

Aloft in a Balloon: Treatment of a Scrapbook of Early Aeronautica Collected by William Upcott, 1783-1840

The Upcott Scrapbook is one of the treasures of the Smithsonian Institution Libraries. Compiled by William Upcott in the early 19th century, this 455 page assemblage of early aeronautica is kept in the controlled environment of the Ramsey Room, which houses the Special Collections and rare books in the National Air and Space Museum. Begun in 1783, the year of the Montgolfier brothers' first balloon flight, the scrapbook is a collection of artifacts covering the achievements of the pioneers of flight. Included are the bold adventures of the Montgolfier brothers, sons of the papermaker of the same name, whose early balloons were indeed made of paper; as well as the accounts of Jean Pierre Blanchard, Pilatre de Rozier, and the daring and romantic Vincent Lunardi, seen in fig. 1 with an equally bold female aeronaut. The scrapbook contains engraved and watercolor illustrations, letters and newspaper clippings, printed ephemera, and manuscript eye witness accounts, all carefully arranged and pasted in place by Upcott.

According to Paul McCutcheon, Research Librarian at the National Air and Space Museum, William Upcott inherited his penchant for collecting from his father, Ozias Humphry, who collected drawings, engravings, miniatures and extensive correspondence with the leading figures of his day. The son, who was trained as a librarian and bookdealer, and held a post at the London Institute, cared for and expanded his father's collections to a point where every shelf, wall and cupboard was filled to overflowing. As if to solve this space problem, the Upcott residence was robbed in 1833. Thankfully, the thieves concentrated on looting the gold and silver coins and left the scrapbook untouched. In consideration of his loss of the coin collection, Upcott's colleagues began a fund to reimburse him. His friends were apparently quite generous, because the following year, Upcott retired to his home, dubbed the "Autograph Cottage," in Islington, and he devoted the rest of his life to his collections. When his estate was settled in 1846, the sum of the collections, including the Upcott scrapbook, were sold at auction by Sotheby.

It is unclear where the scrapbook was from that time until it was purchased by Reverend John F.B. Caruthers III, whose widow presented the book to the Smithsonian in the late 1950's at a ceremony which was attended by some of the greatest aviators in the world. Attendees eagerly added their signatures to the verso of the engraved plate in the beginning of the volume.

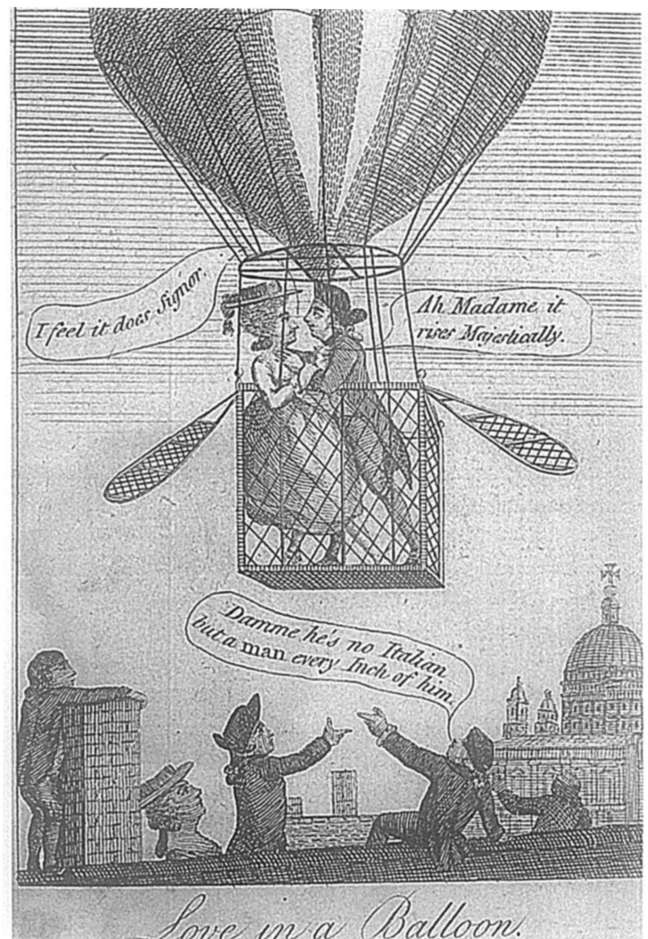


Fig. 1.

