

Spacecraft Studios invites you to launch your own creativity



Allison Merrick's SpaceCraft Studios is a unique blend of a workroom studio space and retail shop with handcrafted gifts and DIY kits. The studio offers classes including sewing, knitting, screen printing, jewelry-making, paper-making, soap-making, glass etching, soldering, metal stamping and many more.

The studio is equipped with the traditional tools and supplies you'd

expect in a crafting space, as well as a digital fabric printer, additive 3D printer and digitizer — and now the Handibot Smart Tool. Allison explained, "I want to learn all I can about the Handibot tool so I can help others integrate it into making." Her husband, Dan Bradley, a software engineer, is fascinated by the possibilities of app development for the Handibot tool.

**"Making things is how we learn
and expand our creativity."**

Allison said, "To me, there's a natural connection between making and education. We learn by making. So as I dreamt of having my own company, I saw a need for a place where people can gather and be inspired and make things... I want to help empower people to start making the things in their world themselves and see where it can take them."

Photos by Jeni Rone



WHERE Charleston, SC

BUSINESS SpaceCraftStudios.com

SHOPBOT TOOL Handibot® Smart Power Tool

What's a Handibot?

The Handibot Smart Tool is a subtractive digital fabrication tool for cutting in woods, plastics, soft metal and more. Unlike "traditional" CNC tools, it's easy to take to any jobsite; you just bring the tool to your work. And it can be run by apps from smartphones or tablets. You can put the Handibot to work with no previous training in CAD or CNC.

The Handibot development team is crowdsourcing app ideas now. Submit yours for a chance to win cool Handi-swig! Visit handibot.com.



ShopBot
handibot®

Handibot® and the Handibot logo are trademarks of ShopBot Tools, Inc.

Mind Your Drone



WRITTEN BY
DALE DOUGHERTY,
founder and CEO of
Maker Media.

Not everybody likes the word drone — industry and military experts avoid using the “D word” in public. They prefer the term “unmanned aerial system or vehicle” and associated acronyms UAS or UAV. Despite plenty of misgivings about military and spy drones, the word drone has become widespread and popular, used with great enthusiasm by hobbyists who hang out on the DIY Drones site and by professional aerial photographers like the L.A.-based Drone Dudes. So what is a drone?

The original meaning of drone is a male bee. The body of a drone is bigger than all other bees (except the queen), but what physically distinguishes a drone is a larger pair of compound eyes. Yet drones have no real work to do but reproduce. They make late afternoon flights to what is called a congregation area, where drones gather looking to mate with a virgin queen. Once these bees succeed, however (and they perform this act in mid-air), the drones fall out of the sky, having left an essential body part behind. That’s all that drones do.

The notion that a drone doesn’t have much work of its own leads to a secondary definition of a drone as someone who lives off the work of others — a parasite. In fact, at the end of summer, the worker bees kick the remaining drones out of the hive. They eat too much and do too little. They can be replaced in the spring.

This helps set up the problem. We not only need to figure out a definition for drones, we also have to figure out what they’re going to do — and not do. While some agree that drones are unmanned, others point out that they’re piloted, preferring the acronym RPA for “remotely piloted aircraft.” That wouldn’t differentiate drones from remote-control aircraft, but it emphasizes that a human, who can be held responsible, is at the controls. A drone can be operated manually or it can be programmed to follow a fixed flight plan.

The distinguishing feature of a drone seems to be the promise of autonomy. Today, a typical flight consists of switching between manual flight and autopilot. How much further might it go? Given the right instrumentation and the ability to process that data, could a drone be programmed to make context-aware decisions, particularly ones that humans are not very good at? A drone might detect problems before they occur, such as responding to gusts of wind or avoiding unexpected obstacles. A drone might also be able to communicate with other drones.

Can a drone be considered a robot, able to obey Asimov’s Three Laws of Robotics? We need drones that explicitly avoid harming humans and can act to protect themselves from destruction. We should expect this much from any fully autonomous

vehicle. A drone then might be said to have a mind of its own.

Until such time, however, that responsibility falls on the person flying the drone. When you fly a drone, you aren’t just a user — you’re a pilot. You must protect your equipment, yourself, and most importantly, other people. A bad or incompetent pilot can injure people or invade their privacy. It’s not a lot different from owning a pet or a car.

Good pilots, like the Drone Dudes, worry that bad or careless pilots will garner the public’s attention, create a climate of fear, and cause governments to restrict or eliminate drones for commercial or recreational use. The reason we need better technology is that few of us are very good pilots.

