Insights

El Paso Science Museum

May 27, 1998

DOE/ER/75954--T1

U.S. Department of Energy
Oakland Operations Office
Program Acquisition and Assistance
Division
ATTN: Jay Dodson
1301 Clay Street, Room 700N
Oakland, CA 94612-5208

Dear Mr. Dodson:

Thank you for sending the Contract Data and Contract Activity Reports dated April 2, 1998.

The grant in question, DE-FG03-94ER75954, was awarded to Insights El Paso Science Museum before my arrival as Executive Director on January 1, 1996. However, there are several current Board of Directors members who also were Board members during the grant period and who helped construct some of the exhibits. Through speaking with them and reviewing minutes of Board meetings during 1994, we have determined that seven of the 10 proposed exhibits were constructed, with an eighth exhibit constructed as an alternative. Photos of seven of the exhibits and preliminary sketches of some are attached as Appendix A. Following is a list of the constructed exhibits:

Hot or Cold	Sources of Energy
Give and Take	Wind Generator
Conduction	Solar Tracker
Convection	Perpetual Motion

Moreover, based on a "DoE Grant Activities Report" from the March, 1994, Board minutes attached as Appendix B, I understand that approximately $15,000-20,000 of the grant (depending on actual time the project received funding from DoE) supported 50 percent of the Executive Director's salary, as she was the Principal Investigator for the project. Approximately $1,456 supported 25 percent of the Museum secretary's salary.

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EL PASO, TEXAS 79901
915 534-0000

pg 8 final

DISCLAIMER

Another $3,259 went towards fringe benefits for the PI and secretary. Finally, based on October 12, 1994, Board minutes, I understand that the DoE grant was to be canceled for 1995, the second year of the two-year award.

If more information becomes available, I will contact you again. In the meantime, please call me or grantwriter Joyce Davidoff Mann with any questions, (915) 534-0000. Thank you for your patience, and thank you for the opportunity to build key exhibits for Insights El Paso Science Museum. These exhibits certainly have helped the Museum fulfill its mission to "promote curiosity and stimulate interest by exploratory, entertaining, exciting, and participatory learning in a broad range of scientific disciplines to persons of all ages regionally and internationally."

Sincerely,

Raymond Shubinski
Executive Director

Attachments (2)
c: Ned Euseppi, President
Joyce Davidoff Mann

EXHIBIT A

Hot or Cold

This exhibit uses Peltier junctions to heat one end of an aluminum pipe and cool the other end. Peltier junctions are stacks of thermo-couples connected in series electrically, in parallel thermally, and integrated into modules. The exhibit has two modules on each end of the aluminum pipe to demonstrate heating and cooling using thermal electric heat pumps. The exhibit also demonstrates the body's sensory reception to heat and cold.

HOT OR COLD

To Do and Notice:

Press the palm of your hand to the center section of the aluminum pipe. Notice that the pipe feels hot.

Touch the ends of the aluminum pipe. Notice that one is hot and the other is cold.

Try touching your forehead, the back of your hand and the inside of your forearm to the center section of the pipe. You may notice that the sensation of heat is more intense or less intense. Sensory nerve cells are more densely packed in some parts of your skin than others, and these dense patches are more sensitive.

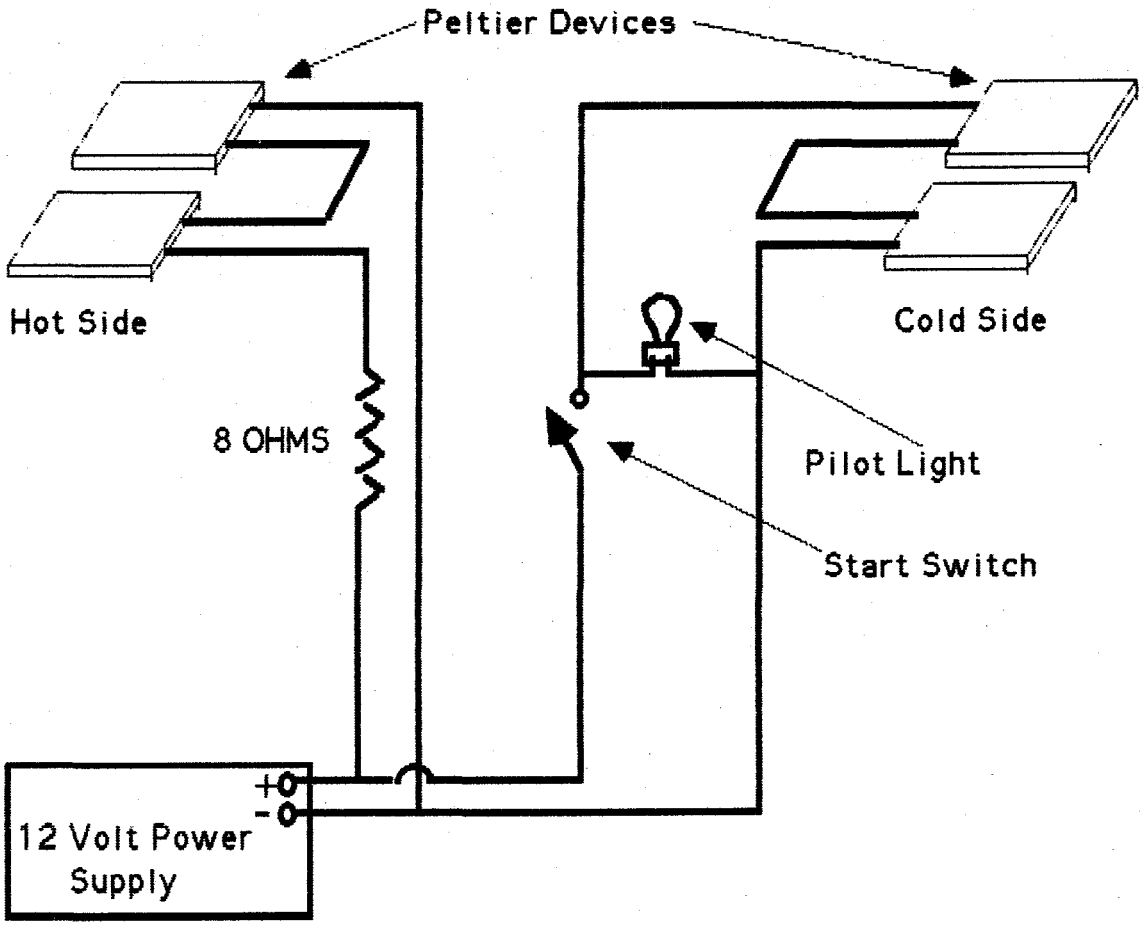
What's going on:

