

WHAT'S NEW IN SOLAR WATER HEATING, PAGE 18

# MACHINE DESIGN

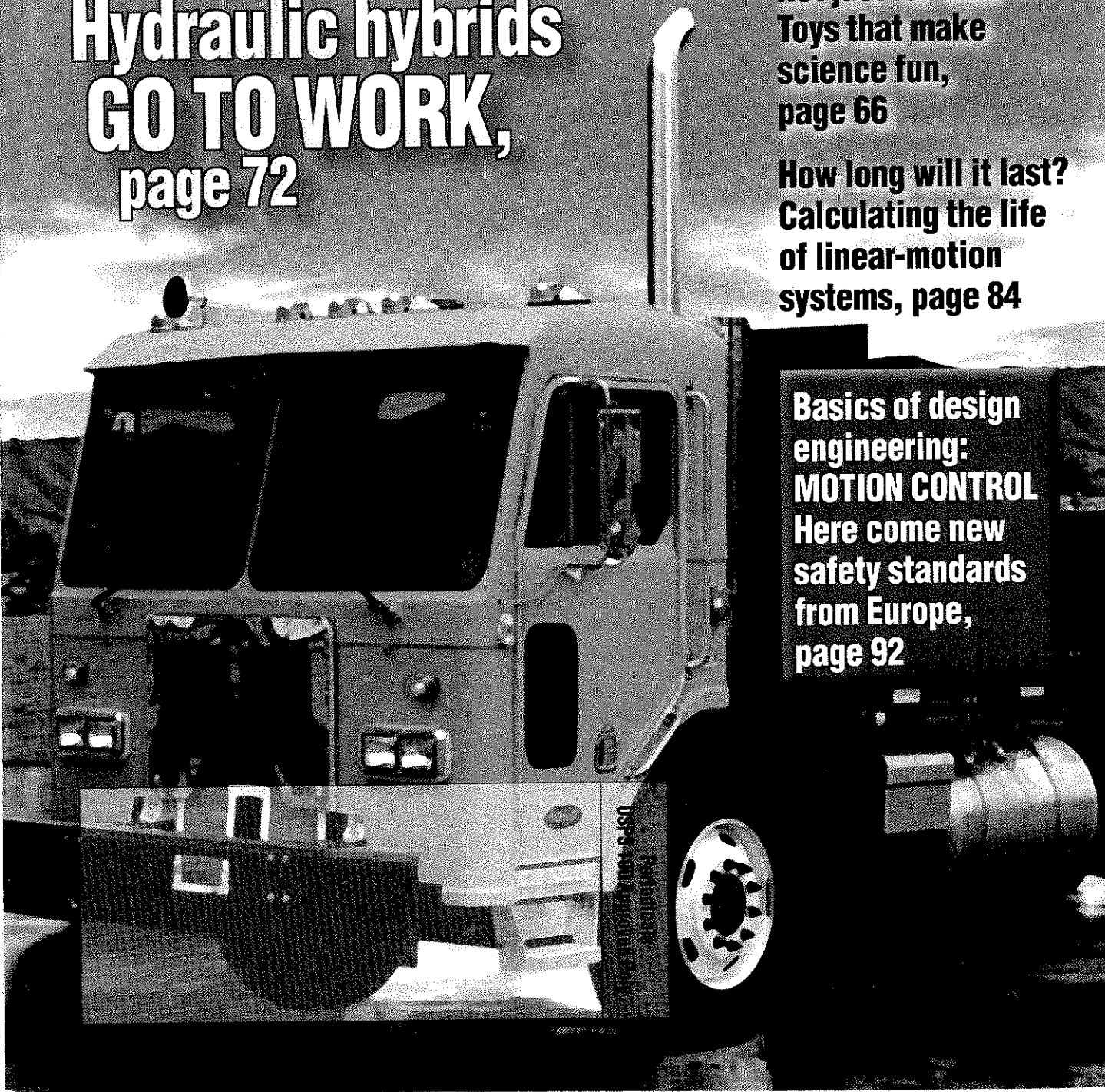
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# Toys that teach

**There are a lot of educational and engineering toys on the shelves. Here are some that caught the attention of our editors.**

## **MACHINE DESIGN Staff**

One of the sneakiest ways to get kids interested in a topic, whether it's engineering or astronomy, is to give them an educational toy or tool that helps them explore that subject. Just don't tell them it's educational.

