U.S.

PARABOLIC COOKER

- Parabolic cookers concentrate many rays of light onto a black cooking pan.
- The amount of concentrated light can result in heating the food similar to placing it on a burner.
- Deep parabolics spread the concentrated light around the cooking pan.
- Shallow parabolics focus light more tightly.

Photo Credits: Better Me Kenya, Solarcooking.org

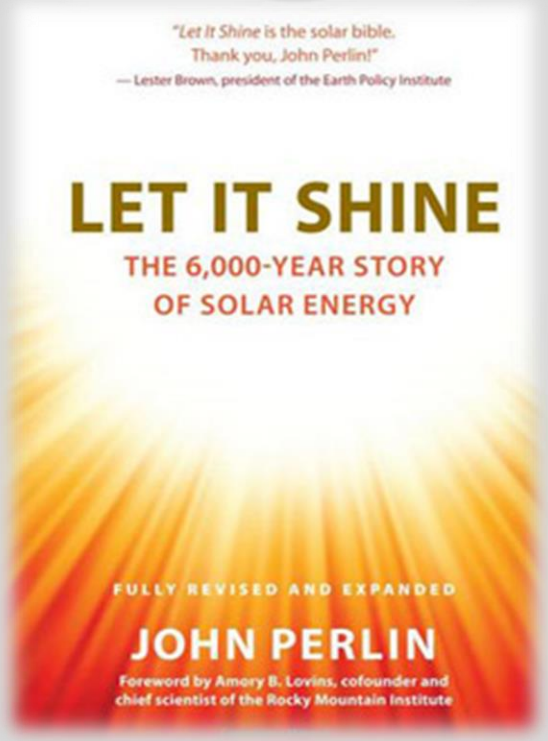
PARABOLIC COOKER

Soup - Bernhard Muller, Germany

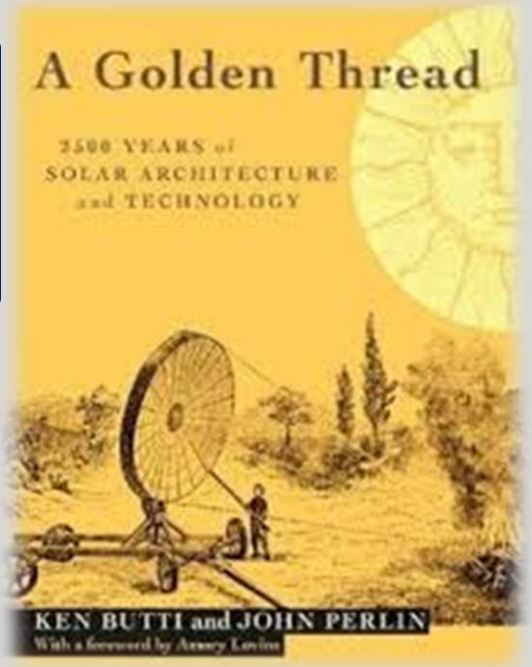
Part 2
A Brief History

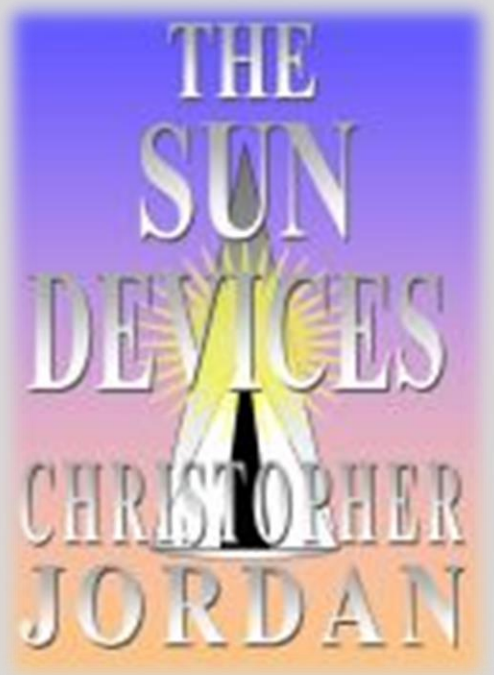
A bronze solar igniter from the ZhOu Dynasty dated 1000BC (Physics of Solar Energy, C Julian Chen)

Ancient cultures used solar orientation of their homes to take advantage of the sun's energy.



