

OUTDOOR COOKING

Box Oven, Camp Stove, Dutch Oven, Fire, Coals, Foil, Grill,
Reflector Oven, Solar Oven, & More . . .

BOX OVEN:

CAMP STOVE:

DUTCH OVEN:

NECESSARY TOOLS: charcoal chimney, leather gloves, long handled tongs,
lid lifter, lid holder, wooden or nylon utensils.

ALSO RECOMMENDED: shovel, whisk broom

Stew
Chicken
Meatloaf
Lasagna
Enchiladas
Shepherd's Pie
Chuckwagon Dinner
Mississippi Mud Cake
Pineapple Upside Down Cake?
Breakfast Casserole — Maryann Jex

"Here's a secret that even most seasoned outdoor cooks don't know: You can prevent burned bottoms, raw tops, and dried-out foods by using properly sized and spaced coals to control the interior oven temperature. Virtually all baked goods can be baked successfully at 350°, which is the ideal temperature for a Dutch oven. To establish and maintain this temperature, the first thing to remember is to use coals from a fire that are roughly the same size as charcoal briquettes.

Or, for more consistency, use briquettes. Charcoal briquettes will burn longer and more evenly than coals from a fire. Use the best briquettes you can afford. There is a difference in quality, and the more expensive brands are generally worth the additional cost.

The optimal number of coals used for any oven is based on its diameter.

For example, if you are using a 12-inch oven, you will need two coals per inch, a total of 24. More coals will likely burn your food and less may necessitate too long a cooking period. To determine how many coals go under and how many go on top, remember the magic number 2:

- 2 coals per inch of oven diameter
- place 2 more coals than the oven size on the lid, and
- place 2 less than the oven size under it.

Example: For a 12-inch oven, $12-2=10$ coals under the oven, and $12+2=14$ coals go on the lid, for a total of 24. The same formula applies to all ovens. A 10-inch oven should have 8 coals underneath and 12 coals on the lid. A 14-inch oven should have 12 coals underneath and 16 coals on the lid.

The placement of the coals is also an important part of proper heat regulation. The proper layout for coals or briquettes under the oven is circular. Coals should be approximately one inch apart in a circle under the oven. Never place coals directly under the center of the oven. If you do, you will create a hot spot and burn whatever you are cooking. By placing the coals in a circle, the natural conductivity of the oven will distribute the heat evenly and effectively.

The coals on the lid of the oven should also be placed evenly in a circle along the flange of the outer lid. However, four of the coals should be placed toward the center of the lid, two on either side of the handle. This coal placement will produce an even, consistent temperature within the oven of approximately 350° and maintain that heat for up to two hours.

In the event that you need to generate a higher temperature inside your oven, "cheat up" the coals. Additional coals placed two at a time, one on the lid and one under the oven, will add another 50°. Two additional coals top and bottom would bring your oven's temperature up to 450°. It is extremely rare to need a temperature of 450°, and you should never need one higher than that.

Good Dutch oven breads seem to be a rarity. However, marvelous corn breads, biscuits, rolls, and sourdough loaves are surprisingly easy to perfect in the old black pot. The larger the oven the better when it comes to cooking breads. A 14-inch oven serves nicely to produce three loaves of bread or up to three dozen rolls or biscuits. To successfully brown breads, however, you must alter the cooking process for the last five to eight minutes of the traditional 25-30 minute, 350° baking time.

First, put a light coat of oil on the interior of a cool oven (including the lid), and let the rolls or bread complete their final rise in the oven prior to applying the coals. Second, place the oven on the coals with the proper number of coals on top as noted earlier. (Remember: no coals directly under the center of the oven.) Third, when there are five to eight minutes left in the cooking time, lift the lid, lightly brush the tops of the breads with butter, replace the lid, then take all the coals from under the oven and distribute them evenly on the top. With all the heat now on the lid, check the bread

every couple of minutes until you think it looks perfect. After brushing the coals and ashes from the lid, remove it, tilt the oven over a bread board, and your perfect bread will gently fall out."

— Roger L. Beattie

<http://www.backwoodshome.com/articles/beattie47.html> 5/15/2004

Regulating Oven Cooking Temperature

First and foremost, always use high quality briquettes. I recommend using Kingsford charcoal. Kingsford is packed tighter than most other brands so it won't pop and spit, and it tends to burn longer than other brands. Avoid using "Match Light" charcoal as it burns hot so it doesn't last as long. Kingsford charcoal will generate good heat for about an hours time. For recipes that take more than an hour to cook, after an hour remove the remaining briquettes and ash from the oven and replenish them with new briquettes. Note: because the Dutch oven is already hot, you will not need as many briquettes as when you started cooking. I usually remove 2-3 briquettes from the top and bottom the first time I replenish them.

The general rule of thumb to produce about a 350° heat is to take the size of the Dutch oven in inches, double the number, and use that many total briquettes. So, for a 12" oven you would use 24 briquettes, for a 14" oven you would use 28 briquettes, etc.. Remember this is just a rule of thumb and does not work for all makes of ovens!

The number one question I am asked is "How many briquettes should I put on the lid and how many should go underneath the oven?". The answer is "It depends on what you are cooking".

For food you wish to simmer such as soups, stews, and chili's; place 1/3 of the total briquettes on the lid and 2/3 under the oven.

For food you wish to bake such as breads and rolls, biscuits, cakes, pies and cobblers (rising); place 2/3 of the total briquettes on the lid and 1/3 underneath the oven.

For food you wish to roast such as meats, poultry, casseroles, quiche, vegetables, and cobblers (non-rising); use an even distribution of briquettes on the lid and underneath the oven.

The golden rule of Dutch oven cooking is "go easy with the heat". If the oven isn't hot enough you can always add more briquettes, but once food is burned, it's burned.

Helpful Dutch Oven Cooking Tips

Watch your ovens while you are cooking. If you see steam coming from around the lids then you are using too much heat. Dutch ovens act as a sort of pressure cooker steaming the food from the inside out making it more tender. If you let the steam out of your Dutch oven, it doesn't help the food and more often than not the top or bottom will be burned.

To keep from generating hot spots which cause uneven browning and burned spots, rotate your Dutch ovens every 15 minutes by turning the oven 90° in one direction and the lid 90° in the opposite direction. The easiest way to manage this is to lift the lid, rotate the oven 90° clockwise, then put the lid back on so it is facing the same way it was when you lifted it. I usually look at the number cast on the lid when I do this. When rotating the oven properly the number on the lid should stay in the same place during the whole cooking process.

When I lift the lid to rotate my ovens I usually peek inside to see what the food is doing. This way I know if the oven temperature is right or if I need to adjust the number of briquettes.

"Stacking" your Dutch ovens is a convenient way to save space and share heat. Stacking is best done when ovens need the same amount of heat on top and bottom. (I.E. - Do not mix and match ovens that require different amounts of heat on top and bottom. Placing an oven with a cake, pie, or rolls in it, on top of an oven loaded with coals on the lid is not a very good idea.)

A Dutch oven lid can be placed over the fire or stove upside down and used as a skillet or griddle. Using the lid in this fashion, you can make virtually error free pancakes and eggs that don't run all over. This is because most lids are shaped like a very shallow bowl so things naturally stay in the center, even if the lid is not level.

Campfire Cooking Tips

I have received a lot of response from people asking how to use their Dutch ovens over a campfire. I have two separate campfire cooking methods I like to use, each depending on the amount of time I want to spend tending my ovens.

The first method involves using charcoal briquettes which are lit in the campfire. I prefer to use charcoal for cooking as opposed to cooking over an open fire because temperatures can be easily regulated with briquettes whereas an open fire is riddled with hot spots that can lead to burned food if your Dutch ovens are not watched carefully. I simply add a pile of charcoal to the center of the campfire to be started by the flames. Once the charcoal is lit, the briquettes are removed from the fire and arranged for cooking near the edge of the fire pit away from the campfire flames. Then cooking proceeds just like it would at home.

