Working with wood can take any number of directions and is often impacted by advances in technology. Most recently, the use of CNC and laser-engraving machines has gained notice among those having a penchant for creative design using wood and other materials. The lowering prices of tabletop models have sparked purchases by computer-savvy woodworkers looking for the next big thing to complement their array of shop machines and hand tools, or, to serve as the primary machine in some small business venture. Here, I’ll walk through the pros and cons of computer-generated woodworking for the home shop and how CNCs and laser engravers work. I’ll introduce you to a few entry-level models, and show off the kinds of wow-factor projects you can create with a simple push of a button.

A little reflection on woodworking history
Prior to the 1870s, hand tools made up the arsenal used by woodworkers for cutting and shaping wood. Stationary line-shaft operations were in existence then, relying on water wheels and windmills to power saws and boring machines. The technology advanced to steam- and gas-powered engines to operate a growing variety of large stationary machines via fly wheels and leather belts. These occupied the floors of wood- and metal-working production shops, not those belonging to small-time cabinetmakers and woodworkers.

Enter the age of the foot-powered machines (treadle-, pedal-, and sometimes hand-driven) that allowed individual woodworkers or small production shops to purchase selected tools to save time while increasing production and precision. They could purchase a scrollsaw, tablesaw, mortise-and-tenon machine, shaper, bandsaw, or lathe, and work with wood (while getting their exercise in). Manufacturers such as W.F. & John Barnes Company excelled at making such machines for professionals and the burgeoning class of hobbyists.

In the 1920s, with electricity at hand, electric motors took
You start with a design idea—one developed using CAD software, an imported photo, or a design you purchased. The software converts the image to gray scale to determine the depth of cut. Then, you transfer it to the CNC and set up the machining parameters. With the CNC spindle axes established, you insert the workpiece and push the “ON” button to activate the machining, a process akin to an easy-bake oven. In short order, the project is complete.

Woodworking’s easy-bake oven: from idea to finished project
CNC is an acronym for Computer Numerical Control. It’s the name given to a machine containing a spindle or router that receives its fabricating marching orders from a computer such as a laptop or desktop unit containing CAD (computer-aided design) software. In a

Note: Some CNCs connect to the computer with a cable to transfer the design; others use a memory stick that you plug into the CNC’s USB port.
CNC machine, depending on the model’s ability, software, and accessories, these orders direct the spindle to cut (typically, up to 3/4” deep), carve, drill holes, and shape a workpiece along various axes (from three to five) according to the intended design. (See Figure 1.) The design can originate from the woodworker using software such as DesignCAD, CorelDRAW, TurboCad, or some proprietary program developed for the CNC company. You can also cut to the quick by importing a purchased project design created by an outside provider. (The diversity of designs available online will amaze you.) Your design may call for the CNC to cut out all of the parts of a project. Or, having made the parts with conventional woodworking tools, you may just want a single part in your project to feature a CNC-carved embellishment or relief—something like a box lid or front.

In any case, the woodworker works with the CNC to establish the axes coordinates, which translates into the movement of the spindle and a selected bit. (See “Spindle Bit Choices” page 67.) Here, with the entry-level 3-axes machine as shown in Figure 2, the X coordinates represents the side to side movement, Y, the front to back movement, and Z, the up and down movement or depth of cut. Higher-priced step-up CNCs offer up to 5 axes, meaning a more complex and capable machine. Added is a circular axis that allows for the rotation of the workpiece such as a turning or other round item during the machining. The remaining axis tilts the workpiece. Together, the 5 axes allow you to create something as sophisticated as a tapered table leg with a rope twist from top to bottom.

