

# Mike's Web Page

## Making your own knife

I still have a good deal to learn about knife making. If you elect to pursue this hobby, please read as much as you can prior to starting (this text only scratches the surface.) Don't expect to make your perfect knife the first time and be aware of the sharp steel, high heats and sparks that you are making in the process. **Learn and practice all proper safety precautions!**

### A (Very) Little About Knife Making

There is a lot more to making knives than I can relate on this page. It's a whole science, art and passion for many people across the globe. Basically, here is the dime tour.

**Methods** - There are two basic methods of making knives. Forging is the tried and true, centuries old way. Sometimes referred to as "heat and beat," forging involves taking a piece of steel and heating it in a forge until it becomes softer and more malleable. The person forging, sometimes called a smith, will use an anvil and a hammer to mash the steel into the shape of a knife. The smith can clean up the forged knife on a grinding wheel, but this isn't essential. The knife is then heat treated to make it hold an edge and finished.

The second method is called stock removal. It involves taking a piece, usually a rectangular bar of steel, and cutting out the outline or profile of the knife. This profile then has the edge bevel cut into it using files or grinders. The degree to which machinery is used in stock removal depends only on the whim of maker. At this stage, the knife is typically polished and heat treated, then finished as any knife would be.

**Styles** - There are also two main styles of fixed blade knives. These styles relate to the way that the handle is secured to the knife. A handle is secured at the end of the knife called the tang. Tangs can be visible or hidden. On a visible tang, you can see it running down the center of the handle if you look at the knife from the top down. Hidden tangs are inserted into the handle and are unseen. They can be secured with glue and/or pins, or the end of the tang can be threaded and the blade can be secured with a nut or threaded end cap. Full tang knives have side plates called scales that are attached to the sides of the handle, usually with pins, bolts and/or glue of some kind.

**Steel** - Wow! that's a loaded question. There are many, many steels good for knife making. Likewise, it follows that there are many that are unsuitable for knives. One thing is certain: if you as ten different knife

makers which steel they prefer, you'll likely get more than 10 different answers! Many makers use more than one type of steel and base the steel they use on a case by case basis on each knife that they produce. This decision often comes down to the intended use that the buyer has for the knife. Knife steels can be so-called high carbon steels that rust easily, or "stainless" steels that resist corrosion more readily.

**Heat Treating** - Different steels require different heat treating methods in order to bring out the most suitable properties for knife blades for each given steel. Some heat treating methods are fairly simple while others require precise temperature and time cycles.

## My Knives

Did you ever want to make a knife? It's a very interesting project that is a lot of work; however, it can produce a quality tool that you can use on your camping trips. A home made knife can also be a great conversation piece for talks with other do-it-yourselfers or outdoors people. The knife pictured below I call a Bird & Trout, and was made in November, 2000. It was my first foray back into knife making after a ten year break. Now, I have the tools and materials needed, and this hobby is proving to be a great past time for me. I love metal working and heat treating the steel is a completely unique challenge.



My First Knife

The *Bird & Trout* knife above was made using a piece of 1/8" thick 1095 high-carbon steel. The knife itself is 7 1/8" long, with a blade of 3 1/8", although only 2 1/8" are sharpened. The guard is made of brass and soldered with silver solder to the blade. The handle is ABS plastic and it has three spacers - two white plastic and one leather. The tang of the blade is called a "hidden, stub-tang," which means that the tang is stuck in the handle. In this case, it is held in place with epoxy. My knife also has a lanyard hole made from a piece of brass tube.

## Getting Started - Tools and Materials

To start knife making, I'd recommend that at a bare minimum, you have the following tools:

- A good face mask - you don't want to inhale the dust from many of these materials.
- Safety glasses - you get one set of eyes only. Protect them.
- A vacuum - knife making is dusty. Steel, wood, brass particles should be cleaned up.
- Files - good, sharp files remove a lot of steel fairly quickly. The

advantage to using them over machinery is that mistakes take longer with hand tools. You can see the errors quicker and recover. The disadvantage to hand tools is the longer time it takes to complete your knife.