The second method entails burying your Dutch oven in coals and is about like cooking in a crock pot set on low heat. I usually use this method when out hunting or fishing (in a campfire safe area) and I don't want to spend a lot of time over my ovens. It starts by digging a 12" deep hole in the center of the campfire pit large enough around to hold a Dutch oven. Line the sides of the hole with flat stones and check to make sure the oven will fit in the hole. Next, start a campfire in the bottom of the hole to get coals going. Keep adding wood to the fire until the hole is 1/2 - 2/3 full of coals. Next kick the fire out

and remove the larger pieces of remaining wood. Dig a hole in the coals that the Dutch oven containing the evening meal can be set in then cover the Dutch oven with the remaining coals followed by a 2" layer of dirt spread out over the coals. Spread 2 wet burlap bags over the dirt and cover them with rocks so they won't be blown away in the event a wind comes up. The burlap bags will help to hold the heat in. Then leave the oven to set for the day.

When you return to camp in the evening the food will be ready for eating. Simply dig the oven up and brush it off with a whisk broom prior to opening it.

— Byron Bills

Mountain Man Breakfast

1 lb. bacon
2 medium yellow onions; diced
1 1/2 c. fresh mushrooms; sliced
salt and pepper to taste
1 green bell pepper; diced
3 cloves garlic; minced
10-12 medium potatoes; sliced
12 eggs; beaten
3 c. grated Cheddar cheese
picante sauce

Heat a 12" Dutch oven using 18-20 briquettes bottom until hot. Cut bacon into 1 inch slices. Add to Dutch oven and fry until brown. Add onion, mushrooms, bell pepper and sauté until onions are translucent. Add potatoes and season with salt and pepper. Cover and bake using 8 briquettes bottom and 14-16 briquettes top for 30 minutes. Season eggs with salt and pepper then pour eggs over top of potatoes. Cover and bake another 20 minutes. Stir gently every 5 minutes. When eggs are done, cover top with cheese and replace lid. Let stand until cheese is melted.

Serve topped with picante sauce.

Serves: 10-12

Vera's Baked Beans

1/2 lb. bacon
1 lb. lean ground beef
1 large yellow onion; diced
1 small green pepper; diced
1/2 c. brown sugar

1/2 c. catsup
16 oz. Homestyle® Chili Sauce
2 Tbsp. prepared mustard
1/2 lb. pre-cooked ham; cubed
2 (31 oz.) cans pork and beans

Heat a 12" Dutch oven using 18-20 briquettes bottom until oven is hot. Cut bacon into 1 inch slices and place in oven and fry until brown. Add onions and green pepper and sauté until onions are translucent. Drain off excess fat. Reduce briquettes on bottom to 12-14. Add brown sugar, catsup, chili sauce, and mustard. Simmer for 15 minutes. Add ham and beans. Cover and add approximately 15 briquettes to the lid. Simmer for 2 hours stirring every 15 minutes.

Serves: 12

This recipe has been handed down by Vera Sorensen of Manti, Utah. It is loved by everyone who has tried it. You'll love it too!

Fruit Cobbler Delight

1 (32 oz.) can fruit cocktail
1 (32 oz.) can sliced peaches
129 oz.) can crushed pineapple
1/2 c. instant tapioca
1/2 tsp. ground cinnamon
1/2 tsp. ground nutmeg
1 yellow or lemon cake mix, dry
1 c. brown sugar
1/4 lb. butter; cut into pieces

Into a 12" Dutch oven add canned fruit (juice included), tapioca, cinnamon, and nutmeg. Stir to mix. Sprinkle cake mix evenly over top of fruit. Sprinkle brown sugar over top of cake mix. Dab butter all over top of brown sugar. Place lid on oven. Bake for 45 minutes to an hour using 12 briquettes top and 12 briquettes bottom heat. Cobbler is done when top is brown and cake has absorbed fruit juices and is no longer dry.

Variation: Combine 1 cup of crushed pecan halves with the brown sugar for a crunchier topping.

Serves: 8-10

Cherry Chocolate Surprise Cake

- 1 chocolate cake mix; prepared as directed
- 1 (20 oz.) can cherry pie filling
- 1 (8 oz.) brick cream cheese
- 1 egg
- 3 Tbsp. sugar
- 1 tsp. vanilla

Pour prepared cake batter into a greased 12" Dutch oven. Spoon cherry pie filling into clumps over cake batter. In a small mixing bowl cream together cream cheese, egg, sugar, and vanilla until smooth. Drop by tablespoons over top of cake.

Place lid on oven. Bake using 8-10 briquettes bottom and 14-16 briquettes top for 1 hour or until top center of cake springs back when touched.

Serve warm with whip cream as topping.

Serves: 10-12

Byron's Garlic Herb Rolls

- 5 1/2 c. bread flour
- 2 Tbsp. yeast
- 1/3 c. non-fat dry milk
- 1/3 c. sugar
- 1 Tbsp. salt
- 3 Tbsp. dried parsley flakes
- 1 Tbsp. + 1 tsp. dried basil leaves
- 1 Tbsp. dried thyme leaves
- 2 c. warm water; 120° F.
- 1/4 c. vegetable oil
- 2 eggs; beaten
- 1/4 c. butter; melted
- 3/4 tsp. seasoned salt
- 10 cloves roasted garlic; chopped

Toppings

- 2 Tbsp. whipping cream
- 2 Tbsp. melted butter
- 1/4 c. parmesan cheese

In a mixing bowl combine 2 cups flour, yeast, dry milk, sugar, salt, and herbs; blend well. Stir in water, eggs, and oil. Mix thoroughly. Stir in remaining flour

1 cup at a time until dough pulls away from sides of bowl. Turn dough out onto a floured board and knead it for 5 minutes until dough becomes elastic and sticky. Roll dough generously in flour, then cover and place in a warm area free from drafts to raise until double in size.

Place raised dough on a floured board and punch down. Separate dough into 16 pieces. Form a ball from each piece and pat down into a round. Brush melted butter over tops of round and sprinkle with chopped garlic and seasoned salt. Pull rounds into an oval and fold in half so the garlic is on the inside. Place the folds of 10 rolls against the side of a warm lightly oiled 12" Dutch oven. Place 5 rolls in the inner circle and 1 roll in the center. Cover and let raise in a warm area for 15-20 minutes.

Brush tops of rolls with whipping cream then bake using 10-12 coals bottom and 16-18 coals top until rolls turn a light brown color. Brush tops of rolls with melted butter and sprinkle with parmesan cheese. Cover and continue baking until rolls turn golden brown. Total baking time should be between 20-25 minutes. For even browning make sure to rotate the top and bottom of the oven 1/4 turn in opposite directions every 10 minutes.

Yield: 16 rolls.

Note: Tina and I served these rolls at the World Championship Dutch Oven cook-off in 1998 where we took 3rd place.

Garlic Cheese Rolls

Dough

- 5 - 6 c. all purpose flour
- 2 Tbsp. active dry yeast
- 1/3 c. sugar
- 1 Tbsp. salt
- 2 c. milk; scalded (120° F.)
- 1 egg; beaten
- 1/3 c. butter; melted

Filling

- 2 Tbsp. melted butter
- 1/3 lb. cheddar cheese; shredded

1/3 lb. mozerella cheese; shredded
1 tsp. granulated garlic
1 tsp. Lawry's Seasoned Salt

Topping

2 Tbsp. butter; melted
3 Tbsp. parmesan cheese

Prepare Dough: In a mixing bowl combine 2 cups flour, yeast, sugar, and salt; blend well. Mix in warm milk, egg, and melted butter. Mix thoroughly. Mix in remaining flour 1 cup at a time until dough pulls away from sides of bowl. Turn dough out onto a floured board and knead it for 5 minutes until dough becomes elastic and sticky. Roll dough generously in flour, then cover and place in a warm area free from drafts to raise until double in size.

Assemble Rolls For Baking: Punch dough down then roll into a rectangular shape about 9" x 13". Brush dough with melted butter, spread on cheeses, then sprinkle with garlic and seasoned salt. Roll dough lengthwise like a jellyroll and cut into 13 1-inch rolls. Place rolls in a lightly greased 14" Dutch oven with 8 rolls around the outside edge, 4 rolls forming an inner circle, and 1 roll in the center. Cover Dutch oven and let raise for 15 minutes.