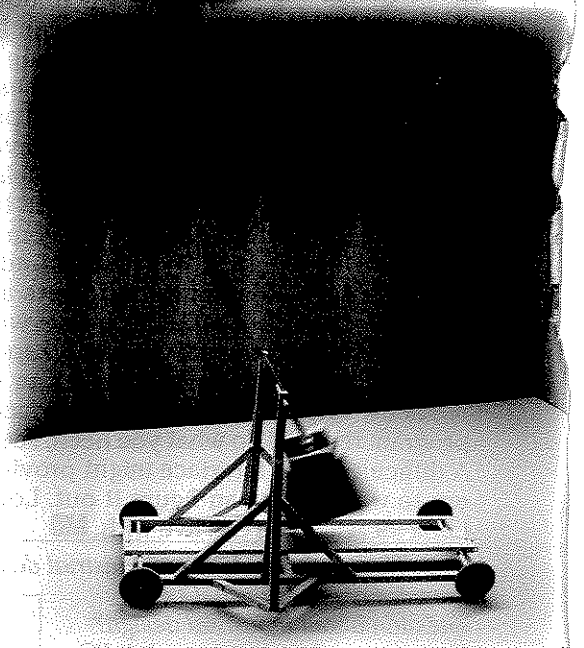
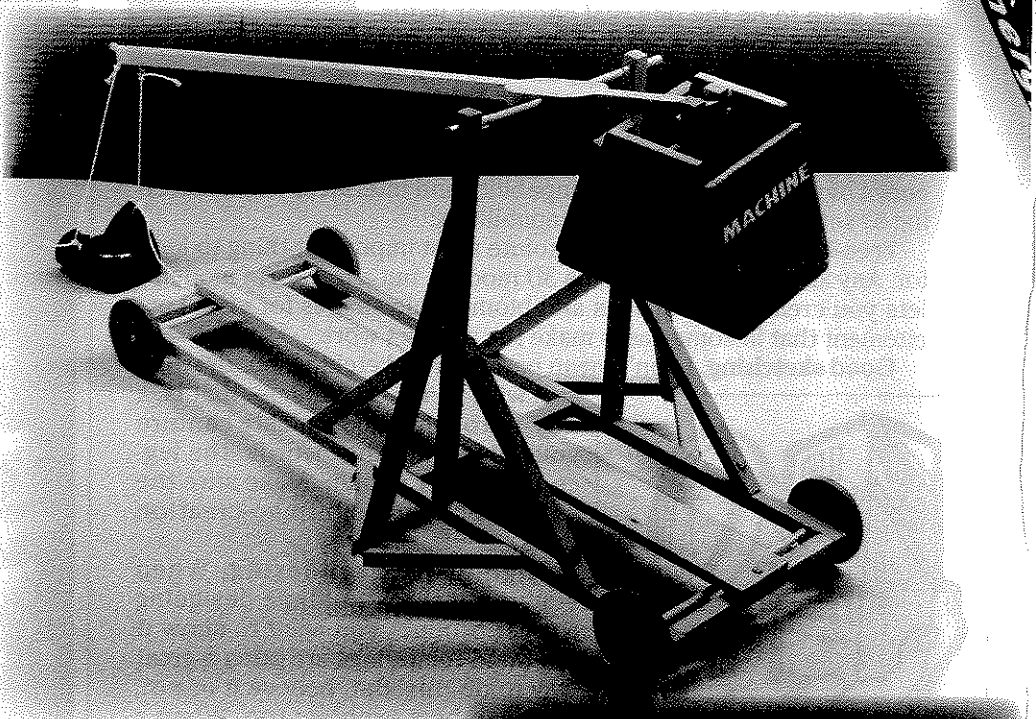
Here are some toys and kits that might kickstart a youngster's interest in engineering and science.

