

## Key Words-

hangi  
umu  
oven  
volcanic  
heat  
conduction  
celcius  
"chemical  
potential  
energy"  
combustion  
kete  
radiation  
less dense  
floats  
convection

## Hangi, Umu, Earth Ovens.

*Hangi* in New Zealand. *Umu* in the Pacific Islands. This tasty cooking technique relies on steam, heated by very hot rocks in an earth oven, cooking the food. A large hole is dug and a large stack of wood with the selected rocks placed on top. The rocks need to be ones that can be heated red hot without exploding so volcanic ones are best. Short lengths of steel railway track have also been used.



The large fire is lit and burns for 3-4 hours heating the stones by radiation. They turn red, then white hot, (800-1100 degrees Celcius has been recorded). The chemical potential energy in the wood is

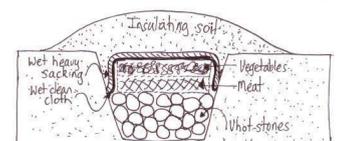
transformed into heat energy by the chemical reaction called combustion. The heat energy radiates from the burning wood to strike the stones causing the atoms in the stones to vibrate. The outer vibrating atoms make atoms beside them vibrate as well so heat energy on the outside moves into the stones or steel by conduction. This continues until there is no temperature difference and the whole object is the same temperature.

The stones are raked to one side and unburnt wood and most of the ash is raked out of the hole. The rocks are returned. A splash of water cleans the rocks off with a puff of steam.

Working quickly, the food in baskets (*kete*) are placed on top of the stones. Meat first, then vegetables on top. Historically the *kete* were made from natural fibres that wouldn't taint the food. Fresh *harakeke* (flax) was not used for this reason. More water is sprinkled on the hot rocks producing steam. The water changes state from liquid to gas and expands. The expanded steam occupies more volume so is less dense than the surroundings. This rising current of hot steam moves heat by convection carrying heat energy with it to other parts of the *hangi*.

A layer of wet clean cloth seals in the steam and protects the food from the overlying wet heavier bags that keep out the soil. Historically a thick layer of leaves was used to trap the steam. A thick layer of soil seals and insulates the oven from losing steam and heat by convection.

A close watch needs to be kept to ensure no steam vents open in the soil covering or the food will not stay hot enough to cook. Three to four hours later the *hangi* is opened and steam should gush out. If it doesn't then a trip to buy fish and chips might be in order.



## Questions - Hangi, Umu, Earth Ovens

Write out the question and then answer them in your book.

### A How well did you read?

- 1) The rocks need to be ones that can be \_\_\_\_\_
  - a) lifted
  - b) heated
  - c) purchased
  - d) exploded
- 2) The chemical potential energy in the wood is released as \_\_\_\_\_ energy.
  - a) smoke
  - b) fire
  - c) heat
  - d) food
- 3) Water is sprinkled on the hot rocks producing \_\_\_\_\_.
  - a) steam
  - b) heat
  - c) noise
  - d) smoke
- 4) The water changes state from liquid to \_\_\_\_\_.
  - a) ice
  - b) steam
  - c) gas
  - d) solid
- 5) This rising current of hot steam moves heat by \_\_\_\_\_.
  - a) conduction
  - b) radiation
  - c) moving
  - d) convection

### B Learn about Words- Vocabulary

You can often tell the meaning of a word by reading the words around it. Find it in the paragraph number shown. Find the word that fits the given meaning then write out both eg furry, produces milk (1) = MAMMAL  
6) earth oven (1) =

- 7) releasing heat energy by chemical reaction (2) =
- 8) outer vibrating atoms make atoms inside them vibrate as well (2) =
- 9) expanded steam occupies more volume (4) =

**C Using Words** One good way to learn words is to use them. Write out the sentence containing the best word.

- 10) The food in baskets (\_\_\_\_\_) are placed on top of the stones (4)
- 11) This rising current of hot steam moves heat by \_\_\_\_\_ (4)
- 12) A thick layer of soil seals and \_\_\_\_\_ the oven (6)

### D Answering Scientific questions.

Write the answer to each of the following making sure you include the question in the answer you write down. The first two have been started for you.

- 13) Describe where the heat energy to cook the food comes from.

The heat energy to cook the food comes from \_\_\_\_\_

- 14) Describe what happens when the heat radiates out of the fire and strikes the stone atoms.

When the heat radiates out of the fire and strikes the stone atoms they \_\_\_\_\_

- 15) Describe how the heat moves into the rocks.
- 16) Describe how expanding heated steam moves up to the rest of the hangi.
- 17) Describe the function of the thick soil layer over the top of the hangi.

**E Extra for fast finishers (something creative)** Choose one.

- Make a list of all the science facts you found out reading the story.
- Make a list of all the Maori words with their meanings and draw a picture for each one.