Bake using 10 briquettes bottom and 18-20 briquettes top until rolls turn a light brown color. Brush tops of rolls with butter and sprinkle with parmesan cheese then bake until golden brown. Total baking time will be 20-25 minutes. For even browning rotate oven and lid every 10 minutes.

Yield: 13 rolls

Piña Colada Cake

Cake:

3 3/4 c. all purpose flour
1 (3.4 oz.) box vanilla instant pudding
1 Tbsp. baking powder
2 1/2 tsp. baking soda
1 tsp. salt
1 cup + 2 Tbsp. butter; softened
1 tsp. vanilla extract
1 1/2 tsp. grated orange zest
2 2/3 c. sugar
8 egg yolks; room temperature
1 c. pineapple juice
1 c. water

1/2 c. Captain Morgan's Spiced Dark Rum
1 c. flaked coconut
8 egg whites; room temperature
1/2 tsp. cream of tartar

Frosting

8 oz. brick cream cheese; softened
1/2 c. butter; softened
1 tsp. vanilla extract
3/4 tsp. coconut extract
2 (16 oz.) boxes powdered sugar
2 Tbsp. Captain Morgan's Spiced Dark Rum
1/2 c. crushed pineapple; well drained
12 oz. toasted flaked coconut

Sift together flour, pudding, baking powder, baking soda and salt. In a large mixing bowl beat butter, vanilla, and orange zest until soft. Gradually mix in 2 cups sugar until light. Beat in egg yolks 1 at a time. Combine pineapple juice, water, and rum in a measuring cup. Alternately mix in flour and pineapple juice mixtures starting and ending with flour. DO NOT overbeat the batter. Stir in coconut. In a separate bowl beat egg whites and cream of tartar until soft peaks form. Gradually mix in the remaining 2/3 cup sugar and continue beating until stiff but not dry. Gently fold egg whites into batter one half at a time.

Grease the bottom and sides of a 12" Dutch Oven. Pour batter into Dutch Oven and spread evenly to sides. Bake using 10-12 coals bottom and 14-16 coals top until lightly golden and top springs back when touched, about 90 minutes. For best results rotate oven and lid 90° in opposite directions every 15 minutes while baking. Allow cake to cool in pan for 15 minutes. Invert cake onto a rack and finish cooling. Cut cake in half horizontally. Separate halves. Place in icebox until chilled.

In a large bowl cream together cream cheese, butter, vanilla, and coconut extract. Slowly mix in powdered sugar and rum. Transfer 1 cup frosting to another bowl and stir in pineapple.

Set 1 cake layer on a plate. Spread with pineapple frosting. Top with second cake layer, smooth side up. Frost top and sides of cake with remaining frosting. Press toasted coconut into frosting on top and sides of cake. Return to icebox and chill for 1 hour.

Garnish with whipped cream and sliced strawberries.

Serves: 18

Note: Tina and I served this dish as our dessert at the World Championship Dutch Oven cook-off in 1999. This dish was voted the number 1 dessert that year. I know you will enjoy it!

Sour Cream Banana Bread

1/2 c. + 1 Tbsp. butter; room temp.
3 eggs
1 1/2 c. sour cream
3 c. sugar
2 1/4 c. mashed ripe banana
3 Tbsp. lemon juice
6 c. all-purpose flour
1 1/2 Tbsp. baking powder
2 Tbsp. baking soda
1 1/2 tsp. salt
3 c. coarse chopped nuts

In a mixing bowl cream together butter, eggs, sour cream, and sugar.

In a separate bowl combine bananas and lemon juice. Stir to mix well.

In a separate bowl sift together flour, baking powder, baking soda, and salt.

Alternately mix flour mixture and bananas into wet ingredients, beginning and ending with flour. Stir in chopped nuts.

Pour batter into a well greased 12" Dutch oven. Place lid on oven and bake using 8-10 briquettes bottom and 14-16 briquettes top for 30-35 minutes or until toothpick inserted into center of bread comes out clean.

Serves: 15-20.

Fresh Raspberry Peach Pie

Crust:
3 c. all purpose flour
1 1/2 c. shortening
1/4 tsp. salt
3/4 c. HOT water

1/4 c. milk

Filling:

1 c. granulated sugar
3/4 c. brown sugar
1/2 tsp. ground cinnamon
1/4 tsp. ground nutmeg
8 tsp. instant Clear Jel
8 c. sliced fresh peaches
2 c. fresh raspberries
2 tsp. almond extract
2 Tbsp. lemon juice
2 Tbsp. butter; cubed

Prepare Filling: In a large bowl mix sugars, spices, and Clear Jel. Gently stir in fruit, extract, and lemon juice. Stir only to mix and moisten, being careful not to mash the fruit. Reserve the cubed butter.

Prepare Pie Crust: Cut flour, salt, and shortening together with a pastry cutter or 2 knives. Add hot water one half at a time. Stir with a fork just to moisten. Knead dough 4 or 5 times. Divide dough in half.

Assemble Pie: Place one piece of dough on a lightly floured board and gently roll out to 1/4" thickness. Place dough in a clean oiled 12" Dutch oven to cover bottom and 2-3 inches up the sides. Spoon in the filling. Dot the top of the fruit with cubed butter. Roll out the top crust and cut into 1/2" strips. Form strips into a lattice top over pie and seal edges with water. Brush top crust with milk.

Bake Pie: Cover and bake pie using 9 briquettes bottom and 16-18 briquettes on the lid for about 1 hour until top crust is golden brown and filling is bubbly. For even browning make sure to rotate the base and lid of the oven a 1/4 turn in opposite directions every 10-15 minutes.

Serves: 12

Recipe courtesy of Terry and Sheilamarie Lewis of Tabiana, UT.

<<http://papadutch.home.comcast.net/dutch-oven-cooking-tips.htm#Temp>>
5/15/2004

Sausage Balls

1 lb Sausage (Mild or hot)
1 Egg

6 oz Grated Cheddar Cheese
3 c Bisquik

Mix all ingredients together. Mixes best with your hands. Pinch off small pieces and form into balls. Cook 10-15 min at 350 in dutch oven. Makes 6 dozen.

Onion Swiss Steak

3 lb round steak, 3/4" thick
2 pkg onion soup mix
1-1/2 tsp salt
2 cans (10 oz) tomatoes
1/4 tsp pepper

Cut steak into serving pieces, season with salt and pepper and place into dutch oven. Sprinkle onion soup mix over top and pour tomatoes over all. Cover and cook over slow fire for 2 to 3 hours or until meat is done and tender.

Beef Stew

2 lb stew meat, 1" cubes
1 lg onion, sliced
3 tbs oil
1 can (1lb 12oz) tomatoes
1/2 c flour
1 clove garlic, minced
2 tsp salt
1/3 c water
1/2 tsp pepper
1 bay leaf
6 carrots, cut into 1" pieces
3 med potatoes, peeled, cubed

Coat beef cubes with a mixture of flour, salt and pepper. Brown in hot oil in bottom of oven. While oven is still hot, pour water in and scrape brown bits from bottom. Place remaining ingredients into oven and cover. Simmer 1 to 2 hours or until meat is tender and potatoes are done.

Stew and Biscuits

1 roast (1/4 - 1/2 lb. per person; cheaper than stew meat)
1 bottle Zesty Italian salad dressing
1 tbsp. Worcestershire sauce
1 tbsp. butter or margarine
1 large onion
1 tsp. pepper
1 tsp. garlic salt
1 tsp. seasoning salt
1/2 c. corn starch
1 - 2 cans refrigerated jumbo biscuits
1 large Ziplock bag
2 - 3 1 lb. bags frozen vegetables (chef's choice - many combinations are available at the supermarket.