- A mini file set costing around \$15 and a few new \$5 files will work wonders. The mini files, or jeweler's files are very, very useful.
- A work bench
- A Bench vise - the "second pair of hands." Very useful.
- A drill - for making a mortise in the handle of a hidden tang knife, or for drilling holes for pins in a full tang blade for attaching scales.
- Sand Paper - in several grits - 36, 50, 80, 120, 240, 400 or finer in whatever combinations you like.
- Clamps - I like C clamps.
- Glue - 3500 pound epoxy works well.
- A hack saw. Note that some steels aren't easily cut with these. Brass and aluminum are.
- Good hack saw blades.
- A small piece of leather, about 4"x4" to protect the blade as it is inserted in the vise jaws.
- Pin material - brass welding rod works. Be sure to have a drill bit that is just ever so slightly larger than the pin material, or use sandpaper to thin the pins down to size.
- Steel - your choice.
- Handle Material - can be wood, plastic, antler, micarta or other. Your handle should be resistant to shock and heat. If you can get any safety handling instructions regarding your materials, read them and heed them.
- Guard or end cap material, if desired. Don't use aluminum for the guard if you plan to solder it. Use brass.
- A method for heat treat. Discussed below.

Also, you might want to have:

- Dremel-type tool. Nice to have for cutting steel with a reinforced cutoff wheel.
- A belt grinder, a band saw, an angle grinder, etc. These make profiling, grinding and polishing much easier.
- Stain, wood hardener or wood sealer for finishing wooden handles.

The Process - Here's how I made the Bird & Trout knife shown above.

In order to begin knife making, I first began by reading as much as I could about the process. There are several books on the topic, and Internet discussion groups such as [Bladeforums](#) and the [Custom Knife Directory Forum](#) provide a wonderful interaction with people with varying degrees of experience. Most, if not all of them are anxious to share their knowledge and provide encouragement, should you decide to start up as a hobby.

After reading, I realized that I needed to make a few decisions about my first knife. First off, I needed decide how I was going to make my knife. I needed to identify a suitable steel and I also needed to determine the style and the method that I was going to use to make the knife. Other

elemental decisions such as shape, features and handle materials would follow.

My first decision was the steel. Knowing I wanted to do my own heat treating, I opted for 1095, a simple, high carbon steel, because it

- makes a good knife blade
- is easily heat treated using home-shop materials
- is inexpensive

Next decision was what style and method to use. Forging isn't really an option at my location, so I opted to make a hidden-tang knife using the stock removal method.

My available tool kit includes a belt grinder. You can use a belt grinder (also called a belt sander) or even hand tools such as files to work the blade into a knife-like shape. The steel needs to be soft, or annealed, to be worked, but 1095 can be purchased that way.

For my next step, I began to assemble my tools and supplies. You can make knives with files and sandpaper, but a belt grinder makes the job go faster, especially if you're using thicker steel. I found a home-made 2x48 inch grinder (that's the belt size) in the want ads and purchased a couple of belts for it from a company called Tru-Grit. I also picked up a few files, epoxy (rated to take 3500 pounds of force) and sandpaper through my local hardware store. Craft supply stores provided me with brass tubing and brass rod. Scrounging , I got various plastics such as ABS, nylon and Delrin. I got more brass plate scrap that could be used for making guards. I ordered a few knife making catalogs from K&G and Texas Knifemaker's Supply. My steel came from Admiral Steel Company. A good workbench is very important, and also a bench vise. Most importantly: **safety goggles** and a **face mask**. You only get one pair of eyes and you don't want to breathe a lot of dust, silica or steel particles!

