

# GUILD OF BOOK WORKERS JOURNAL VOL. 46



**The Fixed and the Variable in the Practice of Bookbinding**  
Christopher McAfee

**Watermarks in Motion**  
Radha Pandey

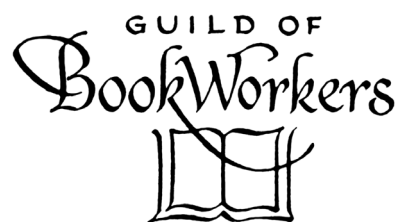
**Contemporary Bindings of Vesalius' De Humani Corporis  
Fabrica, 1543 and 1555**  
Gabrielle Fox with Stephen N. Joffe

**How to Utilize Mica in Bookmaking: An Introduction**  
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**The Board Shear: Background, Maintenance and Safety Con-  
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On the front cover:

*Sunfish* by Daniel Essig. Black stain mica scales. Italian olive wood, mahogany, milkpaint, nails, snail shells. Printers type, handmade paper, back to back book with Ethiopian binding. 18.5 x 13.25 x 2.5 inches. Photo by Daniel Essig. Used with permission.

On the back cover:

*Animal-Mineral-Vegetable-3* by Alicia Bailey. Mica, copper, thread, Tyvek, feathers, dried grasses, cherry, wax, paper, PMA. Coptic binding. Box: book board, book cloth, paper, etched mica label. 2013. 11.5 x 4.25 x 0.75 inches. Collection of Baylor University, Crouch Library Special Collections. Photo © Alicia Bailey. Used with permission.

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# EDITOR'S NOTE

SOME OF YOU HAVE HEARD ME COMPARE the fate of books to the fate of wristwatches. The more digital they get, I would say, the more we value the old mechanical structure as a beautiful luxury to be treasured. But I don't believe that any more. The pendulum of our overly digitized society is beginning to swing back to the physical, the mechanical, the haptic, and while measuring time is intrinsic to how we live our lives, books are so deeply a part of our spiritual, psychological, cultural, emotional, and creative existence that it is almost impossible to imagine life without them in some form.

Look at what's happening: no mere Swatch fashion statement or Rolex status symbol, the basic form of the book is being claimed, reclaimed, and reinterpreted in endless ways, by people around the world—of all ages, in circumstances comfortable and challenged, and for many, many reasons and purposes. E-books and digital technology have done more for the survival and flourishing of physical books and the book arts than anyone anticipated.

This issue of the *Guild of Book Workers Journal* is a mini-survey of how bookworkers engage with the book in its twenty-first century rebirth: through TOOLS, exemplified by William Minter's much-needed guide to the Jacques (and other) board shears; MATERIALS, in Peggy Seeger's introduction to mica; TECHNIQUES, in Christopher McAfee's exploration of when to break the "rules" of binding; TECHNOLOGY, as Radha Pandey marries digital software to traditional hand papermaking; and HISTORY, in the survey of Vesalius in contemporary bindings developed by Gabrielle Fox and Stephen N. Joffe.

All of these articles can also be described in other terms: Minter's guide points to the PROBLEM-SOLVING inherent in our work. Seeger's books, and those by other artists in the accompanying gallery,

illustrate the unlimited DESIGN POTENTIAL of the book form. McAfee and Pandey show that TRADITION is alive in the present moment. And Fox and Joffe highlight the lasting nature of high-quality CRAFTSMANSHIP.

So let no one say that the book is dead, that there is no future for the book arts! I still firmly believe that the future of the book is rich and ripe and getting brighter every day.

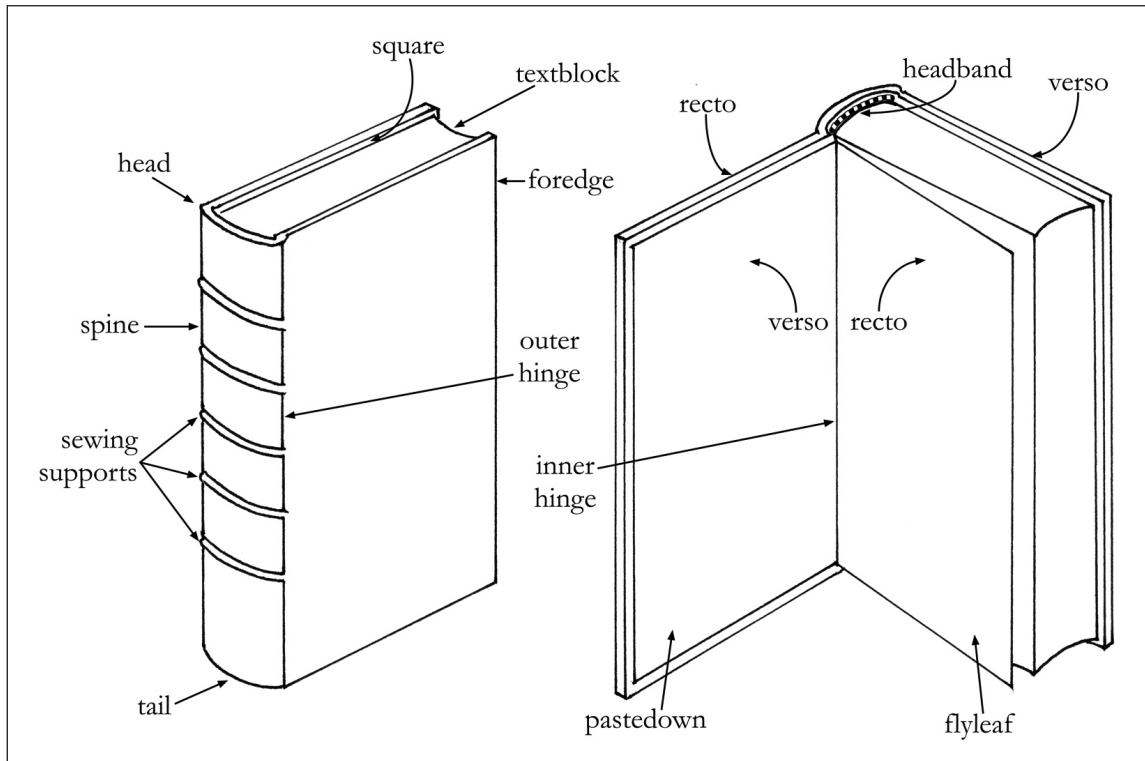


I AM GLAD TO WELCOME my newly elected co-chair to the Journal Standing Committee:

Christine Ameduri is currently archivist and special collections conservator at McDonogh School Archives and Special Collections. She has done book and paper conservation for the Smithsonian National Museum of African American History and Culture and other institutions, and has taught bookbinding as well as lectured at the university level on topics related to the history of bookbinding, the care of book and archival collections, and librarianship. She has been a member of the Guild of Book Workers since 2006, and was involved with the Guild's Potomac Chapter. She has been looking for an opportunity to become more involved with Guild activities and welcomes the opportunity to be serving as co-editor of the Guild's *Journal* with Cara Schlesinger and reading some really good articles!







**Anatomy of a book**

# THE FIXED AND THE VARIABLE

## IN THE PRACTICE OF BOOKBINDING

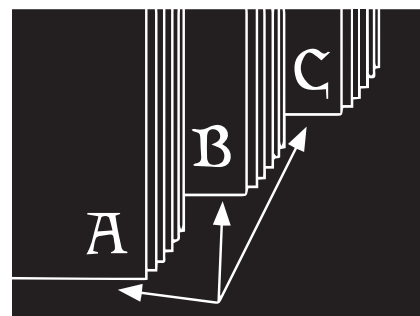
CHRISTOPHER MCAFEE

BOOKS ARE COMPLICATED, BEING THREE-DIMENSIONAL OBJECTS made up of several two-dimensional planes, operating both as static and moveable objects, having various parts that affect their openability. This makes finding the right balance of techniques and materials to create a functioning book difficult. Fortunately, those who have gone before us have already figured most of this out, but that doesn't necessarily make it easy.

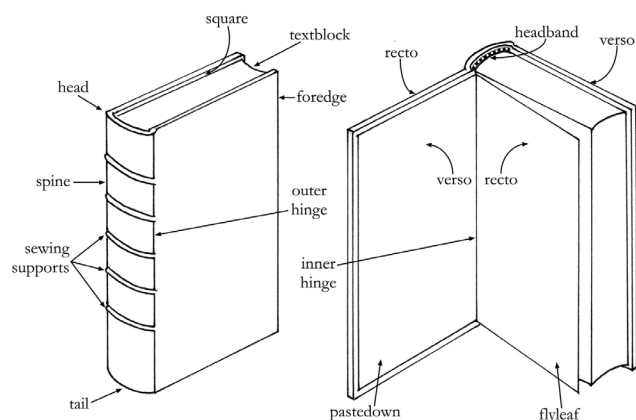
When I began learning to bind books, I was usually taught fixed sets of rules without many variables. For example, when learning a specific binding style, the teacher might require that no. 25 thread be used for sewing, that three tapes be used as the sewing supports, and that a specific combination of Japanese paper, bond paper, and crash be used to line the spine. Teaching this way makes sense; imposing limits like these also simplifies the teaching process, allowing the teacher to focus on technique. Additionally, it's a lot easier for students to learn the bookbinding process when they aren't bogged down by too many details.

The drawback is that students may not later understand how to change their materials or process without diminishing the quality of the book structure. This was certainly how it was for me. After I had completed my training and was binding on my own, I began to wonder whether I could, or how much I could, "break the rules" and vary the procedure or materials. What would happen if I sewed with no. 35 thread or sewed on four tapes? What if I used a different material on the spine? Could I make outlandish book arts while still maintaining the integrity of the book structure? Questions like these led me to a better understanding of how materials and processes affect the overall structure of the book and where those materials and processes could be varied.

The following observations come from my exploration of descriptions, materials, and processes of bookbinding. The information derives from a mixture of personal experience and study as well as from the many other bookbinders with whom I've had the pleasure of associating. I share it in the hope that up-and-coming bookbinders may have a better knowledge of the structure of the book and that they may better understand when the rules of bookbinding are fixed and when they can be varied.

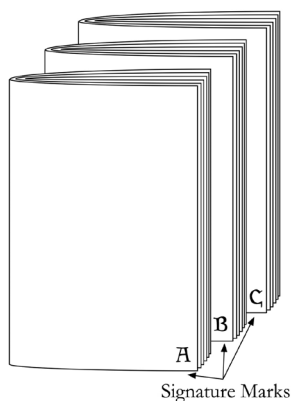


**Chris McAfee is the Head Conservator for the BYU Library Special Collections. He has been binding books since 1992.**



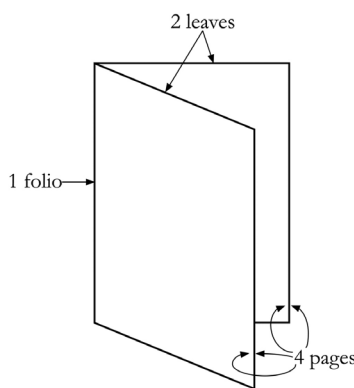
THE **TEXT BLOCK** IS THE PART OF THE BOOK that is made up of paper, whether the printed pages, the endpapers, or other paper. Bookbinders may choose any number of paper types to serve as the text block, or they may have no choice at all, as would be the case with printed books to be bound.

WE USUALLY CALL THE FOLDED GROUPS of paper that are stacked together to make a text block “**SIGNATURES**,” but they might also be called sections, quires, or gatherings. “Signature” is not technically accurate since the word refers to a signature *mark*, which is a letter or number that was printed at the bottom of the first page of each section. The signature mark enables the bookbinder to place the sections in the right order for sewing. How we ended up calling these sections “signatures” is apparently a mystery, but I can imagine it was a natural language progression as bookbinders discussed getting the signatures in order. In essence, if the signature marks were in order, the sections were also in order.



GATHERINGS ARE MADE UP OF **FOLIOS**. “Folio” has a few different meanings, the primary one I know of referring to a large-sized book. The reason for this is that it also refers to a full sheet of paper that has been folded only once. If one were to start with full-sized sheets and form the pages by folding each sheet only once, the result would be a large book. (Twice

folded is “quarto,” thrice is “octavo,” four times is “sextodecimo” or “16mo,” and so on). It seems a lot of modern bookbinders, including me, have taken to using the word to mean any sheet of paper folded once. So, even when I make books that are 16mo, I still call the folded paper “folios.”



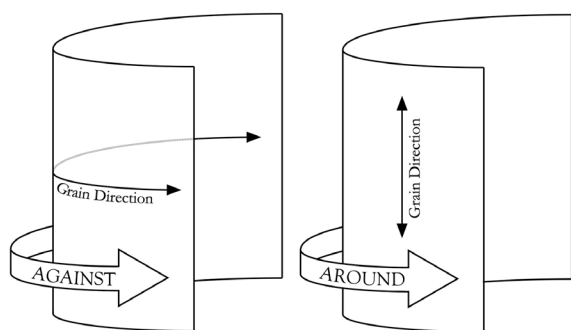
ONE PIECE OF PAPER, WHEN FOLDED into a folio, forms two **LEAVES** or four **PAGES**. The leaves are the individual sheets within a book. The pages are what you see on each side of the leaf. If you fold a gathering out of four

sheets of paper, you will have 8 leaves and 16 pages.

WHEN I TEACH ABOUT GATHERINGS, I am often asked the same question, which is a question I also asked when I first started learning: “How many pages, or folios, are in a gathering?” I usually answer by saying something like “Somewhere between 4 and 6 folios, but sometimes more and sometimes less.” Because there are so many kinds of paper with differing thicknesses, it’s not an easy question to answer specifically. A better question might be, “How *thick* should the gatherings be?” To this I would say a little less than  $\frac{1}{8}$  of an inch, give or take a little.  $\frac{1}{16}$  seems too small and  $\frac{3}{16}$  seems too big. There may be times when you need to do something different, and I’ve seen gatherings smaller than  $\frac{1}{16}$  and larger than  $\frac{1}{4}$ . In other words, it may be acceptable to vary the thickness of your gatherings. In general, however, I’d say a little less than  $\frac{1}{8}$  is just about right.

**GRAIN DIRECTION** IS ONE OF THE FIRST THINGS a beginning bookbinder will learn. It refers to the orientation of the fibers within a sheet of paper or board. Paper will bend or fold more easily around the grain direction than it will against it. In bookbinding, we almost always want the grain direction of everything to be parallel with the spine of the book. There are at least two reasons for this:





1. When the grain direction of the leaves is *parallel* to the spine, the leaves are more likely to drape outwards when the book is opened, meaning the book will be more likely to lie flat when opened.
2. When any or all of the materials that make up a book are perpendicular to the spine, the various parts of the book are more likely to warp, twist, or pucker.

Cloth also has grain direction, straight-grain running parallel to the selvedge and cross-grain running perpendicular to the selvedge. However, this doesn't seem to have any effect on the function of a book. What *does* affect the function of the book is the grain direction of the *paper* that lines **BOOK CLOTH**. The grain direction of this paper is always parallel to the selvedge of the cloth.

While unusual, there may be times when it is desirable to have parts of the book where the grain direction is perpendicular to the spine. Before such a decision is carried out, how it will affect the rest of the book should be considered.

PAPER IS THREE-DIMENSIONAL, and at least two of those dimensions will affect how well the book opens. Height, as it relates to the book height, is not one of them. The height can be short or tall, and it will do almost nothing for the openability of the book. Width, on the other hand, or how far out the leaves extend from the gutter, does make a difference. (The gutter is on this side of the spine (facing you) when the book is open.) The wider the leaves, the flatter the book will open.

The paper's thickness also matters. Because thinner paper bends or drapes more easily, it is more likely to lie flat when the book is opened. Thicker paper will stand out more rigidly from the spine.

**ENDPAPERS** CONSIST OF THE PASTEDOWN and one or more **FLYLEAVES**. The pastedown is the leaf that gets glued to the inside of the cover boards. Flyleaves are the sheets, often decorative, between which the text block is sandwiched. Endsheets can be sewn to the text block as a gathering or as part of a gathering, tipped on to the text block with a bead of glue, or hinged into place. Throughout history, bookbinders have been devising endpapers that improve openability and reduce stress where the book cover and the text block are joined. This provides bookbinders with numerous options for constructing their endpapers.

SEWING IS THE WAY GATHERINGS GET CONNECTED to each other. There are many sewing styles reaching way back in history, and bookbinders are *still* coming up with new ways to sew books! This gives us several options for sewing.

When gatherings are sewn together, they are usually attached to **SEWING SUPPORTS**. These supports can be **TAPES** made of cloth, vellum, etc.; **CORDS** made of cotton, hemp, linen, etc.; or **THONGS** made of leather. Using no supports is also an option. When cords or thongs are used, they are usually "raised" and are evident through the covering material, which is molded around them, but they can also be "recessed"—sewn into notches that have been sawn into the spine.

While they are called sewing supports, they do more than just support the sewing. They may also serve the purposes of holding the gatherings together, of strengthening the **HINGE** (the flexing place where the board meets the spine), or of holding the boards in place. For many binding styles, changing the kinds of sewing supports used might also change the structural integrity, so it may be best to stick with the traditional sewing support. For others, supports may be interchangeable. As an example, a binding with a smooth spine may be sewn with no supports, sewn on tapes, or sewn on cords that have been recessed into the text block's spine.

For aesthetic reasons, sewing supports, especially supports that will be visible on the spine, are traditionally spaced evenly, with greater space left at the head and tail to create a more visually pleasing appearance. The number and placement of supports

may be arranged in less traditional ways as long as the structural integrity of the book isn't compromised.

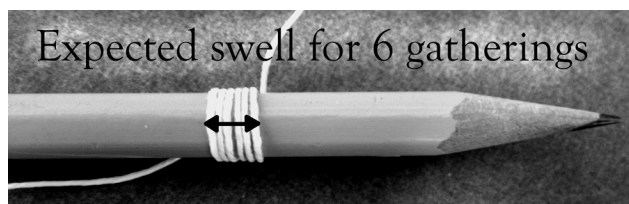
BY VARYING THE THICKNESSES OF THE PAPER, the gatherings, and the thread, you will change the shape of the book. There are, of course, rules about how much these things can vary and still produce a book that operates well. These rules actually do work! This is where **SWELL** comes in. When you have a stack of unsewn gatherings, the thickness of the **SPINE** (the folded side) and the thickness of the **FORE EDGE** (the opening side) are equal. But when you sew the

gatherings together, adding thread to the folds, you increase the thickness of the book at the spine. This is called swell. Having a swell that is either too thick or too thin can cause difficulties in finishing the binding.

There are several things that can affect how much swell a text block will have. The thread's thickness may be the most obvious; thick thread will cause more swell than will thin. The hardness of the thread is also a factor. A hard thread will be more likely to maintain its thickness while a soft thread will be more easily compressed. So a hard thread will produce more swell than a soft thread. The hardness of the paper also has an effect. Soft paper will allow the thread to be pressed into the paper, while hard paper will not. So a soft paper will reduce the amount of swell and hard paper will not. The number of sheets in a gathering, or rather the thickness of the gatherings, can also affect swell. If you have several fat gatherings, you will have less swell than if you have several thin gatherings. Try to imagine what kind of swell would result from these combinations.

- Thin gatherings with thick thread
- Thick gatherings with thin thread
- Soft paper with hard thread
- Soft paper with soft thread
- Hard paper with hard thread
- Hard paper with soft thread
- Hard paper, thin gatherings, and hard, fat thread
- And so on.

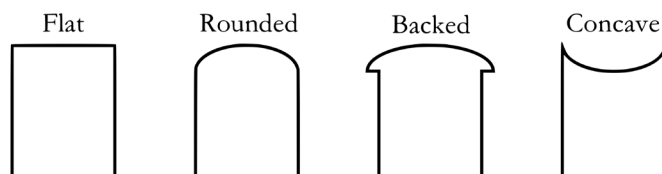
One way to control swell is to figure out how much thread is needed to produce the right amount of swell. By closely wrapping the thread around a pencil x number of times, x being the number of gatherings, the measurement of the combined threads will roughly equal the amount of swell to be expected. To change the amount of swell, change to a thinner or thicker thread.



Another way to control swell is by **KNOCKING DOWN** the gatherings as you go. This is the process of using a knocking down tool or hammer, or even a bone folder, to press or pound each gathering flatter once it has been sewn into place. Another option is to place the sewn text block into a lying press and use a knocking down iron. This causes both the thread and the paper to be compressed, thus reducing swell. Knowing how to control swell is important because it will affect the shape of the book's spine.

BOOK SPINES ARE USUALLY FLAT, ROUNDED, OR rounded and backed. When rounded, the spine is convex (though concave is also an option, but I won't discuss that here).

