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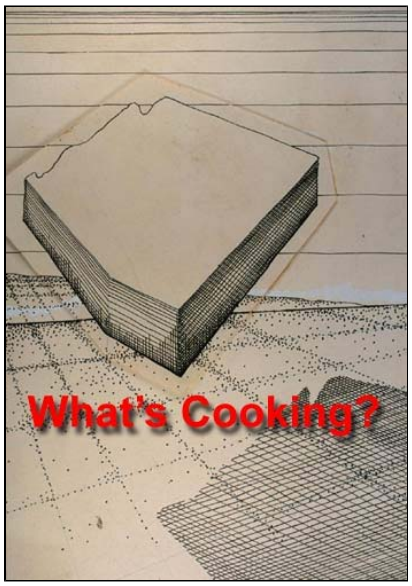
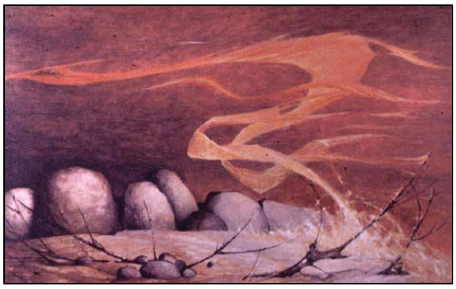
## Solar Cookers - What's Cooking?




Cooking - the event that occurs every day in every home (except for fast food runs or special dinners out) and is taken totally for granted as a part of daily life. We cook breakfast, lunch and a dinner (unless you are on a cold salad kick). We outfit our kitchens with the latest in appliances, from microwaves to double convection oven, to stovetops with a multitude of tradable tops for grilling, broiling and deep frying.



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Did you know that a kitchen is one of the primary rooms for remodeling - both for owner desire and investment?

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Cooking shows fill public TV on Saturdays with Jaques and Julia and America's Test Kitchen, and store racks are full of monthly magazines like Good Housekeeping, Bon Appetit and Food & Wine and we take our love affair with cooking and the equipment it comes with to our backyards with bar-b-cues.

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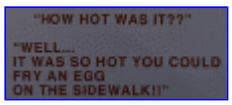
Cooking equipment, just like other types of equipment in the house, uses energy resources to operate and with energy use comes consumption of resources (oil and gas) and costs.

In the summer, Arizonans know that cooking outdoors is "the thing to do" - men return to their primal selves, and women know that it keeps the heat out of the kitchen thereby keeping it comfortable (and an additional benefit is that it helps keep summer utility bills down).

In Arizona, we are blessed with an abundance of sunshine. There is actually more energy in the sunlight that falls upon a house than the total energy that whole house uses over the course of a day. There it is - a resource untapped, underutilized, and available to anyone who wants it.

How about cooking?



We know about cooking with the sun - you've all heard, and probably used, the phrase "it was so hot you could fry an egg on the sidewalk". There is a great history and record of solar cooking ranging from the Age of Inquiry to the present.


During the 18th Century, scientific investigation was in full bloom, looking at natural phenomena and developing an understanding regarding how and why things work. The understanding of natural phenomenon applied to technology was in the forefront of scientific and industrial activity and the utilization of created materials, like glass, was a source of creativity, invention and observation.

There was great fascination with the sun - its composition, its relationship to the weather and cycles, and its impact upon plants, animals and people. Experiments abounded, from the development of magnifying lenses to the creation of highly polished specially shaped mirrors used to focus the sun's rays to melt metals and set distant objects on fire, to creating steam to run a printing press to the development of cooking devices using the sun.

In the late 1700's, experiments with glass and trapped solar heat by French-Swiss naturalist Horace deSaussure lay the foundation for not only solar

cooking but also for passive solar heating of buildings and active heating of water by use of solar collector boxes. Le Journal de Paris received from deSaussure descriptions of experiments and observations.

