

Solar Skills = Sustainable Communities

Service Learning Energized by the Sun

Tor Allen

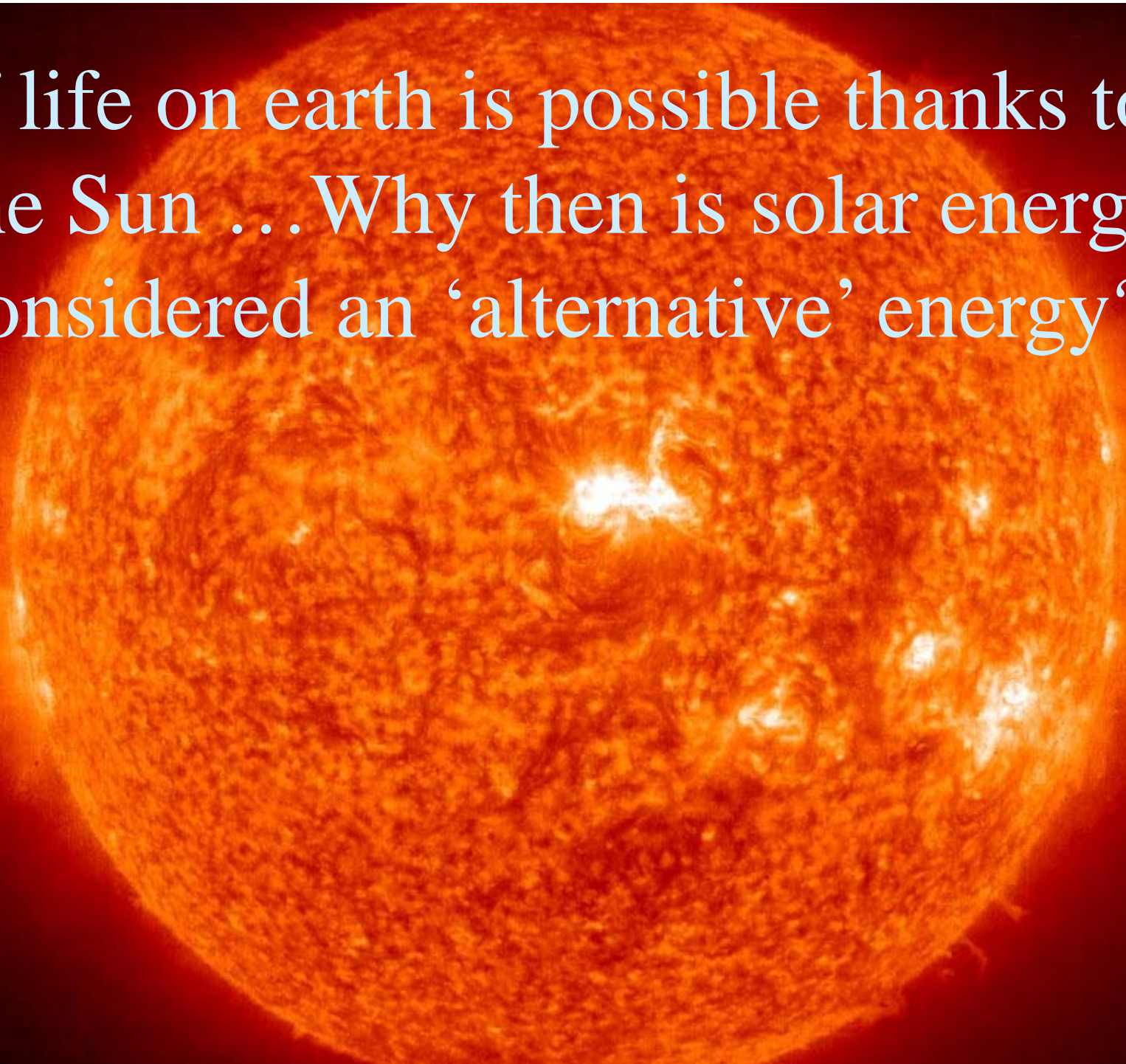
The Rachus Institute

Solar Schoolhouse

March 2013



If life on earth is possible thanks to the Sun ... Why then is solar energy considered an 'alternative' energy?



Solar Schoolhouse Curriculum



- Personal context: “Your Solar Home”
- Hands-on, project-oriented
- Standards Based



Today's focus

- Solar Ovens for your local community or developing country
- Solar Emergency Preparedness Kits
- Solar Battery Chargers
- Solar Powered Tiny Houses.

Solar Ovens Fit for a Feast

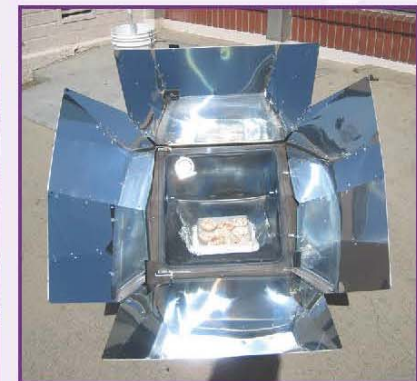
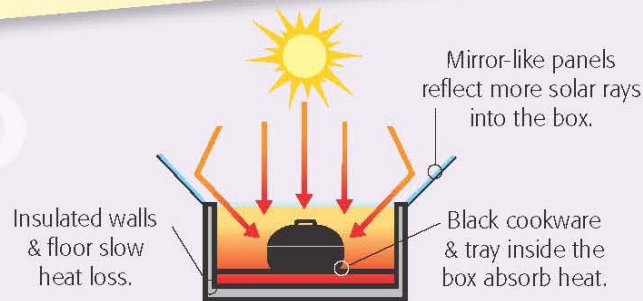
Home Cooking without the Home

Solar ovens have been around for many generations and are still widely used in parts of the developing world. Among its many benefits, solar cooking provides a means of preparing food without using fuel. Solar cookers allow families to reduce fuel expenses and focus their resources on the purchase of food and other necessities.

Solar ovens come in many shapes and sizes but have one thing in common: intensifying the sun's heat to prepare food and sterilize water. Even a simple oven made of a pizza box can generate temperatures high enough to bake cookies. A larger insulated box can achieve temperatures of 250°F, and more than 300°F when reflectors are employed.



Solar ovens are relatively simple and inexpensive to build.



Left: a family-size solar oven.

Above: adding reflectors helps harvest more light, increasing cooking temperature.

To learn more about solar ovens visit: www.solarcookers.org

FAMILY-SIZED SOLAR OVEN WORKSHOP

MAKE YOUR OWN SOLAR OVEN AND START COOKING WITH SUNSHINE.

SATURDAY, MARCH 30TH, 10AM – 3PM

ANALY HIGH SCHOOL - SEBASTOPOL, CA

Participants at this workshop will build a family-sized solar oven. Temperatures in these sunshine-fueled ovens get to 250-300F. This is plenty hot for cooking most foods. In addition to serving as an emergency preparedness tool, solar ovens are great for cooking on sunny days. Solar Ovens help reduce your energy bill and keep your kitchen cool in the summer. A minimum of 2 people (max 4) are encouraged to sign up together to build an oven.

