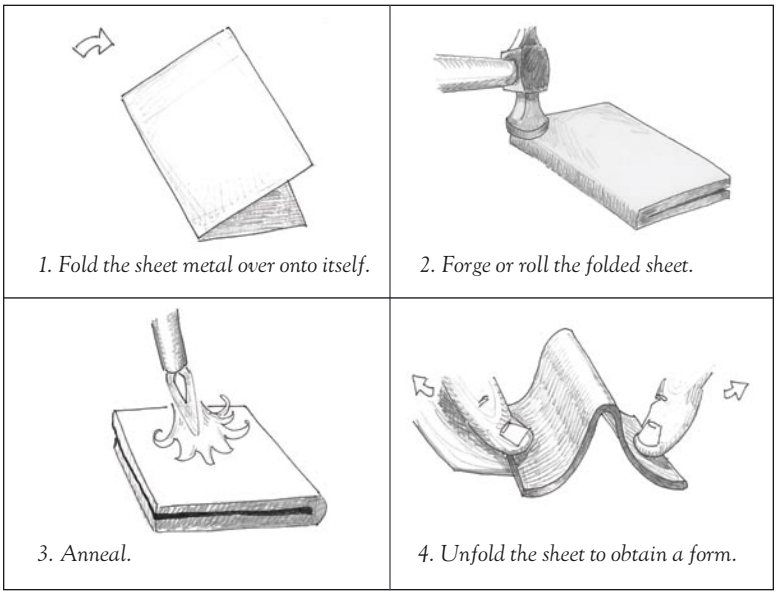
Chapter One

An Overview of the Folds

Most foldforming involves four basic steps:



1. Fold the sheet metal over onto itself.

2. Forge or roll the folded sheet.

3. Anneal.

4. Unfold the sheet to obtain a form.

Principal variations include the style of the fold, the number of folds, and the ways a series of folds react to each other. Some types of foldforming (scoring and bending, for instance), involve setting up a weaker place in sheet metal so that the metal will bend or fold on a specific line. Other avenues of related folds include interwoven and tube folds.

Because this process uses the metal's own characteristics—basically doing what the metal wants to do anyway—radical changes in cross section and surface can be made in only a few minutes. The speed with which flat sheet metal can become a three-dimensional form can seem like magic. The tools used for this are familiar to most metalsmiths: hammers, mallets, anvils, and sometimes a rolling mill. Complex high-relief forms are pro-

duced from single sheets of metal often with a single annealing. These shapes can resemble chased, constructed, and soldered forms, but are produced in a fraction of the time they would take by conventional techniques. For instance, the traditional way to make a square ridge on a piece of sheet is to solder on a square wire, a process that not only anneals the sheet, but threatens firescale and solder spills. In the foldforming technique called Line-folds, we can obtain an almost identical look that avoids those problems, does not involve soldering, and usually takes half the time.

Foldforms are often so beautiful that they can be used as finished objects by themselves, but I think their best use is as starting points or components of more complex pieces. An example of this might be slicing up a foldform, manipulating the elements and reattaching them, or soldering a foldform as an element in a constructed structure. It is also possible to "chase on air" using a T-fold technique, a process that can shorten a chasing procedure by hours. Foldforming offers a major new series of procedures for production work, creating unique textures and surfaces that work well as components for casting. A number of production shops now use foldforming as part of their working vocabulary.

Starting with Paper Models

There is an important difference between the malleability of metal and the way that paper bends, but even so, I've found that paper or sheets of thin plastic can be used to find ideas for starting foldforms. Working with paper allows rapid investigation of starting folds for metal.

Because paper and metal behave differently, there are some limits in working with paper models. Still, paper can offer valuable insights. I remember a ten-hour plane flight in which my experiments with napkins and notepaper yeild several new folds. This Ward Fold shows the difference between paper models and metal forms.

Categories of Foldforms

Over the last two decades, foldforming has yielded hundreds of diverse forms. In fact, it is so easy to work up ideas for foldforming that my original policy of naming new folds after the originator has become unwieldy. In the early days, when a person came up with a new direction in foldforming (not merely a variation on an existing fold), I named that fold for them. Some of those names will appear later in this book. Other folds, such as line, star-pod, T-folds, boat, etc. are ones I have discovered.

In an attempt to make this information easier to understand, I have grouped the folds into categories, or families. Each of these is discussed in greater detail later in this book, but I think it will be helpful to include a short introduction here. It is important to point out, though, that the real power of foldforming comes from the combinations of multiple folds. Just as we teach language by breaking it down into words and letters, the objective in the end is to reassemble those parts into a unique new structure. That's where the magic happens!