Note: The onion can be omitted if the frozen vegetable package includes onion. It's nice to include a specialty mixture of vegetables for color and variety.) 1 package mushroom (or brown) gravy mix. Also, (a package of e.g., McCormick, beef stew seasoning can be used in place of the seasonings and corn starch)

The morning of the dinner, cut up the roast into bite-sized cubes, put the cubes in the Ziplock bag, and add the salad dressing and Worcestershire sauce. Seal the bag and knead to mix the contents. Put the bag back in the cooler until its time to cook. It is best if the meat can marinate at least four hours (this imparts a wonderful flavor to the meat as well as tenderizes it).

Dice the onion. Sauté in the butter in the Dutch oven. Then add the marinated meat and spices and brown the meat. After the meat has browned, add the mixed vegetables and stir. When everything is combined, mix the gravy mix with water in a separate cup per the instructions on the package and add to the stew. If there is not enough liquid to the mixture, add a little more water. Cover the Dutch Oven and allow to cook for about 1/2 hour, stirring occasionally. There will be extra liquid in the stew from the marinade, vegetables, and added water, which will have to be thickened. To do this, mix the corn starch with cold water in a separate cup until it is a thick white liquid. Slowly stir this into the stew over heat until it starts to thicken. Cover and allow to simmer on low heat for 5 - 10 more minutes, stirring frequently. Pull the oven off the fire and uncover. Place jumbo biscuits on top of the stew leaving a small gap between the biscuits. Cover the oven and place the oven on a pile of coals, then place coals on the lid. Check periodically until the biscuits are light golden brown.

Dutch Oven Lasagna

1-1/2 lb. lean ground beef
23 oz spaghetti sauce
8-9 oz shredded mozzarella cheese
3 eggs
2-1/4 c cottage or ricotta cheese
1/4 c. grated Parmesan cheese
13 lasagna noodles
1-1/2 tsp. oregano
3/4 c hot water

Preheat the Dutch oven. Brown the ground beef. When done remove the beef to a large mixing bowl. Add the spaghetti sauce to the beef and mix well. In another bowl, add the cottage or ricotta cheese, Parmesan cheese, mozzarella cheese (reserve a few ounces for later), eggs, and oregano, and mix well.

Place the layers in the oven in the following order: Break up four lasagna noodles into the bottom of the oven. Spread about 1/3 of the meat mixture over the noodles. Spread 1/2 of the cheese mixture over the meat mixture. Break up five noodles and place over the top of the preceding mixtures. Spread 1/2 of the remaining meat mixture over the noodles. Spread the remaining cheese mixture over the meat mixture. Break up the remaining noodles and place over the cheese mixture. Spread the remaining meat mixture over the noodles. Pour the hot water all around the edges of the oven. Place the lid on the oven and bake one hour or until done. Check frequently.

Hints: This recipe works well with charcoal (12 briquettes on bottom and 12 on top). Cooking time can be reduced by pre-cooking and draining the lasagna noodles.

Cowboy Soup

Potato chunks
1 can peas
1 lb ground beef
1 can green beans
1 med onion
1 can baked beans
Chili powder
1 can tomato soup
1 can corn
1 can tomatoes
Bay leaf

Nutmeg, salt, pepper

Brown ground beef and onion together. Add all except seasonings. Do not drain vegetables. Cook until potatoes are done. Add seasonings and cook 30 minutes.

Monkey Bread

4 cans Biscuits
1 c Sugar
1 c Brown sugar
4 tbs Cinnamon
1 stick oleo

Cut biscuits into quarters. Mix sugar and cinnamon in plastic bag. Drop quarters into bag and coat well. Place in dutch oven. Melt oleo in lid and pour over quarters. Bake 350 for 35 minutes.

Dump Cobbler

1 pkg yellow or white cake mix
2 cans pie filling or 1 lg can fruit cocktail
Cinnamon
Butter

Pour cans of filling or fruit cocktail in bottom of dutch oven. Sprinkle cake mix over top of fruit, DO NOT STIR! Sprinkle with cinnamon and cut pads of butter and let fall on surface. DO NOT STIR, it will burn. Cover and bake until bubbly and top is lightly browned, about 30-45 minutes. Any combination of fruits can be used. I recommend 1 can apple filling and 1 can of fruit cocktail.

Pineapple Upside Down Cake

Yellow cake mix (Jiffy cake mix doesn't require eggs)
Pineapple slices
Brown sugar
Maraschino cherries
Butter or margarine

Use a metal pan that will fit into the dutch oven *or* use foil. Put the pan into the oven so that it rests above or on top of 1/2 inch of water in the bottom of

the oven. If you are using foil, wrap the foil over the sides of the dutch oven, so that you have a "pan" inside that just rests on top of the water/other but won't fall in. Use several layers of foil. Put dots of butter in pan. Sprinkle brown sugar over bottom. Place pineapple slices in a single layer on the bottom. Place maraschino cherries in the holes in the pineapple slices. Pour cake batter over this. Close up dutch oven, place coals on top if desired or possible, and bake until done. Also, you can include walnuts.

Mountain Man Breakfast

1/2 lb bacon (or pre-cooked sausage)
Med onion
2 lb. bag of hash brown potatoes
1/2 lb. of grated cheddar
1 doz eggs
Small jar of salsa (optional)

The following requires 6-9 bottom coals and 12 -15 top coals:

Pre-heat 12" Dutch Oven. Slice bacon and onion into small pieces and brown in the bottom of the DO until onions are clear. Stir in the hash brown potatoes and cover; remove cover and stir occasionally to brown and heat potatoes (15-20 minutes) Scramble the eggs in a separate container and pour the mixture over the hash browns. Cover and cook until eggs start to set.(10 - 15 minutes)

Sprinkle grated cheese over egg mixture, cover and continue heating until eggs are completely set and cheese is melted. Optional: cover cheese/egg mixture with a small jar (~ 1 cup) of SALSA. Cover and cook for an additional 3-5 minutes. Slice and server like quiche. (Real men don't eat quiche but I sure get lots of requests to cook up the Mountain Man.) Cooking times will vary with the weather and your state of awake but its almost impossible to screw up. Serves 6.

Breakfast Pizza

All you need is biscuit dough pre-made from the store or homemade if you have the time, eggs, ham, bacon, sausage your preference or all three and cheese. First stretch the biscuit dough thin a spread it over the bottom of the dutch oven so none of the oven can be seen. Then pour a small layer of scrambled eggs over the dough. Add your preference of ham, bacon or sausage or all on top of the eggs if you use bacon pre-cook it. Then spread

the cheese over that and cook for 10 to 15 minutes and the Scouts will eat it up.

Sour Cream Onion Squares

1 large onion, sliced
2 Tbsp. margarine
1 egg
3/4 c. dairy sour cream
1/4 tsp. seasoned salt
1 c. milk
3 c. Bisquick baking mix

Sauté onion in margarine until soft. Beat egg in a small bowl; stir in sour cream until blended; add onions and seasoned salt. Stir milk into baking mix to form a soft dough; turn into a lightly sprayed (with Pam) or aluminum lined Dutch Oven. Bake for approximately 20 minutes or until top is set.

Sopapillas
4 c. sifted all-purpose flour
3 tsp. baking powder
1 tsp. salt
2 Tbsp. sugar
2 Tbsp. vegetable shortening
1 c. milk
Vegetable oil for frying

Mix flour, baking powder, salt and sugar into a large bowl. Cut in shortening until mixture resembles cornmeal. Stir in milk until mixture forms a firm dough. Knead dough on lightly floured aluminum foil or waxed paper just until smooth. Cover; let rest 20 minutes. Roll out to 1/4 inch thickness; cut into squares or diamonds. Heat oil in a Dutch Oven until hot. Fry sopapillas, a few at a time, turning often so they fry evenly until golden brown. Remove from oil with slotted spoon to paper towels to drain. Serve hot with butter & honey or sprinkled with cinnamon sugar.