Included: oven materials – precut plywood shell, hi-temp rigid insulation, tempered glass window, metal absorber plate, thermometer, metal tape, reflective lid. Be prepared to transport your finished oven home: dimensions [21" x 19" x 13"H]

Instructors:

Tor Allen, Director of The Rahu Institute/Solar Schoolhouse.

David Casey, EcoAction Instructor at Analy High School

Who should attend? Students and their Families, Teachers, community members.

Location: Analy High School Maker Space. Sebastopol, CA (park in student parking lot)

Cost: \$160 (\$10 per extra team member) Register via the Sebastopol Community Center at solarschoolhouse.net/soven

Call or Email Tor at tor@rahus.org or 707-829-3154 with any questions regarding workshop content.



www.rahus.org

Baking off grid at Analy High

Students build solar oven that cooks like 'magic'



Solar ovens are constructed by students and parent volunteers at Analy High School, Saturday April 14, 2012.

(Kent Porter / Press Democrat)

By STEVE HART
THE PRESS DEMOCRAT

Published: Thursday, April 19, 2012 at 5:14 p.m.

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Call it Mother Nature's slow cooker.

The family-sized solar oven built in an Analy High School program



www.rahus.org









Afghanistan



Nicaragua



Your Backyard



Storing Solar Energy in a Lunchbox

This Lunchbox Packs a Punch of Power

Solar power is great while the sun is shining, but what about when the sun goes down? Build a Solar Lunchbox charger, and you can store energy in a small battery that will power lights or charge phones and mp3 players even when there is no sunlight. Since Solar Lunchboxes are portable and easy to assemble, they make a great addition to a family's Emergency Preparedness Kit in the event of a blackout.

Charging batteries with solar cells is a common strategy for using solar power in "off-grid" locales. The International Space Station, satellites, road side call boxes, and navigational buoys have been powered day and night by the sun for years. For many uses, the solar/battery combination has proven to be a reliable, durable, and clean power option.



To learn more about building a Solar Lunchbox visit:
www.solarschoolhouse.net/lunchbox



Analy EcoAction Class & Solar Schoolhouse present...

Solar Powered Emergency Preparedness Workshop

Build a portable solar power supply for your family
The Equinox - Saturday, September 24th 8:30am-11:30am

What works when the electric grid goes dark? Not much. Get prepared by attending this workshop and building your own Solar Powered Lunch Box. Yes, there's still room for a sandwich, but the primary function of this portable solar (Photovoltaic) charged power supply is to provide light and charge your communication devices (cell phones, walkie-talkies). The Solar Power Lunch Box can also be used on a daily basis to keep your cell phone charged, and your music devices (iPod, MP3) ready to go.

Participants at this workshop will learn the basics of solar charging circuits, and then build a Solar Power Lunch Box to take home with you. You'll also build a custom LED night light that can be powered by the Lunch Box. Families are encouraged to work together building their emergency unit.

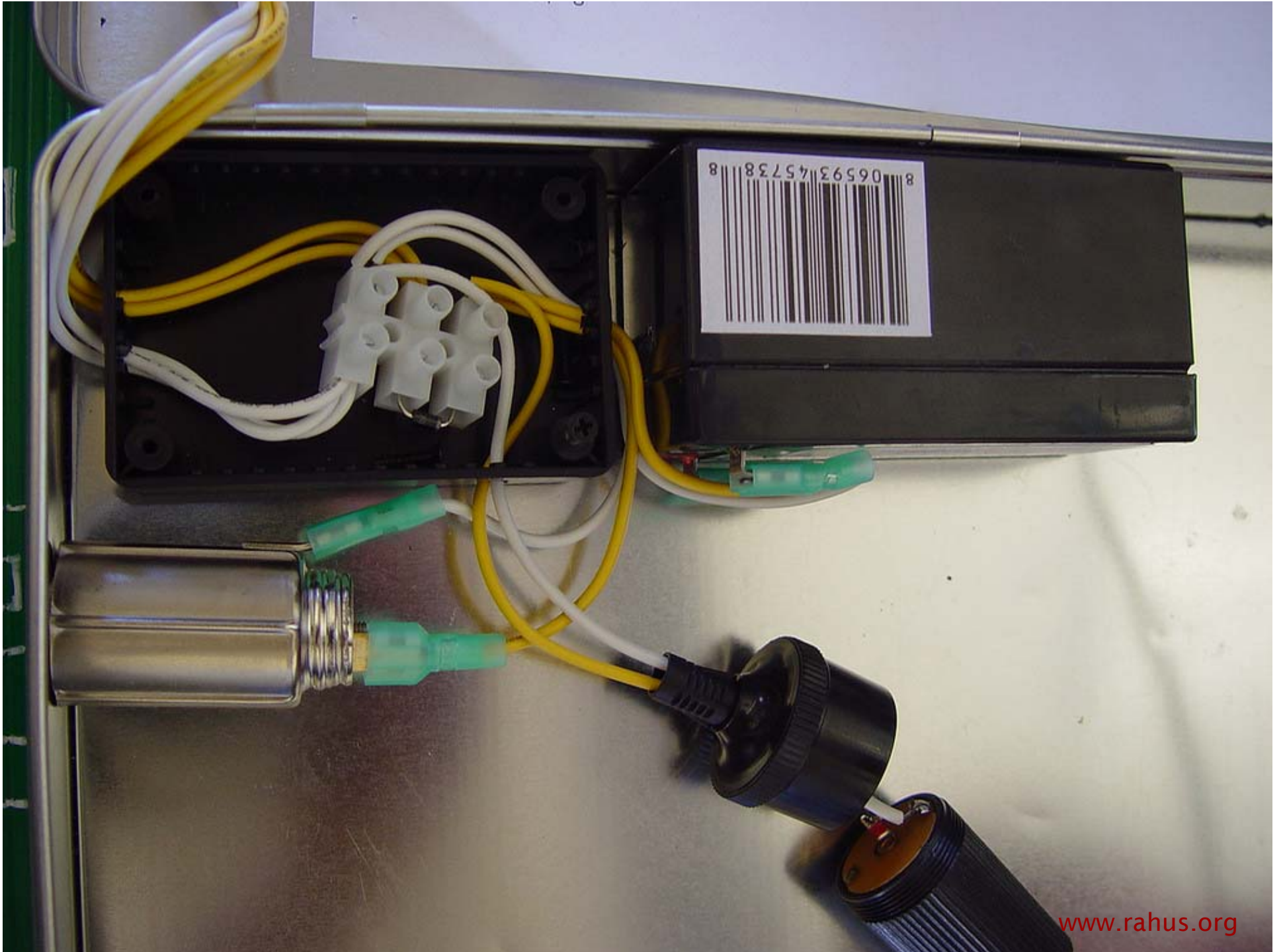
Instructor: Tor Allen, Director of The Rahun Institute and Solar Schoolhouse.