Solar devices from ancient times can be recreated for modern uses.



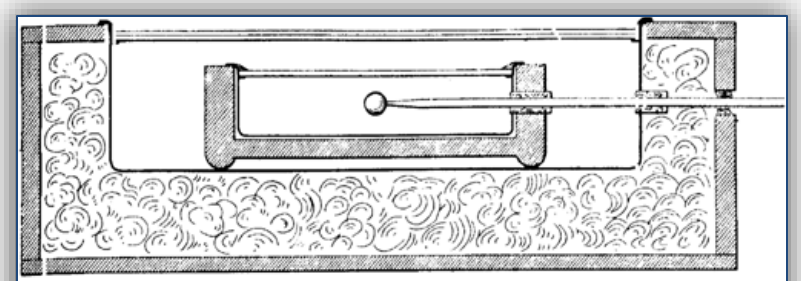


The sun heated houses in many Greek cities 2,500 years ago.

Leonardo da Vinci (1452 – 1519) thought of building mirrors a mile in diameter to heat water for the Florentine woolen industry.

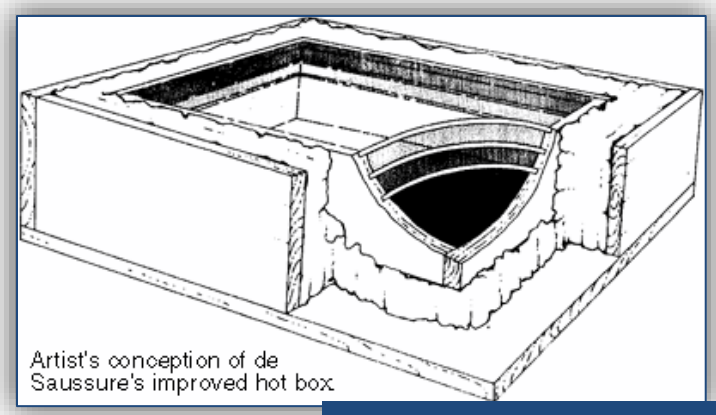
As wood became a scarce fuel source, ancient Roman architects planned entire communities with solar orientation.

Sample of Early Solar Ovens



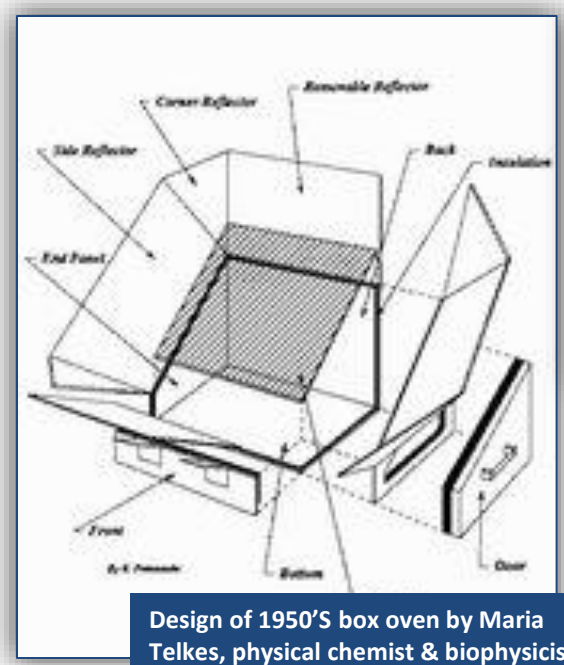
Cross-section of Langley's hot box, which was similar to de Saussure's later models. A thermomether penetrating the walls at right was used to measure the air temperature inside the inner box.