<<http://www.macscouter.com/Cooking/DutchOven.html>>

Pizza Hot Dish

- 2 pkg Crescent rolls
- 1 jar Pizza Sauce
- 1-1/2 lb Ground Beef
- 8 oz Shredded Cheddar Cheese
- 8 oz Shredded Mozzarella Cheese

Brown ground beef, drain. Line dutch oven with 1 pkg of crescent rolls. Spread pizza sauce on dough. Add browned beef, the cheeses and use second pkg of rolls to form a top crust. Bake 30 minutes at 350

FIRE/COALS:

FOIL:

Hobo Dinners/variety . . .Lipton Soup Mix

Banana Boats

- Banana
- 3 Marshmallows
- Chocolate Chips

Directions: Split a banana lengthwise leaving the peel on. Fill with three marshmallows and chocolate chips. Wrap in aluminum foil set on hot coals for two minutes.

Baked Apple Dessert

- 1 apple (Granny Smith or other tart apple is best)
- 1 tsp. Butter
- 1 Tbsp. Brown Sugar
- Dash of Cinnamon
- Dash of Nutmeg
- Raisins (optional)

Directions: Cut apple in half and core. Keep skin on. In the cored areas

place butter, brown sugar and raisins. Sprinkle with spices. Put two halves together and wrap well in foil. Place in hot coals and cook for 20 minutes or while eating supper. Carefully remove from fire and unwrap onto plate. Use a spoon or fork to eat.

Comments: Each person can control the amount of spices and raisins. You could also simply core the apple without cutting in half. When removed from foil, you could also top with granola for an apple crisp feel.

Breakfast Sandwiches

- Non-stick Spray
- 1 English Muffin
- 2 Slices Canadian Bacon
- 2 Slices Cheese
- 2 Eggs
- Butter
- Salt & Pepper

Directions: Spray non-stick on the foil. Make a basket out of foil, which will not leak. Lay the muffin in the foil, open face. Butter the muffin. Put the canadian bacon and cheese on each side of the muffin. Put the canadian bacon and cheese on each side of the muffin. Crack the eggs over the muffins. Salt and pepper to taste. Close up and cook until finished. The recipe should be repeated for each person.

Campfire Muffins

- 6 Oranges
- 2 Pkgs. Muffin Mix, any flavor

Directions: Cut oranges in half and scoop out orange segments (it is the hollowed peel shells that you need, but keep the fruit for use with fruit salad or juice). Prepare the muffin mix according to package directions. Fill the orange peel cups half full of batter. Wrap each one loosely with heavy duty aluminum foil. Place in hot coals and make certain the batter side stays up. Cook 5 - 10 minutes, until muffins are done.

- Roasted Garlic Jam
- 2 Garlic Apples
- Worcestershire Sauce
- Stick of Butter

Italian Bread
Olive Oil

Directions: Wrap each garlic apple with a Tbsp. of olive oil in foil square. Roast on very low flame for 30 minutes. While roasting, mix stick of butter with 2 Tbsp. Worcestershire. Toast slices of Italian bread on open grill. When the garlic apples are ready, they will be soft. Just use a small fork to dip in and take each section. Butter your toast with the butter mixture, then spread the roasted garlic jam. For true garlic lovers only!

GRILL:

REFLECTOR OVEN:

SOLAR OVEN:

The Solar Funnel Cooker

How to Make and Use The BYU Solar Cooker/Cooler

by Steven E. Jones, Professor of Physics at Brigham Young University (BYU), with Colter Paulson, Jason Chesley, Jacob Fugal, Derek Hullinger, Jamie Winterton, Jeannette Lawler, and Seth, David, Nathan, and Danelle Jones.

Introduction

A few years ago, I woke up to the fact that half of the world's peoples must burn wood or dried dung in order to cook their food. It came as quite a shock to me, especially as I learned of the illnesses caused by breathing smoke day in and day out, and the environmental impacts of deforestation -not to mention the time spent by people (mostly women) gathering sticks and dung to cook their food. And yet, many of these billions of people live near the equator, where sunshine is abundant and free. Ergo...

As a University Professor of Physics with a background in energy usage, I set out to develop a means of cooking food and sterilizing water using the free energy of the sun. First, I looked at existing methods.

The parabolic cooker involves a reflective dish that concentrates sunlight to a point where the food is cooked. This approach is very dangerous since the sun's energy is focused to a point which is very hot, but which cannot be seen. (BYU students and I built one which will set paper on fire in about 3 seconds!) I learned that an altruistic group had offered reflecting parabolas to the people living at the Altiplano in Bolivia. But more than once the parabolas had been stored next to a shed -- and the passing sun set the sheds on fire! The people did not want these dangerous, expensive devices, even though the Altiplano region has been stripped of fuel wood.

The box cooker: Basically an insulated box with a glass or plastic lid, often with a reflecting lid to reflect sunlight into the box. Light enters through the top glass (or plastic), to slowly heat up the box. Problems: energy enters only through the top, while heat is escaping through all the other sides, which have a tendency to draw heat away from the food. When the box is opened to put food in or take it out, some of the heat escapes and is lost. Also, effective box cookers tend to be more complicated to build than the funnel cooker.

While studying this problem, I thought again and again of the great need for a safe, inexpensive yet effective solar cooker. It finally came to me at Christmastime a few years ago, a sort of hybrid between the parabola and a box cooker. It looks like a large, deep funnel, and incorporates what I believe are the best features of the parabolic cooker and the box cooker.

The first reflector was made at my home out of aluminum foil glued onto cardboard, then this was curved to form a reflective funnel. My children and I figured out a way to make a large cardboard funnel easily. (I'll tell you exactly how to do this later on.)

The Solar Funnel Cooker is safe and low cost, easy to make, yet very effective in capturing the sun's energy for cooking and pasteurizing water -> Eureka!

Later, I did extensive tests with students (including reflectivity tests) and found that aluminized Mylar was good too, but relatively expensive and rather hard to come by in large sheets. Besides, cardboard is found throughout the world and is inexpensive, and aluminum foil is also easy to come by. And individuals can make their own solar cookers easily, or start a cottage-industry to manufacture them for others.

Prototypes of the Solar Funnel Cooker were tested in Bolivia, and outperformed an expensive solar box cooker and a "Solar Cookit" - while costing much less. Brigham Young University submitted a patent application, mainly to insure that no company would prevent wide distribution of the Solar Funnel Cooker. BYU makes no profit from the invention. (I later learned that a few people had had a similar idea, but with methods differing from those

developed and shown here.) So now I'm trying to get the word out so that the invention can be used to capture the free energy of the sun - for camping and for emergencies, yes, but also for every day cooking where electricity is not available and even fuel wood is getting scarce.

How it Works

The reflector is shaped like a giant funnel, and lined with aluminum foil. (Easy to follow instructions will be given soon.) This funnel is rather like the parabolic cooker, except that the sunlight is concentrated along a line (not a point) at the bottom of the funnel. You can put your hand up the bottom of the funnel and feel the sun's heat, but it will not burn you.

Next, we paint a jar black on the outside, to collect heat, and place this at the bottom of the funnel. Or one can use a black pot, with a lid. The black vessel gets hot, fast. But not quite hot enough to cook with... We need some way to build up the heat without letting the air cool it. So, I put a cheap plastic bag around the jar -- voila, the solar funnel cooker was born! The plastic bag, available in grocery stores as a "poultry bag", replaces the cumbersome and expensive box and glass lid of the solar box ovens. You can use the plastic bags used in American stores to put groceries in, as long as they let a lot of sunlight pass. (Dark- colored bags will not do.)

I recently tested a bag used for fruits and vegetables, nearly transparent and available free at American grocery stores, that works great. This is stamped "HDPE" for high-density polyethylene on the bag (ordinary polyethylene melts too easily). A block of wood is placed under the jar to help hold the heat in. (Any insulator, such as a hot pad or rope or even sticks, will also work.)

A friend of mine who is also a Physics Professor did not believe I could actually boil water with the thing. So I showed him that with this new "solar funnel cooker," I was able to boil water in Utah in the middle of winter! I laid the funnel on its side since it was winter and pointed a large funnel towards the sun to the south. I also had to suspend the black cooking vessel -- rather than placing it on a wooden block. This allows the weaker sun rays to strike the entire surface of the vessel.