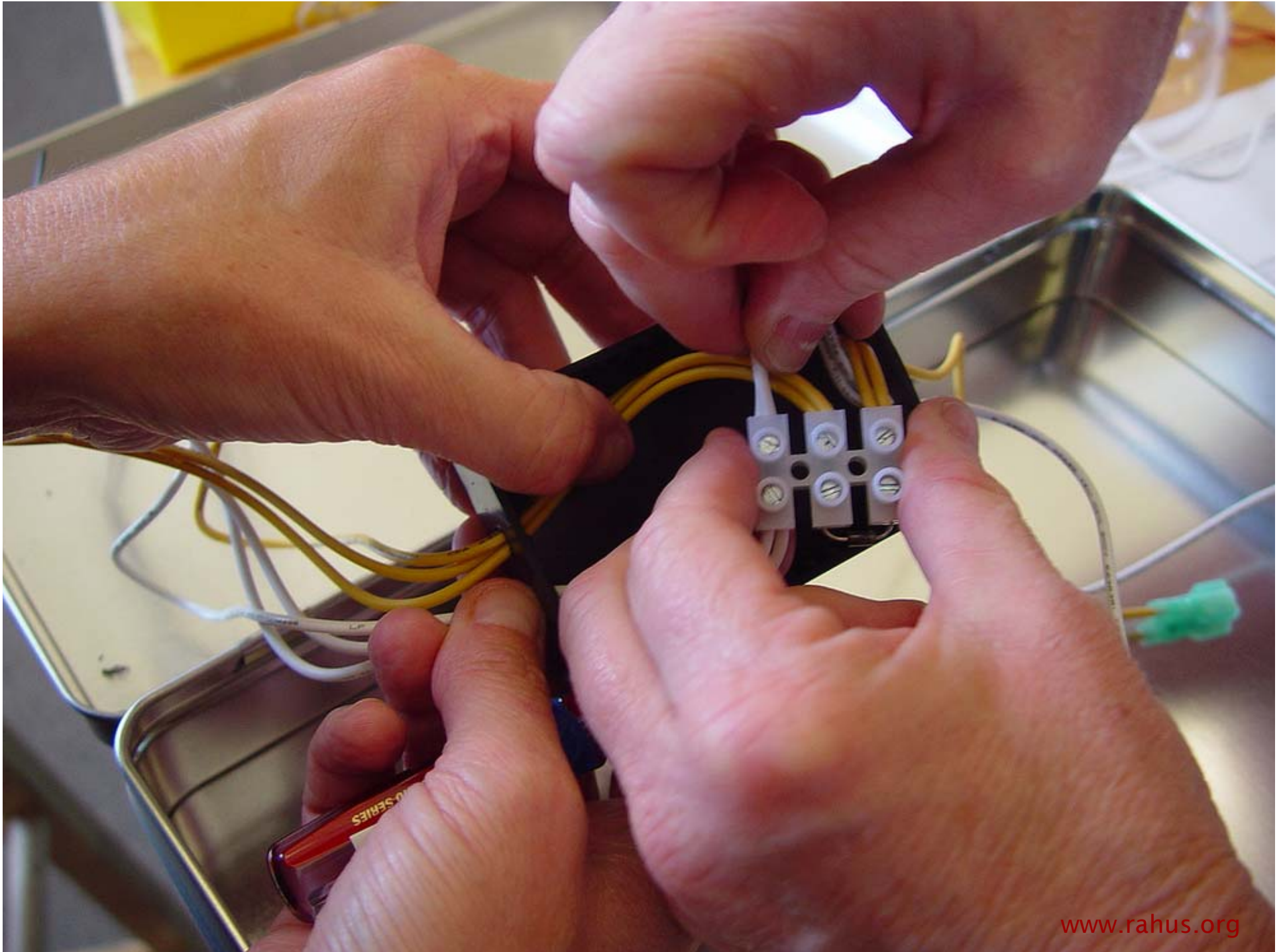
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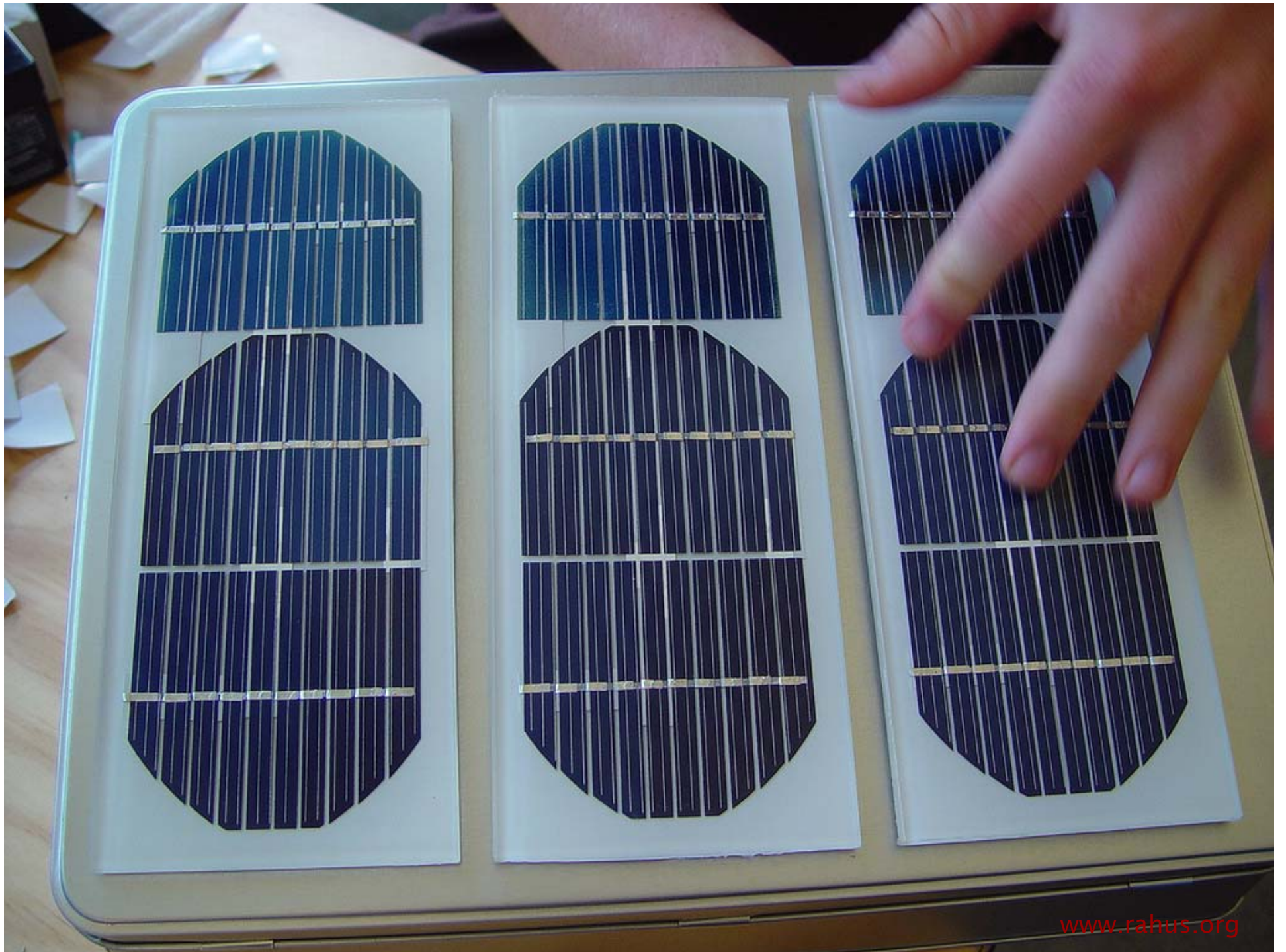
Location: Analy High School. Sebastopol, CA

