

# ROBOTICS RESOURCES

*Tune in each month for a heads-up on where to get all of your "robotics resources" for the best prices!*



## ***Getting Kids into Robotics***

**R**obots and kids go together like bacon and eggs, peaches and cream, resistors and capacitors. Thanks to low-cost construction kits – and not to mention popular movies that glamorize automatons – more and more children are exploring the world of robots.

And that's not a bad thing. Robotics encompasses multiple disciplines, including mechanical engineering, software programming, electronics, even human psychology. In all, it's a great field to be interested in, because there are so many options for further study and exploration.

In this column, we'll review some of the kits, books, and other material available that are either expressly designed to motivate children in learning about robotics, or are readily adaptable to a child-age audience because of their design, support documentation, or other features.

### **Let's Make a Robot!**

Building a robot can be a time-consuming affair, requiring hours of sawing, drilling, grinding, soldering, and programming. Many kids simply don't have the attention span to wait that long before seeing results, so for the typical child a ready-to-go kit is the best option. Ideally, the kit should include all the mechanical and electronic components to make a functional robot capable of at least

rudimentary actions, such as reacting to light or following a black line on a white piece of paper. Fortunately, there are many such kits available, at prices starting at about \$20. Of course, the more sophisticated the robot and its abilities, the more the robot will cost.

At the lower end of the scale is the single-function kit, requiring at least mechanical assembly. By "single-function," it means just that. These 'bots are made to do one thing and encompass no intelligence or programming. For example, the robot may merely react to sound, or follow a line. The OWI-9910 Weasel is an example. Two photo detectors on the underside of the robot detect a line drawn on the ground and two touch switches on its body give it a simple obstacle avoidance mechanism.

Some robot kits are designed for remote control by a human. The least expensive of this breed uses a wired tether. You steer the robot by flicking a set of switches. For instance, there's the OWI-9280 Soccer Pro kit. It's a simple wheel-based vehicle with a two switch wired remote. With a couple of these, your child and a friend can play miniature robotic soccer, pushing a ball around a small field.

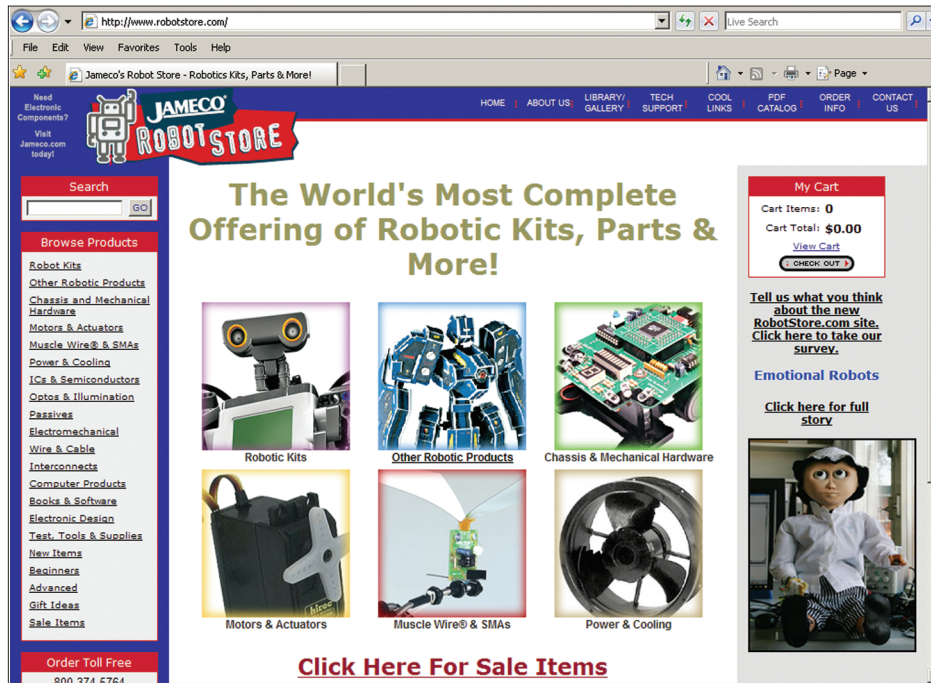
There are many other single-function robot kits, and the OWI product line is perhaps the most complete in this category. The kits

are available from several retailers (a couple of the main online stores are listed in the Sources), and are grouped by skill level. These basic mechanical-only kits comprise the least expensive of the lot. Next, are the kits that require electronics of some kind come with complete and ready-to-go circuit boards, though a few models are available with the electronics also in kit form. These are handy for learning about soldering and electronics construction.