Flat spines are created when sewn text blocks have their spines tapped into a flat shape and glued in that position. If the text block has no swell, the spine will



be virtually square. If the spine has too much swell, the result will be a wedge-shaped book. The result of a slight swell on a flat-spine book, once the cover has been attached, will be a nicely shaped square(ish) book.

One of the reasons for rounding a spine is to distribute the swell. In other words, the result of rounding is that the threads, rather than stacking on top of each other, will be slightly offset from one another, so the text block will be more uniformly flat. I have been told that an ideal round is  $\frac{1}{8}$  of a circle or a 45-degree arc, but I think anything up to  $\frac{1}{4}$  of a circle or a 90-degree arc will work.

Rounded books are often backed, which means they are further shaped so that the folded edge of the **RECTO** and **VERSO**<sup>1</sup> gatherings become shoulders, which provide a space for the cover boards. The process of backing also forms a fold that locks each gathering to the next and the structure created by backing prevents the spine from becoming concave.

These three spine shapes may have their unique purposes, but they can also be interchangeable in some binding styles. It just depends on the desired final product.

**HEADBANDS** ARE THOSE PRETTY THINGS you see at the **HEAD** and **TAIL**, or the top and bottom, of many books. They are situated at the spine area somewhere close to between, and sometimes exactly between, the text block and the cover. They are sometimes decorative and sometimes structural. If they are sewn in, rather than glued on, they offer some protection to spines as books are pulled from the bookshelf. There are various kinds of headbands, many of which can be incorporated into various binding structures. Glue-on headbands can also be purchased or made.

WHEN I WAS A BOOKBINDER IN TRAINING I had the opportunity to learn from several different people over time, and they all taught different ways to line book spines. One day I realized that I didn't know how to choose the right **SPINE LINING** (paper, cloth, vellum, leather, etc.) or how many linings, or which combination of lining materials, I should use. Would the book implode if I did something wrong?!

1 Recto=front. This can refer to the front of a book or to the front of a loose document. In an open book, this may refer to the page on the right hand side, since this is the front of that leaf. Verso=back. This can refer to the back of a book or to the back of a loose document. In an open book, this may refer to the page on the left hand side, since this is the back of that leaf.

I suspected not, but I wondered if the book might not function properly or might fall apart. As it turns out, different materials *can* be used. Knowing *why* spines are lined, and *how* linings affect the book will inform the decision about what linings to use.

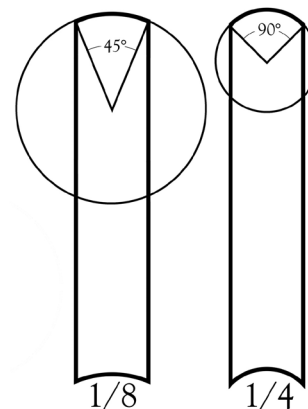
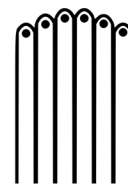
There are several reasons to line spines, perhaps the most important being that it helps hold the gatherings together. Another reason to apply a spine lining, or several linings, is to control how the spine will bend, or how the book will open. The more linings you add, the less the spine will bend. Too many linings and the spine won't bend at all.

Not all binding styles receive a lining on their spine but, when they do, the process is something like this: After book has been sewn, the spine is pasted or glued and then shaped into one of the above shapes. Once the shaping is done, a material is glued to the spine. Most of the time, the material is cut to the width and height of the spine, but at least one of the linings, usually the first, extends a little over the sides for the purpose of strengthening the pastedown and hinge. If the book is thin, few linings will be required. For thicker books, more linings are needed.

The materials used to line spines are varied. One of the more commonly discussed linings is called "**CRASH**" or "**SUPER**" or "**MULL**."<sup>2</sup> This material is a loosely woven fabric, similar to cheesecloth, that has been heavily stiffened with starch. Fabric can also be used as a lining and is much stronger than crash. Another lining material is Japanese paper, which I usually use for my first spine lining. The beauty of Japanese paper is that it is thin but the fibers are long, meaning it's pretty strong while remaining flexible. Western papers can also be used as linings, and

2 Yes, three different words to refer to one thing. It's good to know all three when you're in conversations with several bookbinders.

## Distributed Swell



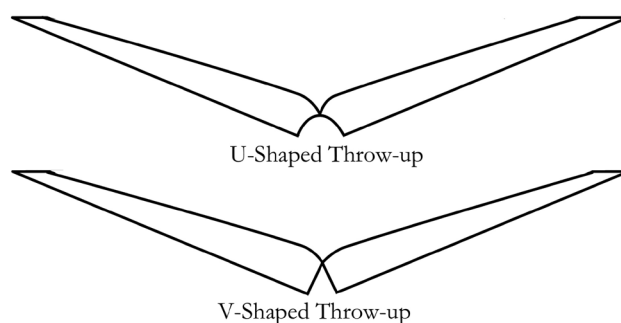


handmade paper is really nice for lining spines.

WHEN I TALK ABOUT **OPENABILITY**, I MEAN HOW easily the book opens. There are several variables that affect the openability of a book, many of which have already been discussed. Blending those variables well will result in a book that opens nicely.

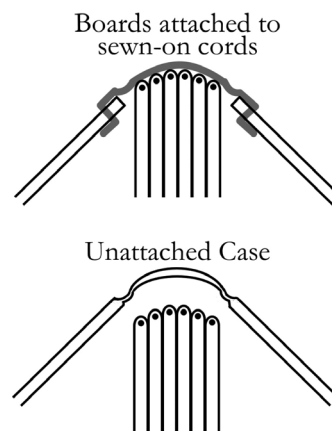
- When the grain direction of the paper is perpendicular to the spine, the leaves will be more likely to stick out. When the grain direction of the paper is parallel to the spine, the leaves are more likely to drape nicely across the book.
- When the paper is large (wide), or when the books format is large (wide), the book will be more likely to lie flat when opened. This is largely due to the book's weight combined with gravity.
- If the paper used for the text block is thick, the leaves will be more likely to stick out when the book is opened. The thinner the paper, the more likely the book is to lie flat.
- **THROW-UP** is used to describe how the spine of the text block bends or curves when the book is opened. When there are only one, or very few, linings on the spine, the throw-up will be a sharp, upside down, "V" which will cause the book to lie flat. When there are more linings, the throw-up will be more of an upside down "U" shape. The "U" shape may restrict openability, but that's not always a bad thing, and the "U" shape is often preferred. When there are too many linings, the spine won't bend at all; when the book is opened, the leaves might even stick straight up, rather than draping open.
- The materials used as sewing supports may affect the bendability of the spine. Stiffer and thicker materials will reduce openability.
- The materials used to line the spine (paper, cloth, vellum, leather, etc.) may affect the bendability of the spine. Stiffer and thicker materials will reduce openability.
- The way the book is sewn may also affect the openability of the book.

All of these things can be balanced to make a book that opens well. A large book will have better openability than a small book, but a large book will also require more support than a small book. Where



adding additional linings and stiffer supports to a small book will restrict the book's openability, those same linings and supports on a large book will help control the shape and manageability of the book—it will feel less “floppy”—while also allowing for good openability.

BEFORE THE 1820S, BOARDS WERE ATTACHED to the text block before the covering material was added. This was done either as part of the sewing process or by lacing the sewing supports through the boards. In case binding, the cover, or **CASE**, is made separately from the text block and then the two are joined together. This makes adding the covering material much easier.



Books may be covered in cloth, leather, and other materials. Even paper alone can be used if the hinge is strengthened. In modern times, book cloth seems to be the most often used material. Today, most book cloth is fabric that has been lined with paper. This prevents any adhesive from bleeding through the cloth when it is being glued. If you don't like the commercially available book cloths, there are ways to use other fabrics, including methods of lining your own.

Books are generally covered according to traditional styles, including quarter, half, three-quarter, or full bindings. But, really, if you can think it up (and if your design doesn't require too much material at the hinge), any design will work.

THE **SQUARE** CAN BE DESCRIBED as how far the boards protrude beyond the text block at the head,

tail, and fore edge. I've never actually heard anyone say exactly how far beyond the edge the boards should protrude, but I have often heard people say, "The square is too big." How can anyone know if the square is too big when nobody can say how big it should be? Well, it's one of those things that bookbinders learn through training and practice and, when they get together, agree that a certain sized square just looks right.

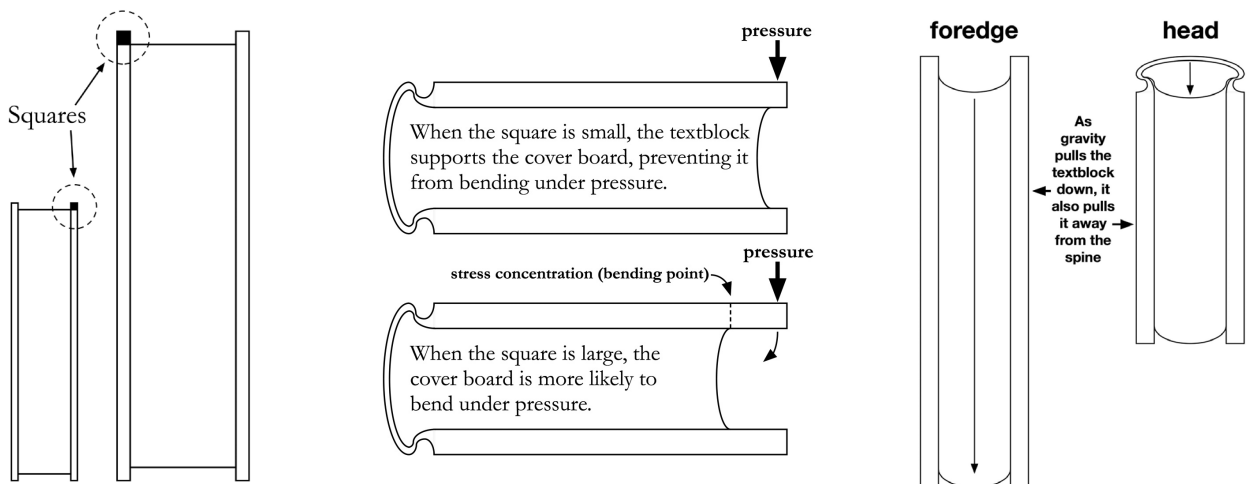
So as not to leave you completely in the dark, there are some things to consider when determining the size of the square. Taking the size of the book and the size of the boards together may provide a guideline. As a general rule, smaller books should have thinner boards and larger books should have thicker boards. It is also generally true that smaller books should have smaller squares and larger books should have larger squares. When in doubt about the size of square you want, cut the boards to protrude beyond the edge of the text block to a measurement that equals the thickness of the board. In other words, if the board is  $\frac{1}{8}$  of an inch thick, cut the square to be  $\frac{1}{8}$  of an inch, and if the board is  $\frac{1}{4}$  of an inch thick, cut the square to be  $\frac{1}{4}$  of an inch. By doing this, you make a square that actually creates a square shape.

Squares do have a practical purpose. By overhanging the edges of the text block, squares protect the text block from damage. They reduce the risk of external forces, such as fingers, causing damage and they also prevent the bottom of the text block from sliding across bookshelves as the book is removed and replaced. In some ways, the reverse is also true and the text block protects the squares, but only if the squares are relatively small. When

heavy-handed book wielders inadvertently apply pressure to the edges of the boards, the text block prevents the edges from bending. When squares are too big and the boards hang too far over the edge of the text block, the boards are much more likely to bend and break.

Can squares be too small? If the text block hangs beyond the edge of the boards, then yes, the squares are too small and leave the edges of the text block unprotected. However, many bookbinders like to make their books with zero squares, having the board edges flush with the text block. Many like the way this looks but there are also practical reasons. Books, especially large, heavy books, can have a tendency to pull themselves apart as they sit on shelves. A text block's own weight can pull it forward and down as far as the square will allow, thus pulling the spine of the text block away from the spine of the cover. Having the boards flush to the edges of the text block prevents this. On the other hand, zero squares increase the risk of damage to the text block, especially at the bottom, where the book slides across a bookshelf as it is removed and replaced.

THERE ARE MANY ADHESIVES that can be used in bookbinding, the most commonly used being **HIDE GLUE**, **PASTE**, **METHYL CELLULOSE**, and **PVA**. One aspect of adhesives that is regularly discussed is whether the adhesive is "reversible." This is a relative term, as anything can be reversible given the right treatment. What we really mean when we discuss reversibility is whether the adhesive is soluble and can be removed or manipulated with careful wet treatments. This may be important if you hope your



book will be more easily repaired should that ever become necessary. There may also be times during the binding process when you will want to “reverse” adhesion. As you consider which adhesive to use, this may be useful information to have.

Hide glue is protein based and is made from the skins of animals. It must be hot to be used, but it is a very effective adhesive. It is rarely used anymore, but is still a viable adhesive for bookbinding. Hide glue is considered reversible.

Paste is vegetable based and made from various kinds of starches. It begins in powder form and is mixed with water, then cooked to form the paste. Paste can be used in various parts of the bookbinding process, but is not always convenient because of its slow drying time. Paste is considered reversible.

Methylcellulose is vegetable based. It begins in powder form and is mixed with water until it thickens. It doesn't take much powder to make a thick mixture. Methylcellulose is a very mild adhesive and is used relatively little in bookbinding. It is often mixed with PVA to make the PVA easier to spread, and to slow the PVA's drying time. Methylcellulose is considered reversible.

PVA (or PVAc) is polyvinyl acetate, a synthetic adhesive. Many of the white glues available on the market are PVAs, but the PVA used in bookbinding is specially formulated to remain flexible when it dries. There are many kinds of PVAs used in bookbinding, and each bookbinder has their own preference. PVA is generally *not* considered reversible, even when it is labeled as such.

Each of these adhesives may be used in multiple situations, but some situations require specific adhesives. For example, when leather is involved, paste is the best adhesive to use. Understanding the properties of adhesives will help you know when, and when not, to use which ones.

BY NOW IT SHOULD BE APPARENT that bookbinding requires knowledge about many kinds of materials and processes. Understanding these and how they work (or don't work) together will augment your ability to produce structurally sound books. Combine that knowledge with training, practice, and skill, and you will be able to make books of high quality

craftsmanship, which is what sets good bookbinders apart from the rest.

I've been fortunate to have opportunities to learn from many different people, hear about different experiences, and participate in debates about various aspects of bookbinding. I have also been fortunate to have jobs where I was able to try various processes and materials. All of this combined has helped me become a better book worker, and I'm still learning. If you are just beginning as a bookbinder, my advice to you is that you seek opportunities to learn and practice. Seek training from experienced bookbinders, learn from as many different people as you can, become familiar with your materials, and practice, practice, practice. By doing this you will learn to balance the fixed with the variable and make quality books.

#### FURTHER READING

For a very comprehensive list of endsheet constructions, visit the American Institute for Conservation (AIC) wiki at [http://www.conservation-wiki.com/wiki/Books\\_Section\\_3\\_\(Book\\_Structures\)\\_chapter\\_1\\_\(endpapers\)](http://www.conservation-wiki.com/wiki/Books_Section_3_(Book_Structures)_chapter_1_(endpapers)) Betsy Palmer Eldridge presented “Sixty Sewing Styles” at the 2008 Standards of Excellence Seminar in Toronto. She has put together a booklet illustrating those sewing styles. [https://guildofbookworkers.org/sites/guildofbookworkers.org/files/standards/2008\\_BetsyPalmerEldridge.pdf](https://guildofbookworkers.org/sites/guildofbookworkers.org/files/standards/2008_BetsyPalmerEldridge.pdf)

An article I read early in my career called “The Movement of the Book Spine” by Tom Conroy helped me understand openability. The article can be found in volume 6 of AIC's *Book and Paper Group Annual*. <http://cool.conservation-us.org/coolaic/sg/bpg/annual/vo6/bpo6-01.html>

For more on quarter, half, three quarter, and full bindings, see the Etherington & Roberts dictionary. Roberts, Matt T., and Don Etherington. *Bookbinding and the Conservation of Books: a Dictionary of Descriptive Terminology*. Washington, DC: Library of Congress, 1982. <http://cool.conservation-us.org/don/>

If you can get a copy of *The New Bookbinder* volume 8 ([http://www.designerbookbinders.org.uk/pub/tnb/tnb\\_o8.html](http://www.designerbookbinders.org.uk/pub/tnb/tnb_o8.html)), there's a great article by Ken Gostling, “Bookworkers & Adhesives,” on the differences between adhesives.



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Close-up of early Delrin test on mould

# WATERMARKS IN MOTION

RADHA PANDEY

AFTER READING THE CHAPTERS “ANCIENT WATERMARKS” AND “Latter-Day Watermarks” in Dard Hunter’s classic *Papermaking: the History and Technique of an Ancient Craft*, during a papermaking class taught by Timothy Barrett at the University of Iowa Center for the Book, I felt inspired. The book is an excellent resource for anyone interested not only in the history of papermaking but also in its techniques and methods, as Hunter describes processes that are not necessarily found elsewhere in great detail.

In the first of the aforementioned chapters, I was taken by Hunter’s speculations on the reasons for watermarking papers, and the variety of signs and symbols used to do so. Building on this history, the following chapter went into great detail about, as the subtitle described, “The Nineteenth-Century Development of Watermarks into an Artistic and Technical Development.”

What caught my particular interest in this chapter were techniques described for the creation of watermarks for currency notes by Sir William Congreve for the Bank of England. He invented what he called Triple Paper, which consisted of a pinkish-red sheet of paper couched—sandwiched in the process of papermaking—between two watermarked cotton sheets, making the marks visible without needing to be held up against the light.

Congreve’s methods and results seemed extremely akin to the tedium of stop-motion animation: the repetition of process, wire and metal work, multiple couchings, replication, attention to color and detail. I was certain that someone out there in the world must have already tried this—creating animation using watermarks in handmade paper.

Multiple online searches for existing animations created this way turned up nothing. It seemed hard to believe that no one had yet used this technique for animation. Taking advantage of the latent qualities of a piece of handmade paper and bringing them to life seemed a natural way of creating imagery in, on, and of paper. It was such a challenging prospect that I simply had to try it.

I WAS NOT NEW TO ANIMATION. I had tried my hand at stop-motion as an undergraduate student in India and completed a five-minute video with figures and props made using wire frames embedded in paper. But a watermark animation would be a first for me.



**Radha Pandey is a papermaker and letterpress printer. She earned her MFA in Book Arts from the University of Iowa Center for the Book. She has traveled to investigate Islamic world papermaking techniques in India, and has since undertaken her own research on the essential tools of Islamic papermaking. Her artist’s books are held in numerous public collections in the United States and abroad.**



I took a closer look at watermarks by other papermakers in *Hand Papermaking* magazine's portfolio series titled "Watermarks in Handmade Paper: Modern and Historic."<sup>1</sup> It contained beautifully executed imagery that ranged from playful line drawings to solid shapes that changed the nature of the sheet itself, to detailed shadow marks like those seen in currency notes. All of these watermarking techniques were incredibly difficult to master and edition. Doing so meant learning not only the papermaking fiber but also the material used for making marks in the fiber, as well as how the two would behave together.

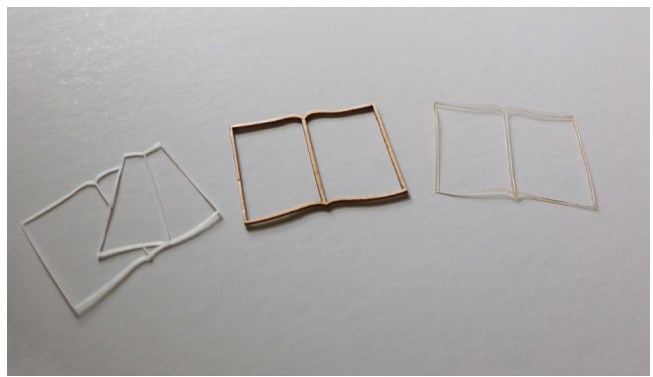
The image I decided to start with was a simple line drawing of an open book. The animation would show a page turning from the right to the left. I could repeat this to make it look like someone was flipping through the pages of this book.

I initially decided to make all the watermarks in a traditional manner, using pieces of copper wire soldered together and sewn on to a mould. For a one-second animation I would need twenty-five frames in all, which meant twenty-five pieces of paper, each with a different watermark.

I had never soldered anything before, and it required a lot of work to perfect the skill. Completing just the first frame took much longer than I had anticipated. The challenge lay in bending the wire in exactly the same manner for all twenty-five frames, making sure they exactly matched. Any variation would create a jump in the finished animation.

Doing this for a one-second animation was possible, but repeating this process for longer projects with multiple, more complex watermarks would be a daunting task. At this point the focus of my research changed. I wanted to be able to make watermarks easily, cheaply, with little effort and cost, so that one could explore the endless creative applications of this method and focus more on the content of the animation than the process.