Samuel Langley 1884



Artist's conception of de Saussure's improved hot box

Horace de Saussure's hot box - 1767



Design of 1950'S box oven by Maria Telkes, physical chemist & biophysicist. Source: Arizona State University

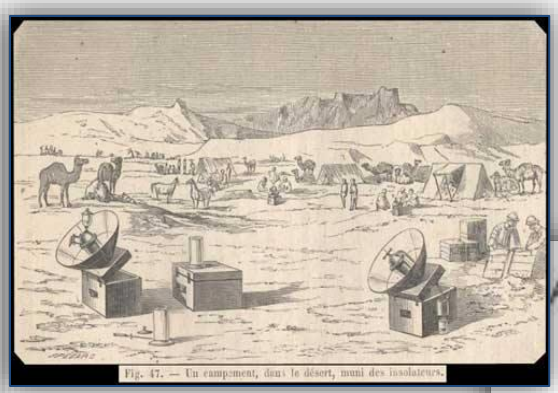
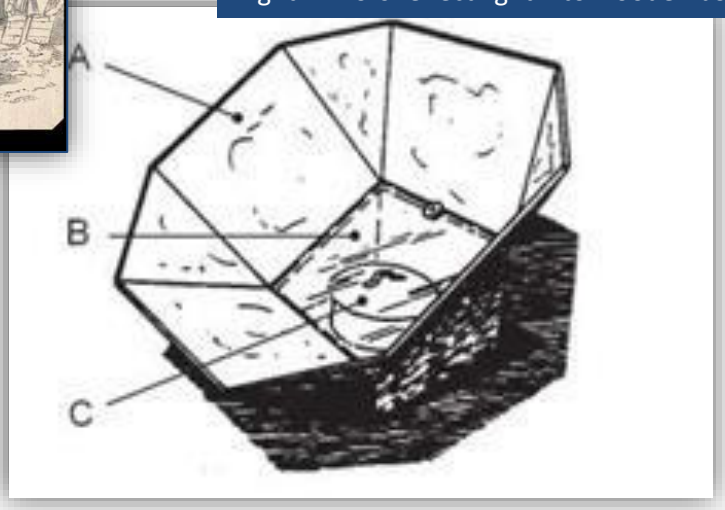


Fig. 47. — Un campement, dans le désert, muni des insolateurs.

W Adams 1878 Bombay, India
Eight mirrors reflect light into wooden box.