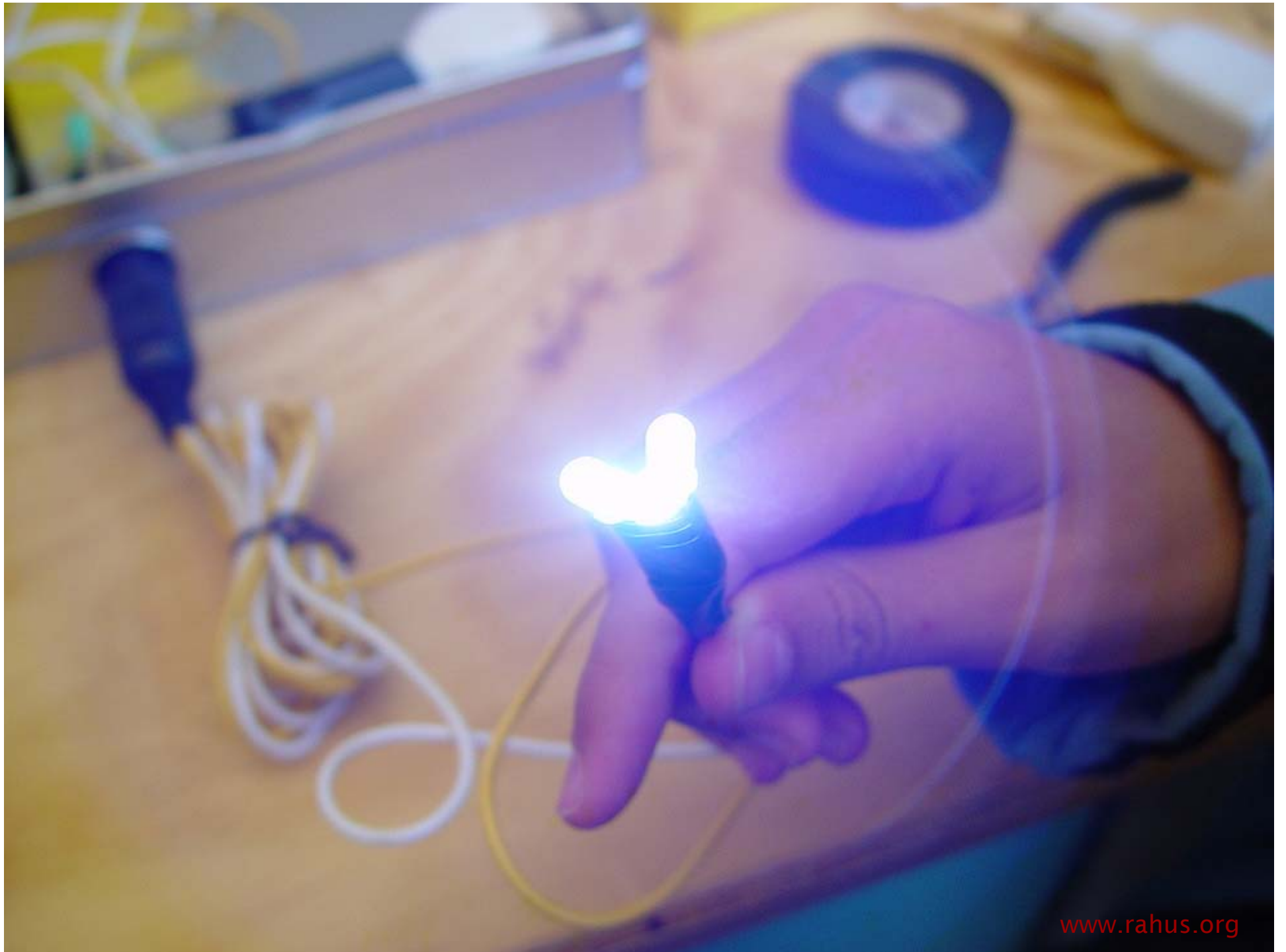


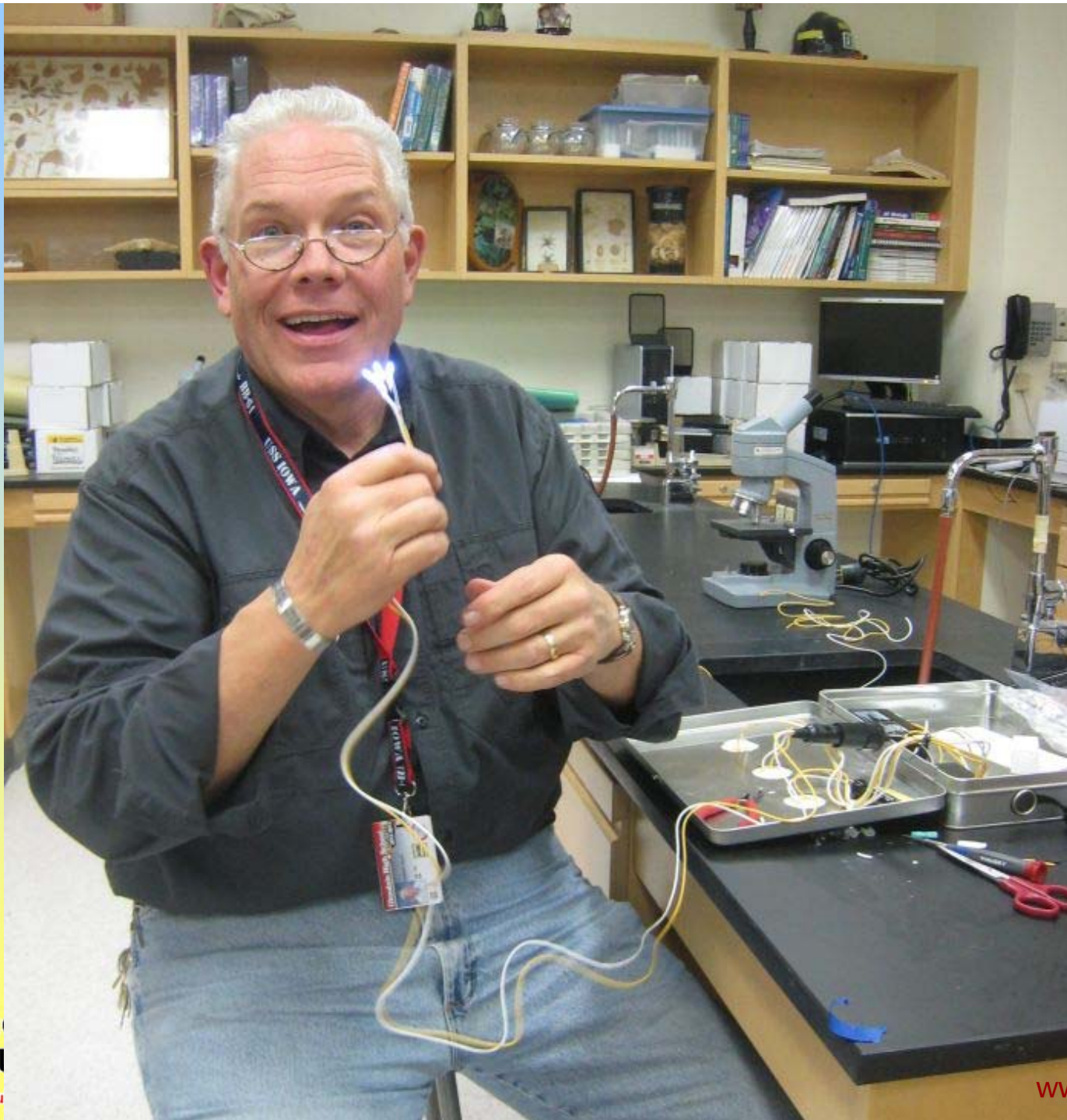








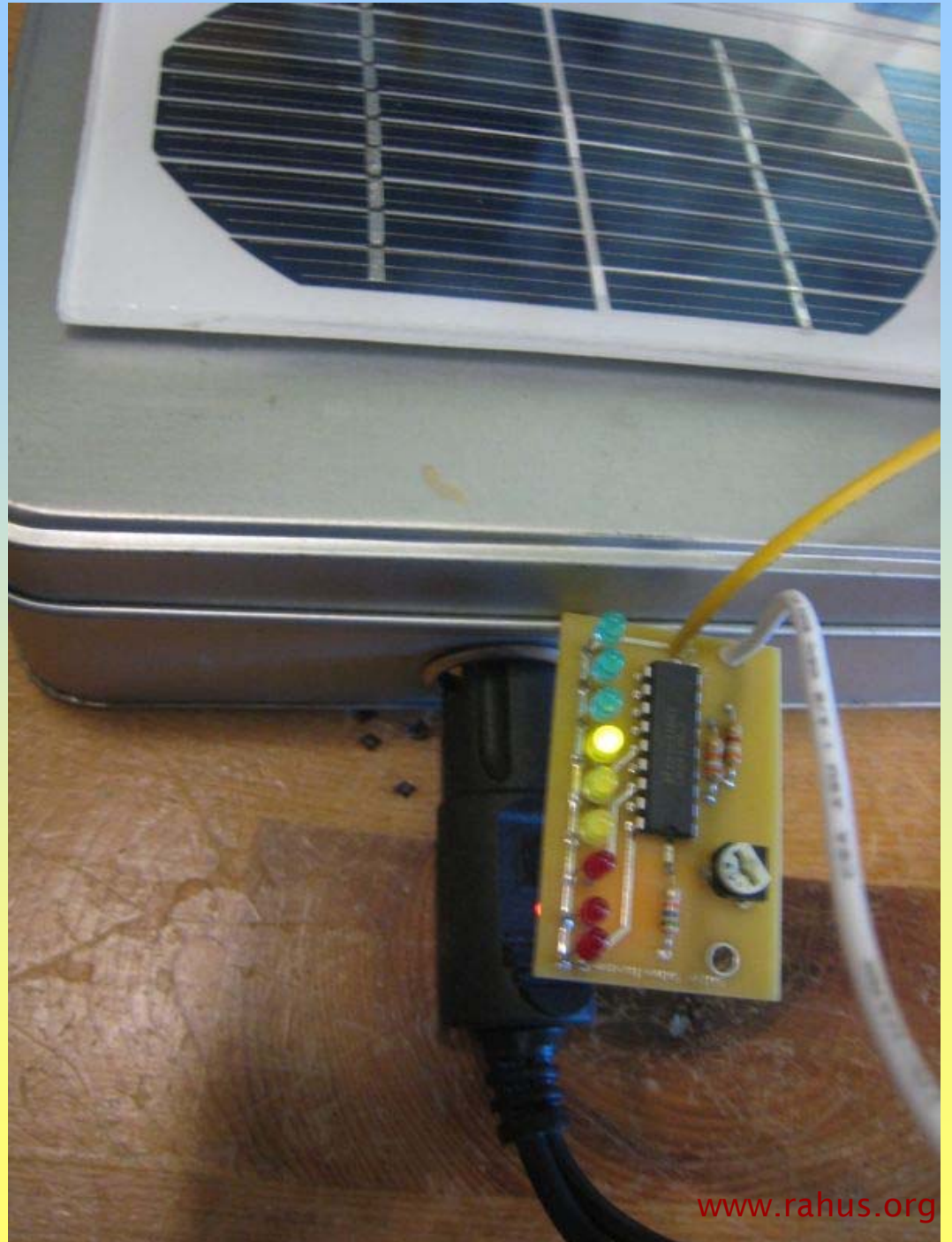








'Fuel' gauge



Solar Lights Brighten the African Night

American Students Design Solar Flashlights as Global Service Project

The Solar Light Design Project was instituted in 2008 by instructor Andrew Kleindolph. Each year, his students at Lick-Wilmerding High School in San Francisco, design and build small solar charged LED lanterns, then donate them to communities where having light at night is a luxury. To date, some 124 lights have been distributed in Ethiopia, Senegal and the Phillipines.

The original light design utilized a single 1 watt LED and provided about 15 to 20 minutes of very bright light per hour of charge. An attached strap allowed it to be carried as a necklace or hung from a wall or tree. Now in it's third design phase, the light features a flashing LED indicating sufficient sun for charging and charges more quickly than previous versions.

Solar charged LED lights provide a safe, clean and renewable alternative to kerosene-based lighting, the current norm. With safe night time lighting, families are able to read and study in the evening, increasing their quality of life.

To learn more about this and other Global Service Projects visit: <http://extrasleepy.com/solarlight.html>



Above: a family in Senegal poses with their solar lanterns.



Above & below: students assemble solar lanterns.



Below: the original design of the solar lanterns.













Solar Decathlon

Santa Clara University Team Places Third in Zero Energy Home Competition



Photo by Chuck Berry

The Santa Clara University Team (top) assembled their award-winning home on the National Mall to compete with teams from 20 other universities.