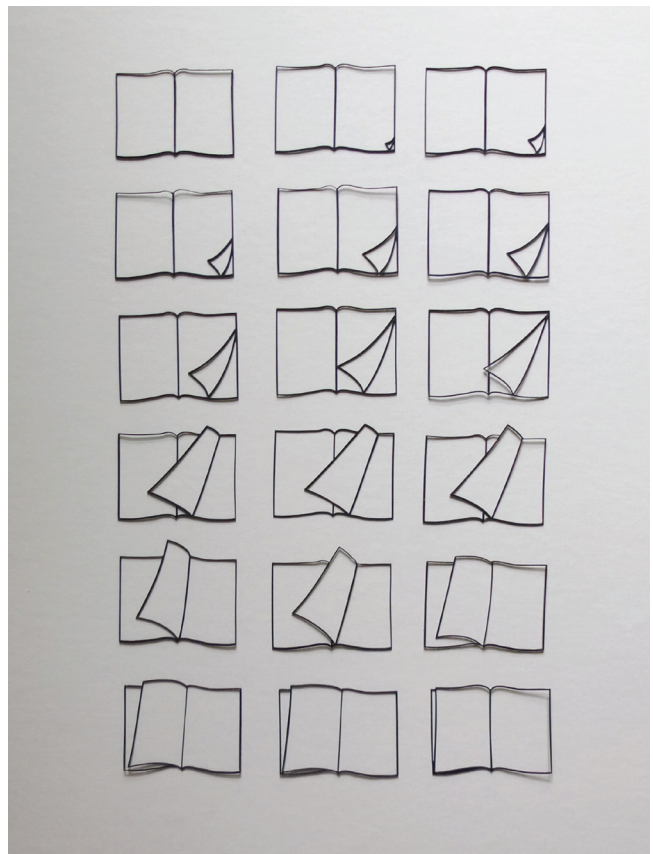
I turned then to other materials: puffy paint on mosquito netting, Mylar (Melinex), adhesive-backed polymers—nothing seemed to render the result I desired. Finally, I decided to try laser cutting all the



**Early tests with different materials: two thicknesses of Mylar (Melinex), and acrylic**

frames out of Delrin, a hard plastic with multiple applications.

Getting the frames to stay on a laid mould during papermaking without sewing them on created another challenge. I tested a variety of adhesives, including Gorilla glue, spray adhesives, and tapes, to no avail. Finally, two-part epoxy was suggested as an adhesive. After some initial testing to ensure the mould remained undamaged, this was what I finally settled



**Frames used for the first animation test of a book turning a page**

<sup>1</sup> Hiebert, Helen, Michael Durgin, Steve Miller, and Judi Conant. 2001. "Watermarks in Handmade Paper: Modern and Historic." Washington, DC: Hand Papermaking, Inc.

on. The only downside of using epoxy was that it took an hour or two to harden. After it set, I would make four sheets of paper, clean and dry off the mould, remove the frame, glue on the next one, and wait for it to set. This slowed down the process, but it was still much faster than soldering and sewing each frame.

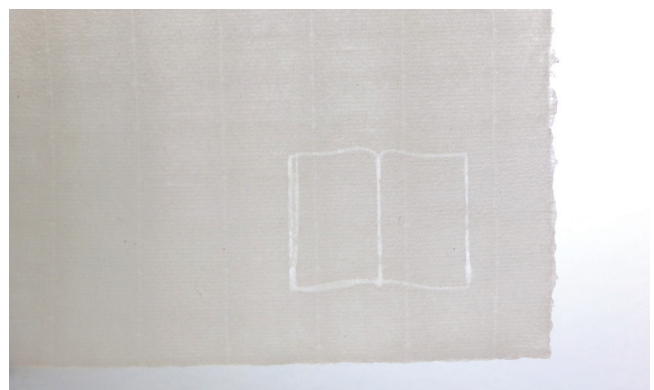
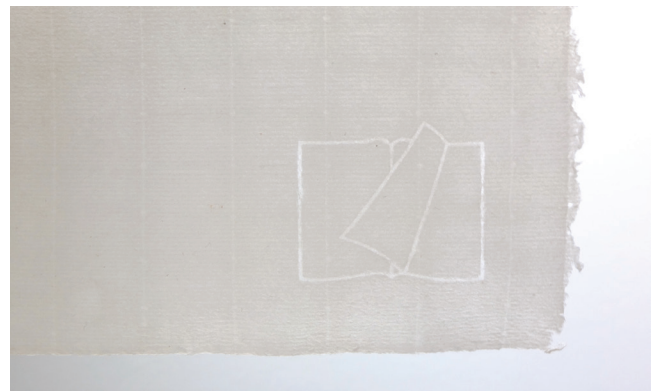
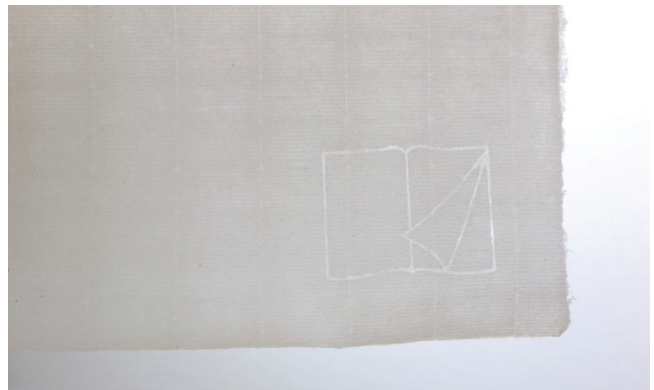
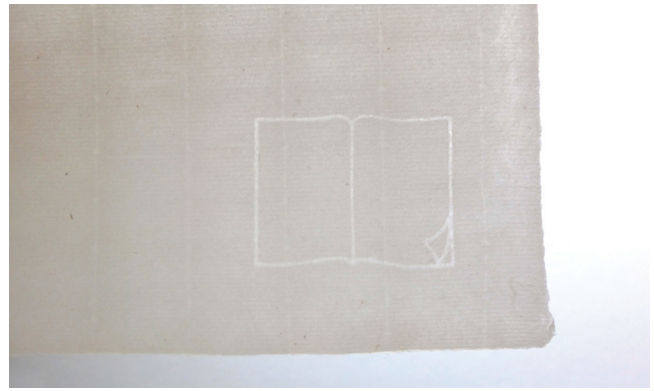
The epoxy worked extremely well keeping the Delrin in place without allowing it to fall into the vat or couch off along with the sheet—that is, when I laid the freshly formed sheet onto a felt to remove the paper from the screen, the Delrin remained adhered. Yet it was easy to remove and replace when I wanted to do so. The fiber I used for making the paper was short cotton linters, which in combination with the clean lines of the Delrin made for beautifully crisp watermarks.

The next step was to devise a system by which every subsequent frame's watermark could be adhered onto the mould in the exact same position as in the previous frame. This meant creating a jig that fit to the edge of the mould, making it easy to attach the new frame in the right spot.

WHEN THE SHEETS WERE DRY, I photographed them in transmitted light and strung the photographs together with Adobe After Effects software. In this way I created my first one-second animation using watermarks in paper. It was a great step in the right direction, but I wanted to try something more complex. I wanted to move from a stationary image to something that moved across the sheet of paper.

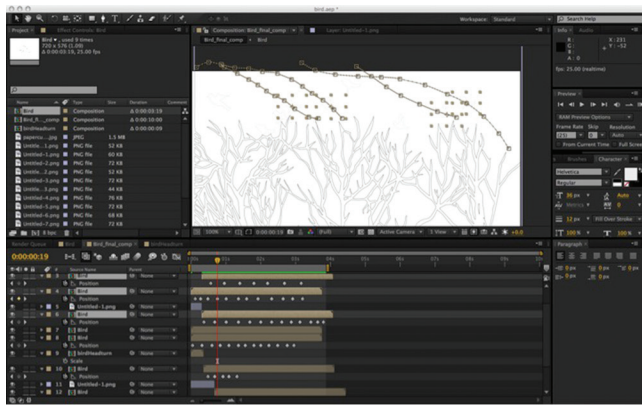
For my second experiment I used a drawing I had made from a photograph I took of the tops of trees after a flock of birds had taken to flight. It was a cloudy day with diffused light. Rendering into watermark animation the moment the birds took off would be perfect—it would capture the light and texture of the day in a way my drawing did not. It would also speak to the sort of light that was present in the sky that day, and the sense of quiet.

I began with the drawing, which I converted into a vector graphic in Adobe Illustrator. This made it easy to manipulate on a computer. I then chose to use Adobe After Effects to determine the flight path of all the birds, mapping how they would move across the mould. This software gave me a more user-friendly approach to animating and was also able



Details of frames from *Paper is Book*





**Screen grab from Adobe After Effects showing the flight path of the birds**

to read Photoshop files. Since I already had extensive experience with both Photoshop and Illustrator, the interface of this software seemed suited to my way of working. Any changes I made to my final frames in Photoshop would directly reflect in After Effects, which saved me some steps and some time.

Though there are, as I mentioned above, twenty-five frames in one second of stop-motion animation, typically, each frame is repeated to register better with the eye. A two-second animation therefore requires twenty-five individual frames, and to create a four-second animation, I had to have fifty frames, each of which would be repeated.

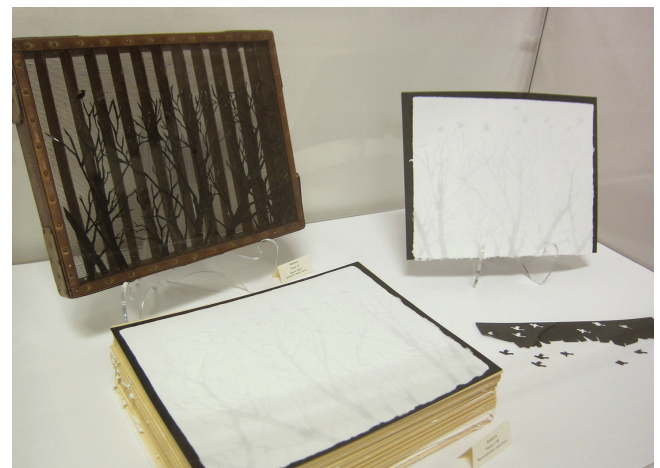
Each frame was laser cut and epoxied onto the surface of the paper mould. The trees stayed in place, but the birds behaved like little islands on the mould's surface, and needed to be moved forward separately. Working with a colleague, we devised a system that allowed me keep the birds following the flight path I had determined for them. We developed a jig with which the birds would fall in register to the treetops below them, using them as a reference.

Each frame (or sheet) took about two hours to make. Most of the sheets held up pretty well on couching, but they were weakest at the broadest parts of the watermark (the tree trunks) and had to be filled in by hand using a thinner consistency of pulp as each sheet was couched. The end result is a slight ebb and flow of transmitted light in the animated photographs, which creates the unexpected effect of lifelike movement in the trees. This lent the animation an ethereal quality, which is what I was after.

Some frames had to be manipulated slightly in Photoshop so as not to distract the eye—tears in the



**Original drawing in graphite used as reference for the animation.**



**(clockwise from left) Delrin mark on laid mould, frame #19, jig for placing birds onto mould, stack of finished sheets.**



**Detail of early Delrin test. Holes in the tree trunks helped water drain.**





**Early Delrin test on laid mould. The deckle helped hold the edges down flat.**

paper, rips in the watermarks themselves, unwanted debris in the sheets, and the simple fluctuations of the light box I was shooting against needed adjustment.

THIS PROCESS OF CREATING SOMETHING NEW from a traditional method of image-making that is integral to the paper taught me not only about the processes behind papermaking and production papermaking but also about materials and how to adapt them to a modern context. As I am a bit of a purist, this was a difficult project to undertake, but the results proved exceptional. Taking image-making a step further and using paper as the image itself instead of a substrate for the image greatly expanded my view of the possibilities within this narrow yet endlessly expansive field.

#### ACKNOWLEDGMENTS

I would like to thank Jeremy Richardson for his immense knowledge and enthusiasm during this process and for finding excellent solution during my materials research. I would also like to thank Timothy Barrett for his encouragement and support during this endeavor.

#### LINKS TO ANIMATIONS

Pandey, Radha. [2013] *Paper is Book*. Video animation. (loop). <https://vimeo.com/63137678>.

———. [2014] *Absence*. Video animation. <https://vimeo.com/113467833>.



**A freshly couched sheet of paper**



**Frame 19 as seen in transmitted light.**

#### SUGGESTED READING

Hunter, Dard. [1943] "Ancient Watermarks: Six and a Half Centuries of Mystic Symbols," pp. 258–280, and "Latter-Day Watermarks: The Nineteenth-Century Development of Watermarks into an Artistic and Technical Development," pp. 281–308. In *Papermaking: the History and Technique of an Ancient Craft*. New York: A.A. Knopf.

Bachram, Simon. 1986. "An Illusive Image: Some Thoughts about Watermarking Handmade Papers." *Fine Print: The Review for the Arts of the Book* xii (3) July: 136–143.





***De humani corporis fabrica.* Andreus Vesalius. 1555 (second edition). Collection of the Medical Heritage Center, Health Sciences Library, The Ohio State University, Size 38.75 x 26.75 cm.**

# CONTEMPORARY BINDINGS OF VESALIUS' *DE HUMANI CORPORIS FABRICA*, 1543 & 1555

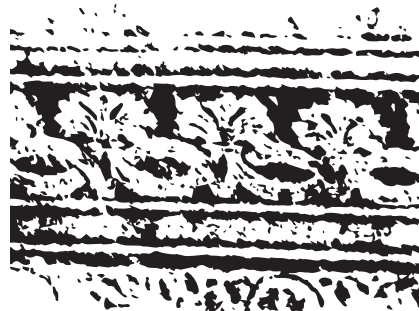
GABRIELLE FOX WITH STEPHEN N. JOFFE

I CARE FOR A PRIVATE EARLY HISTORICAL MEDICAL BOOK COLLECTION which once resided in Cincinnati, Ohio. It isn't extensive in comparison with the rare book departments in public and university libraries that I often work with, but each book is still chosen carefully and of particular interest because of its content. Unlike the institutional collections, with this collection I am able to conserve and maintain every book.

Some of the largest and oldest volumes in the collection are *De humani corporis fabrica*, written by Andreas Vesalius. When I began working with this private library it contained three copies of the second edition, published in 1555. Each copy was in a different style and age of binding. Over the past 25 years, eight more copies of this text, two first editions (1543) and six second editions (1555), have been added to the collection. I have examined all of these as well as six copies held by other libraries, one of which is private, the other three of which are university collections.

This article is an introduction to the information I have gathered about the bindings of *De humani corporis fabrica* while either treating the books (thirteen of the seventeen) or visiting the campus collections for other professional reasons. The questions I have asked about the books have evolved over the years. This article addresses copies of both the first (1543) and second (1555) editions that appear to be in contemporary bindings.<sup>1</sup> Given that more copies continue to be located, my goal is to share what I have learned and present it as a basis for further research and discovery.

For example, in a recent census of over 700 copies, one in five copies are bound in contemporary pigskin, with a lesser number in other leathers or vellum (Margócsy, Somos, Joffe, in press). I would like to know if more copies of *De humani corporis fabrica* have survived in contemporary bindings than other titles published in the mid-sixteenth century. If so, who were the binders? Are the materials and structures themselves responsible for the survival of these bindings or do the subject matter,



**Gabrielle Fox is a fine art binder and book conservator based in Cincinnati, Ohio. She travels to care for libraries and teach bookbinding. Her work is represented in many public and private collections. Gabrielle has published two books: *The Essential Guide to Making Handmade Books* and *Larkspur Press: Forty Years of Making Letterpress Books in a Rural Kentucky Community*.**

**Stephen N. Joffe, MD, FACS, is an Esteemed Professor of Surgery at University of Cincinnati, with over 200 peer-reviewed articles, 40 book chapters, and author of nine books. He encouraged Gabrielle's research into the bindings of Vesalius' *De humani corporis fabrica* and expanded new findings in private and institutional collections.**



**Printer's mark of Johannes Oporinus found in second folio edition 1555**

use of the books, and collections in which they were held in present any explanations? My hope is that the information I present here will allow others to continue to build on my foundation, and that the ways in which this survey has taken shape will help others embarking on similar surveys.

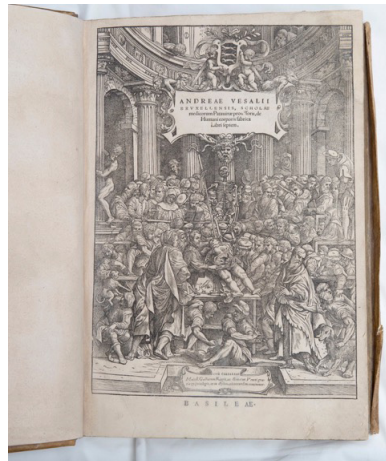
BUT FIRST LET ME GIVE YOU a bit of BACKGROUND about this extraordinary text.

Andreas Vesalius' *De humani corporis fabrica* was first published in 1543. It is estimated that between 800 and 1,000 copies were originally printed (Oldfield 2014, 50). Due to its success, a second folio edition was printed in 1555, and while previous estimates of copies produced were believed to be similar to those of the first edition, it is now thought that there were fewer second edition copies

(Joffe & Buchanan 2015, 10). The first and second folio editions were both printed by Johannes Oporinus in Basel, Switzerland; the illustrations are said to have been produced in the studio of Titian, possibly by Jan Steven van Calcar.

These images were then engraved in large blocks of pear wood by artisans likely to have worked in Venice. Recent information has identified the engravers as Francesco Marcolini da Forlì and Johann Britt (Oldfield 2014, 48).

The illustrations are familiar to many who have no knowledge of the book. The frontispiece shows



**Frontispiece of Vesalius' *De humani corporis fabrica*, first edition, 1543**

Vesalius performing a dissection on a female surrounded by onlookers. Other plates show men at various stages of dissection, lined up against a background of the Euganean Hills from Padua to Venice. Wood engravings of that size and detail point out the skill of the craftsmen. The

publication of the *Fabrica* set a new standard in the making of wood engravings, printing, publication and binding and was a turning point in the history of medicine.

The quincentenary of the birth of Andreas Vesalius was in 2014. The exhibitions, conferences, sculptures, books, and paintings produced in celebration of this particular publication came at a time of renewed general interest in the book as a physical object. In book history, if there was ever any documentation kept about a particular binding, it was usually of its decoration. We now understand that documentation of the binding structure and materials used can be more useful than decoration alone in the history of the book. The structure of a book can tell us more about an individual book's journey than its most recent leather covering.

MY INTEREST IN THE BINDINGS of *De humani corporis fabrica* was initially sparked by examining a second edition (1555) of Vesalius' *Fabrica* in one of the private collections that I help to maintain. It was bound in alum tawed pigskin that appeared to be contemporary. I wanted more information, so I began my research with a documented copy of that edition, also bound in alum tawed leather, whose binder was known. An early auction catalogue provided some very specific information:

Contemporary blind-tooled pigskin over beveled-edge wooden boards by Frobenius Hempel (d.1575); heads-in medallion roll



**Wood engraving of muscle man**





Front and back boards of Watson, 1555. Size 45.75 x 30.75 cm

(Haebler 4); vertical Biblical roll signed FH incorporating the Crucifixion, Annunciation and Resurrection (Haebler 2); horizontal Biblical roll signed FH, incorporating the creation of Eve, a reclining figure, and Jacob's Ladder (Haebler 3); individual subjects from this roll used as vignettes above and below the central plaque on each cover; large pictorial plaque blocked in the center of each cover, the front plaque signed FH, depicting Fides & Spes (Haebler VI); the back center plaque depicting Charity with a beggar (Haebler XIII); original twisted brass clasps, later lettering-pieces on spine (minor wear, a few small wormholes); modern black morocco box. (Christie's 1998)

In a separate document, the dealer's description, noting provenance, stated, "In its original Wittenberg binding of blindstamped pigskin over wooden boards by Frobenius Hempel (d.1575) with Haebler tools 2,3,4, VI, XIII, raised bands on spine in 8 compartments, with original twisted brass clasps, original owner's initials and date 'G F V 1567' stamped in gilt on upper cover. . ." (Watson n.d.).

How exciting to now have some concrete information! But who was this mysterious GFV who had his 1555 edition of Vesalius bound in Wittenberg in 1567, using the bookbinding services of Frobenius Hempel as indicated by the signature FH? I contacted the dealer, who was pleasant and knowledgeable, but could not provide any additional information beyond that listed in the documents I had in my possession.