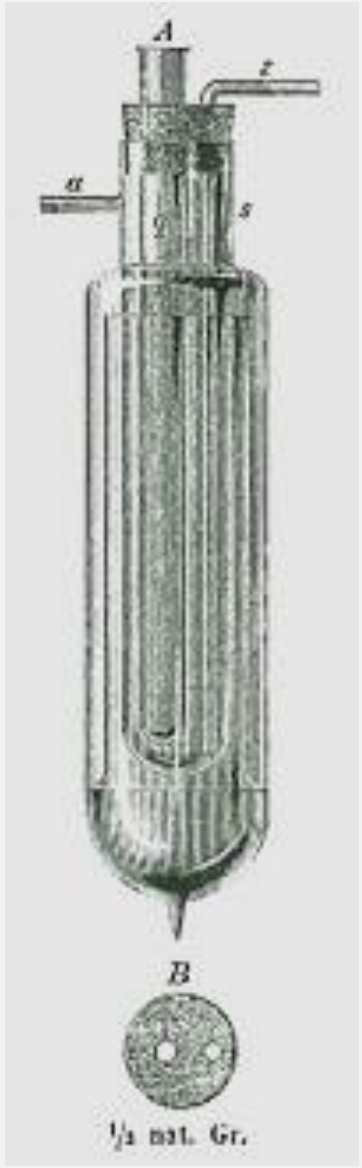


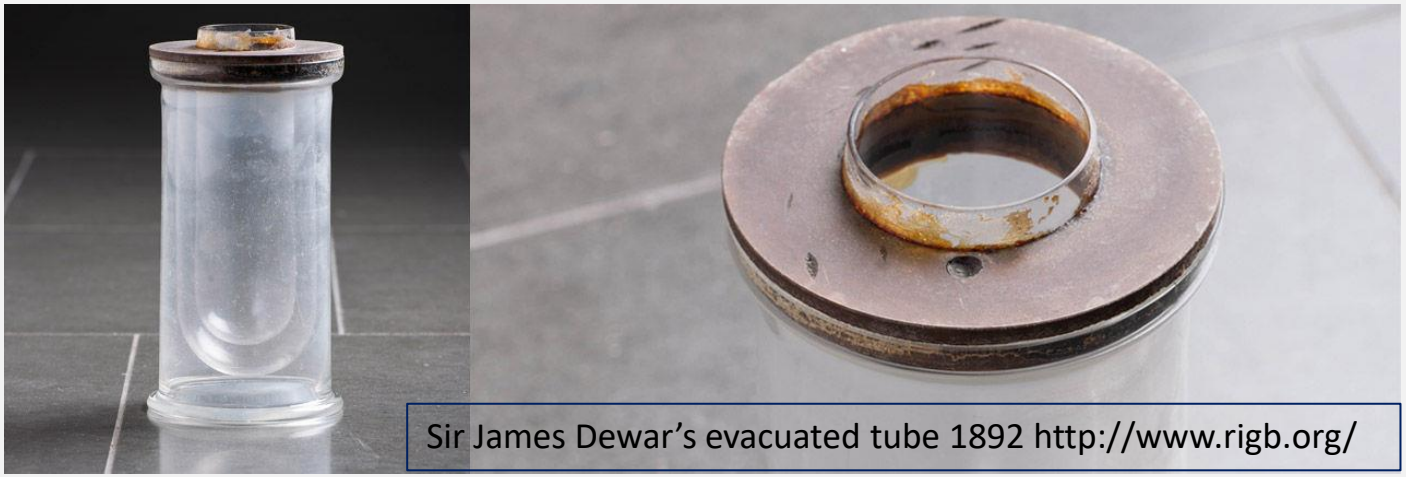
SolarCooking.org

EnergyProfessionalSymposium.com

Original evacuated tube was designed for insulating already heated liquid. Modern evacuated tube was introduced as solar cooker and water pasteurizer in 2006 by Alex Kee of Malaysia.

Adolph Weinhold's vacuum flask 1881





Sir James Dewar's evacuated tube 1892 http://www.rigb.org/

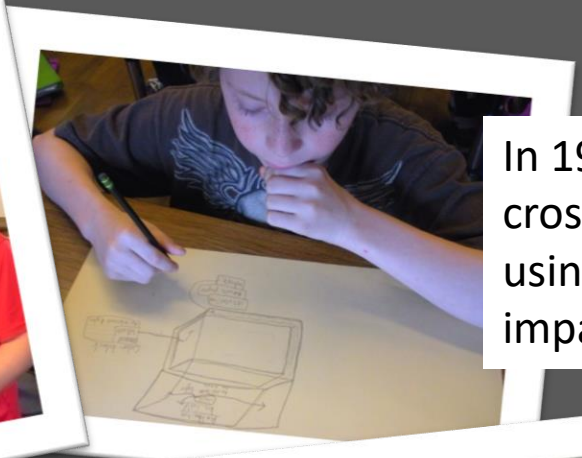
Thermos ad early 1900s

Part 3
Application

Solar cookers are tools for education, wellness, economic empowerment and ecosystem recovery.

Education

Use as a tool for education in science, math and other subjects.