Despite transport delays and the lack of an architecture department, Santa Clara University placed third overall in the bi-annual Solar Decathlon sponsored by the US Department of Energy. 20 teams from around the world designed, built and demonstrated their solar-powered homes on the Washington D.C. National Mall in September 2007. A new category focused on market viability. SCU demonstrated several promising technologies including a solar thermal driven air conditioner. The hotter it gets outside, the more cooling is available!



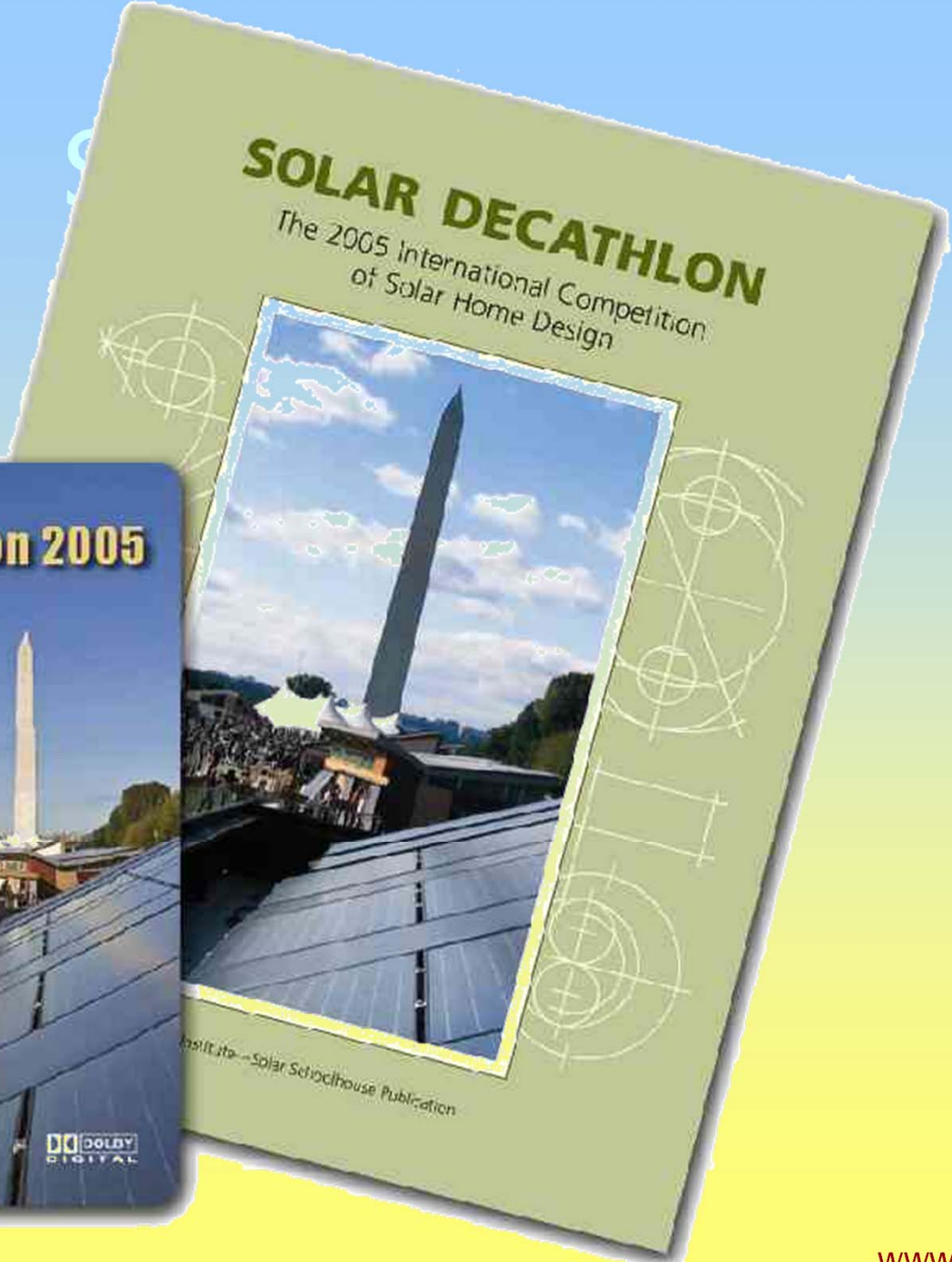
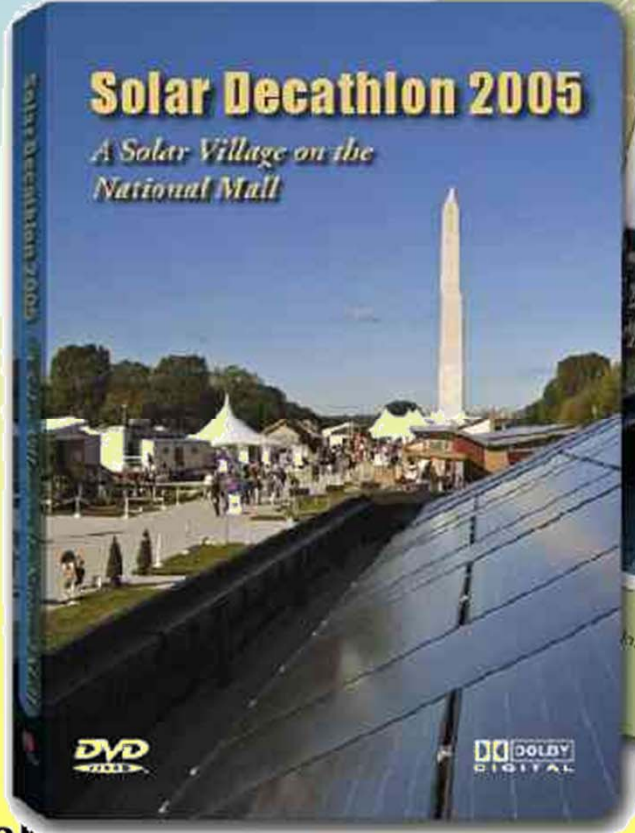
The Santa Clara team used renewable building materials such as fast-growing bamboo (left) and recycled blue jean insulation (below).



College level

- solardecathlon.org
- Engr, arch, construction mgmt, math, communications, business majors





Solar Decathlon Home Design Competition

Twenty Collegiate Teams from Around the World Compete in California

In 2013, California will host the sixth Solar Decathlon in Irvine. This is the first time California will host the U.S.-sponsored competition which has previously been held in Washington, D.C.

Four California teams, along with 16 others from around the world, will design, transport and build 100% solar powered homes, creating a solar village. Owing to its name, the decathlon competition consists of ten contests on which structures will be judged. Student team members come from many fields, majoring in architecture, engineering, construction management, communications and more. They compete by working collaboratively, each within his area of study to demonstrate the variety and creativity possible when building new homes, or retrofitting existing ones.

The Solar Decathlon inspires people of all ages and provides younger students with inspiration for future careers, and paths of study.



Above, members of the Cal Tech team collaborate to design their entry in their repurposed studio.