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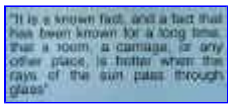
"It is a known fact, and a fact that has been know for a long time, that a room, a carriage, or any other place, is hotter when the rays of the sun pass through glass"

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At the time there was little empirical research regarding temperatures and glass covered heat traps, so in 1767 deSaussure executed a series of experiments to determine the nature of this phenomena by constructing a miniature greenhouse - a series of bottomless glass boxes, nesting within the other with air between, and all sitting on a black base.

He then aimed it to the sun, and measured the temperature inside each concentric box. He discovered that the outermost box registered the lowest of t the temperatures (which was still higher than the outside air temperature) while the innermost box registered the highest at 185 degrees F.

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With a little inventiveness, a lot of inquisitiveness, and further experimenting he observed that "fruits... exposed to this heat were cooked and became juicy, "

deSaussure continued his inquiries by insulating the "hot box" sides with black cork and leaving the glass top, which resulted in increased captured heat, and increasing internal temperatures.

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He tried the apparatus in the plains and in the mountains, and found that while external temperatures were significantly different, the internal temperature of the box remained generally the same. This reinforced deSaussure's idea that while the same amount of solar energy struck the earth, both at the plains and the Alps, the cooler mountain conditions had more to do with qualities of the air and atmosphere, than a difference in solar radiation. Similar to many of today's modern cookers, deSaussure's unit allowed the sunlight to pass through the glass cover which was then captured as heat, within a sturdy, insulated box. The captured thermal energy heated the contents of the box - in this case, food which became cooked.

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British astronomer Sir John Herschel, while in Africa, experimented with the "hot box", so called because of the heat it retained. Herschel was able to cook numerous kinds of food while in various African locations, much to the delight of his guests and colleagues, on who was Samuel Pierpoint Langley, who later became head of the Smithsonian Institute; the American astrophysicist who became intrigued with Herschel's demonstrations and joyfully built hot boxes of his own.

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Frenchman Augustine Mouchot combined the "hot box" with the intriguing mirror experiments of the time. he developed an over - made of a tall blackened copper cylinder surrounded by a cylinder of glass, capturing a 1" airspace between the two. Then he used a solar mirror to reflect and concentrate the sun's energy onto the cooker. The solar mirror reflected sunlight onto the oven cylinder, heating the contents inside to such a rapid degree that the food was cooked in a very short time. Improvement of his "vertical oven" into a 20 x 20 inch box weighing less than 30 pounds that could bake a pound of bread in 45 minutes, and a stew in 3 hours, led to its use by the French Foreign Legion.

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**Bombay, India 1876** W. A. Adams, developed a solar cooking unit very similar to today's popular contemporary ovens. A glass fronted box mounted on a small tiltable platform, and using an eight sided mirror to focus the sun's energy to the center of the cooker, this design reached temperatures high enough to cook a four pound turkey within 4 hours.

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The early 1900's saw scientists, and backyard tinkerers alike, developing designs that improved upon deSaussure's original "hot box", and that development continues to present day and Arizona has a very significant role in that development.

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The First National Solar Cook-off in Phoenix, Arizona on September 19, 1981, sponsored by the Arizona Solar Energy Association was the first event of its kind in the world. held at the Phoenix Civic Center Plaza, it showcased designs from throughout the nation and worlds, from the largest to the smallest of cookers. The largest cooked 60 pounds of food at a tine; the smallest was used by backpackers in the Himalayas.

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Today the solar cooking tradition continues in grand style at Arizona's Annual Solar Potluck, an annual Tucson event put on by Citizens for Solar, a not for profit organization of solar cooking enthusiasts. Hundreds of people, cooking enthusiasts, and the curious alike, get together preparing and eating breads, vegetables, lasagna, chickens and meats and even pizza. Cookers of all shapes and sizes are set up and through the day provide tasty food is shared with all attendees. The Potluck shows just how easy and effective solar cooking is in preparing delicious foods, and the public sees first hand just how this natural no-cost-energy cooking approach provides for a more comfortable kitchen environment and lowers home energy costs in the intense Arizona summers.