For purely mechanical construction, there's the robotics and educational products from Tamiya. Most of these are not found in local area hobby stores, but are common enough online, especially from robotics-specific retailers. We provide a short list of sources for these, as well.

Next up the ladder are fully programmable kits (typical price range is \$120-\$175), where you develop and download a script for the robot's action from a personal computer. Once programmed, the robot is self-sufficient and autonomous. Probably the most well-known kit of this type is the Parallax BOE-Bot (\$160), which consists of a metal chassis and hardware, twin servo motors and wheels, and an already-assembled electronics board (the BOE Board), complete with the Parallax BASIC Stamp microcontroller.

The BOE Board is connected to a host computer via serial or USB.



The Jameco Robot Store sells a number of ready-to-go and kit products ideal for student use.

The programming environment is included free of charge, and there are plenty of coding examples to get you started. The BOE-Bot documentation is extensive, and the nature of the programming language used by the BASIC Stamp makes it well-suited for middle school and higher students.

Other options exist, of course. A relative newcomer is the OOBug, from the makers of the OOPic microcontroller. The OOBug (\$160) consists of an assembled circuit board upon which motors and a clear plastic body are mounted. Assembly time is under 15 minutes. Whereas optical sensors for such tasks as line following or object detection are often extra on other programmable kits, they're standard on the OOBug, and ready for use.

Like the BOE-Bot, the OOBug is programmed via a computer link (specifically a USB cable), and the programming environment is included free of charge. The OOBug further differentiates itself by supporting music, sound, and speech effects, as well as "social" robotics, where robots may be programmed to interact with one another, as well

as the environment.

Finally, for lack of a better term, "learning system" kits encompass those that provide more than one possible robot design. The LEGO Mindstorms NXT and Vex kits are excellent examples. At the core of the kit is a self-contained microcontroller module, which provides for programming the robot. Connection to a host PC is done via serial, USB, and — in the case of older model Mindstorms kits — infrared link. Motors and sensors connect to the microcontroller module in various arrangements, giving flexibility in design.

Then, using plastic or metal parts, you build the robot chassis, either by snapping pieces together (as with LEGO) or assembling the parts using metal or plastic fasteners. In either case, you can completely disassemble your creation so you can reuse all the components again. Learning system kits encourage a greater degree of design experimentation, and are particularly well-suited for kids who are mechanically inclined.

Other learning system kits include Fischertechnik, K-NEX,

Capsela, and Erector.

## Sources

### Construction Toys

[www.constructiontoys.com](http://www.constructiontoys.com)

Online and local retailer of construction toys. These toys are available both online and in the retail store: Capsela; Eitech; Erector; Fischertechnik; Geofix; Geomag; K'NEX; LEGO Dacta; Roger's Connection; Rhomblocks; Rokenbok; Zome System.

### e-Hobbyland

[e-hobbyland.com](http://e-hobbyland.com)

Well-established retail and online seller of all types of toys.

### Elenco Electronics

[www.elenco.com](http://www.elenco.com)

Offers a line of educational electronics and robotics products, including novel "snap-together" kits ideal for younger children.

### Fischertechnik

[www.fischertechnik.com](http://www.fischertechnik.com)

Company website for Fischertechnik in North America. Check out the Retail Outlets links.

### Hobby Engineering

[www.hobbyengineering.com](http://www.hobbyengineering.com)

General source for robot parts, as well as a lengthy list of Erector set kits of all shapes and sizes.

### HVW Tech

[www.hvwtech.com](http://www.hvwtech.com)

Hobby electronics retailer in Canada also resells a number of popular robot kits, including products from Parallax.

### Jameco Robot Store

[www.robotstore.com](http://www.robotstore.com)

Reseller of a number of robot kits, including the Tamiya remote controlled robot construction set.

### KBtoys.com

[www.kbtoys.com](http://www.kbtoys.com)

Online mail order. Check often for deep discounts on LEGO,



K'NEX, and other brands.

**LEGO Shop-at-Home**  
[shop.lego.com](http://shop.lego.com)

Online outlet for LEGO products, including spare parts (when available).