There are two types of temperature cells or receptors in your hand. Some temperature receptors respond only to mildly warm temperatures in the range of ten degrees above or below body temperature. When you touch the center section of the aluminum pipe, both kinds of receptors are stimulated. Some nerve cells tell your brain that the temperature is extreme, while other nerve cells tell your brain that the temperature is warm. If your brain receives these two messages frm receptors that are close to each other, it adds these messages up and gets extreme warmth or hot.

There are thousands of nerve endings in your skin, Although little is known as to the exact function of each nerve ending, it is thought that there are touch, pain, pressure, and two types of temperature-sensing cells.

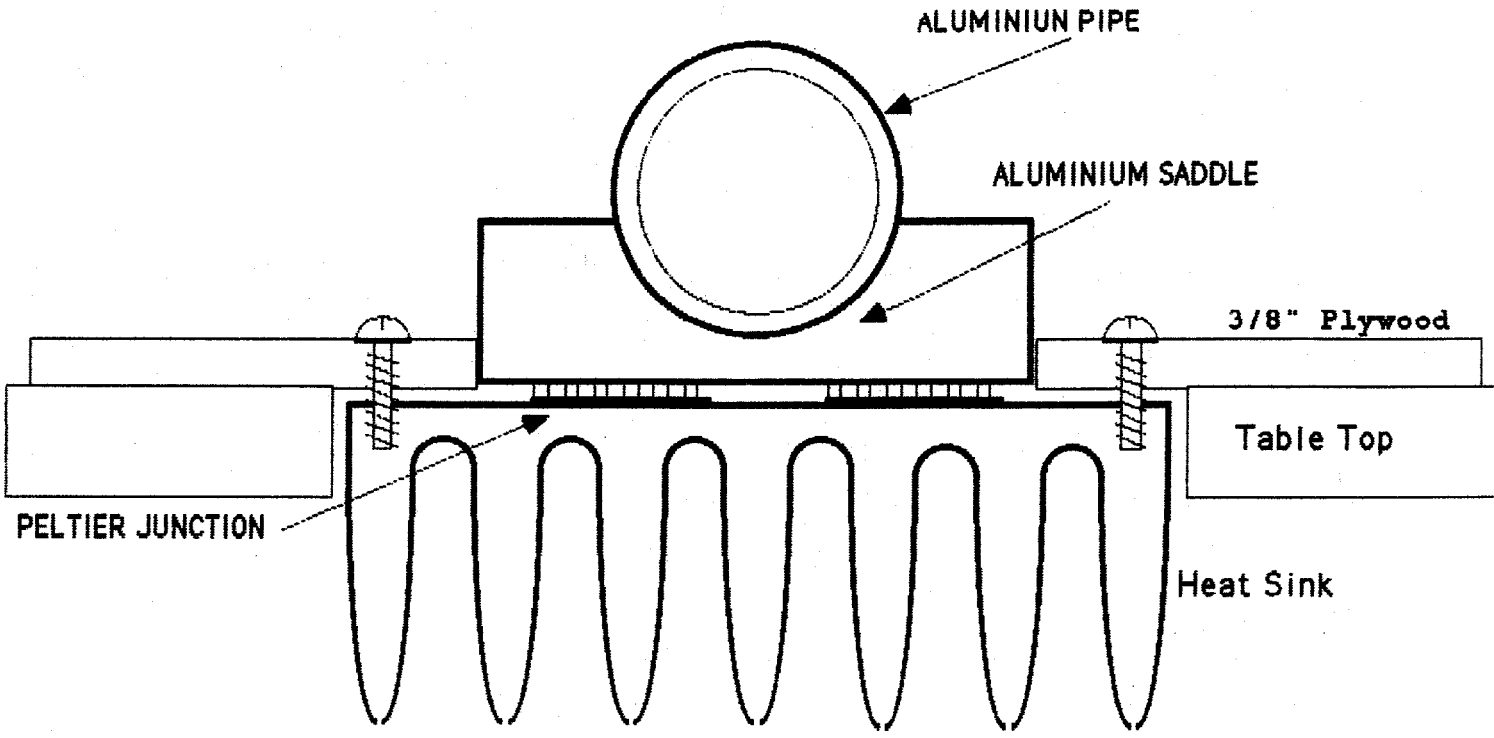
Hot or Cold

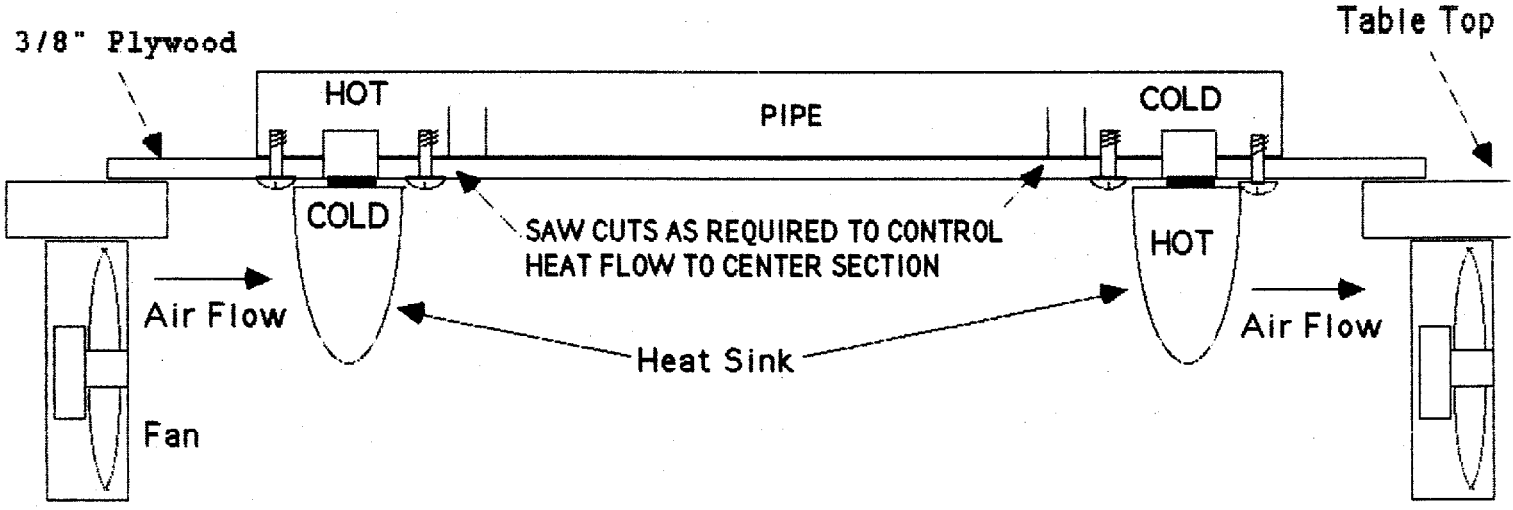
Wiring Hook-Up



14 July '95
WLL

HOT OR COLD





INSIGHTS
17 Dec. '94 WLL
1 July '95

Give and Take

This exhibit demonstrates that a dark or black object absorbs and/or radiates energy. A shiny object reflects energy and radiates energy poorly.

Skillets
(Conduction)

"Skillets" demonstrates the difference in conduction of heat energy through different metals: cast iron, stainless steel, aluminum, and copper. Reference the "Skillets" exhibit instructions following.

SKILLETS

THE DIFFERENT COOKING PROPERTIES OF SKILLETS ARE THE RESULT OF THERMAL PROPERTIES WHICH COME FROM THE USE OF DIFFERENT MATERIALS AND DESIGNS.

TO DO AND NOTICE:

The five skiilets are made of different materials cast iron, stainless steel, aluminum,and copper . Notice the thickness and constructuion of each skillet.

Place the skillets on the hot plugs and wait 40 seconds. Notice the color appearing on the temperature sensitive plastic (liquid crystal material) attached to the bottom of the pans. The liquid crystal is black below 75°F, changes from brown to yellow to green to blue as the temperature rises to 85°F, and returns to black above 95°F.