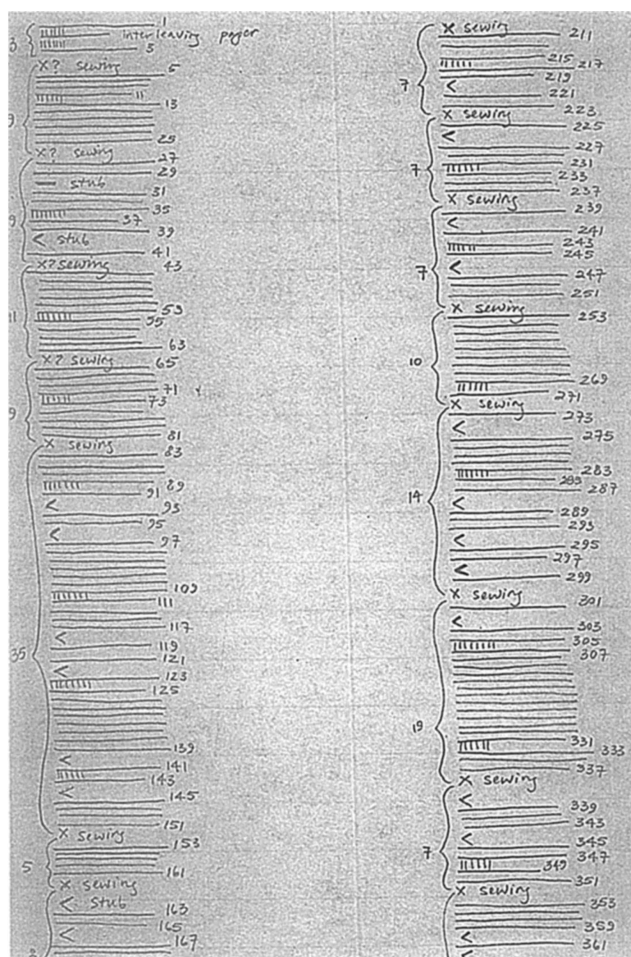


Fig. 2.

The scrapbook seems to have been specially dressed for the occasion. Prior to the event, the book was sent to the Government Printing Office where it was cut out of its binding, oversewn, thoroughly glued, and recased in a library buckram binding. It is because of this binding, and the August 1994 request by two National Air and Space Museum curators that the scrapbook came to the attention of the Book Conservation Laboratory. The Upcott scrapbook was requested for exhibition in "Balloons; the Birth of Flight: 1783-1793." Curators Tom Crouch and Alex Spencer met with Dave Spencer, then head of the National Air and Space Museum Library and myself to discuss treatment options.

We discussed the most obvious features of the book first. This was not its original binding, and the binding was causing damage to the leaves of the scrapbook. The bookbinders at the Government Printing Office had tried hard to create a binding strong enough to support the massive weight of the single volume, 455 page folio-sized scrapbook, but in doing so, they chose rigid materials over which the scrapbook paper could not bend. The binding was causing the paper of the first and last gatherings to

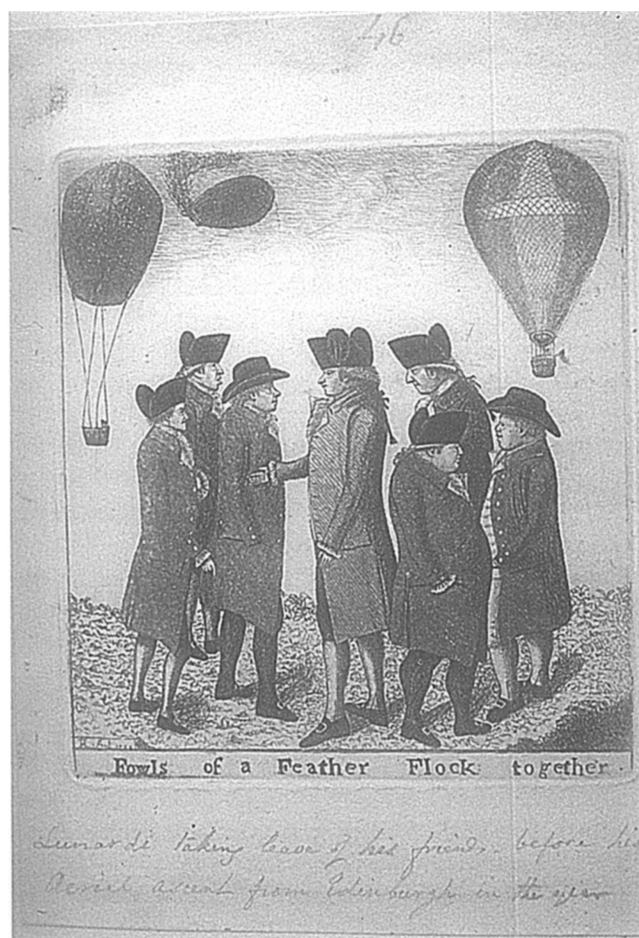


Fig. 3.

break at the hinge. By displaying the volume open for the length of the exhibition, we would be causing damage. Unfortunately, the image which was chosen for the exhibition fell in a particularly vulnerable area.