There are two books written and published by Konrad Haebler about this period of binding. The

book they were both referring to is *Rollen-Und Plattenstempel des XVI, Jahrhunderts*, published in Leipzig in 1928 and reprinted by Kraus Reprint Limited of Nendeln/Liechtenstein and Otto Harraassowitz in Wiesbaden in 1968. There are 10 pages of rubbings in this two-volume, 1,008-page set. I had assumed the catalog's references would be to those illustrations. Sadly, as it turned out, there are no pictures of the tools identified as those on this binding, although the tools' descriptions are listed on pages 172–174 of the first volume. I am a bookbinder and would prefer visual confirmation of a match in the pattern and size, but verifying that the information was from an established source was somewhere to begin.

An online book description from Phillip J. Pirages Rare Books describing a copy of Euripides' *Tragodiai Oktokaideka* has added another potential line of enquiry:

Our edition . . . is the first in a series of at least five editions of Euripides issued in Basel by Hervagius and/or Johannes Oporinus between 1537 and 1562. . . . Our copy was bound in pigskin by Frobenius Hempel, identified by the Bavarian State Library's bookbinding database EBDB as the so-called "Wittenberg Master," known to have worked from 1549 until his death in 1575. (<https://www.pirages.com/pages/books/ST12884/euripides/in-greek-tragodiai-oktokaideka-then-tragoediae-octodecim>)

It is interesting that another publication by Oporinus was also bound by Frobenius Hempel, and also there is a new online resource for further information about this period of binding. The EBDB referred to in the Phillip J. Pirages catalog is the online database Einbanddatenbank, which is a developing source of information about historical bindings ([hist-einband.de](http://hist-einband.de)).

THE SECOND COPY OF THE SECOND folio edition in the collection bound in alum tawed pigskin leather was purchased from H.M. Fletcher, and it came with some description of the binding and binder. In correspondence with the dealer regarding the provenance of the volume, he referred to a previous dealer, noting that "their research had identified the





**Front and back boards of Fletcher, 1555, size 43 x 29 cm**

two sets of initials on the binding, as follows: ‘S.R.’ = Severin Roetter of Wittenberg / ‘H.S.’ = Hans Schreiber of Wittenberg” (letter from H.M. Fletcher dated 9/2/2003). Haebler does list those initials with corresponding information, but he also included other binders listed with the same initials. The Fletcher copy is bound in what is known as the Wittenberg style, and the LUNA: Folger Bindings Image Collection shows examples both bound in wooden boards and covered over pasteboards (<http://luna.folger.edu/luna/servlet/BINDINGS~1~1>). It is safe to assume, but not conclusive, that the initials refer to these particular binders because of their location in Wittenberg and the style of the bindings.

A further description of the tooling has been provided by Daniel Margócsy and Mark Somos in a survey being written of existing copies:

“Contemporary blindstamped German pigskin over wooden boards, clasps present, with allegorical and religious illustrations ‘mors ero mors tua’ & ‘ecce Agnus Dei qui toll.’ A central portrait of Emperor Maximilian by the Wittenberg bookbinder Hans Schreiber (d.1570) and the Wittenberg bookbinder Severin Rötter, who married Schreiber’s widow in 1572” (Margócsy, Somos, and Joffe, in press).



**Front board of Norman, 1555. Size 42.25 x 27.5 cm**

The third copy in the collection, known as Norman because of previous ownership, bound in blind stamped pigskin leather, had a brief binding description in the Christie’s sale catalog of December 1990: “contemporary blindstamped pigskin over beveled wooden boards, covers with roll-tooled panels incorporating small figures of David, Paul and Salvator Mundi, brass catches (clasps lacking), rubbed and worn. . . .”

With no further attribution to a binder I began comparing the Norman copy to the Watson and Fletcher copies to see if it might have similarities to either one. There are similarities, but only in that all three bindings are bound in a similar structure and style. The bindings when examined more closely do not share any characteristics to lead one to believe they are bound by the same person. The decorative tooling is similar, but not the same; the pigskin covering is in a similar style, but the corners and turn-ins are not the same. One binder can certainly vary any of those processes, but more precise evidence would be required before concluding that these copies were bound by the same binder.



**Medical Heritage Center, Health Sciences Library, The Ohio State University, 1555. Size 38.75 x 26.75 cm**

TEACHING BOOKBINDING TAKES ME to many different institutions. Having had my curiosity piqued by the Watson, Fletcher, and Norman copies of the 1555 edition, I began to pay closer attention to copies of *De humani corporis fabrica* held by collections at some of the institutions I visited. The copy of the 1555 edition at the Medical Heritage Center at Ohio State University has what appear to be original covers that have been incorporated into a more recent binding with an obvious repair of the spine.

It was this copy that prompted me to design a questionnaire, which I have filled out for each of the seventeen copies I have examined to date: four copies of the first edition (1543) and thirteen copies of the second folio edition (1555). In addition to completing the survey questionnaire, I have taken photos of each copy examined, noted if the printer's mark is still present, and if repairs have been made to the title page or frontispiece with its large introductory wood engraving of Vesalius performing a dissection. Rather than constituting a complete bibliographic collation, my notes address only those points obvious to me as a binder, concerning the general condition of the paper and any major previous paper repairs. Finally, I have gathered all available information on provenance and drawn a map of each copy's travels as it passed through various owners' hands.

Because texts were often trimmed each time they were rebound, page and binding measurements are interesting potential evidence of a book's binding history. The largest copy that I have seen of a 1555 edition, known as the Watson copy, is in a contemporary binding. The 1555 edition housed at the Thomas Fisher Library at the University of Toronto is the second largest in height of those copies I have surveyed. This copy, bound recently in vellum, is believed to have been annotated by Vesalius for the third edition, which was never published. The fact that this is one of the largest copies leads me to believe it may not have been in any earlier bindings, but I have not been able to find who bound it in vellum and so have no information about its prior condition.<sup>2</sup>

**Vesalius' *De humani corporis fabrica* bindings: Dimensions and period**

Provenance	Size of page	Size of Binding	Binding Century
Watson (1555)	43.5 x 28.5 cm	45.75 x 30.75 cm	16th
Fletcher (1555)	40.5 x 27.5 cm	43 x 29 cm	16th
Norman (1555)	40.5 x 26.5 cm	42.25 x 27.5 cm	16th
Reynolds-Finley, UAB (1555)	41 x 27.25 cm	42 x 29.25 cm	16th
Medical Heritage Center, OSU (1555)	36.75 x 24.25 cm	38.75 x 26.75 cm	16th & 19th
Cantacuzéne (1555)	40.25 x 27.25 cm	42 x 28.5 cm	16th or 17th
Christie's UK (1555)	38.5 x 26 cm	39.5 x 28 cm	19th
Sotheby's UK (1555)	37.75 x 27 cm	39 x 29.5 cm	20th
Thomas Fisher, UT (1555)	42 x 28.5 cm	43.75 x 29.75 cm	21st
B.M. Israel (1555)	36 x 24.5 cm	37.75 x 26.25 cm	20th
Gilhofer (1555)	42.25 x 28 cm	43 x 28.5 cm	18th & 20th
Glenn (1555)	38.75 x 26.25 cm	39.75 x 27 cm	18th & 21st
Quaritch (1555)	41.25 x 27 cm	42.5 x 28.5 cm	17th & 21st
Christie's (1543)	39.5 x 27 cm	40.25 x 27.25 cm	18th
Reynolds-Finley, UAB (1543)	41.5 x 27.25 cm	43.75 x 29.75 cm	16th
Quaritch & Watson (1543)	40.25 x 27.25 cm	41.5 x 28.5 cm	17th
Thomas Fisher, UT (1543)	40.5 x 28 cm	41.25 x 28.5 cm	20th

**Structure of Vesalius' *De humani corporis fabrica* Bindings: Binding material and sewing structure**

Provenance	Binding Material	Boards	Sewing Structure
Watson (1555)	alum tawed pigskin	wood	5 double cords
Fletcher (1555)	alum tawed pigskin	wood	6 double cords
Norman (1555)	alum tawed pigskin	wood	6 double cords
Reynolds-Finley, UAB (1555)	alum tawed pigskin	wood	5 double cords
Medical Heritage Center, OSU (1555)	alum tawed pigskin and calf	wood	5 cords
Cantacuzéne (1555)	vellum	pasteboard	5 cords
Christie's UK (1555)	goatskin & marbled paper	modern board	6 sewing stations (pairs of holes)
Sotheby's UK (1555)	calf	modern board	5 double cords
Thomas Fisher, UT (1555)	vellum	modern board	5 sewing stations (pairs of holes)
B.M. Israel (1555)	sheepskin	modern board	5 double cords
Gilhofer (1555)	calf & goatskin	modern board	5 sewing stations (pairs of holes)
Glenn (1555)	goatskin	modern board	6 sewing stations (pairs of holes)
Quaritch (1555)	calf	modern board	4 double cords
Christie's (1543)	alum tawed pigskin	wood	5 cords
Reynolds-Finley, UAB (1543)	buckskin	pasteboard	5 double cords
Quartich & Watson (1543)	vellum	pasteboard	5 alum tawed thongs (?)
Thomas Fisher, UT (1543)	calf	wood	4 cords

The questionnaire is a work in progress (see p.Δ52 30). As I become more informed about these early bindings, I find that I would like to have additional information about some of the copies I have previously examined. For example, I did not note how the cords were laced into the wood boards, nor did I make notes concerning the rounding and backing or the beveling of the boards up against the text spine shape. In several cases, early bindings that were not

in wood boards had cords cut close to the edge of the spine, and I am curious to know when and why that was done.

One easily visible point of comparison between sixteenth-century alum tawed bindings that I have been noting is the stamping and tooling on each binding. If the same tool has been used on bindings, that fact provides a starting point in identifying the binders or binderies. It alone is not conclusive; a wood



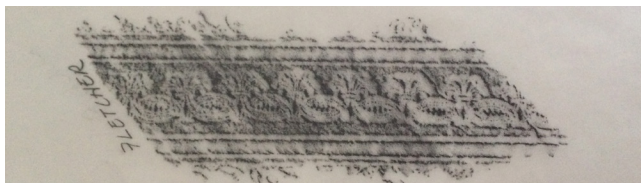
block or finishing tool can be used years later by other binders. And though binding decorations can be compared, they cannot be firmly matched unless one can be certain they are made with the same actual tool. Rubbings are better for this than photographs because they capture the actual dimensions of impression made by the tool.

A design that was often used in the period of these bindings is a roll referred to as an acanthus decoration. I have come across two basic designs: one with dots in the bands and one with lines. It was only after taking rubbings that I could confirm that none of these four examples are the same tool. In fact, none of the other similar tools and rolls are exact matches on any of the seventeen bindings I have examined.

AN EARLIER CENSUS IDENTIFIED 64 copies of the 1543 *Fabrica* (72 have now been identified) and 58 copies of the 1555 *Fabrica* (now 74) in United States



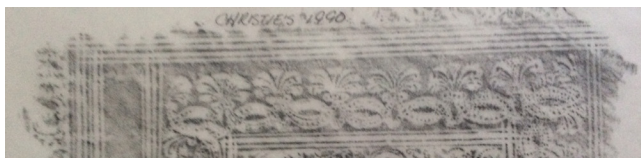
**Rubbing of front board of Watson 1555.**



**Rubbing of front board of Fletcher 1555.**



**Rubbing of front board of Ohio State University 1555.**



**Rubbing of front board of Norman 1555.**

libraries (Joffe & Buchanan, 2015; Margócsy, Somos, Joffe, in press). A new, preliminary worldwide census of 428 books has uncovered 185 copies of the 1543 edition in institutional libraries outside the USA, with ten copies in private ownership. Of the second edition,



**University of Alabama at Birmingham, 1555.  
Size 43.75 x 29.75 cm**

a total of 264 copies are in non-USA institutional libraries. In addition, 55 copies of both editions have either been sold at auction or by antiquarian book dealers since 1990 (Margócsy, Somos, Joffe, in press). These figures are unlikely ever to be exact, as copies in private collections cannot always be found or verified.

There are also rare book collections in institutions that are still uncatalogued or not catalogued online.

The Reynolds-Finley Historical Library at the University of Alabama at Birmingham has a 1543 edition and a 1555 edition, both in contemporary bindings. The blind tooling on the second folio edition is patterned differently from any other alum tawed bindings I have examined, and may have been bound a bit later, although the structure is similar.

The 1543 binding has decorative blind tooling that is very similar to their alum tawed 1555 binding, and is bound in what may be buckskin over pasteboards with remnants of leather ties. One other first edition held in a private collection has similar blind tooling to the University of Alabama at Birmingham's first and second editions,



**University of Alabama at Birmingham, 1543.  
Size 42 x 29.25 cm**



## SURVEY QUESTIONNAIRE

Vesalius, Andreas, *De Humani Corporis Fabrica libri septem*, Basle, Johannes Oporinus, 1543 and 1555

### List of points to be compared and noted:

Size of book                      Size of page  
Edge decoration              Complete copy? Y/N

#### Binding

- Original? Y/N
- If not, when rebound

#### Sewing structure

- Stitch
- Support
- Thread
- Content
- Colors

#### Boards

- Wood or pasteboard
- Attachment
- Pattern

#### Headbands

- Sewn on or off
- Attached
- Laced into board

#### Covering material

- Pigskin, goatskin, calf, buckskin, vellum or other
- Turn-ins
- Corners
- Surface decoration

#### Titling on spine, front board or fore edge text

#### Paper condition overall

#### Original endpapers? Bookplates

#### Any provenance known

#### Any annotations or notes

#### Overall condition report

#### Photos to be taken

- Front board
- Back board
- Spine
- Headbands
- Titling
- Front turn-in with pastedown if there

#### Rubbings



Front board of Christie's, 1543.

Size 40.25 x 27.25 cm

and, like their second edition, is bound in alum tawed pigskin over wooden boards with metal clasps.

THE TWO VELLUM-BOUND COPIES I have examined may or may not be contemporary bindings. The first, Quaritch/Watson, is a 1543 edition, and at first glance

it appeared to be seventeenth century, but having now inspected and handled sixteenth- and seventeenth-century bindings, I believe, based on its structure, materials, and decoration, that it may be contemporary. Its style of blind tooling, which does not have major central engraved blocks, leads me to believe that the Quaritch/Watson binding is probably later than the bindings on the Watson, Fletcher and Norman second editions.

A 1555 edition once owned by the Cantacuzène family, now held in a private collection, initially looked as if it had been rebound. On revisiting the library I found that one corner of a pastedown was loose, and I was able to see the original pastedown beneath it. This evidence leads me to suspect that in fact it too now is in a contemporary (repaired) binding, and the endpapers may be all that is new. It is a very simple vellum binding and difficult to examine very closely without damaging the binding. Again, the new endpapers at first examination indicated that the entire binding may be much later than 16th century.

IT WOULD BE FAR MORE SATISFYING to be able to point out specific similarities in the structure of the books I have examined as well as in their surface decoration. Most of their bindings have survived intact, however, and only so much of the underlying structure can be seen without exerting excessive force to inspect the method of sewing and binding, which could potentially cause damage. In addition, it can be

difficult to determine what is original to the binding and what came later. The 1543 copy sold by Christie’s is structurally very similar to an earlier binding, but identified as seventeenth century in the sale description.

Overall, however, it is intriguing to me that of the seventeen copies of *Fabrica* that I have examined, more than half are in contemporary bindings. Further, the Margócsy, Somos, and Joffe census indicates that 44% of the 1543 edition and 42% of the 1555 edition are in contemporary or near-contemporary bindings, with a high number of alum tawed pigskin bindings. Most appear to be in good condition, which indicates



Front board, Cantacuzéne, 1555.  
Size 42 x 28.5 cm

the care, attention and detail the sixteenth-century bookbinders created for their books (Margócsy, Somos and Joffe, in press). This stands in sharp contrast to J. A. Szirmai’s assertion that only “one to five per cent of original bindings [survive on] medieval books—an inestimable loss for the history of the book” (1999, ix).<sup>3</sup>

IT IS INTERESTING TO CONSIDER why these books were not rebound at a later stage like so many other important books in both private and institutional collections. One reason may be that in 1543, shortly after the initial publication of *De humani*

*corporis fabrica*, Vesalius published the *Epitome*. This was the illustrated essence of the larger text, which was a student’s or poor man’s version. Some of the illustrations were intended to be cut out and assembled in order to clearly illustrate the body in layers. Perhaps more contemporary bindings remain intact of the *De humani corporis fabrica* because the *Epitome* was so heavily used leaving the full version to be referred to less often.

*Fabrica* was sold in an unbound state. As with other books of the period, purchasers could order personalized bindings both to protect the pages and to show their identity as owner. According to the Margócsy et al census, all known surviving copies of the 1543 and 1555 *Fabrica* are currently bound except for the copy at the New York Academy of Medicine. Known as the Lambert copy, it was donated by Dr. Samuel Lambert in a limp vellum wrapper as if in a temporary binding.

In my small study of seventeen copies of the first and second edition of Vesalius, nine out of seventeen (52%) are in contemporary or near contemporary bindings and 35% are alum tawed pigskin bindings. I have many more questions than answers, and I invite input from readers with the hope that we as a bookbinding community can create a resource of information. With so many existing copies in what may be original bindings, we have access to a great deal of information about these books’ structure as well as their design.

WHO DID BIND THE SHEETS OF *De humani corporis fabrica*? And what accounts for the survival of their bindings? Ideally I would like to identify the binder of every existing copy, but for now I would like it if we could locate and identify all the artisans of the contemporary bindings and learn more about them and their techniques of binding.

Contemporary Bindings of Vesalius’ *De humani corporis fabrica*

Date of Publication	Number of Copies	Alum Tawed Pigskin	Leather	Vellum	Total
1543	156	19%	21%	4%	44%
1555	272	22%	6%	14%	42%
	Total 428				

Source: Margócsy, Somos, and Joffe (in print)

## ACKNOWLEDGMENTS

Stephen N. Joffe, MD continues to encourage my research in the bindings of *De humani corporis fabrica*. I would like to thank him for the opportunity to examine the bindings in his collection and his enthusiasm in my broadening the scope of this research to include both other private and institutional collections. He has provided me with information gathered while doing his own research into other aspects of *De humani fabrica corporis*.

—Gabrielle Fox

## NOTES

1. I use “contemporary” as Etherington and Roberts (2011, 373) define it: “A bookbinding produced immediately following the printing of the book; or, before 1700, a binding in the style of the decade or even the quarter century.”
2. Because texts were often trimmed each time they were rebound, the fact that this is one of the largest copies leads me to believe it may not have been bound before. If this is the case, then has it passed from one owner to another more often than a larger copy? The 1543 copy housed at the University of Alabama at Birmingham has stains in the outside margins that appear to have been created before the book was bound because of their regularity. There are some copies of the 1543 edition which have been referred to as smaller copies, and I wonder if those stains were trimmed off when those copies were first bound. If so, the size of the text bears no relation to how many owners have had it rebound. These are all trails that require more information in order to be conclusive.
3. J. A. Szirmai defines his use of historical terms by explaining, “in this book a typological distinction is made between three main categories of medieval wooden-board bindings: the carolingian, the romanesque and the gothic (Chapters 7, 8 9). It should be stressed that these designations are devoid of any historical or art-historical significance and merely describe binding types according to technical characteristics” (1999, 98). Given this definition, the bindings I have described would be considered “late gothic,” under the general heading of “medieval.”

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***Mindfulness*. 2015. 6 by 4.5 inches. Mica covers, pages, embellishments, and traditional Japanese-style wrapper with bone clasps. Unless otherwise specified, all books shown in this article are unique artist's books by Peggy Seeger.**

# HOW TO UTILIZE MICA IN BOOKMAKING

## AN INTRODUCTION

PEGGY SEEGER

WHEN I TEACH WORKSHOPS IN BOOKBINDING WITH MICA, JUST about everyone is excited because they have seen mica someplace, in rocks or driveways. However, in the twelve years I have been making books and reading about them, I have encountered only a few bookbinders or book artists who use this natural material.

Daniel Essig is the book artist perhaps most well known for using mica in his books, for teaching workshops on incorporating mica into books, and making sculptural mica books. He is the teacher who introduced me to mica and instructed me in methods for working with it. He inspired me to spend the past eleven years improving my techniques, creating new ones, exploring ways to use mica in different bindings, and learning about the mineral. Mica can be used in or on almost every part of a book—as covers, pages, windows, embellishments, and in collages. In general, the techniques for working with mica are rather easy to learn, and it doesn't take too long to become adept at using them.

Mica is a general term for a subgroup of sheet and flake minerals in the silicate class. Silicate minerals are distributed widely throughout the solar system and are the most abundant mineral on earth. Sheet mica is found in all three types of rock (igneous, metamorphic, and sedimentary) and can be cleaved into flat, thin, flexible layers down to one transparent layer. The most common type of mica, Muscovite, is found in silica rock that formed when lava cooled very slowly. It is named for the Muscovy province of Russia, where mica was once mined and used as window panes.