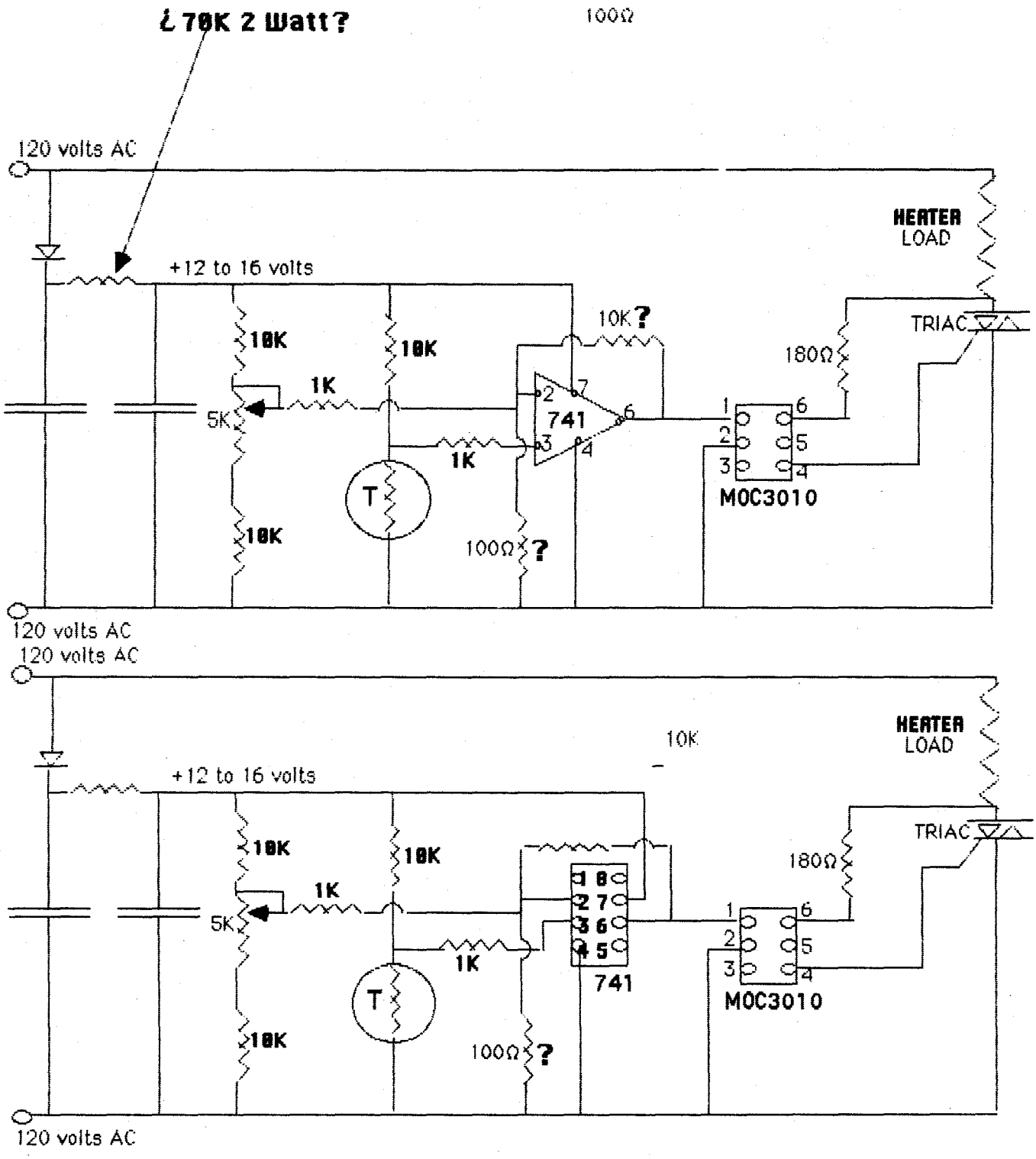
Notice the speed at which the color appears and how rapidly the rainbow ring expands for each pan. Also notice how the width of each ring differs in the two skillets and how the width changes as the ring becomes larger.

Replace the skillets on the aluminum slab and watch the colors change as they cool.

WHAT'S GOING ON:

Heat enters the skillet bottom where it is in contact with the hot plug. If the metal is a good conductor of thermal energy, the heat spreads out rapidly and the temperature rises slowly near the plug. For a skillet with good thermal