Of course, the Solar Funnel works much better outside of winter days (when the UV index is 7 or greater). Most other solar cookers will not cook in the winter in northern areas (or south of about 35 degrees, either).

I thought that a pressure cooker would be great. But the prices in stores were way too high for me. Wait, how about a canning jar? These little beauties are designed to relieve pressure through the lid -- a nice pressure cooker. And cooking time is cut in half for each 10° C we raise the temperature (Professor

Lee Hansen, private communication). I used one of my wife's wide-mouth canning jars, spray-painted (flat) black on the outside, and it worked great. Food cooks faster when you use a simple canning jar as a pressure cooker. However, you can also put a black pot in the plastic bag instead if you want. But don't use a sealed container with no pressure release like a mayonnaise jar -- it can break as the steam builds up! (I've done it.)

How to Build Your Own Solar Funnel Cooker

What You will Need for the Funnel Cooker:

1. A piece of flat cardboard, about 2 feet wide by 4 feet long. (The length should be just twice the width. The bigger, the better.)
2. Ordinary aluminum foil.
3. A glue such as white glue (like Elmer's glue), and water to mix with it 50-50. Also, a brush to apply the glue to the cardboard (or a cloth or paper towel will do). Or, some may wish to use a cheap "spray adhesive" available in spray cans. You can also use wheat paste.
4. Three wire brads-- or small nuts and bolts, or string to hold the funnel together.
5. For a cooking vessel, I recommend a canning jar ("Ball" wide-mouth quart jars work fine for me; the rubber ring on the lid is less likely to melt than for other jars I've found. A two-quart canning jar is available and works fine for larger quantities of food, although the cooking is somewhat slower.).
6. The cooking jar (or vessel) should be spray-painted black on the outside. I find that a cheap flat-black spray paint works just fine. Scrape off a vertical stripe so that you have a clear glass "window" to look into the vessel, to check the food or water for boiling.
7. A block of wood is used as an insulator under the jar. I use a piece of 2"x4" board which is cut into a square nominally 4" x 4" by about 2" thick. (10cm square x 5cm thick.) One square piece of wood makes a great insulator.
8. A plastic bag is used to go around the cooking-jar and block of wood, to provide a green-house effect. Suggestions:

* Reynolds™ Oven Bag, Regular Size works great: transparent and won't melt. (Cost about 25 cents each in U.S. grocery stores.)

* Any nearly-transparent HDPE bag (High-density Polyethylene). Look for "HDPE" stamped on the bag. I've tested HDPE bags which I picked up for free at my grocery store, used for holding vegetables and fruits. These are thin, but very inexpensive. Tested side-by-side with an oven bag in two solar funnels, the HDPE bag worked just as well! (Caution: we have found that some HDPE bags will melt should they contact the hot cooking vessel. For this reason, we recommend using the oven-safe plastic bag wherever possible.)

* An idea attributed to Roger Bernard and applied now to the BYU

Funnel Cooker: place a pot (having a blackened bottom and sides) in a glass bowl, and cover with a lid. Try for a tight fit around the bottom to keep hot air trapped inside. The metal pot or bowl should be supported around the rim only, with an air space all around the bottom (where the sunlight strikes it). Put a blackened lid on top of the pot. Then simply place this pot-in-bowl down in the bottom of the funnel - no plastic bag is needed! This clever method also allows the cook to simply remove the lid to check the food and to stir. I like this idea - it makes the solar cooker a lot like cooking over a fire. See Photographs for further details.

Construction Steps

Cut a Half-circle out of the Cardboard

Cut a half circle out of the cardboard, along the bottom as shown below. When the funnel is formed, this becomes a full-circle and should be wide enough to go around your cooking pot. So for a 7" diameter cooking pot, the radius of the half-circle is 7". For a quart canning jar such as I use, I cut a 5" radius half-circle out of the cardboard.

Form the Funnel

To form the funnel, you will bring side A towards side B, as shown in the figure. The aluminum foil must go on the INSIDE of the funnel. Do this slowly, helping the cardboard to the shape of a funnel by using one hand to form creases that radiate out from the half-circle. Work your way around the funnel, bending it in stages to form the funnel shape, until the two sides overlap and the half-circle forms a complete circle. The aluminum foil will go on the INSIDE of funnel. Open the funnel and lay it flat, "inside up", in preparation for the next step.

Glue Foil to Cardboard

Apply glue or adhesive to the top (inner) surface of the cardboard, then quickly apply the aluminum foil on top of the glue, to affix the foil to the cardboard. Make sure the shiniest side of the foil is on top, since this becomes your reflective surface in the Funnel. I like to put just enough glue for one width of foil, so that the glue stays moist while the foil is applied. I also overlap strips of foil by about 1" (or 2 cm). Try to smooth out the aluminum foil as much as you reasonably can, but small wrinkles won't make much difference. (If even cardboard is not available, one can simply dig a funnel-shaped hole in the ground and line it with a reflector, to make a fixed solar cooker for use at mid-day.)

Join side A to side B to keep the funnel together.

The easiest way to do this is to punch three holes in the cardboard that line up on side A and side B (see figure). Then put a metal brad through each hole and fasten by pulling apart the metal tines. Or you can use a nut-and-bolt to secure the two sides (A & B) together.

Be creative here with what you have available. For example, by putting two holes about a thumb-width apart, you can put a string, twine, small rope, wire or twist-tie in one hole and out the other, and tie together.

When A and B are connected together, you will have a "funnel with two wings". The wings could be cut off, but these help to gather more sunlight, so I leave them on.

Tape or glue a piece of aluminum foil across the hole at the bottom of the funnel, with shiny side in.

This completes assembly of your solar funnel cooker.

For stability, place the Funnel inside a cardboard or other box to provide support. For long-term applications, one may wish to dig a hole in the ground to hold the Funnel against strong winds.

Final Steps

At this stage, you are ready to put food items or water into the cooking vessel or jar, and put the lid on securely. (See instructions on food cooking times, to follow.)

Place a wooden block in the INSIDE bottom of the cooking bag. I use a piece of 2X4 board which is cut into a square nominally 4"X4" by about 2" thick. Then place the cooking vessel containing the food or water on top of the wooden block, inside the bag.

Next, gather the top of the bag in your fingers and blow air into the bag, to inflate it. This will form a small "greenhouse" around the cooking vessel, to trap much of the heat inside. Close off the bag with a tight twist tie or wire. Important: the bag should not touch the sides or lid of the cooking vessel. The bag may be called a "convection shield," slowing convection-cooling due to air currents.

Place the entire bag and its contents inside the funnel near the bottom as shown in the Photographs.

Place the Solar Funnel Cooker so that it Faces the Sun

Remember: Sunlight can hurt the eyes: Please wear sunglasses when using a Solar Cooker! The Funnel Cooker is designed so that the hot region is deep down inside the funnel, out of harm's way.

Put the Solar Funnel Cooker in the sun pointing towards the sun, so that it captures as much sunlight as possible. The design of the funnel allows it to collect solar energy for about an hour without needing to be re-positioned. For longer cooking times, readjust the position of the funnel to follow the sun's path.

It helps to put the Solar Funnel Cooker in front of a south-facing wall or window (in the Northern Hemisphere) to reflect additional sunlight into the funnel. A reflective wall is most important in locations farther from the equator and in winter. In the Southern Hemisphere, put the Solar Funnel Cooker in front of a North-facing wall or window to reflect additional sunlight into your cooker.

After Cooking

Remember that the cooking vessel will be very hot: Use cooking pads or gloves when handling! If you are heating water in a canning jar, you may notice that the water is boiling when the lid is first removed - it gets very hot!

Open the plastic cooking bag by removing the twist-tie. Using gloves or a thick cloth, lift the vessel out of the bag and place it on the ground or table. Carefully open the vessel and check the food, to make sure it has finished cooking. Let the hot food cool before eating.

