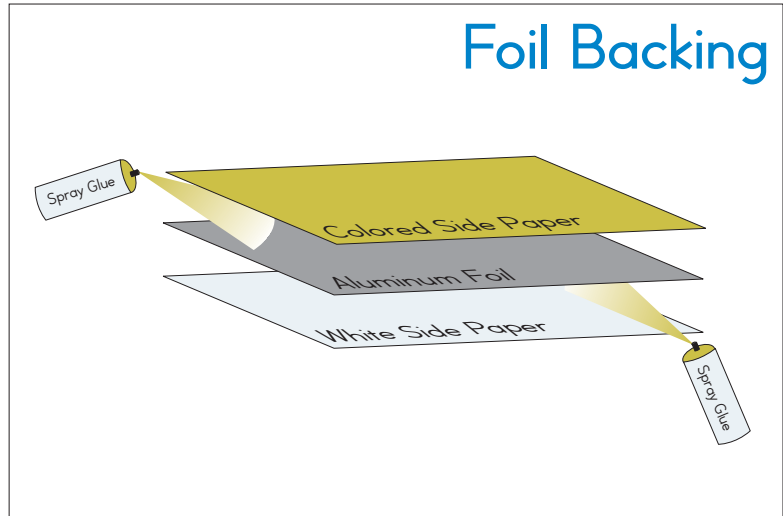


# Materials and Methods

In theory, the only things required for origami is a piece of paper and a pair of hands. In practice, however, you will want to have the right materials for the project at hand. For initial practice attempts, you will want to use papers that are easy to fold, but not necessarily of presentable quality. The two most popular practice papers are commercial origami paper (sometimes sold as kami) and American foil. Both papers are available colored on one side, and white on the other. American foil is preferable as it holds its shape more easily. These papers feature a thin layer of decorative foil that helps your model hold its shape. Most of the origami supply houses sell a 10" version as their largest size, but some thinner wrapping paper can be used if you are looking for something larger. Japanese foil is thinner, and generally easier to fold than the American variety, albeit more expensive. Kami is better for those who have trouble with reverse folds and sinks. Both types of papers will yield adequate results, but almost invariably, more decorative choices will make your models look better.

For display-worthy efforts, you will want to use papers and methods that heighten the result, possibly at the expense of ease of folding. Such methods include foil-backing and wet folding, which includes the related technique of back coating. Both approaches allow the paper-folding artist to use material combinations to create interesting effects.

## Foil Backing



Foil backing is a great way to utilize nonporous materials, and papers with patterns that could get ruined with water (such as newsprint). Foil backing is the process of adding a layer of aluminum foil (yes, the same material you can find at virtually any grocery store) to paper, to give the resulting material unique folding characteristics. A common backing choice is tissue paper, which further enhances the folding properties of the foil (this combination is also known as “tissue foil”). Regardless of the backing material, the metal-like quality allows folds to instantly stay where they are placed. Spray adhesive is used to bond the layers together. This is also known as artist’s adhesive or photo mounting spray, and it contains the same glue found on adhesive tape. You can find this at most art supply stores, but you will find it much cheaper at a hardware or office supply store. While you can usually use 3M’s Spray Mount, some projects (typically involving very thick papers) will require something like 3M’s Super77 Spray Adhesive. All work should be done in a well-ventilated area, as the glue is toxic. You will also want to protect your floor with newspaper. Place a sheet of foil on the floor. Leave the shinier side up first and use as the surface for the main color. In most cases, the foil will be the limiting factor as far as size is concerned, so use as large a sheet as necessary. Spray the glue onto the surface of the foil according to the manufacturer's directions.

If you have a choice of nozzles, use the one with a finer mist. When spraying, be sure to cover the entire surface area of the foil, while paying special attention to the edges. After spraying, you should give the glue about a minute to get tacky.

The next step is to apply your paper to the tacky surface. Start by adhering the bottom edge of your paper to the bottom edge of the foil. Then start working your way upwards until the foil is completely covered. You can also use a baker's rolling pin to apply the paper. Another variation is to start at one corner and work your way to the opposite corner. Try several methods to see which feels most comfortable. For thicker papers, it might be easier to simply drop the paper onto the foil. When you are done, rub out any wrinkles, and then apply another layer of paper on the other side.

To get the largest possible square, cut along the edge of the foil, which should be visible through the layers of paper, provided your papers are translucent enough. If you wish you can also tear through the foil, which is surprisingly accurate (and fun), provided you are using thin enough paper. First, score the paper, unfold, and turn over to leave the resulting crease in mountain fold formation. The paper can easily be torn in this position. Of course, you won't get the largest possible square this way, but it is easier to be accurate.