The second observation related to the meticulous arrangement of the pasted-down ephemera. Upcott was careful to place the cut-outs on the page so that they not only looked pleasing, but could be read in chronological order. However three quarters of the way through the scrapbook, the ephemera jumped a few decades. Towards the end of the volume, the arrangement resumed where it had abruptly left off. The previous binder had obviously rebound the pages out of order, and the volume had since been cataloged at the Smithsonian and a finding aid had been created for the out of order arrangement.

Next we discussed some observations about the scrapbook substrate paper. The handmade sheets had no watermark, were formed on a mold, seemed to have very little sizing, and ranged in pH from 5.4 to 5.6. Despite their acidity, they remained flexible, bright, and showed very little physical damage, except for that done by the binding. Without exception, the articles pasted to the substrate remained well adhered, and equally as flexible. Aqueous

treatment was ruled out because it would disrupt the original placement of the ephemera on the scrapbook page, and it would be inappropriate for the watercolors in particular. However there were numerous places where acid migration from the ink of glued-on ephemera was damaging the facing page, causing reverse imaging on that page. To rectify this problem, previous conservators at the Smithsonian had placed interleaving paper throughout the volume, causing the binding to swell and weaken from being overstuffed.

The exhibition and treatment options which the curators, librarian and I discussed were as follows. First was photoduplication, and limiting the use of the volume by researchers. This option was nixed because of the historical significance of the artifact, and because of its tremendous exhibit appeal. Next we discussed moderate page repair to the damaged first and last gatherings, and a careful choice of the page opening so as to choose a place where the least amount of flexing was required for the most vulnerable pages. This was unfavorable to the curators who had their hearts set on particular images. Option three, disbinding, interleaving with gatherings of buffered paper and resewing, was decided to be the most favorable option for everyone.

Disbinding the volume was also appealing because it created the possibility that numerous pages could be matted, and framed for the exhibition and that the volume could be rebound thereafter. However, then Collections Manager now SI Libraries Director, Nancy Gwinn, noted that doing this would negate the significance of the scrapbook format. A compromise was struck. It was decided that the scrapbook would be rebound in three volumes of a more manageable size. Since the head curator, Tom Crouch, was also working on the Enola Gay exhibit simultaneously and did not have the time to devote to establishing the original order of the Upcott pages, it was decided to maintain the volume in its current page order, and to keep the finding aid as is. The logical breaking points for volumes 1,2 and 3 were determined, and it was agreed upon that one of the three should be bound for the exhibit, and that the remaining two could be rebound thereafter so that pages from them could be matted and framed for the exhibit. The scrapbook format could be maintained, and so could the curatorial desire to display as much of this fabulous book as possible. The curator also supplied the name of a repository in England which housed other scrapbooks compiled by Upcott, so that the binding style could be sympathetic with those in their original covers.

Treatment began by collating the pages prior to disbinding, and creating a "map" of sewing features as the disbinding progressed. (fig. 2) Upon removing the buckram covers, the scrapbook's harsh history revealed itself. This volume had been rebound at least twice. Conjugate

pages had been cut out of their previous bindings, and then rebound first by whip stitching, and later by machine oversewing. Adhesives found were animal glue, PVA and , unfortunately, casein. I prayed that I had misidentified the casein, but my worst fears were confirmed by Ralph Miller, a retired chemist from the Government Printing Office who had since become a volunteer at the Smithsonian Institution Libraries' Book Conservation Laboratory. Mr. Miller, who was employed at the GPO when the Upcott was there in the 1950's, confirmed that PVA and casein were routinely used, and that they were manufactured by the Bordan company. True to GPO practices, he suggested that I chop these adhesive areas off the book. Instead we explored other options. Thankfully, upon further observation, it became clear that the animal glue could function as a release layer for most of the later adhesive layers. Where it was the bottom-most adhesive layer, disbinding proceeded with of ease. However, this was not the case for all of the book.

On areas where whip stitching still remained, the sewing thread acted like a wick, drawing the adhesives deep into the gutter between adjoining pages. On these areas, PVA and casein were drawn approximately one inch into the gutter edge, virtually cementing these pages together. The situation was found in twenty-six locations, affecting 52 pages. This is where the real challenge of the project began, especially in light of the exhibition schedule.