Today Muscovite mica is primarily mined in India, in blocks made up of many layers. It is essentially colorless and transparent, but because blocks consist of many layers, it appears deep brown or black. Sheets have a pearly or glassy luster on their surface. However, Muscovite also can be orange, red, yellow, green, brown, or gray. Orange and black stains found in some mica are caused by foreign materials and minerals present in the silicate crystals as they formed into mica millions of years ago. The characteristic of mica that most charmed me is its glittery appearance—the result of the way it diffuses and reflects light.



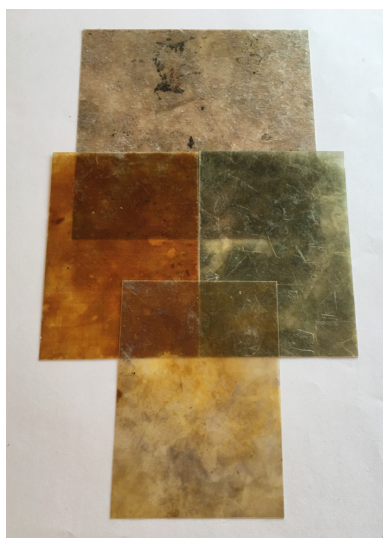
***Peggy Seeger has been making books with mica for ten years, focusing on artists' books for the past three years. She participates in book exhibits at local galleries, teaches bookbinding, and brings book artists to teach workshops in North Carolina. She can be contacted at [peggyseeger1@gmail.com](mailto:peggyseeger1@gmail.com).***



**Natural mica. Clockwise from left: black mica, black mica with black stains, gray mica with a pearly luster, two-layer clear rectangle.**

There are three distinct types of mica that can be used in book arts: natural Muscovite, composite, and commercial products. Natural mica is sold commercially in blocks of many layers and for crafts in small thin pieces with only a few layers. My favorite natural mica has black or copper stains or both.

Composite mica, also referred to as decorative mica, is a manufactured product used in making lampshades and sconces. Mica lamps were a hallmark of the Arts and Crafts Movement at the turn of the last century. Large sheets of composite mica are manufactured by combining layers of natural mica flakes under pressure with a binder. One such binder, shellac, which comes from the female lac bug, imparts its orange to dark amber hue to



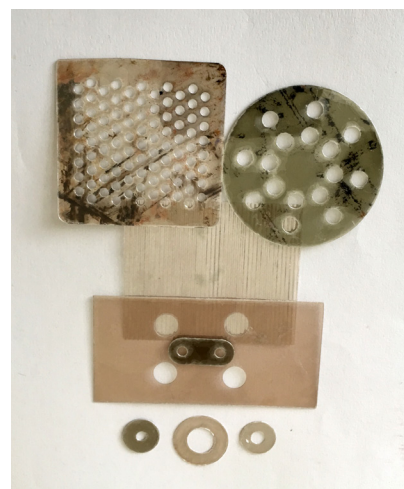
**Colors of composite mica, clockwise from top: silver with black and orange stains, green, golden, and orange.**

the color of orange mica. A colorless synthetic resin is used in the production of silver mica.

Composite mica is sold in several colors—silver, amber, orange, green, golden, and clear—and in several thicknesses and sheet sizes. Each sheet of composite mica has a unique appearance resulting from the size of the flakes of mica used in producing it, the resin, the thickness of the sheet, and any natural staining. Each sheet also varies according to the distribution pattern of flakes in the layers, with some areas of the sheet being lighter or darker in color and more or less translucent.

Natural sheet mica is flexible, extremely heat resistant and nonconductive. It is therefore manufactured for commercial purposes where an inexpensive thermal or electrical barrier is needed, for example in heaters or hair dryers. It is also used to make electronic devices. Layers of natural Muscovite mica are built up into plates with binders, and then stamped, punched, or machined into different shapes, sizes, and thicknesses. Many of these products can be used for

embellishments in bookmaking and collage. They include circles, strainers, thin and built-up washers, corrugated mica, and transistor shields that are usually sold in bulk by industrial suppliers. Mica is also ground to add glitter in paints and cosmetics.



**Commercial mica products, top down: strainers, corrugated mica, transistors, and washers.**

THE BASIC TECHNIQUES for working with natural and composite mica include cutting, sanding, staining, and cleaving mica, and adhering it to itself and other surfaces. Even though mica is hard and durable, both natural and composite mica can be cut easily. I most often use natural mica to protect photos and other images placed in a window on a book cover or page and to make embellishments. Daniel Essig sells natural mica in small sizes and shapes that can be used



without cutting them. Since I buy natural mica in large blocks from Asheville Schoonmaker, it is necessary to cut it to the size I need with a very sharp craft knife (X-acto, Olfa) or scalpel. (I prefer a scalpel since I find the blades sharper and thinner.)

- Cut mica by drawing the knife across the surface against a metal-edged ruler.
- Slowly trim one or two layers at a time, much as you might trim a stack of paper.

For book covers and pages, I use composite mica. Composite mica varies in thickness depending on the manufacturing process, and may be sold according to its caliper thickness or a descriptive category (“light,” “medium,” or “heavy”)—see the resources table on page 40). “Thin” mica has a thickness of about 0.010 to 0.015 inches, “medium” 0.015 to 0.020 inches, while “thick” is 0.030 inches. Thin and medium mica can be cut with a sharp craft scalpel, while thicker mica may be cut more easily with a utility knife. In cutting composite mica, again, always cut against a metal edge. It is tempting after making a few slices to finish the cut without the ruler. Don’t ever attempt to cut without a guide, as you will certainly slip and scratch the mica without one.

Cutting composite mica causes the layers to splay, creating an edge that is thicker than the rest of the sheet and is not attractive. I have found that no matter how straight my cut is, the edge is always very slightly irregular and rough.

- To smooth and even out a splayed edge, first lightly tap down the cut edge with a ball peen hammer, then place the edge slightly over the lip of the bench and sand with 320-grit paper.
- Sanding releases fine silica particles, so wear a painter’s mask if sanding more than a few sheets.

THE CUT EDGES OF COMPOSITE MICA CAN BE stained for an even more finished appearance. I have tried liquid acrylic, water-based markers (Le Plume and others), and permanent markers. I prefer permanent markers because the color is darker—water-based markers require too many applications to achieve a strong color.



**Apply paint sparingly with a cotton cloth and quickly wipe off.**

- Apply fluid acrylic to the cut edge with a Q-tip.
- Marker ink dries lighter than it first appears, so additional applications may be necessary to achieve the desired shade.

- Whichever stain you use, apply scant amounts so it doesn’t wick into the mica sheet, unless you would like to achieve that effect.
- If you get color on the face of the mica sheet in the process, you can quickly wipe it off with a wet Q-tip or cloth.
- The face of a mica sheet can be stained with fluid acrylic to bring out its irregularities. Apply the paint sparingly with a cotton cloth to the whole sheet, or to an area, and wipe off quickly.

LAYERS OF NATURAL MICA CAN BE SEPARATED TO achieve the desired clarity and thickness for your windows or embellishments. Begin by cutting the mica down to the required size. As noted, this step will often cause some splaying on an edge; that is the place to begin separating the layers.

- Insert your scalpel into the splayed edge of the mica and begin separating the layers.
- When you have an opening of about inch or so in, replace the scalpel with a very thin metal ruler and push it to continue gently separating the layers.

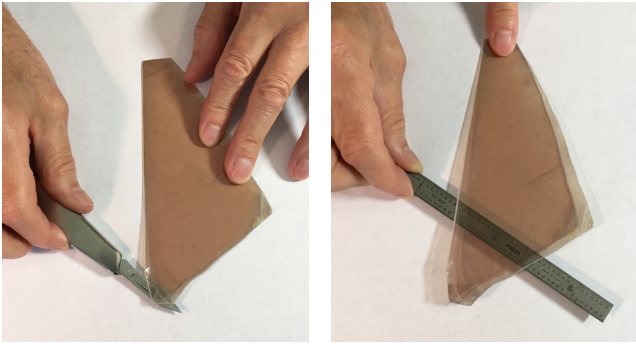
As you proceed, the layers will become thinner, lighter in color, and more translucent, until you have clear layers. Natural mica that consists of only a very few layers is often available in craft stores or from websites and is usually cut into small rectangles or squares. These can be used to add windows to book covers or pages made of composite mica, book board, wood, or metal.



## TWO RESOURCES FOR MICA

	<b>Design Mica Company (Daniel Essig)</b> <a href="http://www.etsy.com/shop/danielessig.com">www.etsy.com/shop/danielessig.com</a> <i>(inventory as of April 20, 2018)</i>	<b>Asheville-Schoonmaker Company</b> <a href="http://decorative.ashevillemica.com">http://decorative.ashevillemica.com</a>
<b>Natural Mica</b>	<p>Mix of 1 by 1.5 inch pieces</p> <p>Natural black stained mica available in 3 by 3 inch pieces; larger sizes available upon request</p> <p>Selection of sizes, thicknesses, shapes, and colorations, including window pieces in large, small, and square sizes; large and small circles with holes, and circle mixes</p>	<p>Irregular pieces of natural Muscovite are available in one-pound batches and five different grades.</p> <p>Grades indicate the size of the pieces of mica, with grade 1 being the largest.</p>
<b>Composite Mica*</b>	<p><i>More distinctive flakes; more variation in color and translucence</i></p> <p>Light weight (0.01–0.015 inch thickness) in golden; 8.5 by 11 inch sheets</p> <p>Medium weight (0.015–0.020 or 0.020–0.025 inch thickness) in extra clear or orange; packs of 4 sheets of 5 by 7 inch or 8 sheets of 3.5 by 5 inches.</p> <p>Deckle edges of sheets</p> <p>Mix of assorted colors and shapes</p> <p>Large and small circles with holes in center</p> <p>Custom cut orders available</p>	<p><i>More uniform appearance</i></p> <p>Sample kit contains fourteen sheets of 6 by 6 inches (ask for shipping price): 7 sheets of .015 inch thickness in clear amber, stained amber, clear dark amber, clear silver, stained silver, copper stained silver, and green; 7 sheets of .030 inch thickness in the same colors.</p> <p>Sheets available in 36 by 36 inches and 18 by 36 inches, in all colors and thicknesses. Either size can be cut down to your specifications.</p>
<b>Commercial Mica Products</b>	<p>Circle mix</p> <p>Steampunk mix (transistors)</p> <p>Circular and rectangular strainers</p> <p>Washer mix</p> <p>Large and small circular disks with holes</p>	<p>Only available in bulk:</p> <p>Mica washers</p> <p>Built-up natural mica washers</p> <p>Corrugated mica</p> <p>Transistor shields</p>

\*Daniel Essig describes the weight of composite mica as, “light,” “medium,” or “heavy,” while Asheville Schoonmaker specifies its actual thickness.



**Left: Scalpel inserted into the splayed edge of the mica to begin separating the layers. Right: After separating the mica layers to about an inch or so, replace the scalpel with a thin metal ruler and push it gently to finish separating the layers.**

COMPOSITE MICA IS MORE DIFFICULT TO CLEAVE than a block or piece of natural mica because the layers have been compressed with resin. If you cleave off layers of composite mica, the resin is exposed and the surface will be shiny, which I especially like. You can cleave both medium and thick sheets of composite mica (thick sheets are the easiest to cleave) but not thin, as it has too few layers. Cleaving even layers off the top of the sheet takes a lot of patience and practice. Part of the fun of cleaving mica is in revealing varied areas of translucence in the different layers.

- Insert the sharp point of a knife or scalpel into a corner of the composite mica sheet at about half the thickness of the sheet and slowly separate the layers.
- If pieces break off, start again on another edge of the sheet until the exposed layer looks consistent.
- Slicing off pieces so only parts of the layer below are exposed creates an interesting effect that I quite like and use often.
- You will also create flakes of mica that can be used as an embellishment, as discussed below.

IN GENERAL, MICA WILL NOT ADHERE TO ITSELF since it is not porous, but two sheets of composite mica (any thickness) can be joined together to make a book cover or page. One of the sheets needs to be backed with copy or text weight paper, or decorative paper of a similar weight.

- Cut the paper approximately half an inch larger around than the cover.

- Brush the mica sheet with a very thin, even coat of polyvinyl acetate (PVA) adhesive or PVA–methyl cellulose mix. (I prefer to use the latter, which sets more slowly, in proportions of two teaspoons of methyl cellulose powder to a half cup of water, mixed with a half cup of PVA.)
- Smooth out the brush strokes with your fingers, especially when the mica sheet is thin and translucent, so they aren't visible through the mica.
- Place the mica on the paper and smooth the paper with a bone folder. (Through experience I have found that placing the glued-out mica on dry paper is easier because it minimizes the paper's expansion and cockling, and it is easier to smooth out the paper once the mica is adhered.
- Let the paper-backed mica dry under weight, especially if backing thin mica, as even when the adhesive is applied to the mica, the moisture can still cause the paper to expand, which can in turn slightly warp the mica.
- When the adhesive has dried, trim off the extra paper around the mica and glue that sheet of backed mica to a second sheet of unbacked mica.

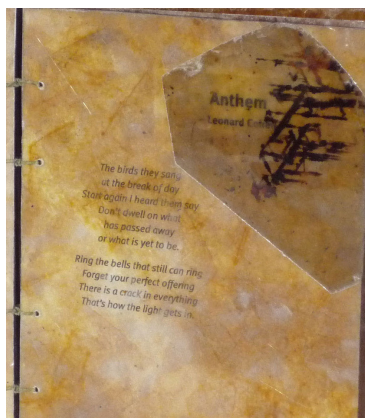
Natural mica can be attached to composite mica by backing the natural mica with paper. I use this technique primarily to place text or an image on paper as an embellishment on a mica cover or page. The natural mica protects the paper.

- Again, cut the backing paper a bit larger than the natural mica.
- Spread PVA on the natural mica, being extra careful not to leave brush strokes.
- Place the natural mica on the paper, smooth the paper with a bone folder, and let the paper dry.
- Spread PVA on the paper backing and place the composite mica on the paper so the edges line up with the edges of the natural mica.

If you want an image or text on the paper backing the composite mica to be visible through the natural mica, the two forms of mica can be adhered directly to each other. I use this technique especially with natural mica that has inclusions such as black streaks or copper deposits. However, the natural mica must also be attached to the composite mica with thread,

ribbon, or rivets in addition to the PVA. This prevents layers of natural mica from peeling off as the book is handled.

I have found that flakes cleaved off composite mica can be attached to another piece of composite mica without a paper backing. The flakes can also be stained after they are glued to the mica.



**Mindfulness. Black stained natural mica over song title on paper adhered to back of composite mica page. Knotted on with waxed linen thread.**

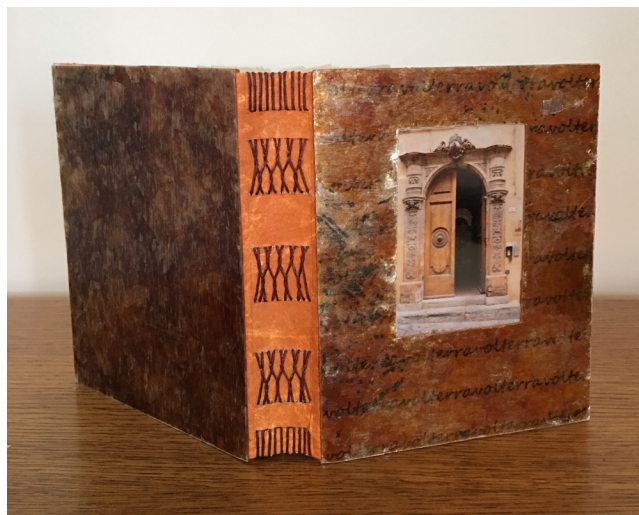
SHEETS OF COMPOSITE MICA make unique covers for books with mica pages, paper signatures, or a combination of both. You can use one sheet of heavy or medium mica as a cover without paper backing. A medium-weight mica cover will reveal some of a decorative flyleaf or text on the first page. A cover made with heavyweight mica will not reveal what is beneath it, but it can be embellished (more on this below).

LAMINATING TOGETHER TWO PIECES of thin or medium mica to create the outside and inside of a cover or front and back of a page offers more design possibilities. One or both of the pieces can be backed with decorative paper, text, lines or portions of text, sheet music, calligraphy, or drawings.

- Cut the two mica sheets to the size of your book and, as above, cut the backing paper(s) larger than the mica sheet. The two mica sheets can be the same or different color or thickness. If backing both pieces of mica, make sure the two backing papers have the same grain direction.
- Since the translucence and color tone of each sheet of mica varies with mineral deposit patterns, move the mica sheet over the backing paper to reveal the most pleasing areas of the paper. Each side of a single mica sheet will reveal the paper differently, so try both sides over the paper. Mark the four corner positions of the mica on the paper.

- Apply PVA to the mica as discussed above and adhere it to the paper within the markings. Let the sheet dry and trim off the extra paper.
- If only one sheet of mica is backed, apply adhesive to the unbacked sheet and join the two pieces of the cover against a right-angle ruler.
- If both sheets of mica are backed, join the cover sheets together by applying adhesive thinly and evenly to one of the sheets.
- The cover will not need extensive drying time but should be weighted with boards or books for several hours.
- The four edges of the cover can then be sanded and stained.
- Mica pages can be created in the same manner as covers.

MICA CAN SERVE AS A COVER in almost any nonadhesive binding structure, including a French/herringbone stitch over tapes, the Crisscross structure (also known as the Secret Belgian Binding), or a single-page Coptic stitch. Mica covers on a book with a combination of mica pages and paper signatures can be bound with the single-page Coptic stitch or other sewn structures for single pages. To make holes for



**Volterra. 2012. 4.5 by 5.5 inches. Blank journal with mica covers and paper signatures sewn with herringbone stitch over stained Tyvek spine.**

sewing through thin or medium mica, use an awl or Japanese screw punch. A screw punch is preferable since it creates a cleaner hole on both sides of the mica. On thicker mica use an electric hand drill.





**Orchid. 2014. 4 by 5.5 inches. Silver mica covers backed with handmade Christmas wrapping paper. The collage on front cover of stained golden mica and a photograph of orchid are protected with natural mica. Sewn with Crisscross stitch.**

FOR EMBELLISHMENTS, COMMERCIAL MICA products can be used as well as natural and composite mica. I sometimes embellish books with windows in the covers or the pages. There are several methods for cutting windows with square corners. The method I use is as follows:

- Mark the desired window outline on the mica with an awl and card stock template.
- With a new scalpel blade, start at the upper corner of one side and cut down almost to the bottom corner, leaving about an eighth of an inch uncut.
- Turn the mica over so the uncut eighth of an inch is now the upper corner and, again using the metal edge, complete the side. Cut the remaining three sides in the same way. I have found that cutting the side in two stages allows for a controlled cut that begins and ends precisely at the intended corners.

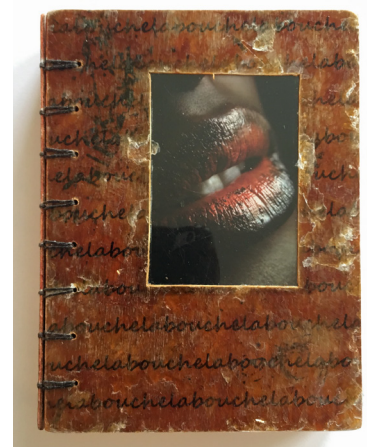
Another method for cutting squared-off window corners is to cut about a quarter-inch down each side from each corner and join the corner cuts with the scalpel. You can also use a chisel to cut each side of the corners (I have used a quarter-inch Flexcut palm chisel with a beveled edge) and join the cuts together with a knife or scalpel. Daniel Essig taught me this method, but I was never able to make my chisel cuts and scalpel cuts the same width.

Regardless of the method you use to cut your window, finish by hammering, sanding, and, if desired, staining the cut edges.

If you cut the window after backing the mica cover with plain or decorative paper, the flyleaf will show through the window. You can also cut a window in a cover before backing it with decorative paper so part of the paper is revealed through the window. If you choose to do the latter, place the mica with the cut window on your backing paper to determine the area you want to show. Mark the backing paper lightly in the corners of the window, then apply adhesive to the mica, leaving at least a quarter-inch unglued area along all sides of the window to prevent its spreading into the window.

AN IMAGE OR PHOTO can be placed in the window with a piece of natural mica protecting it. Before cutting the window, you will need to back the cover in order to prevent the edges of the window and tape holding the window and picture from showing through the cover. Choose a decorative backing paper that complements the image in the window. Once the window is cut, the window edges should be hammered, sanded, and, if desired, stained.