A rotary cutting board is recommended when tearing is not possible, or you cannot see the silhouette of the foil through your backing paper. While a traditional guillotine cutter might suffice, spending an extra \$100 or so on a rotary cutter is worth the investment for the serious paperfolding artist. These can be purchased at better art supply stores or photography supply stores. A pair of scissors can be used when a paper cutter is not as convenient.

If you wish to make a square that is wider than your piece of foil, there is a way to accomplish this. First, you must adhere two (or more) strips of foil together. If you spray along the edge of one piece and attach the other piece along that edge, the results are remarkably seamless. Most likely, the paper you will want to use on the surface will be smaller than the foil piece you have prepared. There is a way around this hurdle as well. First, you should fold your foil in half. The resulting surface area should now be small enough for your paper. Before you use any adhesive, place a sheet of

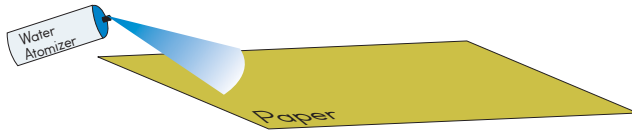
newspaper between the fold to avoid getting any glue on the inner layers. You can now adhere your papers on each side of the foil. When you are done with the gluing part, use a scissor to cut along the folded edge. After you unfold your piece, rub out the crease, and the seam will almost disappear. You can repeat the same process for the other side.

When folding larger models, you might find certain portions to be flimsy. While wire is traditionally used to add rigidity, I have found stuffing layers of foil to be even better. You can fold a piece of foil over upon itself a few times to make it many layers thick. This can be stuffed between the layers of the parts of the model that need more rigidity.

If you are using tissue as the backing paper, where the properties of the foil are at their most extreme, you are in for a radically different folding experience. By themselves, foil and tissue make for flimsy and weak folding materials, but together you have one of the strongest and most resilient materials around. Also, when you make a crease, it will hold very well. It will hold so well that it is difficult to change its direction (i.e., valley to mountain). This makes procedures that require precreasing, such as sinks, difficult to perform. You can unfold the paper after precreasing, rub out the creases must be changed, and replace them with new folds that are in the right direction. Unlike commercial foil paper, you can rub out unwanted creases without leaving a trace.

While it is true that foil backing will make folding your model more difficult for most of its stages, its properties are fortuitous at the end of a model's folding sequence. If your model has many layers, it can easily be flattened. In extreme cases, a hammer can work wonders. After your model is as flat as you desire, you can shape and pose it any way you wish. Your model will hold that shape forever, until you decide to reshape it, or someone or something inadvertently reshapes it. The latter scenario is obviously undesirable. If you use a slightly thicker paper (such as the Japanese papers), you will lose some of the malleability but will have a much more solid looking model, due to its increased thickness. It can still be bent out of shape, but is acceptable if being displayed in a controlled environment.

## Wet Folding



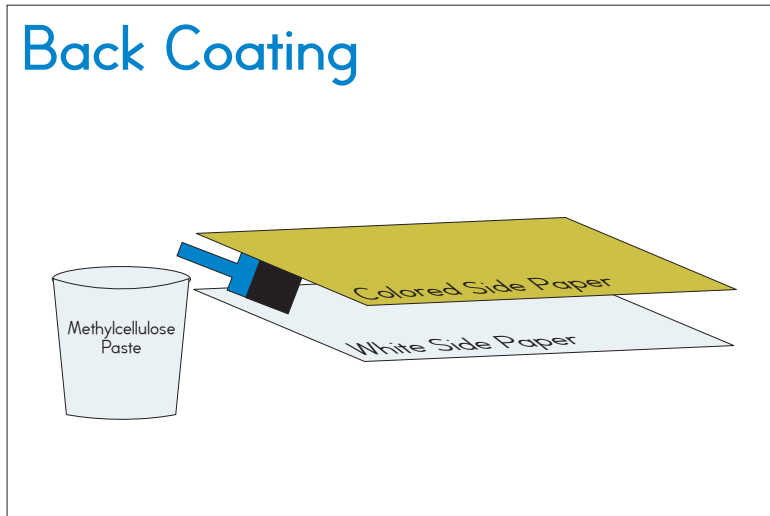
Foil backed paper looks great in person, but the camera lens often picks up the foil through the backing, even when the backing paper seems to be dense enough. This might be okay for some subjects, but to have a less reflective look, wet folding techniques are more effective. The process might be slower, but the results are more permanent.