ShopBot Desktop
3-axis; X, Y, Z movement: 24 × 18 × 5.5”; includes VCarve Pro CAD/CAM design software; shopbottools.com. $4,995

ShopBot Handibot
3-axis; portable job-site model; CAD/CAM software included; shopbottools.com. $2,795 (router not included)

Dining chair from a Legacy Explorer, courtesy of Legacy Woodworking Machinery

Turned and carved lidded box from a Legacy Explorer

Volcano topographic relief carving from a Laguna CNC IQ, courtesy of Laguna Tools
What’s not to embrace?
CNCs offer a lot of advantages over traditional woodworking, while some may not like the manufactured (versus the hand-tooled) look of the end product. These include spot-on precision, production speed, repeatability in making identical parts, safe hands-free machining, and the encouragement to be more creative with project designs.

The downside includes machine and setup costs, as well as the learning curve and time it takes to become proficient in a CAD software program. However, by using designs provided by the maker or a purchased design found online, you can be machining in an hour or two. That’s likely the best way to go when first delving into CNC woodworking. Note that the manufacturers provide extensive educational services and technical support to help you achieve various tasks or designs. Be sure to inquire about such support and compare the services available from maker to maker.

What sort of projects can you hope to achieve? As hinted at with the examples shown here, a CNC will let you apply decorative carvings or 3-D design accents on anything from plaques to boxes to bowls and furniture. It helps you make signs, create precise inlays, cut out perfectly fitting project parts, and take on projects you avoided because you lacked the carving skill or tools.

Should you step up to a more expensive 4-axis or 5-axis machine (not shown here), you'll increase your capability even further.
Finally, because a CNC spindle so closely resembles a router (in fact, some low-end CNCs use a router), the materials you can machine are identical. They include wood, plywood, wood veneer, composite wood materials, plastic laminate, acrylic, and thin metals.

CNC Spindle Bit Choices
This basic set of CNC spindle bits—essentially router bits—allow you to create different cuts and profiles. They include (from top) ¼" and ½" down-spiral bits for through-cutting, 90° and 60° V-bits, ¼" and ½" ball-nose bits for 3-D carving, a ¼" end mill bit for clearing, and a ½" conical V-bit for fine detail.
The laser engraver’s special talents

By contrast, a laser engraver employs an intense magnified laser light beam to cut, carve, and engrave material. Like a CNC, it receives its marching orders from a computer’s design software program. Setup is just like installing a printer, with the engraver’s capacity limited by the size and parameters of the machine, wattage, and design constraints of the project, with lower-powered entry-level models cutting (or burning through) wood or sheet goods that measure 1/4” thick or less. The X, Y, and Z coordinates still apply. One major difference lies in the extraordinary detail in the cut lines and engravings rendered by a laser engraver. The cut or engraved edges, however, display a dark wood-burned look. Unlike a CNC, it’s really not meant to clear waste in large areas. Cost-wise, a laser-engraver can run even higher than a CNC machine, something to consider when looking at how and how often you intend to use the machine, whether for a hobby or for a cutting and engraving business.

To use the laser engraver, you first create a new page in your graphic design software on your computer. Here, you establish the page size to match the size of the piece to be engraved. Then you either use a design that you created or import a design, such as a photo or illustration. At this point you can add words in a variety of fonts. Then, similar to a CNC, you send the image to the laser engraver and set up the printing, engraving, or cutting parameters. Finally, you place your workpiece in the engraver, select your file, and hit “GO.”

The kinds of projects typically cut with an entry-level laser may include architectural models, puzzle parts, or small items such as key chains and name plates. Materials cut with a laser engraver include wood, plywood, wood veneer, composite wood materials, cork, acrylic, leather, cloth, matboard, melamine, paper, Mylar, pressboard, rubber, fiberglass, plastic, Corian, and metal.

Laser engraving is where most of the action lies with this machine. Designs of all kinds and types can be applied to plaques and signs, pet urns, ornaments, picture frames, gunstocks, knife handles, plaques, and countless other items. In addition to the previously mentioned materials for cutting, a laser engraver can engrave acrylic; glass; coated, painted and bare metals; tile, ceramics, and marble; and rubber.

### Materials for engraving

The materials you can cut and engrave with a laser engraver range from wood to metal to glass and acrylic.
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