conductivity, the distance between the blue circle (at about 90° F) and the yellow circle (at about 80° F) of the rainbow is significiant. As more heat enters the skillet, the rainbow becomes wider. If the metal conducts less well the entering heat moves slowly away from the area of contact so that the temperature near the plug rises quickly. In this case the rainbow ring appears promptly but is very narrow.

Thermostat Schematic For Skillets Heaters



8 Mar, '95
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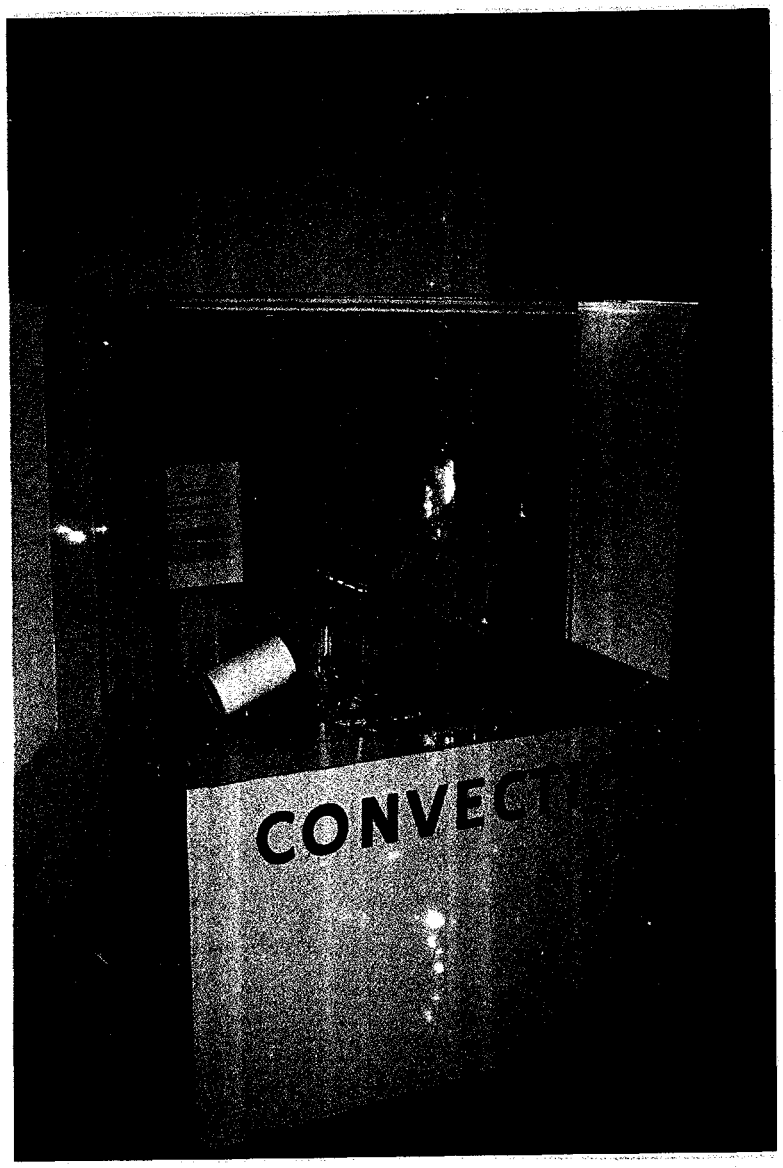
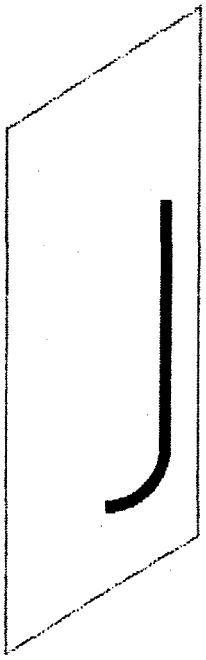


