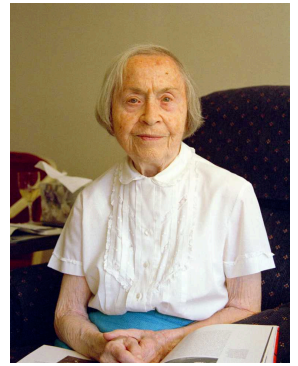
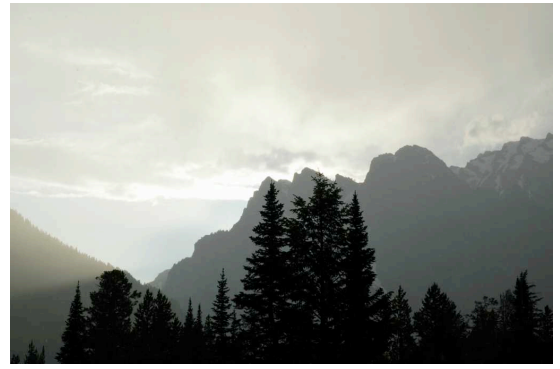
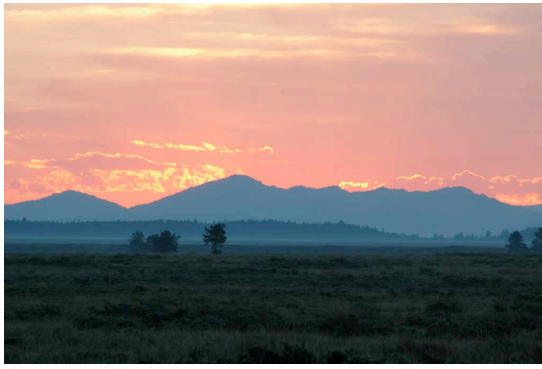


Dave Zucker



Photographs
35 mm and Digital
1999 - 2005

Dave Zucker

dave@dsz123.net | 617.230.0217

Included are projects that highlight
my experience in a variety of fields,
both at work and at play, from software
to engineering to design.

Please feel free to contact me with any questions.

Bluefin Robotics

AUV Lift Hook

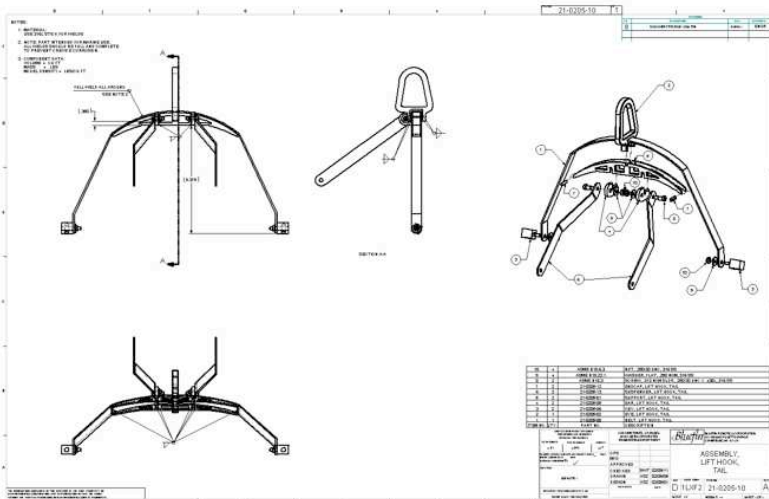
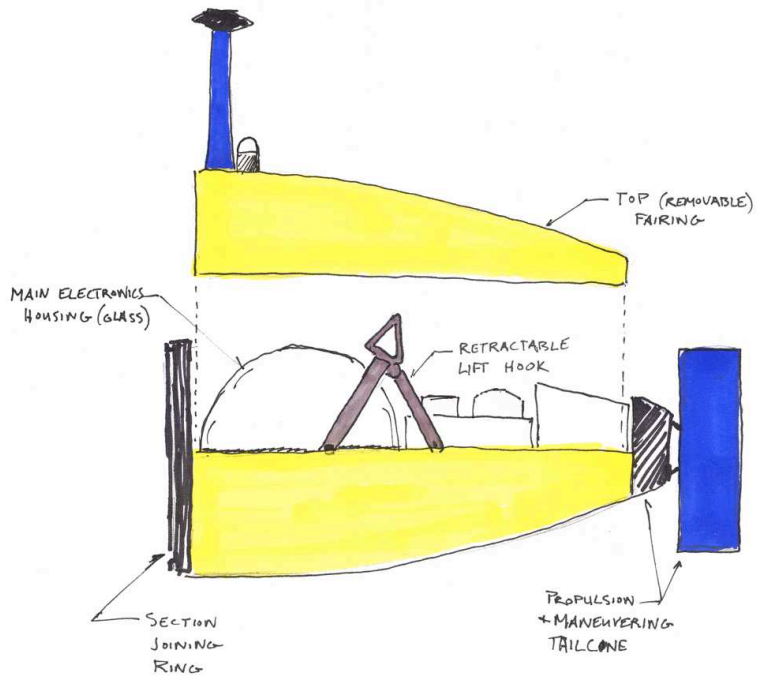
As an intern in the mechanical engineering department, I was given the task of designing a lift hook for one of the autonomous underwater vehicles (AUVs).