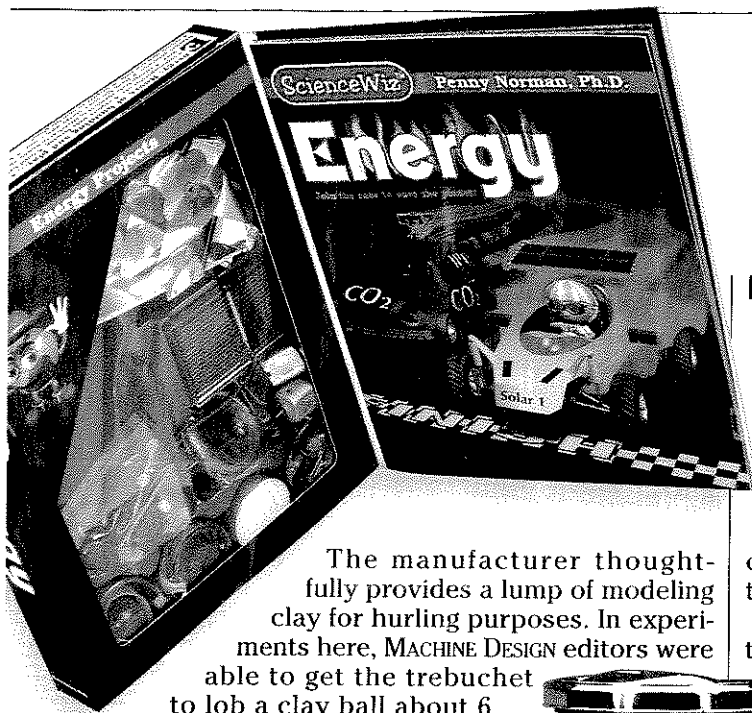
## **READY, AIM, FIRE THAT TREBUCHET**

Many readers have probably found themselves killing a few minutes with an online trebuchet game devised by the engineering catalog site *Globalspec*. But why diddle with a simulation when you can build and operate a real trebuchet, or at least a scaled-down version of a 13th Century design? That's the opportunity you have with this wooden kit.

The trebuchet is all wood and goes together with dowel pegs

and glue. It takes about two evenings to assemble because of glue drying time. The resulting model stands about a foot high in the ready-to-fire position. You add weight to the counterweight box to vary the trajectory of the load hurled in the sling then fire away. (We found that socket wrench heads worked well as weights.)





The manufacturer thoughtfully provides a lump of modeling clay for hurling purposes. In experiments here, MACHINE DESIGN editors were able to get the trebuchet to lob a clay ball about 6 to 8 ft. Our only problem was with a swing-arm linkage that the manufacturer had drilled slightly cock-eyed. It didn't affect the trebuchet's hurling, but it was visibly off-kilter.

The kit, along with other siege engines, is available from **Pathfinders Design and Technology** of British Columbia ([www.pathfindersdesignandtechnology.com](http://www.pathfindersdesignandtechnology.com)) for about \$34.

### POWER TO THE (LITTLE) PEOPLE.

Reportedly a favorite with the National Renewable Energy Lab, ScienceWiz – Energy lets children eight and older learn what energy is, how it's used, and explore various types including solar and magnetic, as well kinetic and potential energy. The kit includes all the materials needed for 22 projects. They can build solar, supercapacitor, and electric cars; spin a flywheel generator; build a battery to light an LED; and perform kinetic chain reactions. In addition, the kit teaches children about choices they face in the future: Where energy will come from, how to make the best use of our resources, and what's best for the environment and health. There's also an instruction book authored by a Ph.D. in biophysics. Other books and kits in the ScienceWiz Series include Light, Motion, Inventions, Chemistry, Magnetism, and Electricity. List price is \$19.95.

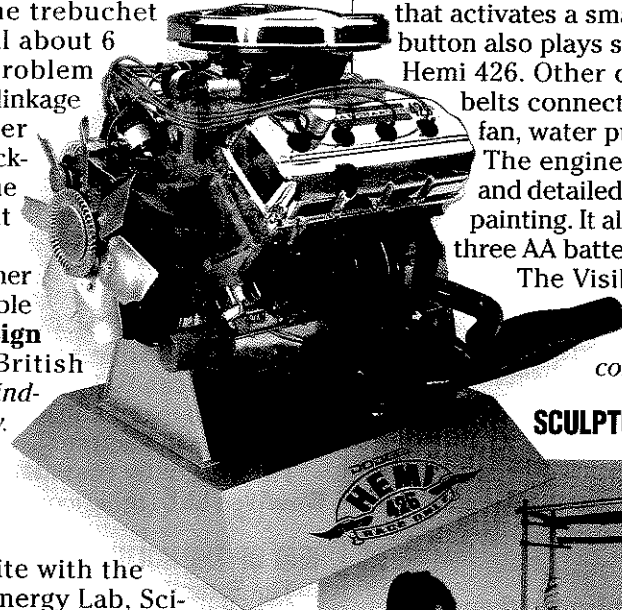
The kit comes from **Norman & Globus Inc.** ([sciencewiz.com](http://sciencewiz.com)), and costs about \$20.