At right, the 2011 Solar Decathlon entry by the California Institute of Technology and the Southern California Architectural Institute.



To learn more about the Solar Decathlon visit: <http://www.solardecathlon.gov>

Solar Decathlon 2013

Irvine, CA

- Plan on visiting
- October 2013.
- Solardecathlon.gov



Tiny Houses

the Mini Solar Decathlon



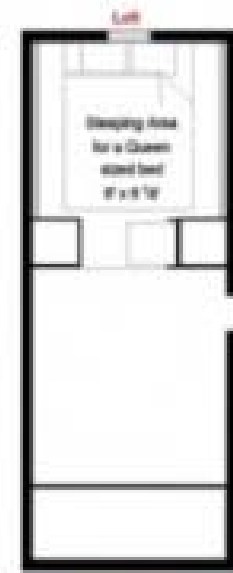
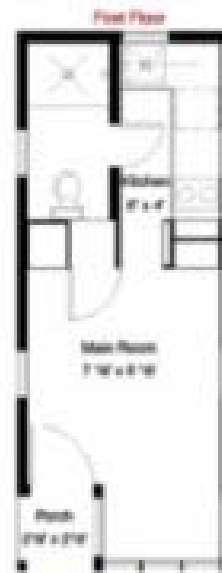
Jay Shaffer, Tiny House Guru

Building and living in Tiny Houses
since 1997.

Located in Graton, CA

Tumbleweedhouses.com





Dimensions

Footprint:	10' x 8'
Trailer Size:	10' x 7'
Floor Height:	13' 0"
Bathroom:	6' x 3'
Ceiling Height:	8' 3"
Loft Height:	3' 0"
Dry weight:	~5000 lbs.
Total Square Feet:	130

note: all dimensions are approximate



Student built Tiny House

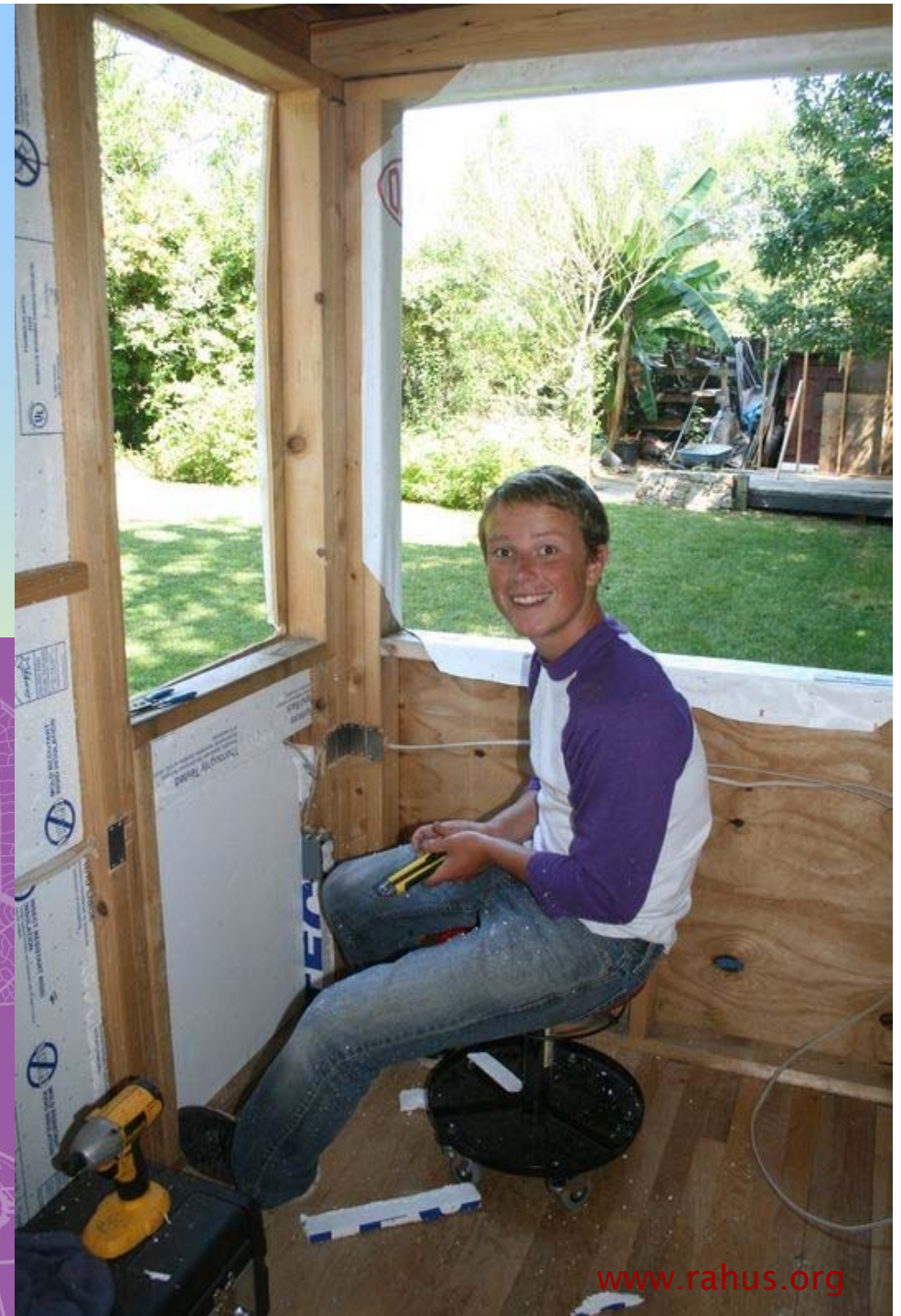
Austin Hay

16 yr old

Northern California

Hopes to bring house to College.

Minihousebuilder.com



Thinking Big, Living Small

Hard work, creativity and a quest for his own space.

16 year-old Austin Hay always knew he wanted to build something, then he got a big idea. As part of a school assignment, Austin began researching what it would take to build a tiny movable house for himself. His research led him to discover the "tiny house movement." Although he just wanted a place to call his own, Austin Hay was demonstrating exactly the ideals of the tiny house trend: use less space, use less energy, drastically cut costs. With money earned as a summer camp counselor, Austin planned to finance and build a 130 square-foot home on a trailer in his parents' Santa Rosa back yard.

He launched his project with construction plans from Tumbleweed Tiny House Co. Tumbleweed founder and tiny house advocate, Jay Shafer agreed to give Austin the plans in return for Austin blogging about the building process. He purchased a double-axle trailer from a used car dealership for \$2,000 and set to work building in July 2010. In an effort to reduce his costs, Austin is using mostly salvage and reclaimed materials. Among other things, the front door, Oak wood flooring, internal paneling, stainless steel sink and electrical wiring were all acquired second hand for little or no cost. Austin is extremely proud that his project has produced just two garbage cans of scrap material that could not be composted or recycled. His estimated final price tag is \$12,000.