Convection

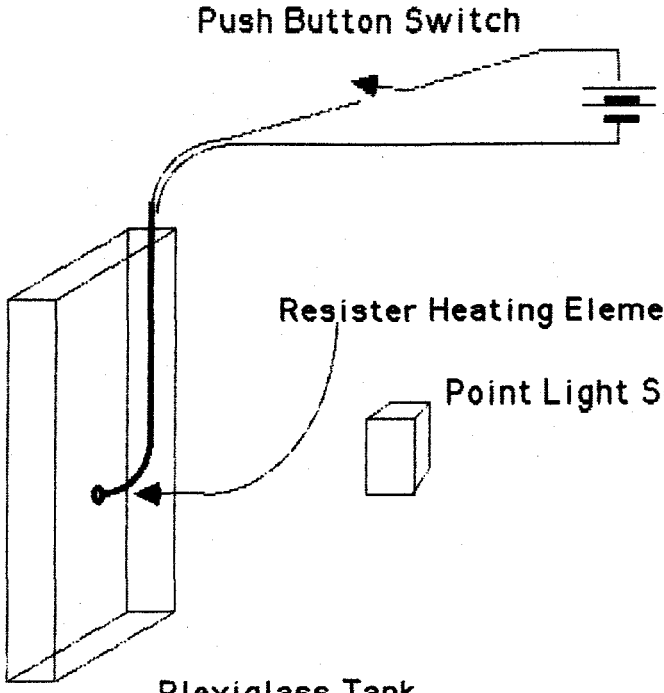
The "Convection" exhibit demonstrates and makes visible convection currents in a liquid <u>via</u> the Schlieren (shadow) effect.