For makers, the most interesting challenge isn’t just building drones or flying them. It’s discovering what drones are good for, what creative uses they have, and what tough problems they might solve. Otherwise, planes and quadcopters will be sold only as toys, not tools, and many people will discard them once they lose interest in their playthings. We’re hoping drones become platforms for developing compelling applications that will push the technology forward and adjust the balance between the light and the dark side of drones. 🍷

Print Directly from a Mac[®]

Introducing the first ever Mac print driver for a laser system



Design



Print



Laser it!

MADEiNUSA

Now Print from Mac and PC

Along with our Windows[®] driver, we are proud to offer the first ever Mac driver created for a laser system. Designed for the Fusion Laser, it allows laser operators to seamlessly print from a Mac computer to Epilog's Fusion series. Now you can design and print to the Fusion Laser from your favorite Mac or Windows computer!

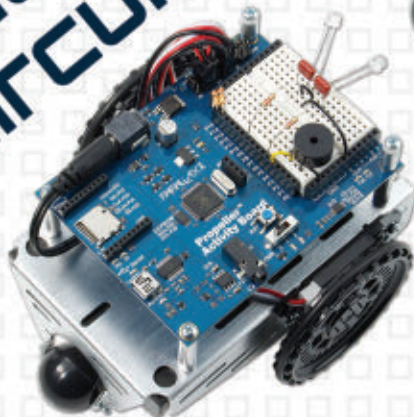
Contact Epilog Laser today for a laser system demo!

epiloglaser.com/make • sales@epiloglaser.com • 888-437-4564

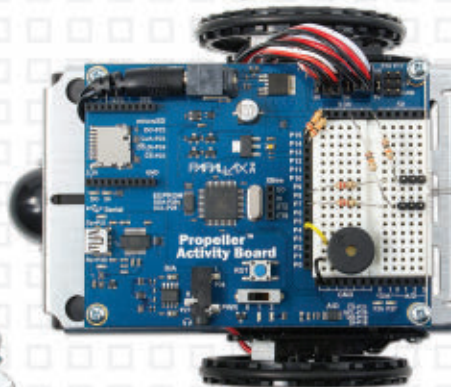


Don't just Plug it in...
Build Circuits!

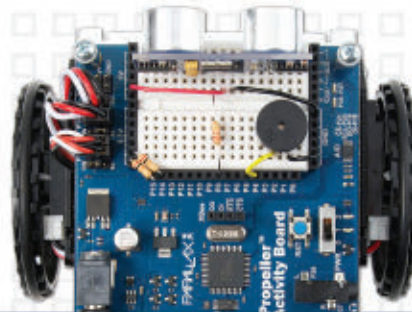
Program
in C on
Mac or PC



Great for STEM* learning!
*Science, Technology, Engineering, and Math



ActivityBot
robot kit
\$199



Learn as an
individual
or a group




PARALLAX

www.parallax.com

Equip your genius.™

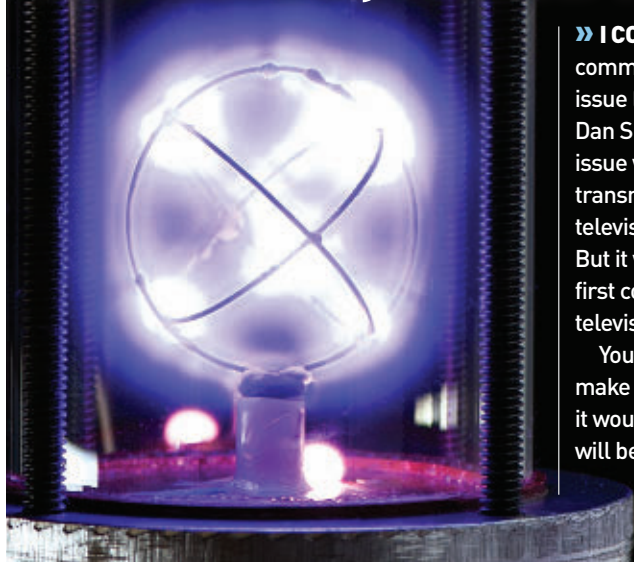


Order ActivityBot (#32500) online or call 888-512-1024 (M-F, 8AM - 5PM, PT).
See the complete lessons at learn.parallax.com/ActivityBot

"ParallaxInc" on Twitter, Facebook, & YouTube

Parallax and 'Equip your genius' are registered trademarks of Parallax Inc.