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Today's solar cookers function much as the early predecessors, but with the advantages of past experience and contemporary materials. The components are the same. An insulated container with a transparent top to allow sunlight to the interior. The light rays impact the interior surface, are transformed to heat energy, which is absorbed by the cooker interior and its contents. While a little heat escapes back through the glass most is contained within the box and/or the cooking utensil. Additional sunlight can be directed to interior by the use of reflectors or winged additions which provide additional area of sunlight gathering potential. These reflectors serve a dual purpose in allowing the regulation of the sun's energy that travels to the box thereby allowing for some temperature control.

Solar cookers come in all sorts of sizes, shapes, and construction. There are commercial products and there are home made ovens. The simplicity of a solar cooker reflects the simplicity of its use and designs fall into some basic categories.


Box cookers, are simple, insulated boxes with a heat resistant transparent cover which can be a removable lid as the oven "door". The interior is black, for fuller solar absorption.

The box container can be made of virtually any material, from high tech polymers to simple plywood to extremely low cost and light cardboard construction, and the solar face is transparent, usually glass but can be other comparable materials.

It provides slow, even cooking of large amounts of food, with temperatures 140 - 225 degrees depending on construction. Addition of reflectors achieve the higher temperatures.


Slant faced cookers. With the slanted face pointed directly at the sun, this type of cooker puts the collector glass in a more perpendicular orientation to the sun's rays while maintaining a level interior.

These are usually highly efficient and the addition of reflectors will increase performance. These cookers can be made to be portable with collapsible reflectors of aluminum or mirrored foil glued to a sturdy backing, folding onto the cooker for easy transport.


Multi-faceted, cone shaped cookers. A faceted conical shaped interior covered with many small mirrors, this cooker brings more reflected light directly to upon the cooking pots reaching temperatures of 300 - 450 degrees F, and operates the same as a conventional kitchen oven. The larger size (generally 4' in diameter), it is large enough to roast a turkey.

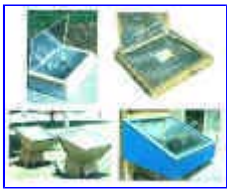
Instead of a totally contained oven and cooking utensils, this cooker, developed in France, has reflector panels, separate from the cooking utensils, directing sunlight directly onto a dark colored pot inside a plastic bag or under a glass bowl. These cookers are extremely portable and easy to assemble and use.


Concentrating cookers. A curved, sometimes concave, reflective surface (aluminum foil, etc.) that focuses the sun's energy to a single focal point at which is placed a pot sitting on a separate stand. Temperatures exceeding 600 degrees F have been attained. This cooker requires more continuous attention in order to keep the focal point on the cooking utensil at all times since the sun angle is continuously changing as the sun moves across the sky.

These cookers can be complicated to make and because of the high heat generated at the focal point, can cause burns and eye injury if not used correctly.

The variety of cookers shows that there is choice for the user - depending on situation, costs, and desire. All work and the common question regarding which is best gains this response from solar cooking enthusiasts.


Today, solar cookers are growing in use, not only in technological, energy rich countries, but also in countries where there is no energy for cooking and depleted resources for even a fundamental cooking fire. Whether motivated by need or by choice, solar cooking is finding its way into the lives oand lifestyles of peoples around the world. Community kitchens outfitted with solar cookers provide prepared food for large groups of people, and cookers are used in Arizona backyards net to, and in place of, the American barbeque, and are even being designed as a permanent component of existing and new housing.

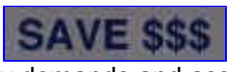


Arizona has an abundance of sun; a treasure of solar experience and knowledge, and an affinity for outdoor cooking. Solar cooking is natural fit - not only for celebrating the summer but for year round use, and it can be a significant aspect of keeping summer cooling bills down.

Solar cookers come in a variety of configurations and constructions; are commercially available or can be self-constructed, but have a commonality ---


they are effective


fun to use




reduce energy demands and associated costs

**HEALTHIER**

and according to solar enthusiasts, they are healthier.

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# WHAT'S COOKING?

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