I produced a design that satisfied the given requirements:

- ◆ must fit inside AUV and attach to existing structures
- ◆ must not interfere with maintenance procedures
- ◆ must support the weight of the aft vehicle section

The lift hook comprises custom-made and off-the-shelf stainless steel parts. It bolts to a set of 1" thick plastic plates in the vehicle, and hinges out of the way to allow access to the main electronics housing. The eye of the hook protrudes through the top fairing.

I produced shop drawings of the parts (see below), and oversaw assembly and testing (see top right) of the piece.



Vehicle operators reported the design a success, and commented on the ease-of-use.

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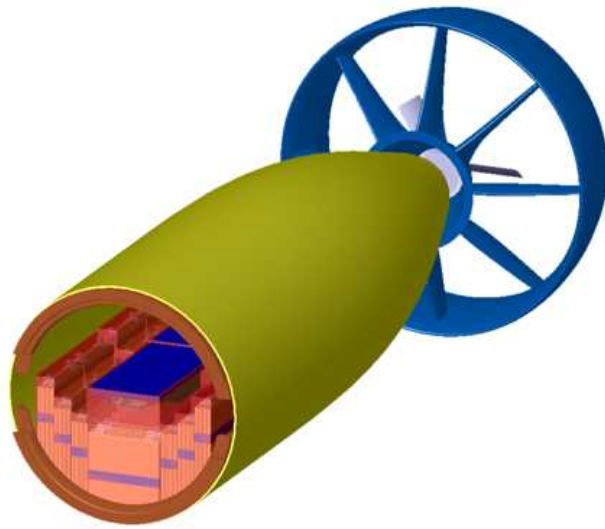
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E

E



Bluefin Robotics

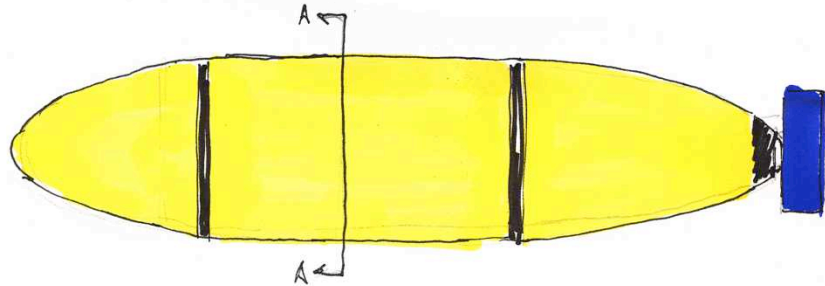
12" Diameter AUV

Bluefin began manufacturing smaller vehicles -- 12" diameter instead of the larger 23" diameter -- and I explored ways to fit batteries in to the new hulls.