- To make the protective cover, cut a piece of thin natural mica an eighth of an inch larger all around than the window. Several layers of natural mica will be clear and sturdy enough to work with.
- Place strips of super adhesive double-sided tape an eighth of an inch wide along each side of the window on the inside of the book's cover or the back of the page. (I buy double-sided tape at [www.RubberStampConcepts.com](http://www.RubberStampConcepts.com).)
- Remove the backing from each strip of tape—making several small cuts with a scalpel on one

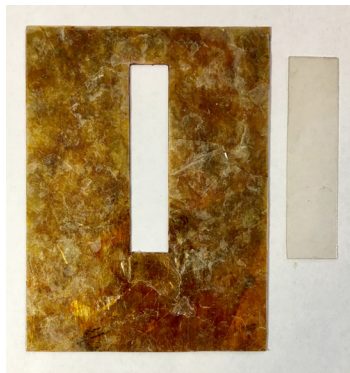


**La Bouche. 2008 4.5 by 5.75 inches. Crisscross binding. Mica covers backed in paper showing the words "La Bouche" repeated in lines (window edges unstained).**



end of each strip will make it easier to do this. Adhere the protective mica cover to the tape.

- Cut the image to the size of the window plus a quarter of an inch around.
- Apply double-sided tape around the window next to and slightly overlapping the edge of the natural mica, and attach the image. I draw a border with a permanent marker around the image that will appear in the window both to accentuate it and to make attaching it behind the window easier.
- Finally, apply PVA to the backing paper, leaving a quarter of an inch around the window unglued, and attach it to a second sheet of mica.



**After cutting a window in the mica cover sheet, cut a piece of thin natural mica an eighth of an inch larger all around than the window.**

SETTING A MICA FRAME around the image within a cutout window is another way to add distinction to a cover or page. It is the embellishment that was the most difficult for me to learn to do accurately. Even the slightest variation in the dimensions of the frame and the window will be very visible. The color of the frame should be different than the color of the cover.

- Decide on the size of the image that will appear in the window and the dimensions of the frame surrounding it.
- Cut the frame first, making sure the sides are straight and the corners are squared on both the inner and outer edges. Very lightly sand and stain all edges.
- Next, cut the window in the mica sheet to the size



**Finished cover with image protected by natural mica.**

of the image plus the surrounding frame.

- Adhere paper backing to the mica sheet after the window is cut and again, I recommend using a decorative paper that complements the framed image. The paper provides support for the inset frame and also prevents the taping of the mica window and image from showing through.
- Apply PVA to the frame and adhere it to the decorative paper within the window. If you wish to prevent the decorative paper backing from showing through the frame, either stain the back of the frame or back it separately with paper.
- Cut out the decorative paper from the inside of the frame.
- Adhere a protective natural mica layer and then the image as described above.



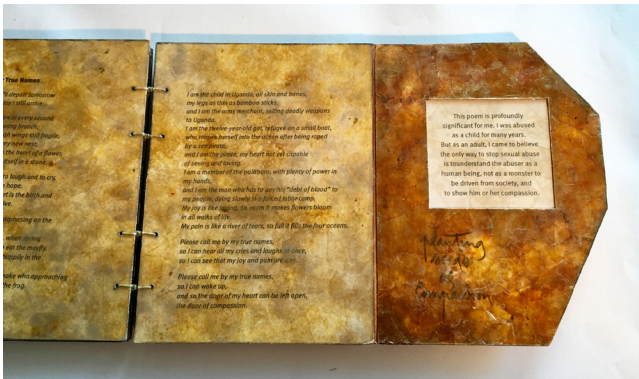
**Delight. 2016. 5 by 5 inches. Composite mica cover with mica window and photo with black border.**



**Mindfulness. Silver mica backed with drawing of fig branch; inset orange mica frame and natural mica window surrounding photo of Buddha head in tree roots.**

A FOLD-OUT TWO-PAGE SPREAD is another distinctive embellishment that can be added to a book with mica pages. Four sheets of backed mica can be joined with Tyvekz which creates very strong hinges. Tyvek is very easily stained to match or complement the color of the mica.

- Cut four pieces of composite mica, two for each page of the spread.
- Cut one piece of Tyvek one inch wide and the height of the pages. Stain both sides of the Tyvek



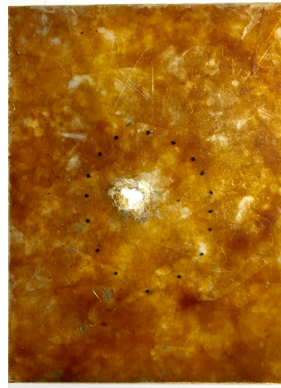
**Mindfulness. Fold-out spread with trimmed corners.**

with acrylic paint, watercolor, or marker. The color will fade as the Tyvek dries, so you may want to apply several coats. A lighter color will reveal more of the Tyvek's texture.

- Lay one piece of the Tyvek on the bench and apply PVA thinly and evenly to the entire piece with a brush.
- Quickly position two of the mica pages right next to each other on the Tyvek, turn the sheets over, smooth the Tyvek with a bone folder, and close the spread to create a hinge on the inside.
- Reopen the spread and apply PVA to the mica pages and the exposed Tyvek between them. Place the second set of pages on the first, aligning the edges, press down on the pages with your hand and close quickly in the opposite direction.
- Place an embellishment (e.g., a loop of thread), text instruction ("fold out"), or other indicator on the outer page of the fold-out to show that the page should be opened. I like to cut the corners of the fold-out page for this purpose.

A "GEODE" (AS DANIEL ESSIG, the inventor of this technique, calls it) is a form of window created by peeling away layers of mica from an area of a mica sheet to reveal an image or text below.

- Before backing the mica, use a fine marker or awl to outline in dots the desired shape of the geode window.
- Firmly tap the mica in the middle of the shape with the round end of a ball peen hammer to open a hole.
- Enlarge the hole by peeling off layers of mica from the center out toward the edges.



**Outline in dots the desired shape of the geode window and tap to open a hole. Continue peeling until the shape is achieved. Back the mica sheet with paper decorated with an image or text.**

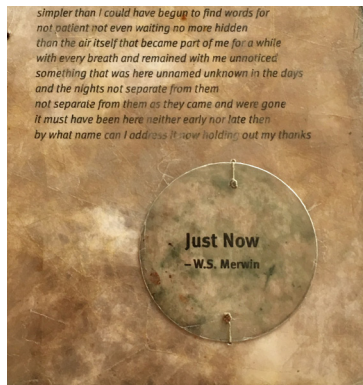
- Continue hammering the mica edges and peeling until you reach the desired shape as you initially outlined it.
- Stain the edge of geode with fluid acrylic on Q-tip or leave the natural edges, which will be lighter in color than the rest of the sheet.
- Back the mica sheet with paper that is decorated, for example, with a photo or text. You can also cut the backing paper from around the geode and add a mica window and image as described above.

THERE ARE MANY OTHER WAYS to embellish mica pages or covers, as well as those made from binder's board and decorative paper.

- Sew a circle or other shape of natural mica to composite mica with waxed linen thread: using a drill or awl, pierce sewing holes in both the shape and the mica sheet to which it will be sewn. Pierce a second set of holes in the mica sheet around the edge of the shape. Starting at the back, sew through the sheet and the natural mica shape, up over the edge of the shape, and again through the sheet to tie off in back. Sewing in the other direction and tying off with a knot on the natural mica is also simple and effective. You can adhere the shape to the sheet with PVA before sewing to achieve a smoother connection.
- Back a natural mica shape with decorative paper and glue it to book board covered with decorative paper using PVA.



- Create natural mica banners with paper backing made from headlines, lines of poetry, or quotes. Use thread, rivets, mica flakes or PVA to attach the banner to a composite mica sheet or covered book board.
- Sew lines of thread, ribbons, or paper through composite mica by making holes with an awl or slits with a scalpel or palm chisel.
- Use rivets, thread, E6000, or PVA to adhere commercial mica products, such as washers and strainers, to mica sheets or paper.
- Adhere flakes of composite mica with PVA to sheets of composite mica, images, or paper to add another design element or glitter. An overlapping line of mica flakes on a mica page can be a very attractive design element.



**A circle of natural mica covering the title and author of the poem on the composite mica and sewn with four-ply linen thread. The title, author and poem itself are printed on the paper backing the mica page.**



***I am Not Old and My Creative Process.* 2017. 5 by 6.5 inches. Traditional four-sided Japanese-style case with closure made of natural mica backed with decorative paper, ribbon, and bone clasp.**

MICA IS AN EXCITING NATURAL MATERIAL for novice and experienced bookbinders to work with. Its covers offer beginners an easy entry into bookbinding because they eliminate some of the challenging steps in cased-in binding such as mitered corners, infills within turn-ins on inside covers, and laying down pastedowns. When I began learning bookbinding,

I spent a year making blank books with fore edge flaps, first with paper and board and then with mica and paper. My first two artists' books, *Mindfulness* and *Delight*, were made with mica covers and pages. Finally, experimenting with mica's sheet structure, colors, translucence, and distinctive characteristics of each sheet is simply great fun.



***Delight.* Line of orange composite mica flakes adhered to a green mica page**

## REFERENCES

I learned about the mineral mica primarily from vendor and geology websites. These are a few that provide basic facts.

<http://geology.com/minerals/muscovite.shtml>

<http://www.minerals.net/mineral/muscovite.aspx>

<https://mineralseducationcoalition.org/minerals-database/mica>



# A GALLERY OF ARTISTS' BOOKS WITH MICA

**Alicia Bailey**



**Animal-Mineral-Vegetable-3.** Mica, copper, thread, Tyvek, feathers, dried grasses, cherry, wax, paper, PMA. Coptic binding. Box: book board, book cloth, paper, etched mica label. 2013. 11.5 x 4.25 x 0.75 inches. Collection of Baylor University, Crouch Library Special Collections. Photo © Alicia Bailey. Used with permission.



**Crystalline Flower.** Book board covered with a commercial Wyndstone paper. Each copy has a mica washer and copper bead affixed to the cover. The book is housed in a tray box lined with Japanese Tare paper. The outside of the box is a rich brown Japanese cloth with an inset label of etched mica. 3 x 2.5 inches, housed in 2.625 x 2 inches cloth-covered box. Archive and process materials for this work held by University of Denver, Penrose Library Special Collections. Photo © Alicia Bailey. Used with permission.

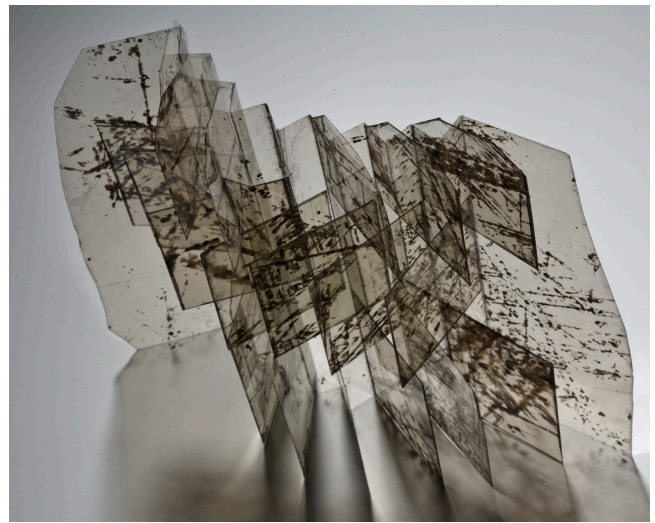


## Alicia Bailey



***Tile Paintings.*** Altered book paired with four tile shards created from a book published by The Victoria & Albert Museum. Four shaped holes (roughly the shape of the shards) cut through the cover and all of the pages; in the recesses rest the shards. The shards are protected when the book is closed with mica laminated in between the first end page and first few pages of the text block. 8 x 5.5 x 0.5 inches.

## Hedi Kyle



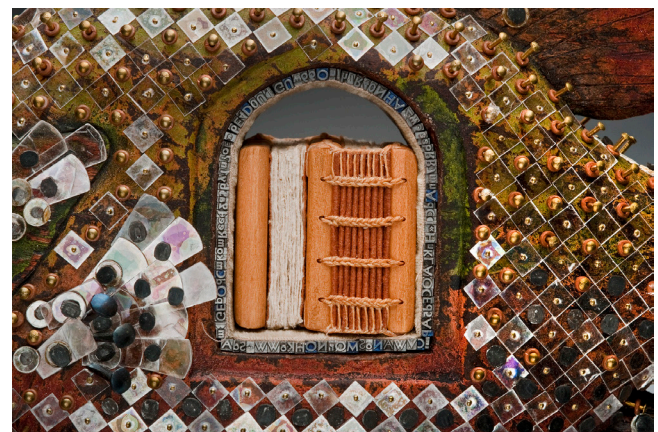
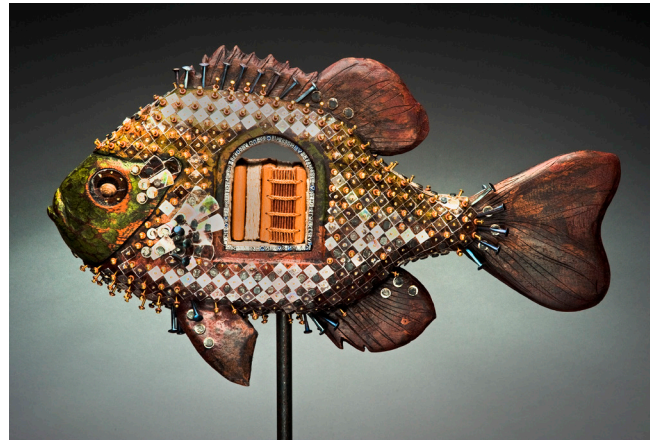
***Flag Book.*** 23 x 30 x 2 cm. I often envision the flag book as a movable screen to define space. Light and shadow capture my interest. At Penland I came across pieces of mica with inherent markings. They were transformed into this flag book. Photograph by Paul Warchol. Used with permission.



**Daniel Essig**



**Ammonite.** Wooden book. Mica window with composite amber mica frame. Ethiopian binding. 5 x 4 x 2 inches.



**Sunfis .** Black stain mica scales. Italian olive wood, mahogany, milkpaint, nails, snail shells. Printers type, handmade paper, back to back book with Ethiopian binding. 18.5 x 13.25 x 2.5 inches



**Latent.** Altered book, detail . Geode window in clear composite mica, Ambrotype in case. Cave handmade paper. Ethiopian binding. 6 x 4 x 2.5 inches.





**John Jacques and Sons Bookbinders' Shear**



# THE BOARD SHEAR

## BACKGROUND, MAINTENANCE AND SAFETY CONSIDERATIONS FOR THE JACQUES AND SIMILAR MODELS

WILLIAM MINTER

THE BOARD SHEAR MAY BE THE MOST FREQUENTLY USED TOOL IN a bindery, and due to its size, it is the focal point of many shops. Over the years, I have had the opportunity to test the cutting action of many board shears. While some are acceptable, others have a major problem with the upper blade pinching or not cutting in certain places along the entire length. Not only are these shears difficult to use, the pinching could be causing serious damage to the blades and other parts of the tool. In other cases, the blade may have to be pulled toward the bed for a clean cut, which could damage it.

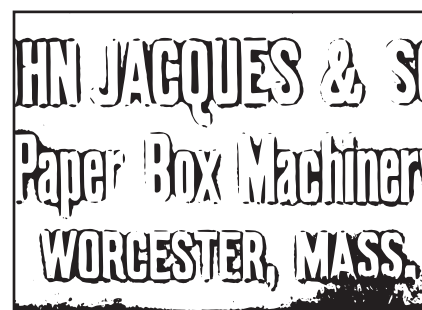
As far as we know, there is no proper instruction manual for this important tool, so with help from numerous colleagues, the following information has been compiled to provide a history of the board shear as well as guidelines for proper safety and maintenance:

### I. GENERAL SHEAR MAINTENANCE

- I.1. Metal objects
- I.2. Protecting the work surface
- I.3. Bumper for the cutting blade
- I.4. Oiling
- I.5. Lubrication of axle bolts
- I.6. Clamp cushion or pad
- I.7. Annual maintenance
- I.8. Auxiliary gauge for cutting narrow strips

### II. BLADES

- II.1. General notes
- II.2. Cleaning the blades
- II.3. Sharpening
- II.4 Mounting surfaces
- II.5. Mounting and aligning the bed blade
- II.6. Anatomy of the upper blade on the Jacques shear
  - II.6.A. Hub and axle bolts
  - II.6.B. Lubricating the axle bolts



*In 1978, after a seven-year apprenticeship with noted fine bookbinder and book conservator Bill Anthony, William "Bill" Minter started his own book conservation practice in Chicago and later moved to Pennsylvania. In 2014, Minter was named the senior book conservator for the Pennsylvania State University Libraries (aka Penn State). He is known for his inventive character, with many different items to his credit, the most notable being the ultrasonic welder for polyester film encapsulation.*

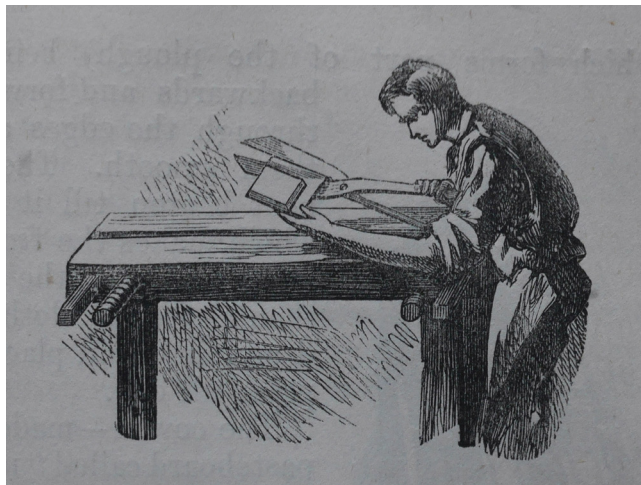
- II.6.C. Yoke
- II.7. Adjusting the upper cutting blade on the Jacques shear
  - II.7.A. Tools
  - II.7.B. Testing the cut
  - II.7.C. Diagnose the problem
  - II.7.D. Adjustments
  - II.7.E. Patience
- II.8. Adjusting other shears

### III. SQUARING THE BOTTOM/TABLE GAUGE

- III.1. Testing the squareness of the gauge
- III.2. Squaring the gauge, iron-top shear
- III.3. Squaring the gauge, wood-top shear

### IV. SAFETY CONSIDERATIONS

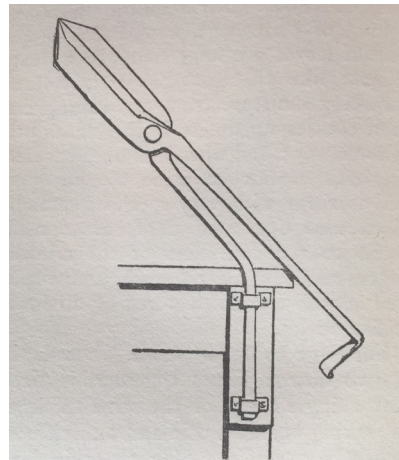
- IV.1. Safety pin or bolt on counterweight arm
- IV.2. Counterweight bar
- IV.3. Clamp clearance safety
  - IV.3.A. Safety stop to reduce clearance
- IV.4. Blade down or blade up?



**Using a Press Shear. Photo by Jeff Peachey. Used with permission. <https://jeffpeachey.files.wordpress.com/2011/01/millboard-shears4.jpg>**

EARLY BOARD SHEARS, according to Jeff Peachey, were called “press shears,” which are similar to a modern pair of sheet metal cutters.<sup>1</sup> These cutters were first held in a bookbinder’s lying press and later mounted to the end of a workbench.

In 1857, John Toulmin was granted a United States patent for an improved shear called a “Vibrating



**Mill-board shears, From Douglas Cockerell, *Bookbinding and the Care of Books*, second edition, figure 45, p. 126, John Hogg, London, 1906.**

Shear.”<sup>2</sup> Mr. Toulmin’s patent states, “The nature of my invention consists ... of hanging the movable blade ... so that ... said blade can be adjusted with the greatest accuracy, whereby the shears can be constantly kept in good cutting order.” This is precisely what

is needed in a bindery. Over the years, numerous manufacturers, such as John Jacques and Sons, Latham, Sheridan, Hickok, Krause, Hoe, and others made various improvements on the shear. Another name found on shears is Gane Bros., but these were rebranded, as they must have been made by manufacturers such as Jacques.

A 1923 John Jacques and Sons sales brochure shows three different models of board shear<sup>3</sup> as well as shears that could be mounted on a workbench. To cut lightweight materials, such as those used to make boxes for food, hats, and other items, there was the “Card Cutter or Fine Paper Box Makers’ Shear” and the “Strawboard Shear.” Both of these models usually had a wooden top, but an iron top was also available. The third model, and my preference, is the iron-top described by Jacques and Sons as the “Bookbinders’ Shear.” I consider this model to be superior, the “Cadillac” of board shears, because the cutting blade is supported by a sturdy, angular, L-shaped casting that is less prone to flexing during a cut. With the Box Makers’ and the Strawboard Shears, the upper blade is supported by a flat, rectangular casting that may flex during a cut, especially when cutting a thick and dense binder board.