Austin has had some help building, but has done the majority of the work himself. He claims that he learned most of what he knows in shop class and by helping his father rebuild the family home after a fire. When complete, Austin's house will have a kitchen with a sink, refrigerator and stove; a bathroom with a shower and composting toilet; a living area with vaulted ceiling; and a loft sleeping area large enough for a full size mattress. Electricity and water are supplied using external hookups similar to the method used by RVs and a stand-alone solar electric system will provide backup power.

Construction has already progressed to the point where Austin is sleeping in his house, although the bathroom is not installed so he uses the facilities in his parents' home. His plan is to take his house with him to college and live wherever he can find the water and electrical hookups.



"My favorite part of my house is that it is mine and has my blood, sweat and hard work put into it."

—Austin Hay



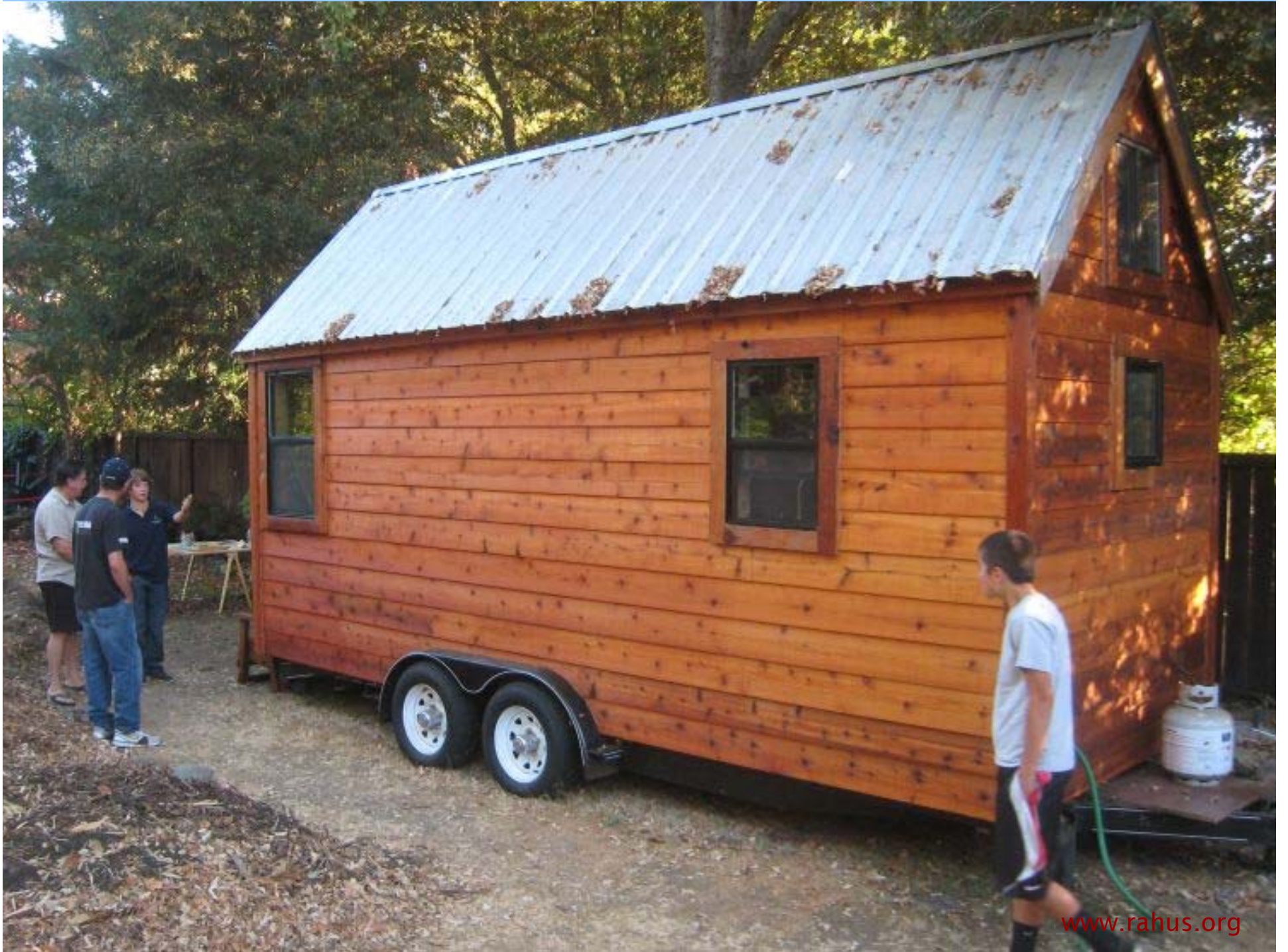
Learn more about the tiny house movement.

Visit: www.tumbleweedhouses.com and www.minihousebuilder.com



House warming Fall '12





interior



Trailer for school tiny house

2012-13: Rancho Cotate High School, Rohnert Park , CA



Analy HS 12/13













Added Value

- Educational outreach
- Small ecological footprint
- Energy efficient
- Net zero energy
- Potential solution for affordable housing.
- doable

Neighbors Helping Neighbors Go Solar

Volunteers Install Solar Systems for Low-Income Homeowners

GRID Alternatives is a nonprofit organization and a licensed solar installer. Their mission is to install solar electric systems exclusively for low-income families, helping to assist struggling families with less-expensive solar power. Since 2004, GRID Alternatives has installed more than 2,700 solar electric systems in California, helping to reduce homeowner electric bills by approximately 75%.

All system design, engineering and equipment is provided by GRID Alternatives. Much of the installation work is done by community volunteers and local job trainees. Each project brings an opportunity for hands-on training and experience to the volunteers. To date more than 11,000 community members have been trained while working in the GRID Alternatives Solar Affordable Housing Program.

In addition to helping families, the solar systems installed by GRID Alternatives will prevent an estimated 233,719 tons of greenhouse gas emissions from being released into the atmosphere over the next 30 years.

To learn more about GRID Alternatives and to volunteer visit: www.gridalternatives.org



Building a Solar Boombox

Sun Charges your Player and the Speakers do the Rest

Building a boombox is a simple project requiring only a pair of recycled speakers, earbuds, and a box. Hook up an MP3 player with a solar charger and you have a Solar Boombox that lets you play your music anywhere.

Play volume is limited by speaker size, boombox design, and MP3 input. Want it louder? Add a Solar powered amplifier to add some extra "boom."

Creativity is not limited. Boomboxes can be built with boxes and speakers of all sizes. Decoration of the device puts your personal touch on your grid-free music player.



To learn more about...
visit: [xxx](http://www.rahus.org)



Add social element

- Educational
- Functional
- Your neighborhood
- Another part of the world

Solar Schoolhouse Curriculum



- Personal context: “Your Solar Home”
- Hands-on, project-oriented
- Standards Based



www.solarschoolhouse.org
www.solarschoolhouse.org

Education Energized
by the Sun

Summer Institute for Educators



For a Better
Tomorrow...

Thanks!

Tor Allen

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