D

D

The batteries for the larger vehicles just barely fit into the smaller hull. However, their rectangular cross-section meant the center of buoyancy and center of gravity were nearly in the same place, resulting in an unstable vehicle.

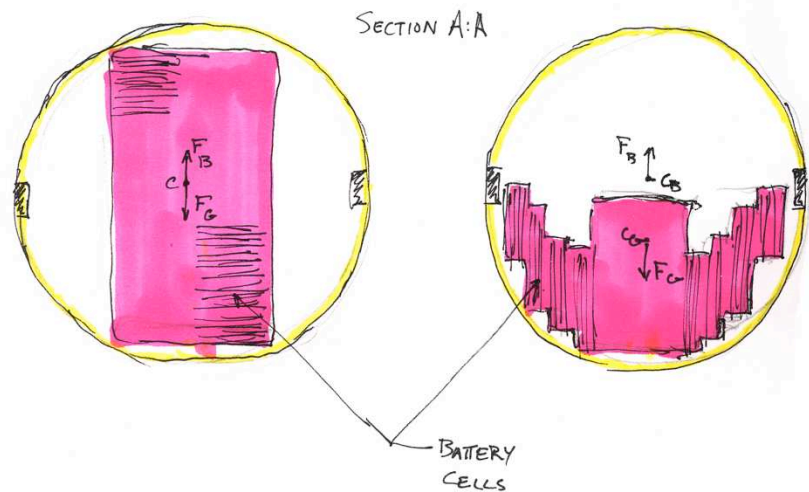


C

C

I proposed a stepped battery that provided for a much more stable AUV.

Ultimately, smaller rectangular batteries were made, but the stepped shape I created was used for other components of the vehicles.



B

B

I also supervised another intern as we designed and created a software tool to create a propeller for the 12" vehicle. This work included interfacing with MIT-written software that generated propeller cross-sections and using SolidWorks macros to import the profiles.

A

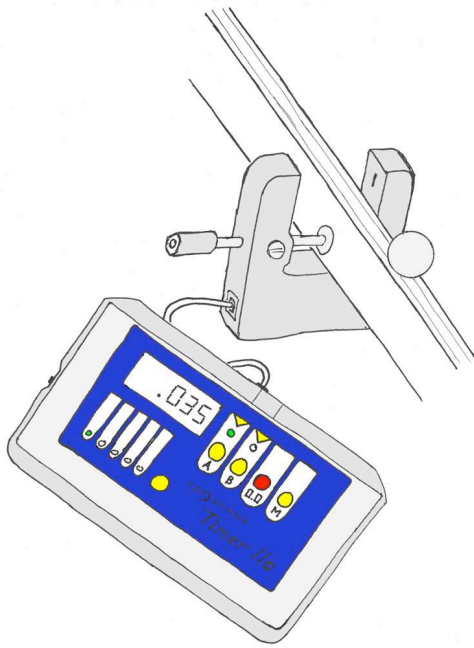
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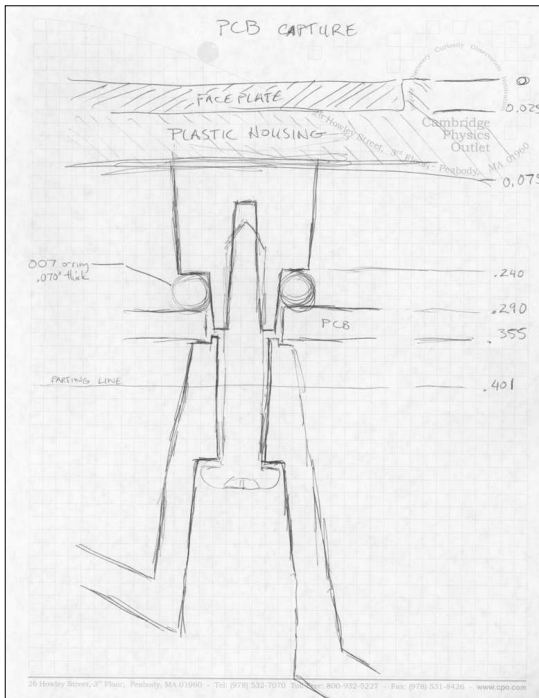
2

1



As shown above, the Timer acts like a stopwatch that can be started and stopped by interrupting an invisible beam of light in a photogate. The apparatus can be used to measure the speed, acceleration, frequency and period of various objects.