Helpful Hints

1. Avoid leaving fingerprints and smudges on the inside surface of the cooker. Keep the inner surface clean and shiny by wiping occasionally with a wet towel. This will keep the Solar Funnel Cooker working at its best.
2. If your funnel gets out-of-round, it can be put back into a circular shape by attaching a rope or string between opposite sides which need to be brought closer together.
3. For long-term applications, a hole in the ground will hold the Funnel Cooker securely against winds. Bring the funnel inside or cover it during rain storms.
4. The lids can be used over and over. We have had some trouble with the rubber on some new canning-jar lids becoming soft and "sticky." "Ball canning lids" do not usually have this problem. Running new lids through very hot water before the first use seems to help. The lids can be used over and over if they are not bent too badly when opened (pry off lid carefully).
5. The jar can be suspended near the bottom of the funnel using fishing line

or string (etc.), instead of placing the jar on a block of wood. A plastic bag is placed around the jar with air puffed inside, as usual, to trap the heat. The suspension method allows sunlight to strike all surfaces of the jar, all around, so that heats faster and more evenly. This suspension method is crucial for use in winter months.

6. Adjust the funnel to put as much sunlight onto the cooking jar as possible. Look at the jar to check where the sunlight is hitting, and to be sure the bottom is not in the shadows. For long cooking times (over about an hour), readjust the position of the funnel to follow the sun's path. During winter months, when the sun is low on the horizon (e.g., in North America), it is helpful to lay the funnel on its side, facing the sun.

Tests in Utah

I have personally used the Solar Funnel Cooker to cook lunches over many weeks. My favorite foods to cook are potatoes (cut into logs or slices) and carrot slices. Vegetables cook slowly in their own juices and taste delicious. I also make rice, melted cheese sandwiches, and even bread in the Solar Funnel Cooker. I usually put the food out around 11:30 and let it cook until 12:45 or 1 pm, just to be sure that it has time to cook. I've never had any food burn in this cooker.

I have also cooked food in the mountains, at an altitude of around 8,300 feet. If anything, the food cooked faster there - the sunlight filters through less atmosphere at high altitudes.

I find that people are surprised that the sun alone can actually cook food. And they are further pleasantly surprised at the rich flavors in the foods which cook slowly in the sun. This inexpensive device does it!

Students at Brigham Young University have performed numerous tests on the Solar Funnel Cooker along with other cookers. We have consistently found much faster cooking using the Solar Funnel Cooker. The efficiency/cost ratio is higher than any other solar cooking device we have found to date. Mr. Hullinger also performed studies of transmissivity, reflectivity and absorptivity of alternate materials which could be used in the Solar Funnel Cooker. While there are better materials (such as solar-selective absorbers), our goal has been to keep the cost of the Solar Cooker as low as possible, while maintaining safety as a first priority.

Tests in Bolivia

The BYU Benson Institute organized tests between the Solar Funnel Cooker and the "old-fashioned" solar box oven. The solar box oven cost about \$70 and was made mostly of cardboard. It took nearly two hours just to reach

water pasteurization temperature. The Bolivian report notes that "food gets cold every time the pots are taken from and into the oven." The solar box oven failed even to cook boiled eggs. (More expensive box cookers would hopefully work better.)

An aluminized-mylar Solar Funnel Cooker was also tested in Bolivia, during the Bolivian winter. Water pasteurization temperature was reached in 50 minutes, boiled eggs cooked in 70 minutes, and rice cooked in 75 minutes. The Bolivian people were pleased by the performance. So were we! (La Paz, Bolivia, August, 1996)

I also donated two dozen solar funnel cookers for people in Guatemala. These were taken there by a group of doctors going there for humanitarian service. The people there also liked the idea of cooking with the sun's free energy! For an aluminized-Mylar Solar Funnel Cooker kit, please contact CRM (licensed manufacturer) at +1 (801) 292-9210.

Water and Milk Pasteurization

Contaminated drinking water or milk kills thousands of people each day, especially children. WHO [World Health Organization] reports that 80% of illnesses in the world are spread through contaminated water. Studies show that heating water to about 65° - 70° C (150° F) is sufficient to kill coliform bacteria, rotaviruses, enteroviruses and even Giardia. This is called pasteurization.

Pasteurization depends on how hot and how long water is heated. But how do you know if the water got hot enough? You could use a thermometer, but this would add to the cost, of course. When steam leaves the canning jar (with lid on tight) and forms "dew" on the inside of the cooking bag, then the water is probably pasteurized to drink. (The goal is to heat to 160° Fahrenheit for at least six minutes.) With a stripe of black paint scraped off the jar, one can look through the bag and into the jar and see when the water is boiling - then it is safe for sure.

Think of all the lives that can be saved simply by pasteurizing water using a simple Solar Cooker! (See also Recent Advances in Solar Water Pasteurization)

Safety

Safety was my first concern in designing the Solar Funnel Cooker, then came low cost and effectiveness. But any time you have heat you need to take some precautions.

- * The cooking vessel (jar) is going to get hot, else the food inside won't cook. Let the jar cool a bit before opening. Handle only with gloves or tongs.

- * Always wear dark glasses to protect from the sun's rays. We naturally squint, but sunglasses are important.

- * Keep the plastic bag away from children and away from nose and mouth to avoid any possibility of suffocation.

Cooking with the Solar Funnel Cooker

What do you cook in a crock pot or moderate-temperature oven? The same foods will cook about the same in the Solar Funnel Cooker -- without burning. The charts below give approximate summer cooking times.

The solar cooker works best when the UV index is 7 or higher. (Sun high overhead, few clouds.)

Cooking times are approximate. Increase cooking times for partly-cloudy days, sun not overhead (e.g., wintertime) or for more than about 3 cups of food in the cooking jar.

Stirring is not necessary for most foods. Food generally will not burn in the solar cooker.

Vegetables (Potatoes, carrots, squash, beets, asparagus, etc.)

Preparation: No need to add water if fresh. Cut into slices or "logs" to ensure uniform cooking. Corn will cook fine with or without the cob.

Cooking Time: About 1.5 hours

Cereals and Grains (Rice, wheat, barley, oats, millet, etc.)

Preparation: Mix 2 parts water to every 1 part grain. Amount may vary according to individual taste. Let soak for a few hours for faster cooking. To ensure uniform cooking, shake jar after 50 minutes. CAUTION: Jar will be hot. Use gloves or cooking pads.

Cooking Time: 1.5-2 hours

Pasta and Dehydrated Soups

Preparation: First heat water to near boiling (50-70 minutes). Then add the pasta or soup mix. Stir or shake, and cook 15 additional minutes.

Cooking Time: 65-85 minutes

Beans

Preparation: Let tough or dry beans soak overnight. Place in cooking jar with water.

Cooking Time: 2-3 hours

Eggs

Preparation: No need to add water. Note: If cooked too long, egg whites may darken, but taste remains the same.

Cooking Time: 1-1.5 hours, depending on desired yolk firmness.

Meats (Chicken, beef, and fish)

Preparation: No need to add water. Longer cooking makes the meat more tender.

Cooking Time: Chicken: 1.5 hours cut up or 2.5 hours whole; Beef: 1.5 hours cut up or 2.5-3 hours for larger cuts; Fish: 1-1.5 hours

Baking

Preparation: Times vary based on amount of dough.

Cooking Times: Breads: 1-1.5 hours; Biscuits: 1-1.5 hours; Cookies: 1 hour

Roasted Nuts (Peanuts, almonds, pumpkin seed, etc.)

Preparation: Place in jar. A little vegetable oil may be added if desired.

Cooking Time: About 1.5 hours

MRE's and prepackaged foods

Preparation: For foods in dark containers, simply place the container in the cooking bag in place of the black cooking jar.

Cooking Times: Cooking time varies with the amount of food and darkness of package.

How to Use the Solar Funnel as a Refrigerator/Cooler

A university student (Jamie Winterton) and I were the first to demonstrate that the BYU Solar Funnel Cooker can be used - at night - as a refrigerator. Here is how this is done.