### I. GENERAL SHEAR MAINTENANCE

Proper maintenance of a shear is important, and every board shear manufacturer seems to have designed its own system for adjusting the alignment of the cutting



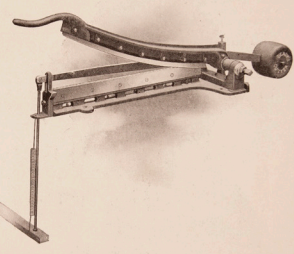
JOHN JACQUES & SON, WORCESTER, MASSACHUSETTS

### Bench Shear

THIS machine consists of the castings to which upper and lower knives are bolted and balance weight hung ready for cutting. Bed can be bolted to a suitable table or bench.

Suitable for cutting all kinds of flat material such as zinc, light iron, straw and mat board, the same as our regular shears.

Furnished with or without clamp.



Prices with Clamp	Wgt. crated	Prices without Clamp
30-in. \$65	200 lbs.	30-in. \$60
33-in. 70	245 lbs.	33-in. 65
40-in. 75	325 lbs.	40-in. 70
45-in. 85	375 lbs.	45-in. 80
50-in. 95	400 lbs.	50-in. 90
55-in. 105	500 lbs.	55-in. 100
60-in. 125	550 lbs.	60-in. 115
72-in. 150	620 lbs.	72-in. 140
100-in. 200	1090 lbs.	100-in. 190
120-in. 250	1500 lbs.	120-in. 240

Page Seven

JOHN JACQUES & SON, WORCESTER, MASSACHUSETTS

### Strawboard Shear

With Angle Table Gauge

THE best low-priced shear on the market. A first class shear at a low price, with iron frame and hardwood top.

TABLE GAUGE—Sliding in iron groove in table, locking parallel with blade for regular cutting with taper pin, can be set parallel or at any angle desired by turn of hand wheel.

CLAMP—Foot clamp, raising parallel, and self adjusting to all thicknesses of stock.

RACK GAUGE—The same as on our high-priced shear. Runs out 20 inches, moved by rack and pinion gear and held by hand screw accurately parallel to bed knife.

Top made of best kiln-dried birch.

PRICES including Spring Gauge:

Size	Weight crated	Price
30-inch	680 lbs.	\$165.00
40-inch	850 lbs.	180.00
45-inch	890 lbs.	200.00
50-inch	980 lbs.	225.00
55-inch	1130 lbs.	250.00
60-inch	1375 lbs.	275.00

Boxing for Export Extra \$5.00



Page Six

JOHN JACQUES & SON, WORCESTER, MASSACHUSETTS

### Card Cutters or Fine Paper Box Makers' Shears

THIS shear is adapted to the fine class of Card and Box Work, for printers, stationers, lithographers, etc., with our improved gauge and sectional clamp.

Gauges are set square and true instantly by one adjusting or holding screw. Table gauge set in position on table square with cut by hand screw.

Parallel Table Gauge fitted to and sliding on table gauge and clamping at any desired distance from knife.

Back gauge moved by rack and pinion gear, raising out twenty inches and set by hand screw.

Slats are attached to this gauge to support light materials in the cutting.

CLAMP is of our sectional design, raises parallel, and clamps equally well on all widths and thicknesses of stock. Automatic Clamp operates by raising the knife, self adjusting to all thicknesses of stock, clamping close to the cut.

Foot clamp is held up by a spring and made to clamp by foot pressure.

Wood top is thirty-six inches wide. Iron top is twenty-six inches wide.

NOTE—In ordering state whether wood or iron top, automatic, or foot clamp is desired.

Price, including spring gauge.

Size	Weight crated	Price
30-inch	750 lbs.	\$200.00
35-inch	800 lbs.	210.00
40-inch	900 lbs.	225.00
45-inch	930 lbs.	250.00
50-inch	1000 lbs.	275.00
55-inch	1100 lbs.	300.00
60-inch	1200 lbs.	325.00

Boxing for export extra \$5.00

Foot clamping price, \$10 less



Page Eight

JOHN JACQUES & SON, WORCESTER, MASSACHUSETTS

### Bookbinders' Shears

THE Best Shears on the Market

THIS is our heavy all-iron shear with our new sectional clamp.

Iron Table, twenty-six inches wide with our quick adjusting gauges.

Nickle-plated rules set in table.

Back gauge slides on top of frame by rack and pinion gear, allowing cuts of twenty inches in width, and is clamped in any location as desired.

Slats are furnished for supporting this materials.

Foot clamping, with our sectional clamp, which raises parallel and is self-adjusting to all widths and thicknesses of stock.

Spring gauge furnished unless otherwise ordered.

Price of Spring gauge deducted from list when not wanted.

With spring gauge:

Size	Weight crated	Price
33-inch	850 lbs.	\$210.00
40-inch	950 lbs.	225.00
45-inch	1040 lbs.	250.00
50-inch	1100 lbs.	300.00
60-inch	1300 lbs.	350.00

Boxing for export extra \$5



Page Ten

#### Models of Jacques board shears, as shown in 1923 sales brochure

blade. In my opinion, the Jacques is the best because of its simplicity and ability to counter the effects of years of wear.

It appears that the John Jacques and Sons shears were very popular, since they are found in many of today's binderies and conservation labs, especially in the United States. A great number of these shears were undoubtedly made in the early- to mid-1900s. While there is a serial number stamped on the yoke, we may never learn when each shear was made. Unfortunately, the archives for Jacques may have been lost.

We must remember that when these shears were manufactured decades ago, they were designed and intended for use in large binderies hundreds or thousands of times a day. Today the modern bookbinder might use a shear a hundred times a week. Knowing how to make adjustments to correct problems or to properly align a newly sharpened blade will help ensure that these tools remain in use for a long time to come. These shears were well built and will last many lifetimes with proper care and handling.

Following are a number of small points to consider for the good of your board shear:

**I.1. METAL OBJECTS:** Ideally, a metal ruler should not be used at a board shear. In time, that ruler will invariably be forgotten and then slide under the cutting blade, which could cause damage.

**I.2. PROTECTING THE WORK SURFACE:** The surface of the wood-top shear can be readily protected with a good coat of polyurethane varnish. The iron top can also be treated, but the compound used must be easy to apply and must not chip off. One suggestion is to apply a light coat of butcher-block wax or microcrystalline wax on a regular basis.

**I.3. BUMPER FOR THE CUTTING BLADE:** Many shears have a leather or rubber bumper for the cutting blade handle. That bumper could have worn out or is missing, thus the blade-handle bangs against the frame, causing unnecessary stress to the parts—as well as to coworkers. An alternative to the rubber bumper

is a piece of hard-durometer polyurethane,<sup>4</sup> which is more durable than standard rubber.

**I.4. OILING:** Some shears have lubrication holes, such as at the foot treadle, where oil should be added, perhaps on a regular basis, such as annually. Unfortunately, lightweight oils like “3-in-1” oil could drain away and may have to be applied more frequently. A heavyweight oil, such as a 30-weight automotive oil, would be much better.

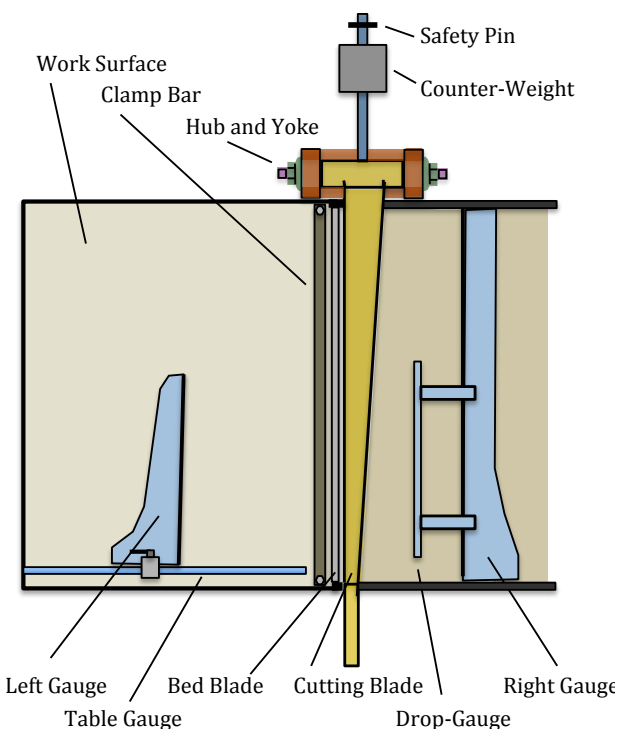
**I.5. LUBRICATION OF AXLE BOLTS:** It is good practice to lubricate the axle-bolts and hub of the shear on a regular basis. Details about how to do this appear below in section II.6.B.

**I.6. CLAMP CUSHION OR PAD:** Some shears have a leather rope or rubber tube inset in the clamp to hold the material during cutting. Replacement parts are available from suppliers, such as Bindery Tools, LLC. There is, however, an alternate approach. The cushioning material can be removed completely and the clamp tested for uniform holding. In some areas there could be too much clearance, so tape or thin shims can be added. Then the entire underside of the clamp is covered with a length of cardstock or similar durable material, such as 20 pt. plastic. Before attaching this strip, which is initially made wider than the clamp, one side is first laminated with book cloth using double-sided tape. The assembly is then secured to the bottom of the clamp with double-sided tape—cloth side down, to hold materials being cut and prevent their slipping—and cut by the shear. This newly cut edge now identifies precisely where the blade will cut and serves as a helpful guide to eliminate guessing when pencil trim-marks are used on materials.

**I.7. ANNUAL MAINTENANCE:** It is a good idea to schedule an annual test of all bolts to ensure that they are snug. This includes the foot-treadle bolts, which always seem to loosen. Also, be sure that the bolt for the counterweight is still tight, as vibrations could cause it to loosen.

**I.8. AUXILIARY GAUGE FOR CUTTING NARROW STRIPS:** When cutting very narrow strips of material, a waste piece of similar thickness can be cut first using the

left gauge (there seems to be a consensus among colleagues about using the term “gauges” for certain parts of the shear; more on gauges below). This new strip will now serve as an auxiliary gauge that will readily fit under the clamp. With this auxiliary gauge in place, all cuts will be perfectly parallel, especially with very narrow spine pieces.



**Parts of a board shear**

## II. BLADES

**II.1. GENERAL NOTES:** The most important point with any board shear is that the cutting blade should move freely along the entire bed blade without pinching or restriction, and should also cut cleanly and uniformly. In fact, the upper blade should make a clean and uniform

sound during its movement when it is not cutting any material. Consider the way that a good pair of scissors cuts cleanly and smoothly. A board shear can do the same if all of the parts are adjusted properly. And while it is designed to cut thicker materials, a board shear should also cut a thin sheet of paper easily and cleanly without the need to force the blade.

The lower, “bed” blade is straight, but the upper blade has a slight curve. Obviously, each of these blades is an important part of the entire shear and should be sharp. Sometimes when people think the blades need to be sharpened, it is possible that the upper blade simply needs a minor adjustment

for a proper cut. Furthermore, one national blade sharpening company has suggested that the blades on our shears may only need to be sharpened every twenty years, especially considering our limited use. Remember, these shears were designed for heavy industrial use for many hours a day.

The cutting edges on both the upper and bed blades come to a sharp corner that will round over with use. The bed blade is very broad to provide support for the cutting edge. The upper blade, especially on the bookbinders' shear, will have a similarly wide and flat shape along the bottom edge, thus providing the support and strength to cut binder's board. Other shear blades, however, may have been sharpened much like a guillotine blade, with very little edge support. This style of blade, coming to an acute angle, is best suited for cutting only paper or leather.

Shear blades are "bi-metal" blades—that is, they are composed of two different hardnesses of steel. The main portion of the blade, where the bolt holes are located, is regular steel, whereas the actual cutting edge is a much harder metal that has been inlaid and welded in place. This difference in hardness can be shown by taking a needle to scratch the side or the top of the blade. The harder metal will not scratch.

**II.2. CLEANING THE BLADES:** Sometimes the blades can accumulate a deposit of adhesive residue that will affect the cutting action. While various solvents can be used, WD-40 is a readily available solution. Extreme caution must be exercised while cleaning a blade, so thick protective gloves should be worn. In some cases, you might even have to scrape the vertical part of the blade to assist with adhesive removal. A piece of aluminum or brass can be used as a scraper, since these are soft metals that will not harm the blade. After cleaning, wipe the blade dry, which may leave an infinitesimal amount of oil that will be beneficial to the cutting. In other cases, some binders have used paraffin wax or bar soap as a lubricant. When cleaning,

and while using the cutter, never put your head under a raised blade. BE SAFE AT ALL TIMES!

**II.3. SHARPENING:** If the blades need to be ground, this should be done at the same degree-angle as the original. If the blades are slightly dull and in good condition, most of the sharpening should be done along the short or bevel-edge of the blade. In other words, grinding should be only be done on the bevel edge because this will insure a solid, stable blade.

In some cases, the grinder may have to remove stock from the thickness of the blade, but it should be an absolute minimum. If there is excessive grinding on the thickness, the blade will become unstable because it will be too thin and could warp, thus making it difficult or impossible to adjust.

If the blades for your shear have been removed, lay them on a flat surface as a test. Knowing that the blades are indeed flat will make it much easier for the adjustments. If the blades are warped, they will have to be replaced.

Also note: If the blades were overly ground in the thickness, the original bolts could protrude, which is definitely not desired, as that will damage the opposing blade. An overly

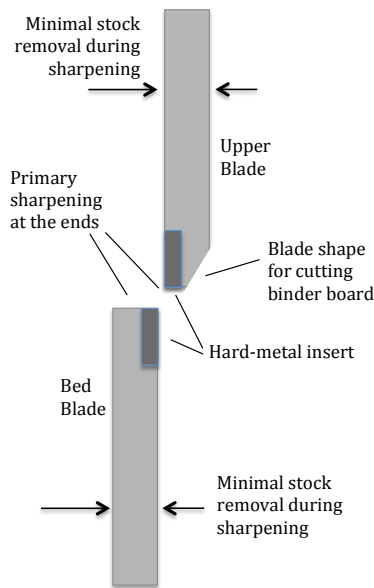
ground bed blade may also be reduced in thickness, which will affect the accuracy of the inlaid ruler (see below).

**II.4. MOUNTING SURFACES:** Each bed blade must be attached to a clean and uniform surface. There should be nothing to interfere with the flat blades. All old shims should be removed and the mounting surfaces should be clean of all debris, such as paint, that could interfere with the flat surface.

#### **II.5. MOUNTING AND ALIGNING THE BED BLADE**

The bed blade is mounted first because this will establish the reference point or line.

- Most shears will have adjusting screws for the bed blade that allow a newly sharpened bed blade to be set



**Details of board shear blade**



perfectly flush with the top of the work surface. If the bed blade is not flush, materials could be marked or damaged during a cut because of this misalignment when the clamp bar is used.

- If the thickness of the blade has been overly ground, the inlaid ruler may not read correctly. If this is the case, it is possible to insert a Mylar shim or spacer between the bed and the blade; this spacer should be inserted along the entire length of the blade.

#### II.6. ANATOMY OF THE UPPER BLADE ON THE JACQUES SHEAR

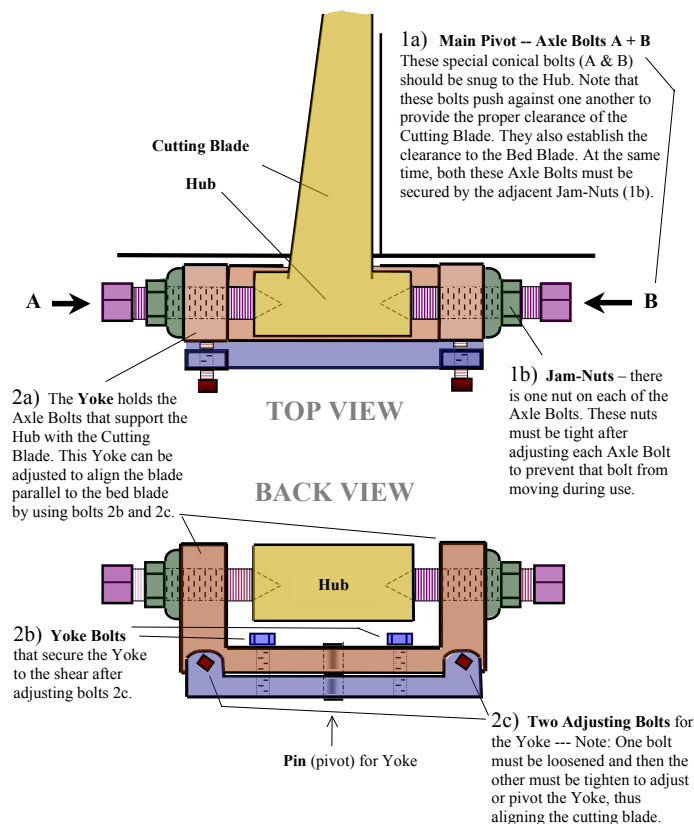
Before discussing how to adjust the upper blade, it's important first to understand the various parts of its mechanism.

**II.6.A. Hub and axle bolts:** In most designs, the upper cutting blade is supported by a hub that pivots between two axle bolts. These two specially shaped bolts push against one another, thus supporting the hub and the cutting blade. They must be adjusted correctly to provide the proper clearance between the upper cutting blade and the fixed bed blade. An important note is that these two axle bolts must also be locked or secured with the adjacent jam nut. Failure to tighten the jam nuts will allow the axle bolts to loosen as the shear is used.

When adjusted properly, the axle bolts should be snug, yet not overly tight, which will allow the cutting blade to move freely, but with good support overall. If the bolts are too tight, there will be excessive wear. However, if the axle bolt is too loose, all of the weight and stress will be on small areas of the bolts, thus causing excessive wear.

#### JACQUES BOARD SHEAR

Main Components for Adjusting the Cutting Blade



Hub and yoke of the Jacques & Sons board shear

There is a slight possibility that the end of the axle bolts with the cone shape may have worn excessively, which might be the result of their shifting if the jam nuts were loose. When this has occurred, a problem arises when you try to make a fine adjustment and everything goes wrong, creating an even bigger challenge. Should this be the case, it may be necessary to remachine the axle bolts as well as the hub for a smooth and uniform shape.

#### II.6.B LUBRICATING THE AXLE BOLTS:

Ideally, the axle bolts and hub of the shear were lubricated with a good quality wheel bearing

grease when the shear was last serviced. It is possible to disassemble a shear to allow greasing of these vital parts without upsetting the alignment. This technique can also be used if the shear needs to be moved.

To grease the hub and the bolts, loosen jam-nut A (see diagram on this page) and then loosen axle bolt A sufficiently to allow removal of the cutting blade arm assembly. If axle bolt B is not moved, the alignment will remain intact, with no interference. The pivot end of the axle bolts and the hub should be lubricated with heavy-duty grease, such as automotive wheel bearing grease.

**II.6.C. YOKE:** Another important feature of the Jacques shear is the yoke that can be rotated or pivoted by two additional adjusting bolts, but only after loosening two more bolts that secure the yoke to the base. Through adjusting these bolts, the cutting blade is made perfectly parallel to the fixed bed blade, even after decades of use.

Making the upper blade parallel to the bed blade and adjusting the proper clearance between the blades are the two primary adjustments. Note that the Latham shear and other manufacturers have a slightly different technique for adjusting the alignment of the cutting blade.

#### II.7. ADJUSTING THE UPPER CUTTING BLADE ON THE JACQUES SHEAR—PATIENCE IS REQUIRED!

II.7.A. TOOLS needed to adjust the blade include two large adjustable wrenches for the axle bolts and jam nuts—one adjustable wrench must be capable of fitting the large jam nut that is 1-7/16", the other must fit the 1" axle bolt. These two wrenches are needed so that the axle bolt can be held at the desired setting while the jam nut is tightened. In other words, do not allow the axle bolt to turn when the jam nut is being secured. Note: Do not use pipe wrenches or pliers, as they will damage the parts. Other smaller wrenches will also be needed.

II.7.B. TESTING THE CUT: Before any adjustments are made to the upper blade, check that both blades are clean and free of any nicks or adhesive residue that could interfere with a good cut. Then SLOWLY AND CAREFULLY lower the cutting blade and observe the contact point between the two blades. If the blade will not move freely, it may be necessary to adjust the axle bolt to move the upper cutting blade away from the bed blade—see ADJUSTMENT B1 below (next page). Ideally, the cutting blade should lightly contact the bed blade during the entire cutting motion. There should be no area where the blades are pinching.