The electronics inside weren't changing, but the faceplate and plastic housing were completely new.



CPO Science

Timer IIe

In the spring of 2005, I was asked to redesign one of CPO's top-selling products -- the Timer.



The new design features:

- ◆ a custom injection-molded housing over 50% cheaper than the old design
- ◆ a simple shape and color scheme that doesn't intimidate students (above)
- ◆ a circuit board secured by vibration-free mounts (left)
- ◆ a metal stand for easier viewing
- ◆ a battery door (on the back side) removable by hand

The new design debuted at a recent trade show with excellent reviews from educators.

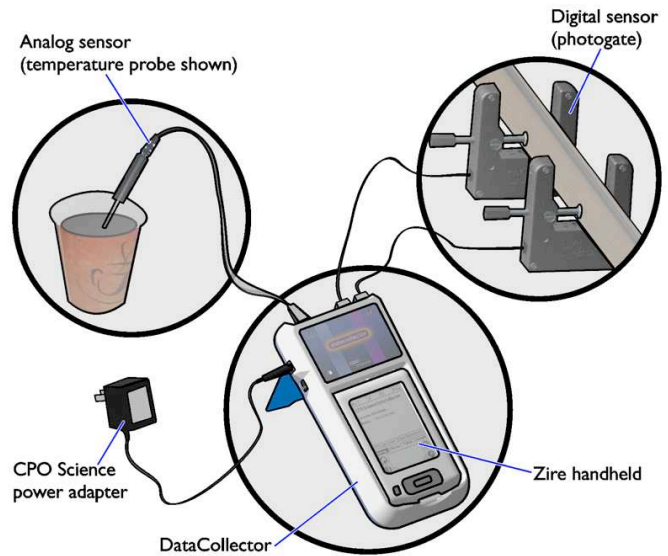
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CPO Science DataCollector

In 2003, CPO decided to expand on the Timer and develop a device that students could use to collect data not just from photogates but also various analog and digital probes. The DataCollector was to record data like temperature, voltage, pH, light transmission, etc. from commercially available sensors.

The DataCollector contains custom-built electronics to interface between the sensors and a Palm Zire 21 handheld computer. After collecting data, students would synchronize the Zire to a PC and use Excel to perform further analysis.

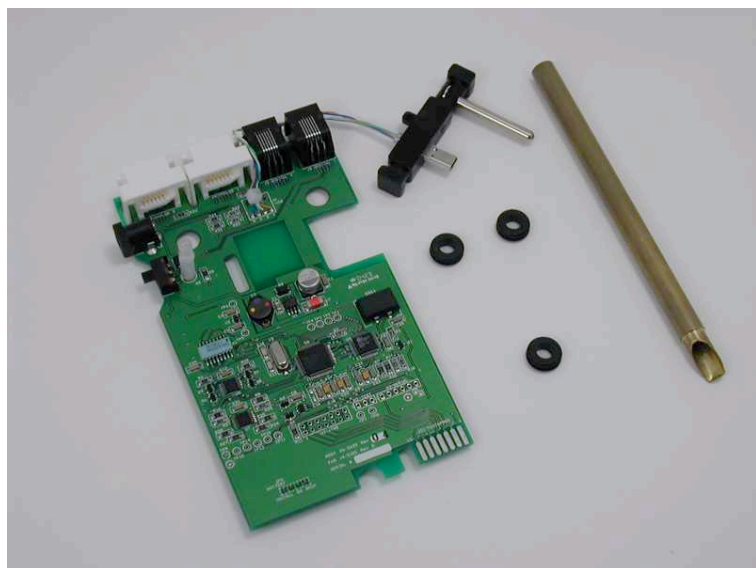
Our team designed the end-user software running on the Zire, and I oversaw the developer writing the software.



