Background Information—Plugging In to the Sun

Solar energy: The sun's energy relies on nuclear fusion, which is an atomic reaction in which the centers of atoms (nuclei) of one kind combine together to make a larger atom of a different kind. One result of this bashing together is the release of a great amount of energy. In the sun, hydrogen is converted to helium. In solar atomic fusion four hydrogen nuclei join together to form a single helium nucleus.

Heat: Heat is the energy associated with the random motions of the atoms or molecules (or even smaller units) that compose matter. Heat causes substances to rise in temperature, fuse, evaporate, expand, or undergo various other related changes.

Cold: Cold is the absence of heat, nothing more. This is an important point! When you chill something, you don't "add" cold, you "subtract" heat.

Heat Transfer: Conduction, convection and radiation are the three ways in which heat is transferred from one place to another.

> **Conduction:** Conduction is the transfer of heat through matter, particle by particle. Molecules move when heated, and collide with one another. As a result of the collision, energy and momentum are exchanged and transferred from one particle to another, in effect transferring heat.
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> **Convection:** Convection is the transfer of heat through the movement of gases or liquids ("fluids"). This circulatory movement occurs when a non-uniform temperature exists in a fluid. Warmer, less dense fluid is pushed away from the source of heat by cooler, denser matter. The moving fluid carries energy with it. Currents in the ocean form due to convection, with water at the equator gaining more heat from the sun than water at the poles. Weather patterns develop in direct relation to these ocean currents - witness the El Niño and La Niña patterns related to changes in current flow, due to cooling and warming in the Pacific Ocean.
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> **Radiation:** Radiation is the transfer of heat that does not require matter in transmission. It is energy traveling as electromagnetic waves.

The Laws of Thermodynamics: These laws describe the system of heat energy. They encompass these (and other) ideas: Energy is never created or destroyed, but is converted from one form to another. At times, energy dissipates and it is hard to measure, but it is never "lost." Heat energy flows in one direction, from warmer matter to cooler, until equilibrium is struck. Also, when energy is transferred or transformed, part of energy assumes a form that cannot pass on any further.

The Egg on the Sidewalk Dilemma: The problem with cooking an egg on the sidewalk is that even direct sunshine on an egg isn't enough to cook it, nor is the stored heat of the sidewalk underneath. Further, the air around the egg is constantly changing, so any heat

in the warming egg and sidewalk is constantly diffused in convection currents. Conversely, in a solar cooker solar energy is reflected by shiny panels, and is bounced and concentrated into the oven where it is absorbed as heat in the egg. Further, if the inside of the oven is insulated, the air around the food will heat up, aiding the cooking of the egg.