Note that the bed blade is ground and mounted in such a manner that the cut will be made at the junction of the two blades, thus there will be clearance between the blades after the upper blade has passed the cutting point. If the cutting blade pinches at any point, or if there is excessive clearance in an area, an adjustment will be needed. The entire action of cutting should be accomplished by lowering the cutting blade past the bed blade, and there should be no need to pull the blade toward the bed or to force it for a cut.

If everything looks good, test-cut a thin sheet of paper along various sections of the blade and note where the cuts are good or not so good. Again, there

should be no need to force the blade for a cut, though there may be a need to "guide" or gently pull the blade when cutting heavier binder's board.

II.7.C. DIAGNOSE THE PROBLEM: The following examples are possible problems you may encounter. Adjustments to address them follow in the next section.

- Cutting at only one end: If the test cut of the thin paper is good at one end of the blade but not at the other, it may be necessary to adjust the yoke—see ADJUSTMENT A below (this page). It is important that the upper blade is first parallel to the bed blade before making other adjustments.
- Blades pinching: If the cutting blade is pinching in one area along its length, the axle bolts need to be adjusted to move it out and away from the bed blade—see ADJUSTMENT B1 below (next page).
- Excessive clearance all along: If there is excessive clearance and the thin paper is not cut, but instead folds over along the entire length, then the axle bolts need to be adjusted inward—see ADJUSTMENT B2 below (next page).
- Little or no cut at each end: If the blades have good contact and cut in the middle, but there is little or no cutting at each end, the cutting blade may already be somewhat parallel to the bed blade. In this case, the cutting blade may need shims at the ends — see ADJUSTMENT C below (next page).
- No cutting in the middle: If the blades have good contact and cut at each end, but do not cut in the middle, the cutting blade may already be parallel to the bed blade. In this case, the cutting blade may need shims in the middle — see ADJUSTMENT C below (next page).

II.7.D. ADJUSTMENTS: To resolve the problems identified in the examples above, make the following adjustments:

- A. Adjusting the Yoke: It is important to understand that the yoke is secured by two bolts (2B in the diagram on page 54) located under the hub, and that the yoke is also mounted on a pin that is adjusted by two other bolts (2C, left and right).

If there is a need to adjust the yoke, first slightly loosen the 2b bolts that secure the yoke to the base. Then one of the bolts at 2c must be loosened and the

other bolt tightened to move or rotate the yoke for an adjustment; both bolts should then be snug. Note that any tiny adjustment of the 2c bolts can make a huge change in the alignment, so be patient.

After adjusting, always retighten both of the 2b bolts to resecure the yoke to the base. Lower the blade slowly and carefully to test the cutting action. Readjust as needed until the upper blade is perfectly parallel to the bed blade. Finally, adjust the clearance with the axle bolts as described in B2 below.

- B1. Adjusting the axle bolts for a looser cut: First loosen the jam nut for axle bolt A and then loosen the bolt a small amount, perhaps about 15 degrees (less than 1/16th of a full rotation). Note: A tiny adjustment may have a huge effect on the alignment, so you must be very patient.

After adjusting axle bolt A, resecure its jam nut. Then loosen jam nut B and tighten axle bolt B, though not too tight. While holding axle bolt B in place, resecure the jam nut. Slowly lower the cutting blade for a test. Adjust further as needed.

- B2. Adjusting the axle bolts for a tighter or closer fit to the bed blade: First loosen the jam nut for bolt B and then loosen axle bolt B a small amount, perhaps about 15 degrees (less than 1/16th of a full rotation). Note: A tiny adjustment may have a huge effect on the alignment of the blade, so you must be patient.

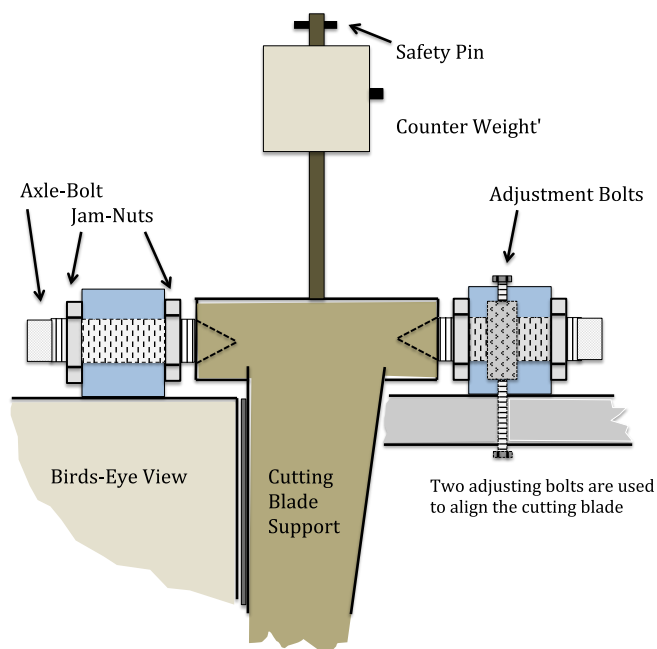
After adjusting axle bolt B, resecure its jam nut. Then loosen jam nut A, and tighten axle bolt A, though not too tight. While holding A in place, resecure the jam nut. Slowly lower the cutting blade for a test. Adjust further as needed.

- C. Shims for a uniform cut: If, after making all of the mechanical adjustments, a thin sheet of paper cannot be cut in some places, it may be necessary to insert shims. While a machinist might use thin metal shims, similar thin pieces of polyester film (Mylar/Melinex) are more readily available and will serve an identical purpose because the film will remain stable and will not compress in this application. Thin strips of 2-, 3- or 4-mil polyester film will therefore compensate for irregularities in the upper cutting blade.

Pieces of film should be cut to a length to fit between the bolts that secure the cutting blade to the

support; the pieces should be tall enough to reach to the top of the blade and extend beyond the bottom. These pieces of film can be folded or creased so that they will stay in place when the bolts are loose. When adding these tall shims during the adjusting process, record the thickness and the number that have been inserted in case they later need to be replaced. Add shims as needed and tighten the bolts securely before each test cut. Add or remove shims as needed for a perfect cut. When all adjustments are completed, trim off the exposed parts of the shims.

II.7.E. PATIENCE is undoubtedly the most important part of this entire process. When all the components are properly adjusted, you can be proud of your accomplishment, knowing that your shear will operate smoothly and cut all materials with no tearing or fold-overs. And during use, your shear will make a clean sound and almost “sing” sweetly as it cuts your material. Your shear will last a lifetime.



**Latham Board Shear**

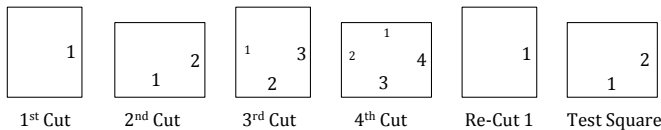
## II.8. ADJUSTING OTHER SHEARS

- Latham board shear and similar: The Latham was manufactured in Chicago from about 1893 to 1928. This shear uses a different method to adjust the main pivot axle bolts. Its design incorporates a special, internal nut that is adjusted by two other bolts. Other manufacturers may have similar mechanisms.



- Vagelli Board Shear and similar: The modern Vagelli board shear was made in Italy. This shear has only one adjustment along the main support shaft for the blade, which is done by manually sliding the cutting blade into position. It appears that there is no possibility for fine adjustment such as can be made on many older shears.

Testing the Squareness of the Table Gauge of a Board Shear



### III. SQUARING THE BOTTOM/TABLE GAUGE

While a good clean cut is important, another important feature of any board shear is obtaining a perfectly square cut. Before checking the squareness of the bottom/table gauge to the blade, it is a good idea to first check that this gauge or bar is indeed straight. There have been cases where this bar was bowed or bent, which will cause numerous problems.

**III.1. TESTING THE SQUARENESS OF THE GAUGE:** After the straightness of the gauge has been confirmed, some binders might use a carpenter's square to test the alignment to the blade. While this may work, there is an alternate way that should be much more accurate. To test of the squareness of the table gauge, use a large, approximately 18" square, sheet of thin cardstock, such as 10- or 20-point map folder stock. Align one edge to the table gauge, make a cut, and identify that as #1. Next, align the #1 edge to the table gauge and make adjacent cut #2—you are now cutting the sheet in a clockwise rotation with the latest cut along the table gauge.

Continue cutting each edge, making certain that the newly cut edge has been aligned perfectly to the table gauge. After the fourth cut, align that edge to the table gauge and recut the first edge. Now rotate the cardstock one more time and compare the square with the bed blade.

If indeed every corner is a precise 90-degree angle, the #2 edge will align PERFECTLY with the bed blade. If there is any difference, then the amount out of square will be 1/4 of that total amount. If you

want perfectly square cuts, the table gauge should be adjusted accordingly.

#### III.2. SQUARING THE TABLE GAUGE, IRON-TOP SHEAR:

If your shear is an iron-top, such as the Jacques Bookbinder's Shear, the table gauge is easily adjusted. Loosen the large knob a small amount and lightly tap on the table gauge, perhaps with a small hammer, to make a minor adjustment. Then resecure the knob and do another series of test cuts. Note: To hold the table gauge more securely, small C-clamps can be added at each end.

#### III.3. SQUARING THE TABLE GAUGE, WOOD-TOP SHEAR:

If your shear has a wooden top, there are other points to consider.

- Use of wood screws: In some cases, the table gauge may be secured with wood screws in holes that have enlarged, allowing the screws to loosen and thus not hold the gauge properly. At the same time, the table gauge could shift during normal use when the left gauge is moved. Another problem could occur if the holes in the table gauge are too small, which would prevent a proper adjustment.



T-Nut

An alternative to the use of wood screws is to use a bolt secured to a threaded insert, such as a "T-Nut," a simple nut recessed into the underside of the wood top. This modification requires some up-front carpentry, but the result

will allow the table gauge to be securely held. At the same time, the bolt hole in the gauge must be large enough to allow for adjustments.

- Expansion and contraction of wood: Consider that changes in relative humidity could affect the alignment of the gauge. Since the wood will expand and contract with changes in relative humidity, this could be an issue.

One solution recommended by Daniel Kelm is to replace the natural wood top with MDF (medium-density-fiberboard), commonly used for high-quality countertops. Since MDF is made from finely ground wood particles, it is less susceptible to dimensional changes from humidity.

- Space beneath the gauge: Another small problem with the table gauge may be that there is a space that allows paper to slid underneath. If this is the case, perhaps a small piece of paper can be glued in place and trimmed flush to the edge of the gauge.

Obviously, a square table gauge is a vital part of any board shear. The maintenance of your shear will show in all of your work, so keep your table gauge square!

## IV. SAFETY CONSIDERATIONS

**IV.1. SAFETY PIN OR BOLT ON COUNTERWEIGHT ARM:** Many years ago, the Guild of Book Workers produced a video on maintaining the Jacques Board Shear. That video, *Examination of the Jacques Board Shear*, is still available through the Guild's library, and it is found with other videos from the Standards of Excellence conference in Salt Lake City, Utah, in 2000.



**Safety pin for board shear counter-weight**

In the video, the first and most important point made was the use a safety pin or bolt at the end of the counterweight arm to prevent the weight from dropping off.

While the weight is known to have

dropped from some shears, there have, fortunately, been no serious injuries. I personally know of two cases where the weight fell off. In one instance, as the weight slid to the end, the handle rose to its highest point, and when the weight dropped off, the handle came crashing down, narrowly missing a colleague's head, but struck her on the collarbone. Fortunately, there were no broken bones, but there was a serious and painful bruise. Therefore, a safety pin or bolt at the end of the bar is a vital necessity.

There should be hole at the end of the counterweight bar with a pin or bolt as a safety; if not, a hole should be drilled and a bolt should be added IMMEDIATELY! In some cases, the bar may be too short to allow a pin, thus a hole should be drilled and tapped into the end of the bar to allow the use of a proper bolt and a large washer as a safety.

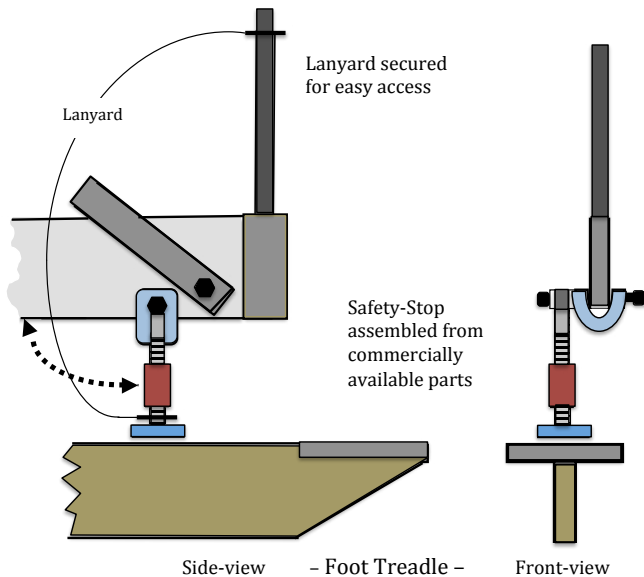
**IV.2. COUNTERWEIGHT BAR:** You should also examine the opposite end of the counterweight bar. On some shears, there is only one bolt to secure that arm to the hub and the bar might even extend through the hub. In some cases the bolt that secures the bar could loosen with similar dire consequences. On my shear, I was able to add a second bolt, as a safety pin, where the bar comes through the hub casting.

**IV.3. CLAMP CLEARANCE SAFETY:** In recent years, another safety issue has been raised regarding the clearance under the clamp. There have been a number of reports where colleagues have severely pinched their finger, which is extremely painful, and one even lost a fingernail. This safety concern caused a close examination by some university health officials.

In one case, the solution was to install a Plexiglass guard, but that obviously will not solve this problem. At the same time, such a guard will interfere with our efficient use of the shear. Another solution was to permanently reduce the clamp clearance by shortening the connecting shafts of the clamp. This solution, however, created a new problem by making it difficult or impossible to use the shear with thicker materials, such as sheets of foam or folded corrugated board. We therefore need a better solution.

**IV.3.A. SAFETY STOP TO REDUCE CLEARANCE** There is a simple and safe alternative that reduces the clearance to ¼" for safety concerns, yet permits the flexibility we desire. A safety stop in the form of a pendulum can be assembled from commercially available parts to reduce the clamp clearance for a safe gap. This stop should reduce any concerns as well as prevent injury. The stop is adjusted to a ¼" clearance to allow most binder's board to be easily inserted, yet prevent a pinched finger. When a thicker material is to be cut, a lanyard is pulled to temporarily move this stop. As soon as the cut is made, the stop will return to the preset position and again reduce the clamp clearance to ¼."

This safety stop has a special clamp that is secured to the crossbar under the shear. For the iron-top shear, the stop is secured immediately above the foot-treadle of the clamp. The wood top requires a slightly different arrangement where the stop is attached to the frame. If you are interested, parts are listed below,<sup>5</sup> or contact the author.



### Clamp Safety Stop for the Jacques Board Shear

IV.4. BLADE DOWN OR BLADE UP?: One big question in a bindery is whether to leave the blade up or down. Many feel that having the blade down is the safest. However, if the blade is down, there is the risk of bumping into the handle, especially if the walkway is too narrow—and walking into the handle is not safe. At the same time, with the blade up, the shear is always ready for immediate use. This debate will continue, and your decision depends on the placement of the shear in your workspace.

The counterweight can be set to a point where the blade will balance for smooth operation, or it can be set to keep the blade up or down, whichever is your preference.

### CONCLUSION

The board shear is an important and essential tool in a bindery or conservation lab. It will also be the focal point for visitors who are amazed at the size of this so-called “paper cutter.” Obviously, the shear should always be in good condition for the best and safest operation. May we all have a safe and well-maintained board shear that easily cuts paper and board square. With proper care it will last your lifetime and longer.

### ACKNOWLEDGMENTS

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### NOTES

1. Jeff Peachey has written numerous blog posts about the origin of the board shear: <https://jeffpeachey.com/2011/03/07/possible-origins-of-the-board-shear/>
2. 1857 US patent, “Vibrating Shear,” by John Toulmin: <https://patents.google.com/patent/US18065A/en?q=bookbinder&q=shears>
3. John Jacques and Son 1923 sales catalog, pages 6, 7, 8 and 10. <https://guildofbookworkers.org/content/jacques-and-son-catalog-1923>. Special thanks to our dearly departed colleague, Joe Newman, who provided this catalog, which is now housed at the Northeast Document Conservation Center. It is made available through the Guild of Book Workers.
4. Polyurethane Rubber Rod, 80-A (Hard) Durometer, ½” diameter: McMaster-Carr (part #8695K173). Note: Masking tape can be used to increase the diameter for a tight fit.
5. The clamp safety stop is composed of the following parts, which are available from McMaster-Carr: hanger clamp (part #3048T51); rod end (#3798K23); furniture glide (#23105T65); coupling nut (#90264A460); bolt (#91251A334—this needs to be cut shorter); washers (#92141A031).

### SUPPLIERS

Bindery Tools, LLC: Board shears, blade sharpening, parts and service. <http://www.binderytools.com>

Jorson and Carlson: Blade sharpening. <http://www.jorsonandcarlson.com>

McMaster-Carr Industrial Supply: Various parts and materials. [www.mcmaster.com](http://www.mcmaster.com)

William Minter Bookbinding: Details for clamp safety stop. [wminterbook@gmail.com](mailto:wminterbook@gmail.com)



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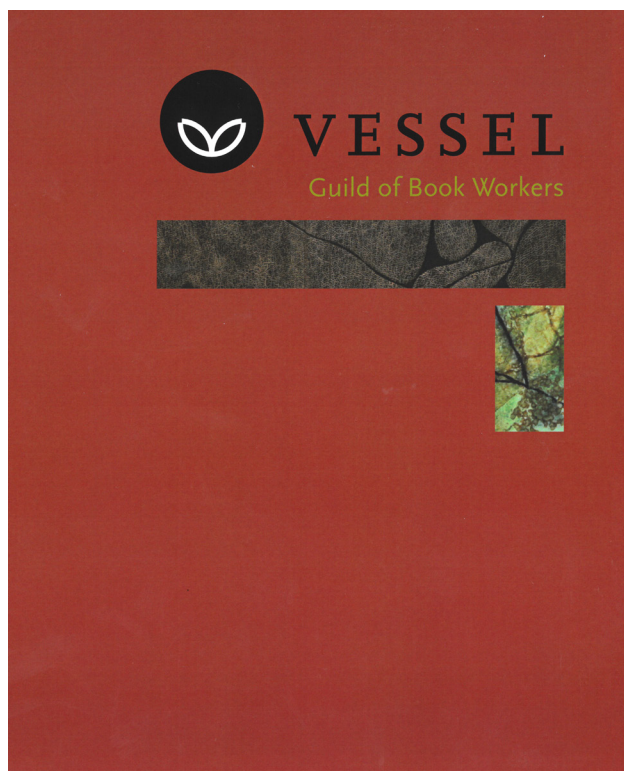
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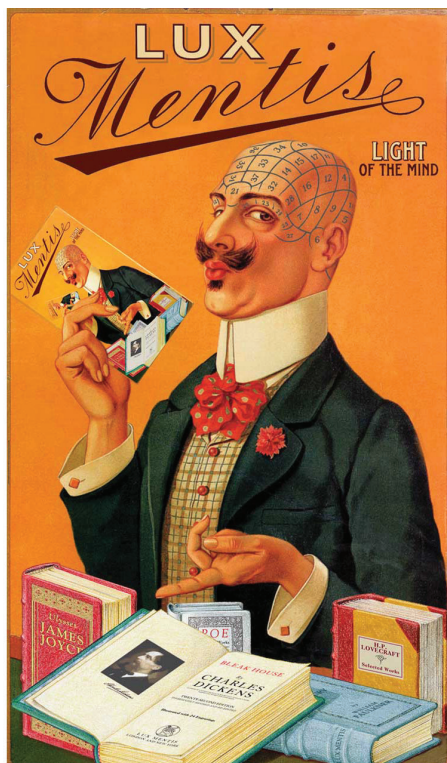
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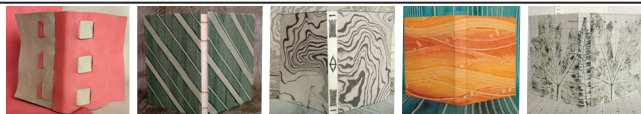
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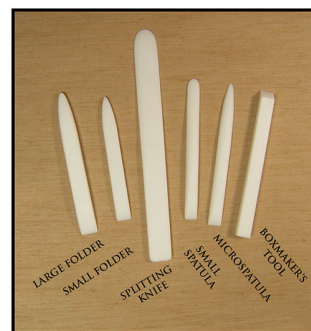
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