I worked with a team to design:

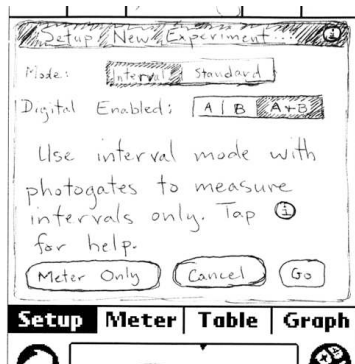
- ◆ the overall case shape
- ◆ detailed solid models of the plastic case and stand
- ◆ the PCB shape and mounting
- ◆ the method for attaching the Zire
- ◆ the software interface on the Zire

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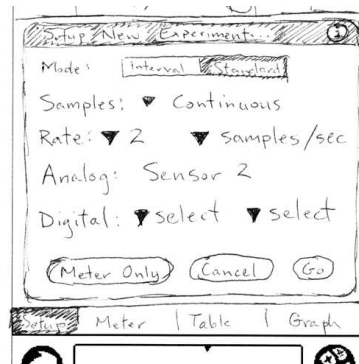


More on the DataCollector

Shown left is the printed circuit board with the donut-shaped rubber bushings that provide vibration isolation. I invented and made a tool (also in the photo) to make inserting the grommets easy for our manufacturing technicians.



5A

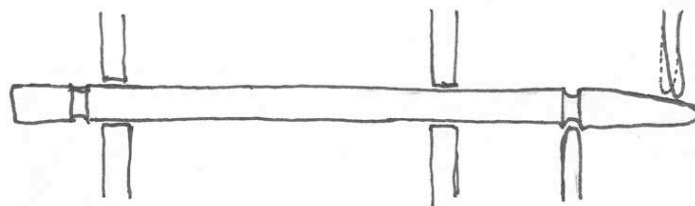


5D

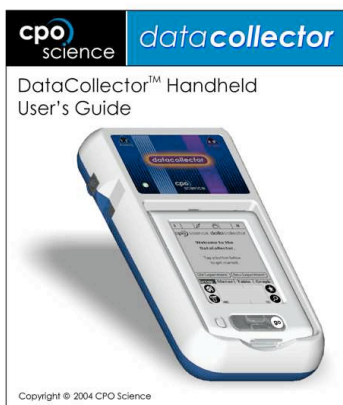
Working with the software developer, teachers, and students, we designed the software interface to include straightforward setup and available context-sensitive help.

I also programmed the synchronization interface (the conduit) used to send data from the Zire handheld to a PC.

There is storage for the plastic Zire stylus in the DataCollector case. I designed a retention mechanism (right) into the case that didn't require any additional parts or costly mold features.



ZIRE STYLUS CAPTURE



I laid out and wrote the User's Guide for the DataCollector using Adobe FrameMaker.