Wet folding involves lightly dampening your paper during the folding process, so when it finally dries it will retain its shape. When paper is wet, the sizing (glue-like substance) that holds the paper fibers together is loosened. Once the paper is dry again, the sizing will hold the paper in its new position. Taking advantage of this property of paper enables the folder to hold shapes that seem to defy gravity. Not all papers contain a lot of sizing, so you might have to add a methylcellulose paste to your paper before folding. To do this, you first add the methylcellulose powder (which is sold at many art supply stores) to water and mix the compound until it is syrupy. You can use about a teaspoon for each cup of warm water. This paste can now be brushed onto your paper with a standard painter's brush. After the paper is dry, it will be even easier to wet fold. To speed up the drying process, you can use a table fan.

When wet folding it is important to realize your paper will expand, often unevenly. This makes accurate folding much more difficult. Also, reference fold crease lines become difficult to see while paper is wet. For these reasons, you may prefer to delay wetting the paper until key folds are in place. When you are ready to wet the paper, it is important not to allow the paper to get soggy. By using an atomizer's mist sparingly, a leathery texture can be obtained from the paper. These spray bottles can be found at many perfume sections; try to find one with as fine a mist as possible.

Holding your model in position while drying can be a creative challenge. Tools that work include twist ties (the plastic-coated ones that are often used for electrical wire packing), portable clamps, and painter's masking tape. As an example, you can wind a twist tie around the legs of your insect model, bend them into the desired position, and secure them to a flat surface with masking tape. After further moistening your model with your atomizer, it will retain its stance after it is dry and the bindings have been removed.

## Back Coating



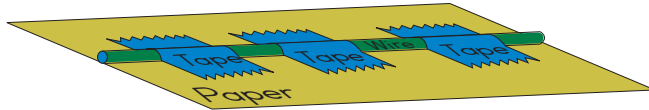
A related technique to wet folding is back coating. Since most specialty papers are monochromatic, the two-toned effect in many origami models is lost. You can use methylcellulose paste to adhere two complementing colors of paper together. Brush the paste on one paper, being sure to work on a smooth surface, as the paper will pick up any texture from your working surface. Apply the second sheet on top, brushing it into place. You can cut your square once it is dry, using a table fan to expedite the process. Again, a rotary cutter is recommended. The materials you chose to mate together should both be porous and fibrous enough to stay together, otherwise you might have to resort to foil backing.

Papers that work well include the Unryu variety (both regular and soft) from both Japan and Thailand. These papers might be labeled as containing mulberry or kozo fiber, but other fibers will work as well. You can also try Yatsuo papers from Japan, which are made from kozo and sulfite pulp, and have a much smoother look than the Unryu papers. These and other fine art papers can be found at better art stores and via mail order. You can expect to pay about three to four dollars for a 25" x 37" sheet.

Other important paper considerations include weight, which is how a material's thickness is described. To give you a gauge of what this means, standard copy paper is often at 20 Gr/M2 weight. Of course, you will double your thickness if you are bonding two sheets together. Try to keep the total thickness under 80 Gr/M2. When dealing with lighter colors, you might have to work with thicker papers just to get the right opacity (but you can mate them with lighter weight darker papers if you are trying to avoid additional thickness). As a test, you can hold the paper against a black surface to see how well it eclipses its backing. Sometimes, having the contrasting color show through is a good thing, as your color choices will seem to blend a bit. One thing you would like to avoid is having your paper bleed (having the dye run) when wet. The most temperamental colors tend to be reds and black, but it is a good idea to test out a sheet first if possible.



## Dry Wiring



Both wet folding and foil backing will give your models a sculpted look. Sometimes it is preferable to have a crisper look, where the paper looks less molded and more folded. Simply folding your paper without any of these special techniques will sometimes work, but for most models (especially those that are very complex), will have sections that will gradually spring apart. The solution is to strategically add wire to these troublesome sections.

For most models, florists wire will suffice. 26 gauge is a good thickness for most scenarios, and 22 gauge can be used where more strength is needed (lower numbers correlate with thicker gauges). The wire typically has a PVC coating (often green) that can be secured simply with a few pieces of scotch tape. For some heavier duty situations, PVC glue is useful. It can be cut with a pair of scissors, but heavier gauges might be best trimmed with a wire cutter.

The wire has a palpable thickness, and it can sometimes be a challenge to avoid having it bulge through the surface layers of your model. It is best to lay the wire along a fold line that is on the underside of your model. In rare cases, you can cover the wire with multiple layers of aluminum foil to cover up the bulge.

It will be necessary to unfold and refold your model, adding wire as you feel it is helpful. Of course, this adds to the challenge of folding, but when done well, the results are worth it. As with foil backing, the final model can get bent out of shape, so special care is needed when storing. With enough experimentation, you should be able to conceive the perfect material for any model.