What excitement when the steel finally arrived - two, six foot lengths of HR1095. Plenty of knife material for me! With most everything I needed, I marked the shape of the knife blank on the steel. I began the process of profiling, or cutting out the rough shape of my blank. Excitement soon turned to frustration (which in the end only makes this hobby more satisfying) when I tried to cut the 1095 with a standard hack saw. Surprise! The HR1095 that I bought was not annealed. That stuff is tough! Note to self - next time, buy CRA1095. CRA = Cold Rolled, Annealed.

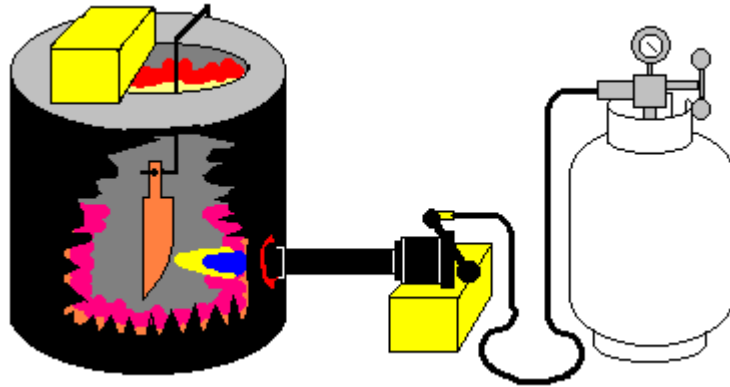
I eventually solved this problem by using a Black & Decker Dremel-type hobbist's grinder with abrasive wheels to cut out my design. I'd recommend that if you pursue that method (instead of say, a band saw) that you use the reinforced wheels, as they last much longer and do not shatter like the non-reinforced types. Also, pursue all **safety** precautions!

Once the initial blank is rough-profiled, I took it to my grinder with a 40-grit belt and shaped it more, evening out the profile and smoothing the burrs that the hobbist's grinder made. Then I began to grind the bevels

that would form a cutting blade out of the blank. I had marked transition lines on the blade of where I wanted the bevel to start. This process is something you need to "feel" out. It takes patience, and gets more frustrating when you mess up a grind. Correcting it, in my case, changed the profile of the blade. I consider that all part of the learning process. The steel heats up while being ground and needs to be dipped in water frequently to cool it down.

Once I was satisfied with the profile and edge bevel, I changed grits to 100 and began to sand out all of the grinding marks on the blade in preparation for heat treat. I worked progressively finer grits and switched to hand-sanding with the blade locked in a bench vise. It is sanded to minimize imperfection. Then the knife must go through a tempering process. This involves heating the blade up to a point at which it loses its magnetic properties (at this high heat, a magnet won't stick to the steel!) At this time, the red-hot steel is dunked into a quenching medium. This makes the blade super hard. And super brittle. Once cooled, it must be reheated to a lower temperature for about an hour to soften it back to the point to be a good hardness for knives.

**Heat Treating Process - Hoo Boy!** Heat treating is next and is where the real fun starts. There are several ways to accomplish this, from using an acetylene torch to sending the blade off for custom heat treat. I opted to build a heat treating furnace based on instructions published on the Internet by [Tim Lively](#). It looks like this:



It is constructed from a steel 5 gallon pail. It is lined with a mixture of kitty litter clay and wood ash. Also, it has a hole cut in the side about 3" up from the bottom through which I place a [Ron Reil](#) venturi burner, built from his published instructions. That is connected to a 20-lb propane tank. I cover most of the top of the furnace with fire brick, leaving enough space for exhaust and place my blade inside to heat until it is red and non-magnetic.

On a side note, these types of heating forges do require periodic maintenance. This clay/ash combination is good, but mine has begun to crumble from repeated heat treating sessions. I expected this. One modification that I did was to coat the inside with furnace cement. I thinned the cement down a little with water and painted it onto the inside of the furnace. Some minor cracking has occurred, but the

clay/ash liner is less crumbly.