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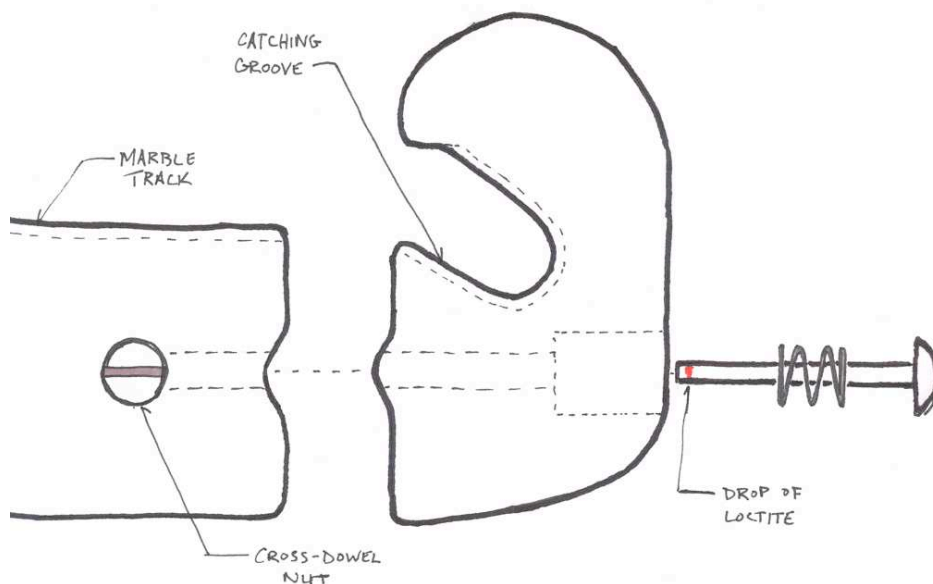
CPO Science

Straight Track

I designed this simple product to allow students to investigate motion due to gravity in conjunction with the Timer or DataCollector.

The 'C'-shaped piece at the end of the track can either catch the marble (as above and right) or swivel out of the way for experiments in projectile motion (shown below).

The sprung mechanism is simple, intuitive, and uses parts common to other CPO products.



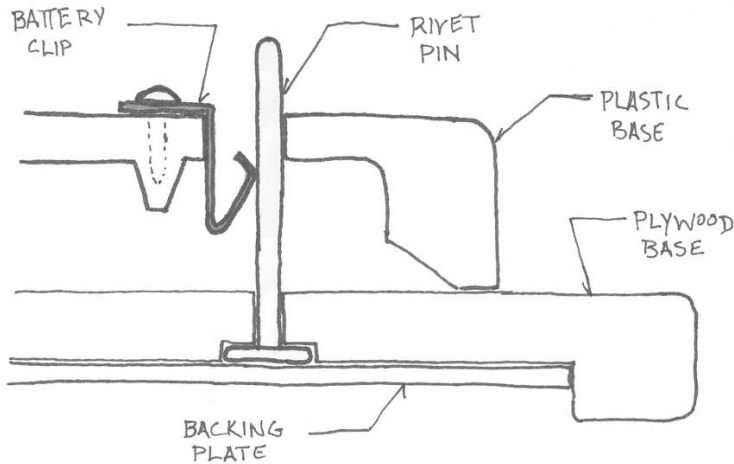
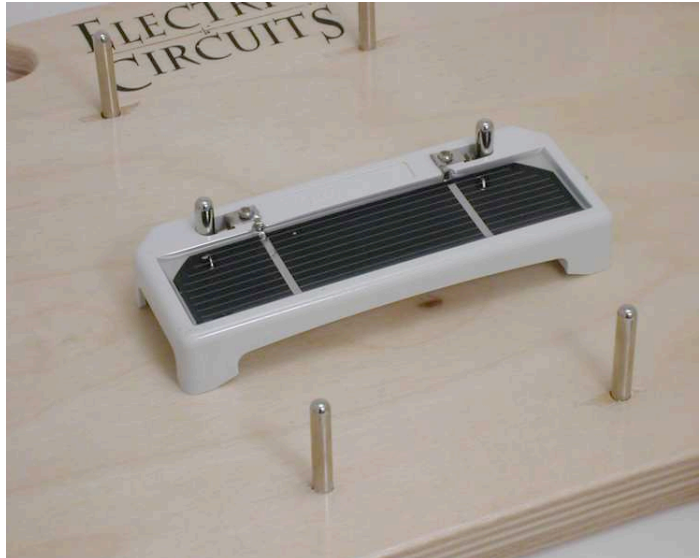
The straight track is manufactured at CPO's factory. I programmed the CNC router to cut the wood parts and worked with production managers to ensure an easy-to-assemble product.