Line-Folds

A basic line-fold is made by folding a piece of metal, flattening the fold edge, annealing the metal, and unfolding it.

Several varieties of line-folds.

T-Folds

T-Folds represent an enormous number of starting points for investigation of form. The primary advantage of a T-fold is that two fold edges are formed at once, which immediately makes the forms more complex. They also offer a wide range of options, including the size, shape, and location of the three flanges or panels of the "T." Using a vise to pin the legs (or not) as the metal is hammered influences the outcome considerably.

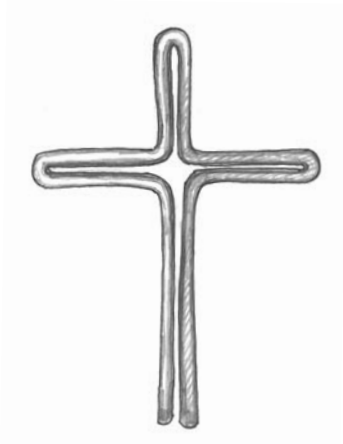
T-Folds. Primary variables are achieved by whether the fold edges are forged and how the sheet is unfolded.

In this cross section view of a T-fold the fold edges are marked with arrows. Most foldforms have fold edges.

Cross-Folds

While a T-fold has two fold edges, and is thus more efficient than a plain line-fold, if you are trying to make fold edges, a cross-fold will give you three at once. Cross-folds can be used to make three parallel line-folds much closer together than possible any other way.

Cross-folds are made by creating a structure with the cross section of a cross, or plus sign: +. In this example, two folds have been made, the second running at a right angle to the first.



The cross section view of this fold shows where the name comes from.

Rolled-Folds

Rolled-folds owe their name to the fact that they are made with a rolling mill. Rolled-folds are either a package folded up evenly and put through the mill (as with the Heistad Cup) or are folded so that one side has more layers of metal than the other.

Heistad Cup, showing several views of the cup simultaneously.

Good Fold (rolled-fold variation). This illustrates the smooth curves typical of this form.

Woven-Folds

Woven-folds involve simple interweavings that are used to lock different parts together (as in an Adams Fold) or are worked while interlocked, or even just left folded together as a shape. An example of this last is "Boondoggle," which many children learned in summer camp. People who know a lot about simple interweavings that can be adapted for foldforming include those who do chair caning, pastry work, sewing and ribbon work, leather strip work, and basket makers. Children's rainy day book projects are a source for ideas. Everything you learned to do with gum wrappers as a child can be brought into metal.

This example of a woven-fold is made by interlacing two strips of metal, in the same way that many of us wove lanyards with boondoggle at summer camp.

Adams Fold. This complex form illustrates what can happen when combining foldforming techniques. In this case, linefolds were woven together.

Scored-Folds

When folding paper, it is common practice to run a scribe along a straight edge to make a dent in the material. This process is called scoring. In traditional metalworking, a crisp mitered corner is created by removing metal, usually with a scraper, a graver, or by machining. A simpler (but cruder) approach is to compress metal along the area to be bent by either striking it with a sharp steel rod or against the edge of an anvil. All of these methods are also called scoring.

In my experiments with foldforming, I refined a method by using a rolling mill and a tough wire to create a controlled indentation along a line I want to bend. After rolling, the metal is annealed and bent with fingers along the groove that was pressed into the metal by the wire. Another way of doing this that produces the same effect is to tape a wire onto the sheet metal and then planish it evenly on an anvil surface. Depending on the thickness of the sheet and the intended use, the bend area is sometimes soldered to improve its strength.

There are a number of folding options that are possible only by a sequence of scoring, soldering, and unfolding. I prefer using a separating disk for most scoring and bending procedures. Straight scoring and curves can be done freehand. To obtain a sharp bend, score until a line shows distinctly on the reverse side of the metal. Bend the sheet with your fingers, then solder from behind to strengthen the fold. Bending up a curved scored line will give dimension relative to the degree to which the curve is folded. If, after soldering, you gently unfold the piece again and flatten it, you will obtain a curved line-fold.

A selection of forms showing the sensuous curves achieved by folding after scoring with a separating disk.

Shear- and Forged-Folds

Examples of shear- and forged-folds, singly and stacked.

Pleated-Folds

These are folds that are pleated, similar to the fans we made as kids. They can be pleated in a number of different ways beyond the simple back and forth "venetian blind" approach. Angles of pleating can be alternated and widths varied to produce differing results. The main key to pleating sheet metal evenly is to start in the middle of the sheet and work outward.

Examples of pleated-folds. This foldform is particularly easy to repeat consistently.