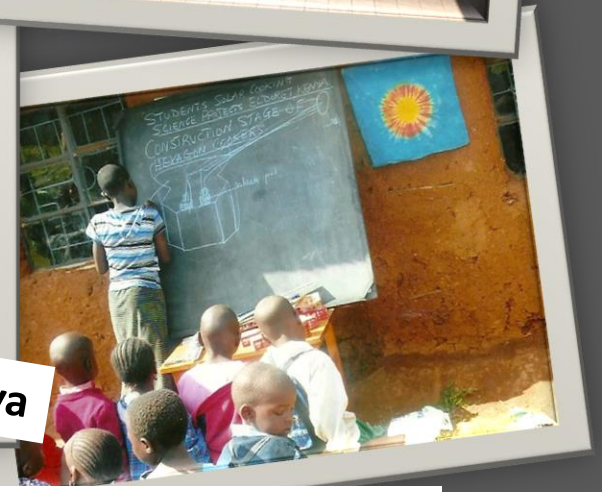


In 1996, Mary Buchenic developed cross-curricular, project-based lessons using solar cookers. Solar cookers are impactful tools for teaching.

Photo Credits: M Buchenic

Education

Use as a tool for education in science, math and other subjects.



Teachers around the world share solar cooking with their students. We depend on our youth to help this technology develop and improve.