### MUSCLE POWER ROARS TO LIFE

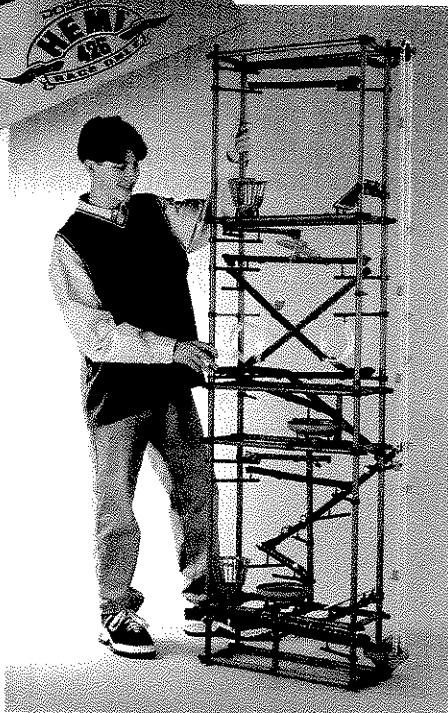
The classic Visible V8 model many of us grew up lusting for has got a racy cousin, the Visible Dodge Hemi 426. The quarter-scale model of the engine that powered Dodge Challengers, Chargers, and Super Bees includes more than 300 clear, silver, and chrome parts, including the fuel pump, alternator, dip stick, and dual carburetors. Kids 12 and up will learn the basics of the internal combustion engine while putting the plastic model together,

The clear parts let you see the crankshaft, pistons, cam, and valves move when you push a button that activates a small electric motor. Pushing the button also plays sound recorded from an actual Hemi 426. Other details include fuel lines and belts connecting moving parts such as the fan, water pump, alternator, and flywheel. The engine comes with a display stand and detailed instructions for assembly and painting. It also requires modeling glue and three AA batteries (not included).

The Visible Racing Hemi costs about \$100 from the **Testors Corp.**, Rockford, Ill. ([www.testors.com](http://www.testors.com)), (800) 962-6654.



### SCULPTURE OR RUBE GOLDBERG?



Though it's called Chaos Tower, this construction set is actually used to build controlled Rube Goldberg-type devices. You might've seen such contraptions in one of the 15 museums that have intricate Chaos Tower displays. But the kit is said to be simple enough for kids nine years and older. It includes 670 plastic pieces, all with lifetime warranties. The pieces snap to-

gether in structures that can be over 5-ft wide or 6.5-ft tall or have footprints as small as 10 × 22 in.

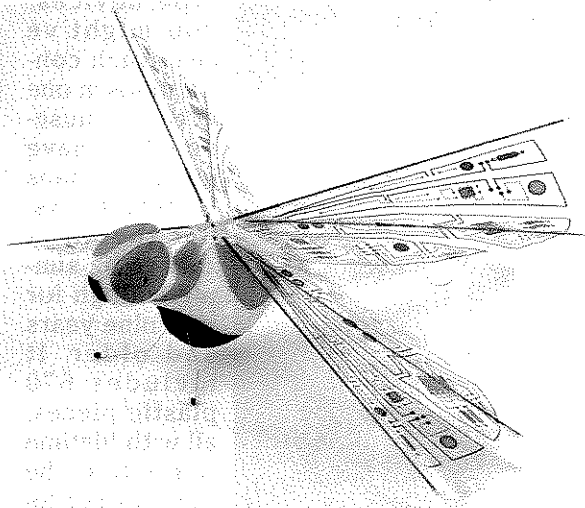
A motor-driven chain lifts balls to the top and they roll down through one or more courses of chutes made up of slides, funnels, catch baskets, trampolines, and a host of other mechanisms. (Once addicted, players can order additional components, including a ball trap, xylophone key and vortex sets, and all Chaos Tower kits work with each other, even older versions.) Another cool feature is that it can be easily moved, even by children. So there's no need to tear down complete or partially built masterpieces just because mom and dad want to throw a party.

The kit, which has won numerous awards, including Toy of the Year for six years, comes with a CD chock full of activities appropriate for grades 3 through 12. According to Jim Robarth, the Tower's inventor, "These hands-on activities teach younger children the vocabulary of physics while older children can apply math skills in a sophisticated manner. And children can become kinetic artists while learning the cause and effect of physics and gravity." The toy is powered by an ac adapter, because, as the company says, "no one likes batteries."

Chaos Tower costs about \$120 from **Chaos Toys** ([www.chaostoy.com](http://www.chaostoy.com)).