The Solar Funnel Cooker is set-up just as you would during sun-light hours, with two exceptions:

1. The funnel is directed at the dark night sky. It should not "see" any buildings or even trees. (The thermal radiation from walls, trees, or even clouds will diminish the cooling effect.).
2. It helps to place 2 (two) bags around the jar instead of just one, with air spaces between the bags and between the inner bag and the jar. HDPE and ordinary polyethylene bags work well, since polyethylene is nearly transparent to infrared radiation, allowing it to escape into the "heat sink" of the dark sky.

During the day, the sun's rays are reflected onto the cooking vessel which becomes hot quickly. At night, heat from the vessel is radiated outward,

towards empty space, which is very cold indeed (a "heat sink").

As a result, the cooking vessel now becomes a small refrigerator. We routinely achieve cooling of about 20° F (10° C) below ambient air temperature using this remarkably simple scheme.

In September 1999, we placed two funnels out in the evening, with double-bagged jars inside. One jar was on a block of wood and the other was suspended in the funnel using fishing line. The temperature that evening (in Provo, Utah) was 78° F. Using a Radio Shack indoor/outdoor thermometer, a BYU student (Colter Paulson) measured the temperature inside the funnel and outside in the open air. He found that the temperature of the air inside the funnel dropped quickly by about 15 degrees, as its heat was radiated upwards in the clear sky. That night, the minimum outdoor air temperature measured was 47.5 degrees - but the water in both jars had ICE. I invite others to try this, and please let me know if you get ice at 55 or even 60 degrees outside air temperature (minimum at night). A black PVC container may work even better than a black-painted jar, since PVC is a good infrared radiator - these matters are still being studied.

I would like to see the "Funnel Refrigerator" tried in desert climates, especially where freezing temperatures are rarely reached. It should be possible in this way to cheaply make ice for Hutus in Rwanda and for aborigines in Australia, without using any electricity or other modern "tricks." We are in effect bringing some of the cold of space to a little corner on earth. Please let me know how this works for you.

Conclusion: Why We Need Solar Cookers

The BYU Funnel Cooker/Cooler can:

- * Cook food without the need for electricity or wood or petroleum or other fuels.
- * Pasteurize water for safe drinking, preventing many diseases.
- * Save trees and other resources.
- * Avoid air pollution and breathing smoke while cooking.
- * Use the sun's free energy. A renewable energy source.
- * Cook food with little or no stirring, without burning.
- * Kill insects in grains.
- * Dehydrate fruits, etc.
- * Serve as a refrigerator at night, to cool even freeze water.

(Try that without electricity or fuels! See also Balancing the Scales.)

The burden for gathering the fuel wood and cooking falls mainly on women

and children. Joseph Kiai reports from Dadaab, Kenya: "Women who can't afford to buy wood start at 4 am to go collecting and return about noon... They do this twice a week to get fuel for cooking... The rapes are averaging one per week." From Belize: "Many times the women have to go into the forest dragging their small children when they go to look for wood. It is a special hardship for pregnant and nursing mothers to chop and drag trees back to the village... they are exposed to venomous snakes and clouds of mosquitoes." (Anna K.) (Quoted in newsletters by Solar Cookers International.)

And the forests are dwindling in many areas. Edwin Dobbs noted in Audubon Magazine, Nov. 1992, "The world can choose sunlight or further deforestation, solar cooking or widespread starvation..."

Americans should be prepared for emergencies, incident to power failures. A Mormon pioneer noted in her journal: "We were now following in their trail traveling up the Platte River. Timber was sometimes very scarce and hard to get. We managed to do our cooking with what little we could gather up..." (Eliza R. Snow) Now there's someone who needed a light-weight Solar Cooker!

Here's another reason to use a solar cooker. Many people in developing countries look to see what's being done in America. I'm told that if Americans are using something, then they will want to try it, too. The more people there are cooking with the sun, the more others will want to join in. A good way to spread this technology is to encourage small local industries or families to make these simple yet reliable solar cookers for others at low cost. I've used this cooker for three summers and I enjoy it. Cooking and making ice with the funnel cooker/cooler will permit a significant change in lifestyle. If you think about it, this could help a lot of people. The BYU Solar Funnel Cooker uses the glorious sunshine -- and the energy of the sun is a free gift from God for all to use!

Answers to commonly-asked questions

Will the cooker work in winter (in the United States)?

As the sun moves closer to the southern horizon in the winter, the solar cooker is naturally less effective. A good measure of the solar intensity is the "UV index" which is often reported with the weather. When the ultraviolet or UV index is 7 or above-- common in summer months-- the solar cooker works very well. In Salt Lake City in October, the UV index was reported to be 3.5 on a sunny day. We were able to boil water in the Solar Funnel Cooker during this time, but we had to suspend the black jar in the funnel so that sunlight struck all sides. (We ran a fishing line under the screw-on lid, and looped the fishing line over a rod above the funnel. As usual, a plastic bag was placed around

the jar, and this was closed at the top to let the fishing line out for suspending the jar.)

The solar "minimum" for the northern hemisphere occurs on winter solstice, about December 21st each year. The solar "maximum" occurs six months later, June 21st. Solar cooking works best from about March 20 - October 1 in the north. If people try to cook with the sun for the first time outside of this time window, they should not be discouraged. Try again when the sun is more directly overhead. (One may also suspend the jar in the funnel, which will make cooking faster any time of the year.)

It is interesting to note that most developing countries are located near the equator where the sun is nearly directly overhead all the time. Solar Cookers will then serve year-round, as long as the sun is shining, for these fortunate people. They may be the first to apply fusion energy (of the sun) on a large scale! And they may accomplish this without the expensive infrastructure of electrical power grids that we take for granted in America.

How do you cook bread in a jar?

I have cooked bread by simply putting dough in the bottom of the jar and placing it in the funnel in the usual way. Rising and baking took place inside the jar in about an hour (during summer). One should put vegetable oil inside the jar before cooking to make removal of the bread easier. I would also suggest that using a 2-quart wide-mouth canning jar instead of a 1-quart jar would make baking a loaf of bread easier.

What is the optimum "opening angle" for the funnel cooker?

A graduate student at Brigham Young University did a calculus calculation over two years ago to assess the best shape or opening angle for the Solar Funnel. Jeannette Lawler assumed that the best operation would occur when the sun's rays bounced no more than once before hitting the cooking jar, while keeping the opening angle as large as possible to admit more sunlight. (Some sunlight is lost each time the light reflects from the shiny surface. If the sunlight misses on the first bounce, it can bounce again and again until being absorbed by the black bottle.) She set up an approximate equation for this situation, took the calculus-derivative with respect to the opening angle and set the derivative equal to zero. Optimizing in this way, she found that the optimum opening angle is about 45 degrees, when the funnel is pointed directly towards the sun.

But we don't want to have to "track the sun" by turning the funnel every few minutes. The sun moves (apparently) 360 degrees in 24 hours, or about 15 degrees per hour. So we finally chose a 60-degree opening angle so that the

cooker is effective for about 1.2 hours. This turned out to be long enough to cook most vegetables, breads, boil water, etc. with the Solar Funnel Cooker. We also used a laser pointer to simulate sun rays entering the funnel at different angles, and found that the 60-degree cone was quite effective in concentrating the rays at the bottom of the funnel where the cooking jar sets.

See also: Tests of the Solar Funnel and Bowl Cookers in 2001
<<http://solarcooking.org/funneltests01.htm>>

For questions regarding the complete Solar Funnel Cooker kit using aluminized Mylar and a jar for the cooking vessel, please contact CRM at +1 (801) 292-9210.

Recent updates to this project can be found at
<<http://physics1.byu.edu/jones/rel491/solarbowl.htm>>
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<<http://solarcooking.org/funnel.htm>>

Hot Dogs

Have each camper bring an empty carton of milk, 1-quart or 1/2 gallon. Place hot dog in bun. Wrap in tin foil. Put in milk carton, and place carton in fire circle or other safe burn spot. Light top of carton. By the time the carton is burnt to ground, THE HOT DOG IS COOKED!! I have not tried this, but the Ranger said it worked and the dawg was nicely cooked, and the bun was lightly toasted. Sounds like a perfect 'just before leaving' meal -- NO CLEAN-UP!!