Photo Credits: Camily Wedende, Solarcooking.org

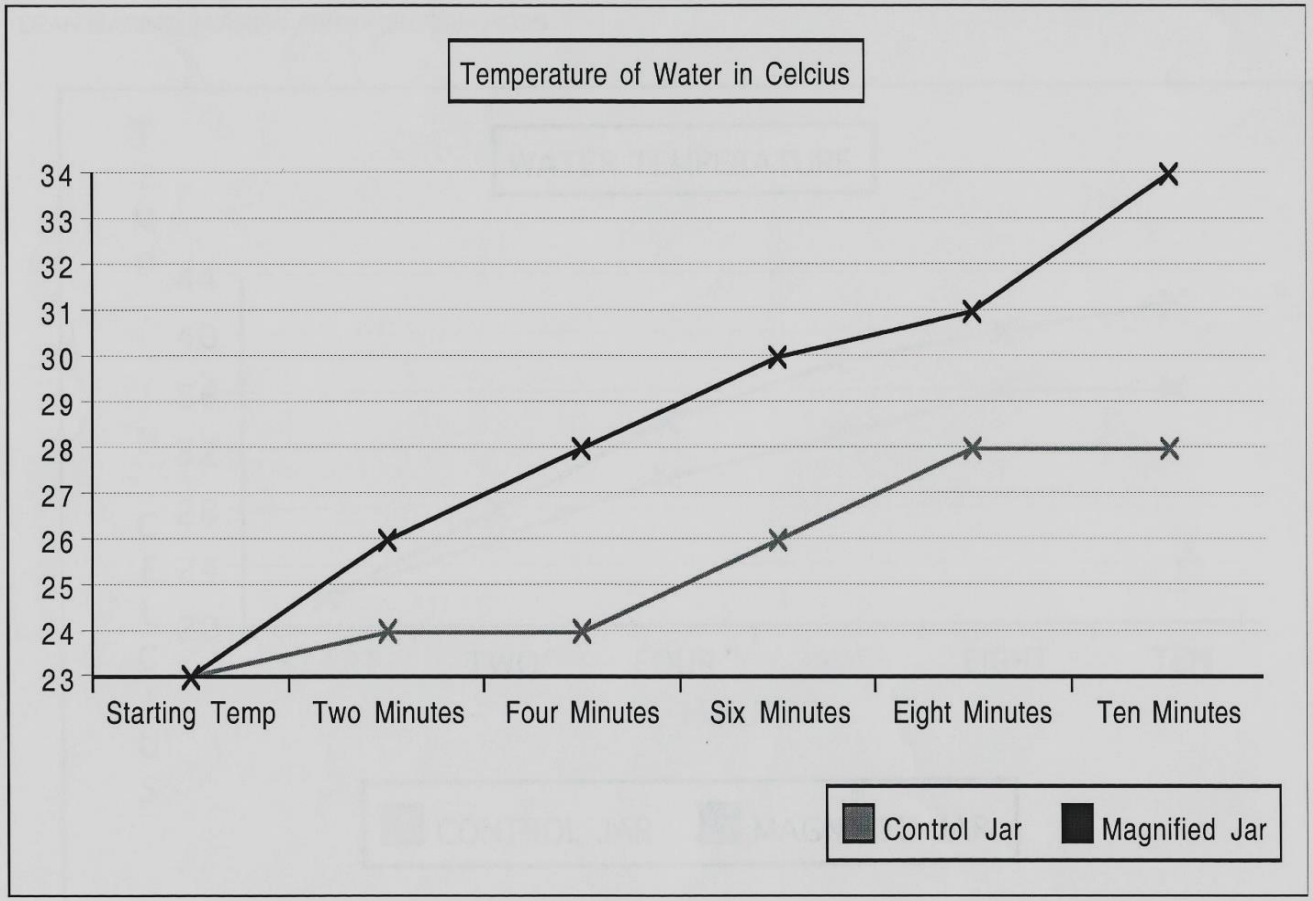
Education

Use as a tool for education in science, math and other subjects.

Teachers around the world share solar cooking with their students. We depend on our youth to help this technology develop and improve.

Photo Credits: J Gasser, M Buchenic, Better Me Kenya, Solarcooking.org

Students conduct introductory experiment to test effect of directing light onto a penny in a jar of water. (Concepts support planning and design of ovens).



COPPER PENNY, TRANSPARENT JARS W WATER, THERMOMETER, TIMER, MAGNIFIER.

Photo Credits: M Buchenic

Wellness

What health issues can be dramatically reduced by solar cooking?

Those related to open fire cooking:

- **Pneumonia**
- **COPD**
- **Asthma**
- **Eye damage**
- **Burns**

Friends of the Old (FOTO) works in Western Kenya in area with 60% poverty.

FOTO works to provide the elderly with means to **safe drinking water**, minus the **burden of gathering firewood** and the **dangerous exposure of women and children to cooking smoke**.

FOTO Director: Dinah Chienjo
Source:solarcooking.org

Solar Cookers can pasteurize water and milk, destroying the **micro- organisms that cause disease.**

WAPI (Water Pasteurization Indicator) is a tool that indicates when water or milk is safe to drink.

The WAPI can be safely used with solar cookers.

Source:solarcooking.org

Workshops and Training for Water Testing, Solar Pasteurization, and Solar Cooking

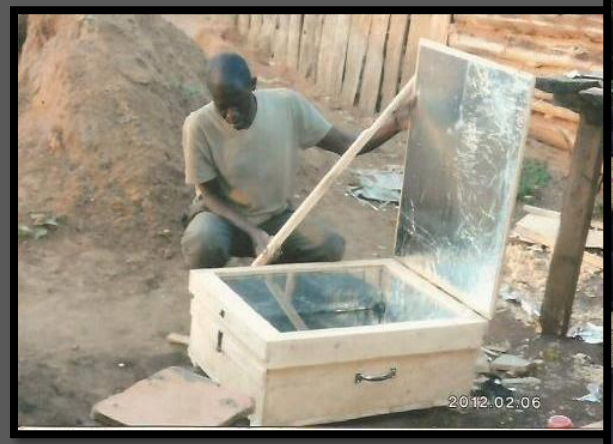
Photo Credits: Bernhard, Mueller, SolarCooking.org

Economic Empowerment

Use as a basis for economic empowerment.

- Restaurant in Villaseca, Chile cooks with the sun.
- Retained heat baskets for sale in Nairobi, Kenya.
- Box ovens for sale in Eldoret, Kenya.
- Home bakery in Lesotho sells baked goods made in a solar tube.

Photo Credits: Ivan Yaholnitsky, Camily Wedende, Faustine Odaba, SolarCooking.org



Economic Empowerment

Use as a basis for economic empowerment.