**CATCH A BUZZ: THE REMOTE-CONTROLLED FLYING INSECT**

The world's first radio-controlled flying insect, the Flytech Dragonfly, lets children eight and up



command a wing-flapping ornithopter as it flutters, soars, dive bombs, glides, and hovers for landings. The dual-wing Dragonfly can be used indoors or outside as it flies at up to 18 mph. The remote control lets users adjust wing speed and tail-rotor speed at ranges up to 50 ft. The remote also serves as the charging base for the two lithium-polymer batteries that power the Dragonfly. (A 20-min recharge lets the device fly for 10 min.) The control also takes six AA batteries.

LED eyes keep you apprised of the battery's condition by blinking, pulsing, or shining clear and bright. The flexible body and wings are light and strong, and can "take a lot of punishment" and not damage too many household decorations, according to the manufacturer.

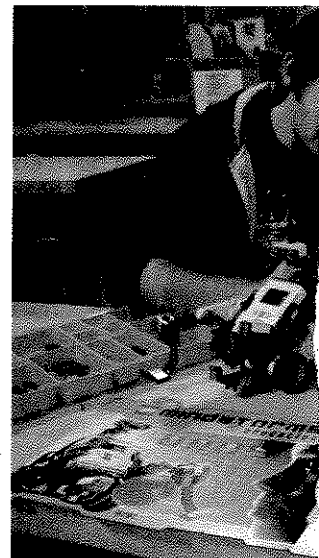
The Dragonfly costs about \$50 and comes from **WowWee Ltd.** ([www.wowwee.com](http://www.wowwee.com)), (800) 310-3033.

**HEAT UP THE HOLIDAYS IN YOUR SOLAR WORKSHOP**

The Solar Workshop lets kids explore solar energy and photovoltaic cells and learn how they convert light to electricity. It also lets them delve into how motors and other mechanical devices can best make use of solar-generated electricity.

The kit's 320 parts can build 12 models, including a solar-powered tractor, truck, treaded vehicle, car, elevator, drawbridge, fan, and airplane, and conduct 30 experiments using those models. And all parts work with other Physics kits. A 64-page booklet offers illustrated instructions.

The Physics Solar Workshop costs about \$60 from **Thames & Kosmos LLC.**, (401) 683-5535, ([www.thamesandkosmos.com](http://www.thamesandkosmos.com))



## BUILD YOUR OWN ROBOT

The Mindstorms NXT kit lets you build a robot out of snap-together elements. An Intelligent Brick with a 32-bit microprocessor serves as the brain, while three servomotors and sound, touch, light, and ultrasonic sensors let the robot walk, talk, and see. The kit includes 519 parts such as axles, beams, gears, and connector pegs for a robot that can amble, cavort, wobble, quake, and otherwise move in fantastic and imaginative ways. Other parts let kids create features such as eyes, hats, mouths, beaks, tails, and arms. The kit includes easy-to-use PC and Mac-compatible programming software and should help children learn basic software and engineering principles.

Mindstorm NXT costs about \$250 and is for kids 10 and up. It's from **Lego** ([www.lego.com](http://www.lego.com)), (860) 749-2291.

## FINALLY, A FUEL-CELL-POWERED CAR

With the Fuel Cell Car and Experiment Kit, children 12 years and older can build a model car that runs on distilled water and sunlight. The kit contains all you need to build the 8-in.-long car, including chassis, wheels, wires, motor,

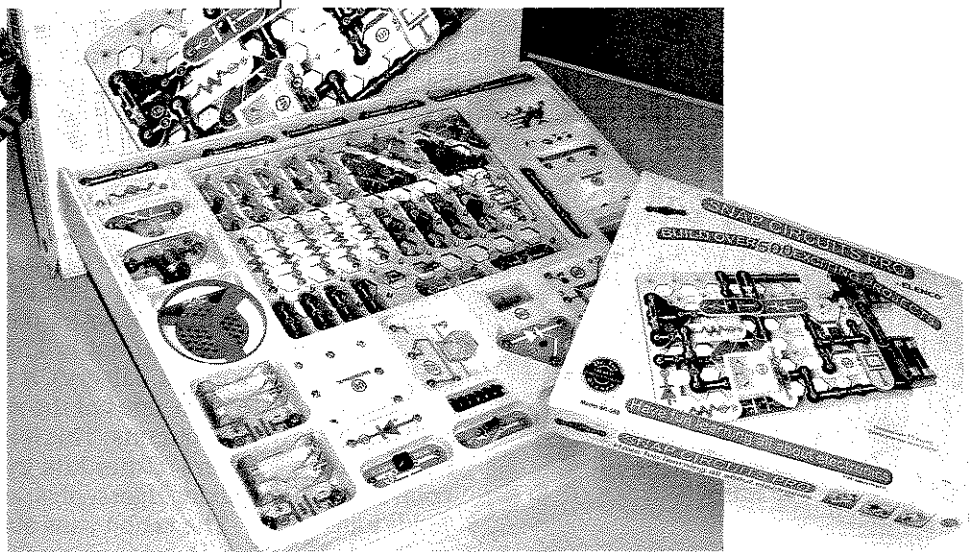
electronics, solar panel, fuel tank, syringe, and fuel cell. After putting the car together and adding water, just shine a 75-W lamp on the solar cell or put it in the sun, and you're ready to go. The see-through body lets you see hydrogen being generated.