CONVECTION CURRENTS



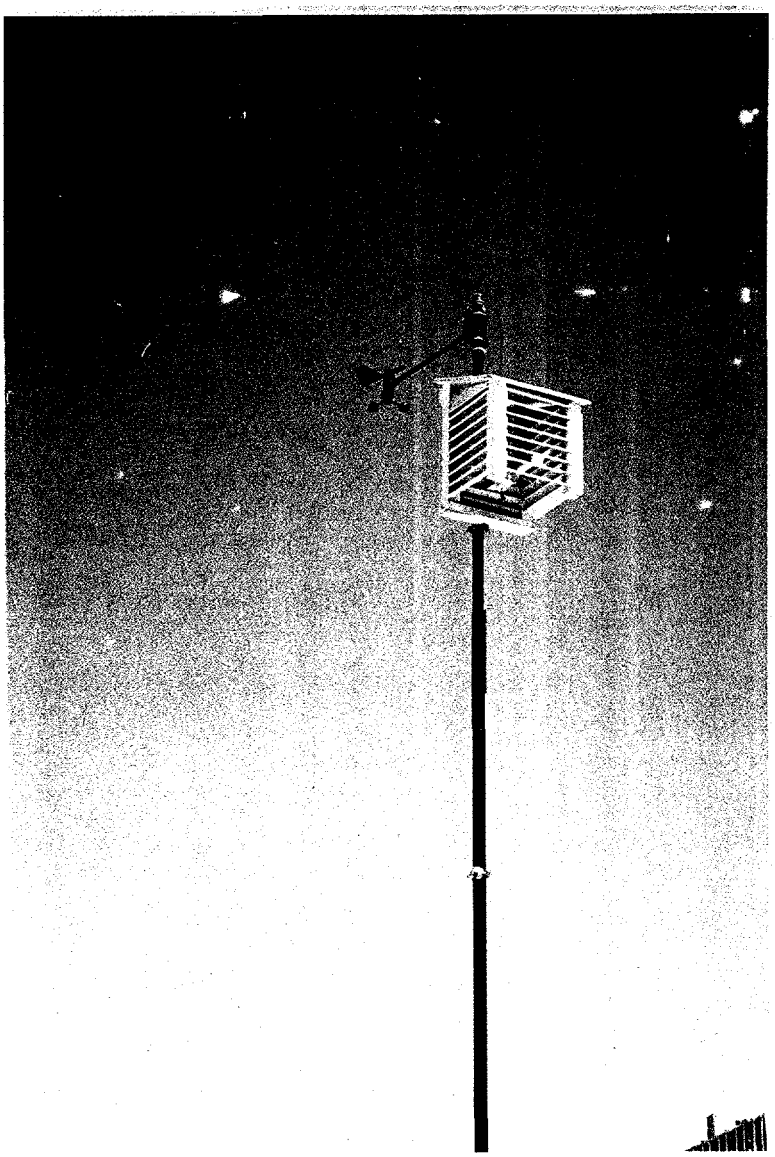
White Screen

Schlieren Image of Convection
Currents Appears on Screen



Plexiglass Tank
Filled With Water

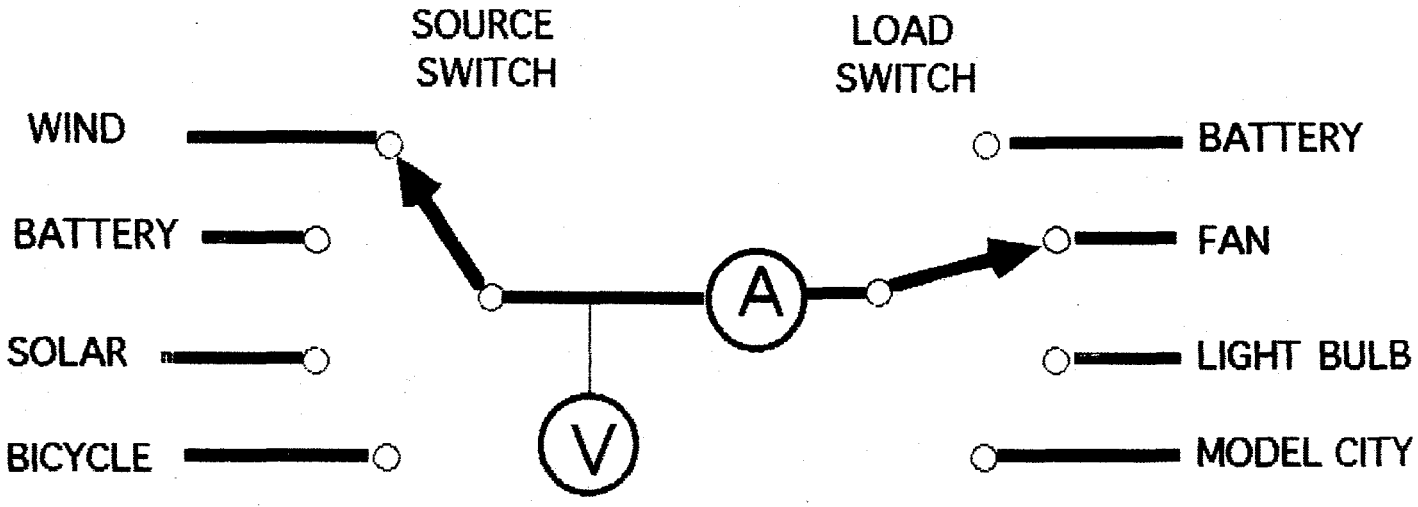
Insights Museum
May '94 WLL



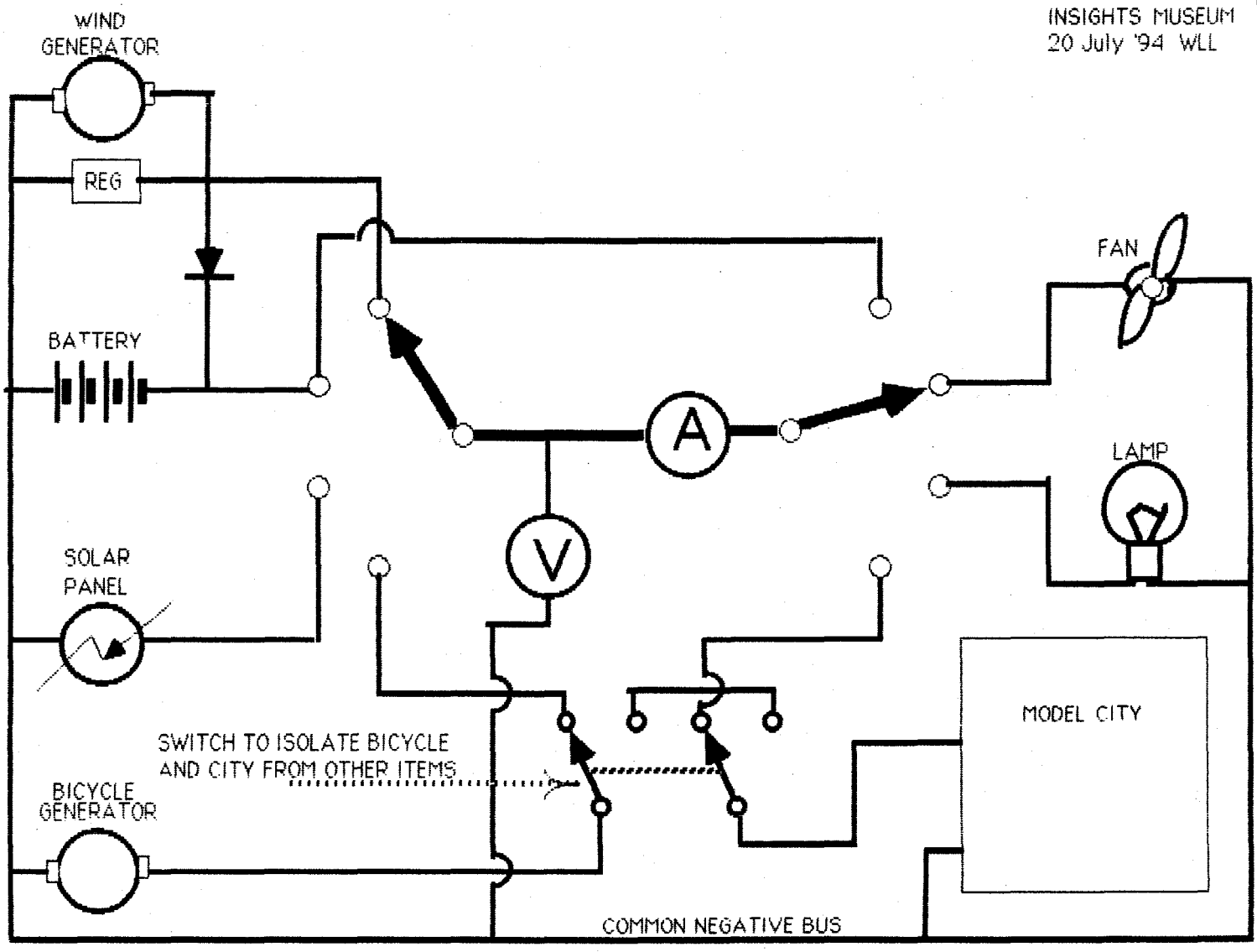
Sources of Energy

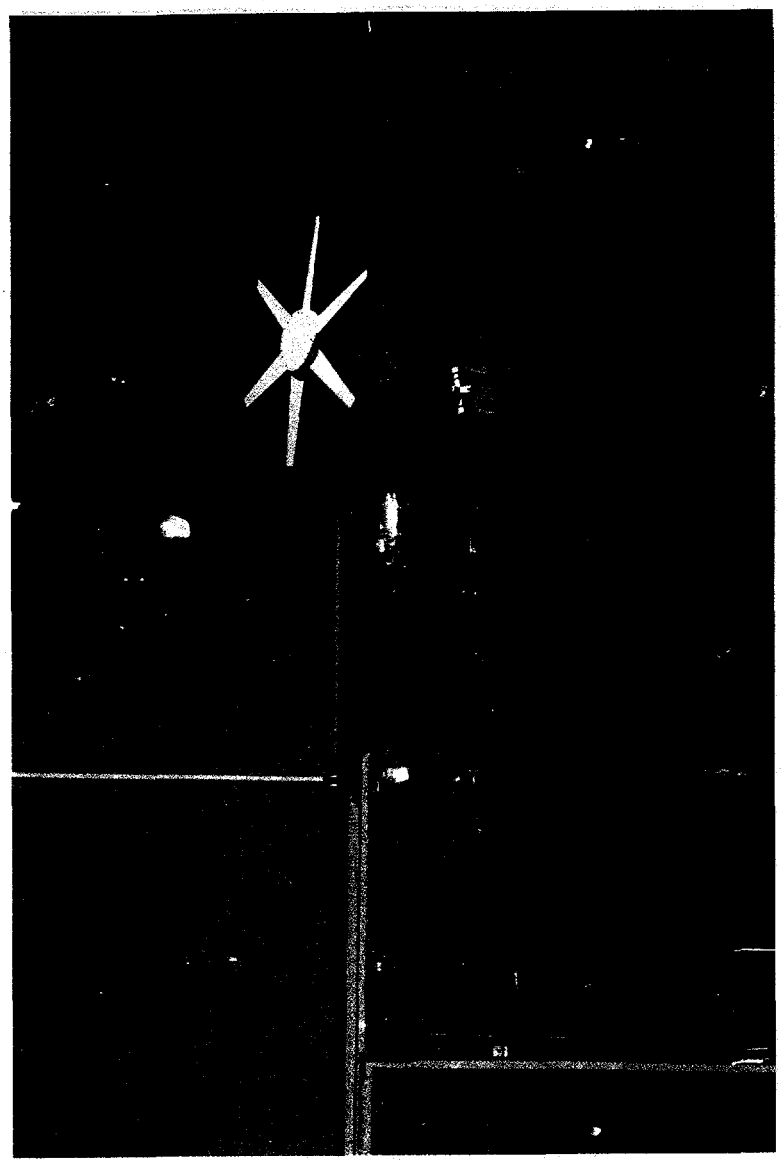
This exhibit displays a control panel with options for different sources of energy: wind, battery, solar, and bicycle generator. It includes a load switch to a battery, fan, light bulb, and model town. The exhibit also contains a volt meter and an ammeter to monitor electrical conditions. Finally, the exhibit includes an outdoor weather station pictured at left, with a computer monitor as part of the main display.