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CPO Science

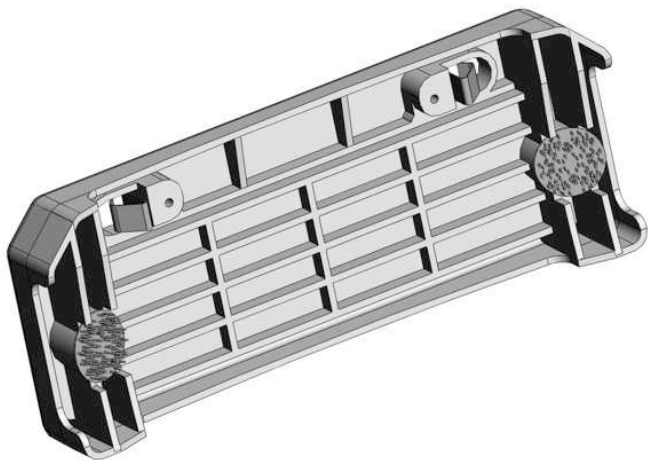
Solar Cell

CPO developed an Earth & Space Science curriculum in 2003 and needed a photovoltaic cell product to accompany it. This cell is used in conjunction with the Electric Circuits product (show right) and on its own.



To make an electrical connection to the zinc plated rivet pins on the Electric Circuits base, I incorporated a battery clip that presses against the rivet. Making the connection is as simple as sliding the solar cell on to the board.

The fragile cell is embedded in a pool of epoxy making it quite resilient. Interestingly, the epoxy does not block much light to the cell and does not reduce the voltage produced.



The back of the part is ribbed to resist flexing and minimize the volume of plastic used. There are pads on the underside with velcro dots used to attach the cell to a globe (for a specific experiment).

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Woodworking



Cribbage Board, mahogany, aluminum, brass and steel, 2004.

I designed and made this for a girlfriend who shared an interest in cribbage. On the back side of the board, a pocket for storing cards and pegs is covered by a steel plate, held in place by magnets.

All woodworking was done with hand-tools, and I turned the pegs on my small metal lathe.

Piano bench, bird's eye maple and walnut, 2005.

A friend commissioned this piece, asking for a unique bench with storage for music under the seat.

The walnut pieces around three sides of the shelf keep the music from falling out and provide contrast to the beautiful and complex grain of the maple.



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SHEET 8 OF 9

Miscellaneous Crafts

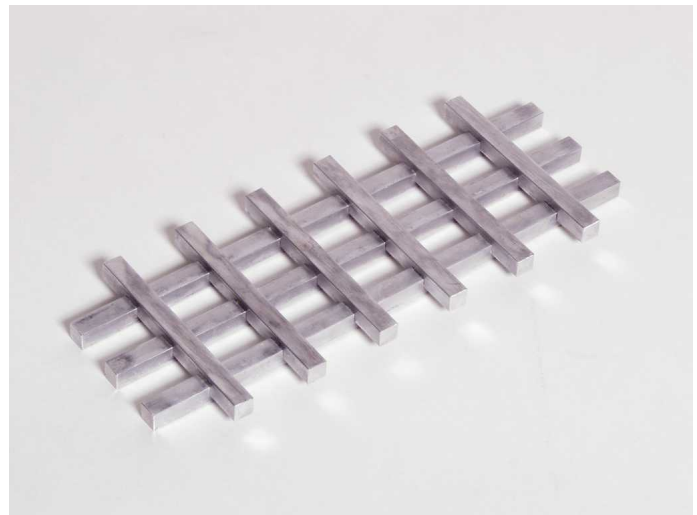


Menorah, copper pipe, fittings and washers, 2004.

I designed and made this in an afternoon. I was inspired by the pipe fittings at the hardware store.

Trivet, aluminum (no fasteners), 2002.

Though also functional, I devised this project to teach myself how to use the vertical milling machine at Bluefin. The bars are held together by friction-fit lap joints.



Scarf, wool, 2001.

I designed the pattern and allowed for the variegated yarn by using different skeins on alternating rows.



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