**LEGO Mindstorms**  
[mindstorms.lego.com](http://mindstorms.lego.com)

Informational page for the LEGO Mindstorms sets. Be sure to check out the user-to-user forums to see what other LEGO builders are up to.

**Junun.org**  
[www.junun.org/MarkIII/](http://www.junun.org/MarkIII/)

Resellers of the Mark III mini Sumo robot kit, originally designed by the Portland Area Robotics Society (PARTS) for mini Sumo competitions. The kit includes all hardware, motors, wheels, and electronics. The website also sells low-cost sensors, such as the Sharp IR proximity modules, and various support electronics common in amateur robotics.

**Machine Science**  
[www.machinescience.com](http://www.machinescience.com)

Offers an expandable metal robot base, which includes motors, wheels, microcontroller, and other electronics.

**Norland Research**  
[www.smallrobot.com](http://www.smallrobot.com)

Kit of parts for turning a Texas Instruments scientific calculator into a robot.

**OObug**  
[www.oobug.com](http://www.oobug.com)

Entry-level "deskpet" robot kit. The OObug differentiates itself in that it is designed to build cooperative or social robots, able to communicate and share information between each other.

**Only Toys**  
[www.onlytoys.com](http://www.onlytoys.com)

Only Toys carries metal Erector sets; most are for building vehicles, and some (like the Steam Engine) are quite elaborate. The

company also sells Rokenbok radio controlled toys.

**OWI Robots**  
[www.owirobots.com](http://www.owirobots.com)

Importer of the OWI robot line of educational robotics.

**Parallax**  
[www.parallax.com](http://www.parallax.com)

In addition to microcontrollers such as the BASIC Stamp, Parallax offers numerous robot kits, including the BOE-Bot (wheeled) and Penguin (walking). Also offers robot components, such as wheels, servos, and sensors.

**Pololu**  
[www.pololu.com](http://www.pololu.com)

Makers of small plastic robot bases designed for use with Tamiya motors. Also sells servos, wheels, and treads and sprockets for building tracked robots, as well as sensors, microcontrollers, and other electronics.

**qfix**  
[qfix-shop.de](http://qfix-shop.de)

German-based manufacturer and seller of small robot kits for education. Website is in Deutsch and English.

**RB Robotics**  
[www.rbrobotics.com](http://www.rbrobotics.com)

New owners of the RB5X educational robot. As noted on the website, "The RB5X robot has been produced for over 20 years. With a proven track record and a developed set of teaching aids, it is a great choice for any classroom." Full kits and individual parts available.

**Robix**  
[www.robix.com](http://www.robix.com)

Aluminum robot kits, primarily designed for educational use. The aluminum pieces and servos can be constructed in numerous ways to make a variety of robotic forms.

**Robotis**  
[www.robotis.com](http://www.robotis.com)

Manufacturer's site for the

Robotis line of robot construction sets and parts. Check out the dealer pages to find a reseller near you.

**Robotshop**  
[www.robotshop.ca](http://www.robotshop.ca)  
[www.robotshop.com](http://www.robotshop.com)

Resellers of Fischertechnik and other robot construction sets.

**Robot Kits Direct**  
[robotkitsdirect.com](http://robotkitsdirect.com)

Plastic robot kits in various skill levels, from beginner to advanced. An example is the OWI-9910 Weasel, which combines touch sensing and a basic wall hugging behavior.

**Solarbotics**  
[www.solarbotics.com](http://www.solarbotics.com)

Primary retailer of BEAM robots – a "simple is better" approach to design. Products include various light-attracted bugs and walking robot kits, motors, solar cells, and electronics.

**Tamiya**  
[www.tamiya.com](http://www.tamiya.com)

Home page for Tamiya. Check out their Educational Construction Series line of kits, such as the remote controlled robot construction set. No online ordering, but you can use the product listing to see what's available.

**Timberdoodle**  
[www.timberdoodle.com](http://www.timberdoodle.com)

Timberdoodle specializes in home education products. They offer a good selection of Fischertechnik kits at good prices. Also sells K'NEX and electronics learning labs. Be sure to check their "swan gong" closeout deals.

**VexLabs Vex Robotics Kits**  
[www.vexlabs.com](http://www.vexlabs.com)

Makers of the VEX Robotics Design System. Use their online ordering system. **SV**

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