Nuclear Fusors, Homemade Sugar Rockets, Hard Cider, and 3D Printing Raves



» I CONTINUE TO BE AMAZED AND DELIGHTED WITH MAKE. I have to commend your contributors for their ingenuity and practicality. In the latest issue (Volume 36) I was especially fascinated by the Nuclear Fusor project by Dan Spangler — well written, clear, and concise. I do, though, have to take issue with his statement on page 93 regarding Philo Farnsworth. John Baird transmitted the first televised pictures of moving objects in 1924, the first televised human face in 1925, and the first real-time moving object in 1926. But it was electronics inventor Farnsworth who is credited with inventing the first completely electronic television. So to clarify, it was Baird who invented television and Farnsworth who invented the first fully electronic television.

Your magazine really inspires me up from my seat to get involved and make things. I wish it would be more widely available in the U.K., as I'm sure it would inspire many young inventors and engineers. With this thought, I will be donating a yearly subscription to my old school.

—Christopher Glasgow, Byfleet, Surrey, U.K.



» Earlier this month my son Tucker and I followed William Gurstelle's instructions to build the Homemade Sugar Rockets featured in MAKE Volume 35

(page 70). We failed, learned, failed some more, learned some more, and through persistence had great success and improved the recipe to our liking, and hopefully to yours, too. I hope the following notes on the process will help you with this fast, easy, and super-fun project.

—Wayne Arendsee, Fort Worth, Texas

+ Read Wayne's tips and tricks at makezine.com/fatherson/.

» Thanks for the great tutorial (Volume 36, page 132, "Kitchen-Table Cider Making"). My notes from one batch of apple cider and two batches of pear:

First, the filtration bag gets heavy. I made the apple cider without the bucket with holes and the bag slipped off the larger

bucket and fell in, causing me to have to strain everything again. Second, my brewing bag gets clogged up pretty fast. Strains really well, but requires a lot of squeezing at the end to get all the juice out. Third, the bottled cider flavor really reflects what you put into it. The apples, for example, were tarter than my pears. Fourth, the sugar added beautiful little bubbles. Haven't sampled the non-sugared bottles, yet.

Without the suggestion of using a juicer, I might not have made any cider this year. But your instructions provide a clear and easy path for a first-timer. Well done.

—Matt Friedrichs, via the web

» I gotta admit, I've really been enjoying these practical examples of 3D printing that you guys have been kicking out lately (Make: Ultimate Guide to 3D Printing 2014, page 14, "10 Cool 3D Printed Objects,"). We've seen years of 3D printers kicking out the same Yoda heads. I've frankly been rather skeptical about the "3D Printing Revolution" that's been prophesized, and still am somewhat, but these posts are changing my thinking bit by bit.

—Andy Tanguay, Ann Arbor, Mich.

IN RESPONSE TO THE B9 CREATOR REVIEW IN THE MAKE: ULTIMATE GUIDE TO 3D PRINTING 2014 (PAGE 93):

» I own a B9 and have been absolutely blown away by the detail it is able to produce. I use it for my business as a product designer and for making N-scale model trains — where it is able to match (yes, match) the detail of injection-molded parts. I had about 15 prints where I made various mistakes but now it pretty much works every time, and Mike Joyce [the founder] has personally helped me to overcome issues along the way — as he has for almost everyone who has bought one of these machines. I have no affiliation to Mike or B9, except as a very, very satisfied customer. If you want small parts with exquisite detail (jewelers, small scale modelers, small product prototypes), then this is the machine for you.

—Robert Fryers, via the web

» It's worth stressing that this entire project has been open sourced by Joyce. I built my own printer, loosely based on his designs and using his software, and he was incredibly helpful as I was feeling my way through. A very generous maker, with a very cool product!

—William Fredette, Worcester, N.Y.

MAKE AMENDS: In MAKE Volume 36's Country Scientist column, "How to Use LEDs to Detect Light," in the schematic in Figure D (page 138) the LED should be reversed, with the anode connected to ground and the cathode connected to IC1-2. Thanks to intrepid reader Rob Kuschinsky for pointing this out.

The MAKE iPad App is coming Jan. 21st!



A totally
new way to
experience
Make!

- Interactive Content
- Video Integration with Tutorials
- Expanded Project Builds

Make:

Find out more at: makezine.com/go/ipadapp