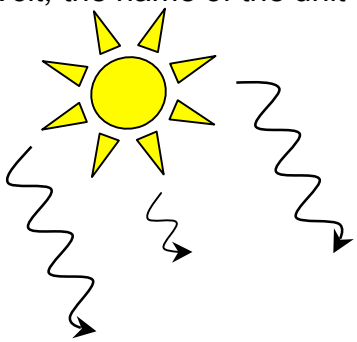
Turning sun wavelengths into sound and light

A solar cell is an electronic device that produces electricity when light falls on it. The light is absorbed and the cell produces direct dc voltage and current. The device has a positive and a negative contact between which the voltage is generated and through which the current can flow. You connect these contacts to whatever it is you want to power.

Solar cells have no moving parts. Effectively they take light energy (wavelengths or colours of light) and convert it into electrical energy in an electrical circuit, exploiting a physical process known as the *photovoltaic effect*. The term '*photovoltaic*' is derived by combining the Greek word for light, *photos*, with *volt,* the name of the unit of electromotive force.)



BUZZER AND LED ACTIVITY

You will need:

- Solar electric cell
- Buzzer AND 2V LED
- Light source

To activate the buzzer or LED connect:

- Positive terminal of solar cell to the red wire of the buzzer or LED
- Negative terminal of solar cell to the blue wire of buzzer or LED
- Place the solar cell in sunlight. It may be enough just to hold the cell to a window

Cover part of the solar cell and listen to how the sound changes or how this effects the intensity of the 'glow' of the LED. The buzzer converts electrical energy into a mechanical vibration that emits sound waves.

How much light does the solar (photovoltaic) cell need? Getting the best from your photovoltaic (solar electric) cell

A bright light source has more energy!

A solar cell converts light energy into electrical energy. If the intensity of light falling on the cell goes down, the electrical power output falls also. The electrical current output from the cell is very sensitive to light intensity. Maximum power output is produced when the incident light beam (i.e. when it is pointed at the sun) is perpendicular (90 degrees) to the cell surface.

Solar power is best obtained from the sun!

The UNI-SOLAR solar cell is designed for daylight or natural wavelengths of light (including diffuse light i.e. light scattered by cloud cover), not wavelengths from artificial light sources. Soft white fluorescent lighting works best with the UNI-SOLAR cell but output will only be approximately 10% if maximum.

The power output of the solar cell will be inversely proportional to the square of the distance from the light source to the surface of the solar cell. In other words, the motor in our solar car/boat kit will work when the solar cell is directly under the artificial light source, but if you double the distance you will only get 1/4 of the light intensity and the motor will probably stop working.

Dull days!

Diffuse sunlight from a cloudy sky can provide enough energy for the solar motor of the car/boat or mini-water pump to spin – but not always to run these devices. For the car, it will depend on gear ratio, wheel surface and size, the surface you run the car on, time of day and season.
Solar radiation is very variable – from place to place, from time to time and from season to season. For example, in the UK during the winter months, when the sun is 'lower' in the sky, diffuse sunlight may not run the car or boat during the early morning hours but by mid-day the car and boat will work.

OK so there is no sun at all today...

A 100W standard tungsten filament bulb held closely to (but not touching) the collector side of the solar cell will spin the motor. However, it is not the way to show how solar energy works. Remember that about 95 of the 100watts going into the lamp is given off as heat not light! Beware of burns to hands and melting plastics. A halogen security lamp (500w), OHP projector lamp or high intensity spotlight will power the car, but again the heat build-up is a safety issue.

NOTE - *Low energy lamps will not power the motor.*

Explaining and demonstrating natural energy use

Natural energy sources such as the sun, the wind and waves vary in intensity all the time. Harnessing and storing this energy is an important aspect of renewable energy, which is well illustrated by this solar electric model car kit.

Please demonstrate solar power with electrical devices that will work under the natural light conditions present at the time. For example, the 12V piezo buzzer in this kit will work under poor natural light conditions with the solar cell in this kit.