By this time, I've prepared my quench oil. It is used corn oil and is placed in a small can and heated to about 120 degrees Fahrenheit. I check my steel for its "quench-readiness" with a magnet. Once the steel is so hot that it loses its magnetic quality, it is ready. When my blade has reached nonmagnetic quench temp, I quickly remove the blade and dunk it into the quench oil. It smells like French Fries! As a safety precaution, I shut down all of my heating materials before the quench, and I have a fire extinguisher ready, just in case.

I scrounged a toaster oven that reaches 425 degrees, and this is my tempering oven. One hour at 400 is what I'm using at this time, but I'm a real newbie. This may change as I gain more experience. One tip I can pass on, though is this: don't temper indoors! Placing the oil-soaked blade in a 400 degree oven results in smoke! Do this outside and your neighbors will think you're cooking.

Then it is back to the vise for sanding and polishing until the blade looks almost finished. I do not put an edge on the blade until the knife is done, keeping it unsharpened for safety's sake. Next, I opted to put a brass guard on my blade. I began work on the guard.

My guard is cut from 3/8" brass plate. I mark it to shape and rough it out using a hacksaw and drill for cutting out the tang hole. I use a drill bit that is smaller than the 1/8" thickness of the blade, and files, sabersaw blades and sandpaper to get the hole as close as possible to a snug fit for the blade. I use silver solder to solder it on.

Time to work on the handle! I cut out spacer material from plastic or leather as required or preferred. I alternate spacers and rough-fit the plastic handle by first drilling it out. Once everything is dry-fit, I slather on a generous amount of epoxy and put it all together. I lock it in a vise to ensure a snug fit and let it dry overnight.

Rough-shaping of the handle is done using a fine-toothed woodworker's saw and my belt grinder. I basically shaped it to fit comfortably in my hand. Final shaping is done with various grits of sandpaper. I finished it off at 400. My final step was to add the ferrule for the thong hole.

I used my drill press to drill a hole slightly larger than my brass tubing and epoxied this in place, leaving it again to dry overnight. I repeated the finishing process to make the tubing flush with the handle, and then I had finished my first knife.

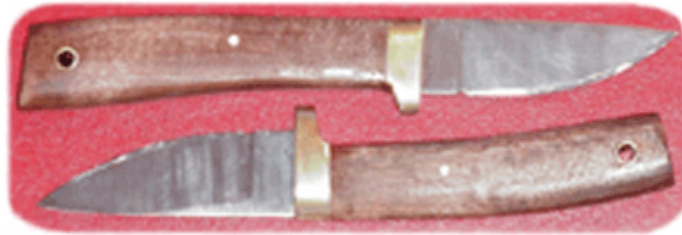
Second Attempt - the "Wilderness Knife"



For my second knife, I thought I'd like to make a "Wilderness Type" Knife. This particular one has a full tang and has scales, or sides, held in place with epoxy and bolts. The Wilderness Knife is also made of 1095 steel 1/8" thick. The handle is made of nylon. The bolts mentioned above are made specially for knife making. They are constructed of two threaded sleeves and a bolt that runs between them and give a "bulls-eye" effect when the heads and remaining sleeves are ground away.

I've also since upgraded my grinder to a Coote 2"x72"x6". I love it! Anyone want to buy a homebuilt 2"x48" grinder?

These are some of the other knives I've made.



These are made in the same manner as my first knife, although the handles are actually maple.

### Knife Kits

If making a knife start to finish isn't within your means, you might consider buying and completing a kit. I sent one such kit off to an interested hobbist. It looked like this:



This is a 1095 blade that I designed, profiled, ground and heat treated. It was left "in the rough," meaning that it was shipped with the carbon from heat treating still on it. I provided the Do-It-Yourselfer with Loveless-style bolts and a brass ferrule for the holes that I had drilled in the blade blank, and some micarta for handle material. The quarter was only for scale. Using hand tools (mainly sandpaper and files) and a vise, this knife can be completed and personalized as time permits.

**Kits provide an excellent mid-step between complete scratch built knives and purchasing a finished blade.**

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