Bethel Business and Community Development Centre in Lesotho, Africa. The school's primary mission is to provide skills and knowledge to young men and women for well-being and self-reliance through experiential learning.

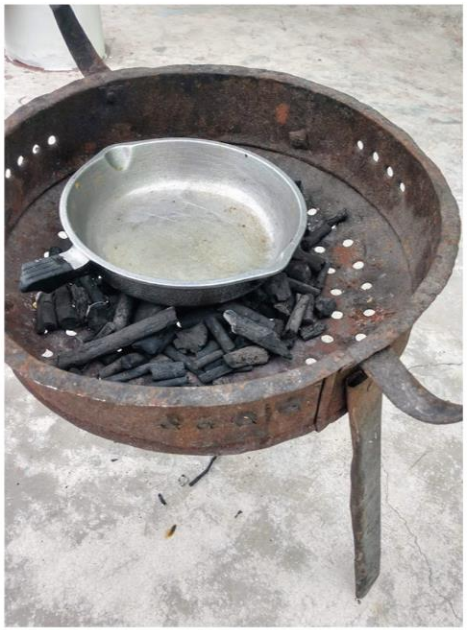
Solar Cooking is part of daily life at this off-the-grid educational facility.

Data collection related to oven alignment.

Photo Credits: Ivan Yaholnitsky

Ecosystem Recovery

Use as a way to reduce dependence on charcoal and wood and combat deforestation.



Fuel in the form of wood or charcoal remains the predominant energy source for over two billion people worldwide. To stem the rate of deforestation and erosion, alternate integrated cooking methods can be adopted that include solar.

Photo Credits: J Gasser, M Buchenic

Fuel sources demonstrated in Haiti – charcoal, LPG, and sunlight.

Ecosystem Recovery

Use as a way to reduce dependence on charcoal and wood and combat deforestation.

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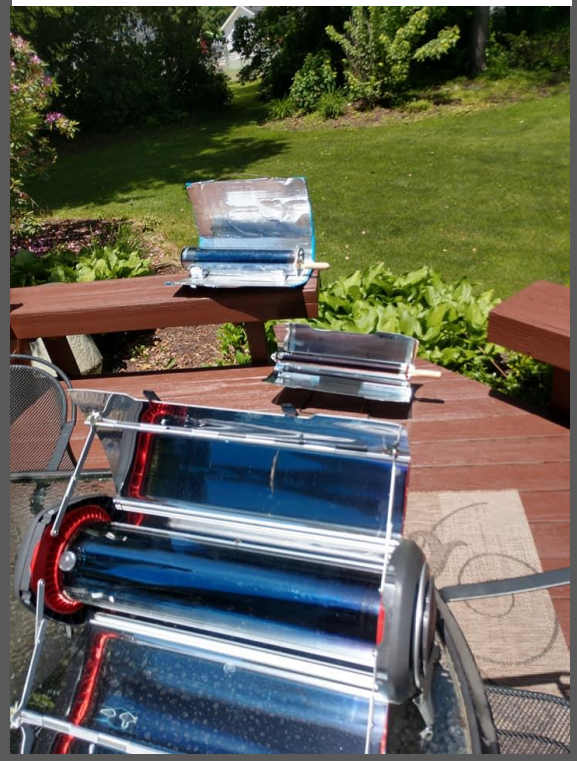
Women in Haiti demonstrate cooking with two different fuel sources – wood and sunlight.

Photo Credits: J Gasser, M Buchenic

Ecosystem Recovery

Make a personal choice to cook with clean solar energy.

Use the power of sunlight as your fuel and reduce the use of fossil fuels.



Snowstorm knocked out your power? Cook with the sun instead.

Example of compact oven for camping.

Photo Credits: J Gasser, Sunflair.net and SunshineOnMyShoulder.com

HOW MIGHT SOLAR COOKING IMPACT YOUR LIFE?

Connect with us!

Solar Education Project

Website: GDSnonprofit.org

Email: SolarEducationProject@gmail.com

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