The kit also includes a 96-page, full-color manual with over 30 experiments that help children (and adults) understand fuel cells. Experiments let users study water decomposition in the fuel cell, the influence of light on electrolysis, and the qualities of a solar cell.

The kit costs about \$150 from **Thames & Kosmos LLC** ([thamesandkosmos.com](http://thamesandkosmos.com)), (401) 683-5535.

## CIRCUITS 101 MADE FUN

The Snap Circuits Pro set for kids eight and older builds FM and AM radios, digital voice recorders, burglar alarms, and doorbells. It contains over 75 parts,





min charge gives about 5 min of flying time.

There's also an active PalmZ community on the Web, with lots of videos of the plane posted on *YouTube*, *Metacafe*, and elsewhere. One reason for its popularity is that the infrared remote works over any of three channels. This lets you fly PalmZ planes in formation, hold races, and so forth. It also seems PalmZ is a popular platform for mods among R/C enthusiasts. For more info, check out

which are mounted on plastic connectors that snap together, so you don't need any tools or soldering irons (but you will need four AA batteries). Parts include a voice-recording IC, FM-radio module, analog meter, transformer, relay, and seven-segment LED display. Illustrated instructions show you how to build over 500 projects, plus 73 experiments you can do using a PC.

The Snap Circuit Pro Series costs about \$80 from **Elenco** ([www.elenco.com](http://www.elenco.com)), (847) 541-3800.

**PALM-SIZED FLYER**

The Silverlit PalmZ R/C flying plane, with its 8-in. wingspan and 7-in. length, is small enough to take off from your hand. And its EPP foam components make the wings and fuselage nearly unbreakable under ordinary use, so it's perfect for kids of all ages. You can crash the plane numerous times without damaging it or the items it happens to run into. (Nevertheless, the manufacturer thoughtfully provides a spare rudder and some repair tape.)

The PalmZ carries a rechargeable lithium battery. It is recharged by hooking it into the remote control which holds four AA cells. A 15-

reviews of the plane at [geardiary.com](http://geardiary.com) and good discussions at [rcuniverse.com](http://rcuniverse.com) and [rc-groups.com](http://rc-groups.com).

The PalmZ is for ages eight and up. It goes for about \$40 from **Silverlit Ltd.** ([www.silverlit.com](http://www.silverlit.com)).

**ROBO RABBIT.**

The Mechanical Rabbit robot kit helps children over 10-

years old learn about motors, gears, and linkages while having fun. A colored but clear body and gearbox let them see the inner workings. The semitransparent bright-pink body and gear box are also relatively easy to put together. The only tool you should need is a screwdriver. Inside, motor rpms are slowed in a 16.6:1 gearbox and transferred to the legs via crank plates. Rear legs kick the robot forward in a hopping motion just like the real McCoy. Changing the link rod connection with the crank lets kids choose between four hopping speeds. The rabbit hops best on flat, smooth surfaces.

The robot is powered by an AAA battery (not included), which helps keep this agile bunny light on its feet. For state-of-the-warren hopping, the motor and battery case are in the front of the body, so most of the weight rests on the front legs. Rollers on the front paws let the rabbit handle the extra load. The rabbit bot is 4.5-in. long, and weighs only 3 oz. (without battery). It comes with guides that attach to both sides of the rabbit so it can be used on Mini 4WD circuits. This lets kids of all ages race it against others. Other kits in the Robocraft Series include walking tigers, pigs, and giraffes, and ostriches.

The rabbit runs about \$16 from **Tamiya America Inc.** ([tamiyausa.com](http://tamiyausa.com)), (800) 826-4922. **MD**