ALTERNATE POWER CONTROL PANEL



INSIGHTS MUSEUM
20 July '94 WLL



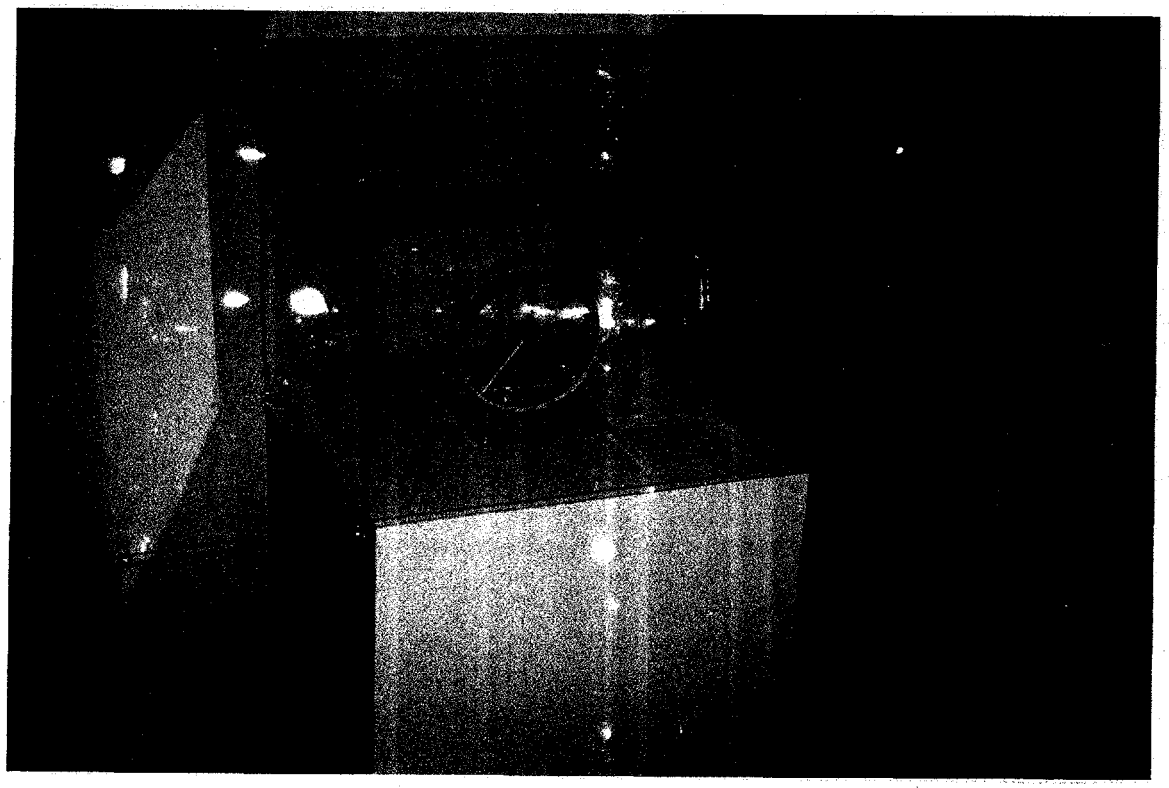


Wind Generator

In this exhibit, output is used and controlled by the "Sources of Energy" exhibit. "Wind Generator" is located on the Museum rooftop.

Solar Tracker

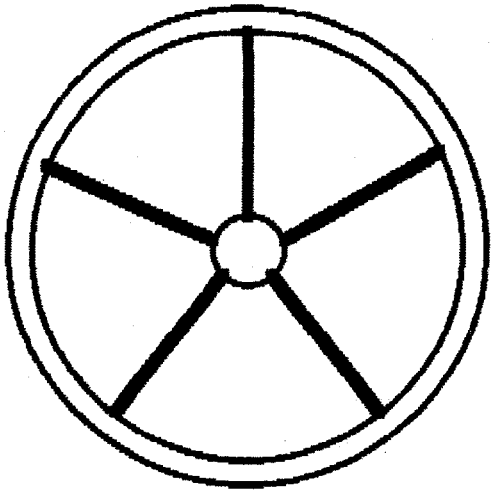
This exhibit currently is in storage at the Museum, since it is not rugged enough to withstand the manipulation of thousands of school children annually. It was successfully used, however, during the 1994 solar eclipse.



Perpetual Motion

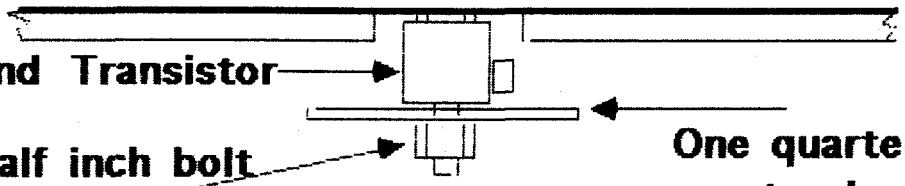
"Perpetual Motion" was constructed as an alternative to other exhibits proposed in the original grant request. It uses a brushless DC motor circuit. The wooden wheel contains 20 round refrigerator door magnets. The electronics to run the wheel are out of view below the exhibit base. The purpose of the exhibit is to demonstrate the misconception of perpetual motion or over-unity energy source.

PERPETUAL MOTION ?



Nine inch dia. wood wheel with twenty refrigerator door magnets in the rim.

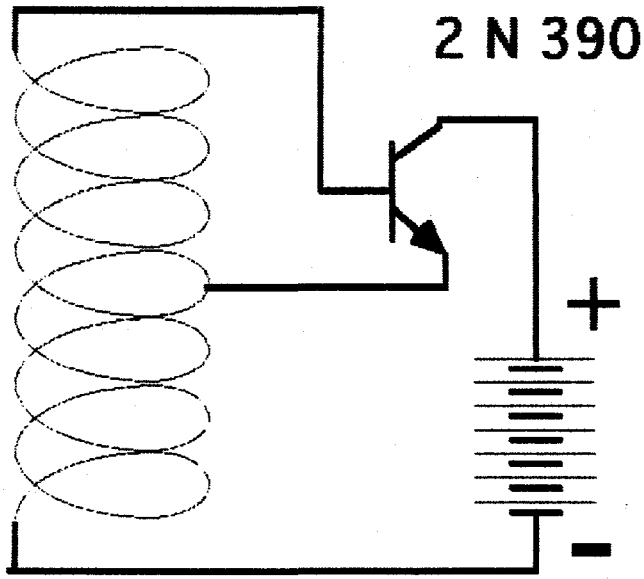
One half inch plywood with two inch hole. Formica top covers hole.



Coil and Transistor

One half inch bolt magnetic core

One quarter by one and one quarter by five inch cold rolled steel magnetic sink and mounting bracket.



Coil is two coils removed from 120 volt Westinghouse hysteresis clock motors and connected in series.

PERPETUAL MOTION ?

The principle of the conservation of energy states that energy can never be created or destroyed. It can be transformed from one form into another, but the total amount in the end is unchanged.

Even though this wheel keeps turning without any apparent source of energy, PERPETUAL MOTION IS IMPOSSIBLE and it must be getting energy from some source.

The energy which turns the wheel is converted to heat in the bearings of the wheel and in stirring the air around the wheel.

Where do you think that the energy is coming from?

How is the energy being converted to the mechanical rotation of the wheel?