The most conservative means were tried first. Because the substrate paper was extremely prone to tide lines, and because at that time the laboratory did not own a suction machine, phase one involved trying solvent chambers. Cotton wool was first packed tightly into laboratory glassware, and was then saturated with solvent. Here and throughout the project, Horie's textbook *Materials for Conservation: Organic Consolidants, Adhesives and Coatings* was consulted for solvent choices. This done, the glassware was inverted over the area needing treatment, and the solvent fumes were left to soften the adhesives. This technique has been quite successful for us in the past, although I should advise those who try it to be sure to place mylar below the blotter on your treatment table surface. I forgot the mylar, and now my wooden bench top has solvent chamber produced circles where the glassware sat. Despite trying various solvents and varying the lengths of time applied, the adhesives did not soften sufficiently to allow for separation of the pages without fiber disruption. Phase two began. Using Gortex, solvent saturated blotter and mylar top and bottom, I created a different type of solvent chamber which I hoped would produce stronger affects. The manufacturers of Gortex were first consulted to ensure that the molecules of the chosen solvents were larger than the Gortex pore structure, and would therefore be restrained from wetting out the document. Again varying solvents, lengths of time, and even weight on the

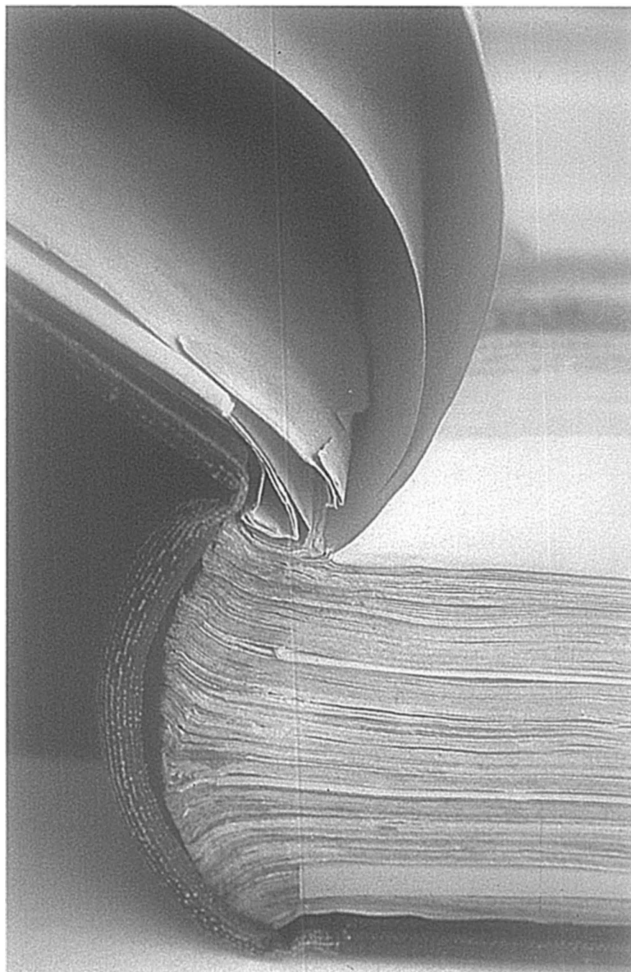


Fig. 4. Before treatment

solvent sandwich were tried, and again the adhesives did not soften sufficiently to allow for separation of the pages without fiber disruption.

The next option discussed but not attempted was enzymes. Although, theoretically, protease would be the enzyme of choice to eradicate the casein, practically, we could not find a way to apply it and remove it. The casein, remember, was sandwiched between two layers of paper, so we could not get the enzyme in contact with the adhesive. We discussed creating wedges of protease in agar, and then prying the paper apart with these wedges, but determined that not feasible. And since aqueous treatment was ruled out, enzyme removal would be impossible.

By now, the deadline for the exhibition was looming large. So

for the one volume that absolutely needed treatment and rebinding for display, the Gortex sandwich method was reluctantly used. Once the adhesive had softened, pages were separated via scalpel and occasionally Gortex thread, which was used as a slicing aid like dental floss. I was not completely happy with the results, but after page repair and rebinding, which I will describe in detail later, volume 3 made a fine showing at the exhibition. However, I vowed that after the exhibition, I would find an alternate way to separate the glued-together pages of volumes 1 and 2. Thankfully, by then we had won a grant for the purchase of a Museum Services Book Suction Wedge. I anticipated that by using it, I would finally be able to flush the solvents through the paper while avoiding tide lines and would be able to soften the adhesives sufficiently to remove the adhesives with ease. I was wrong.

Here let me go into some detail about what solvents were used and how they were applied. As always, I first choose the least volatile, safest solvents, and then progress into more dangerous territory. For the solvent chamber, the Gortex sandwiches, and the suction wedge, the solvents used were ethanol, methanol, acetone, methyl ethyl ketone, ammonium hydroxide, toluene, xylene, and tetrahydrofuran. On the suction wedge, the solvents were applied with a pipette by dropping the solvent on the uppermost layer while trying to separate the pages with a teflon spatula. Although copious amounts of solvent were applied in this manner without incurring tide lines, the adhesives still would not soften enough that the pages could be separated without a moderate amount of fiber disruption.

Then Yasmin Khan, who was at that time a third year intern in the University of Texas at Austin's book conservation program working at the Smithsonian Libraries' Book Conservation Laboratory, and who is now a conservator at the Library of Congress, suggested applying the solvents in order of polarity, from most polar, to least polar

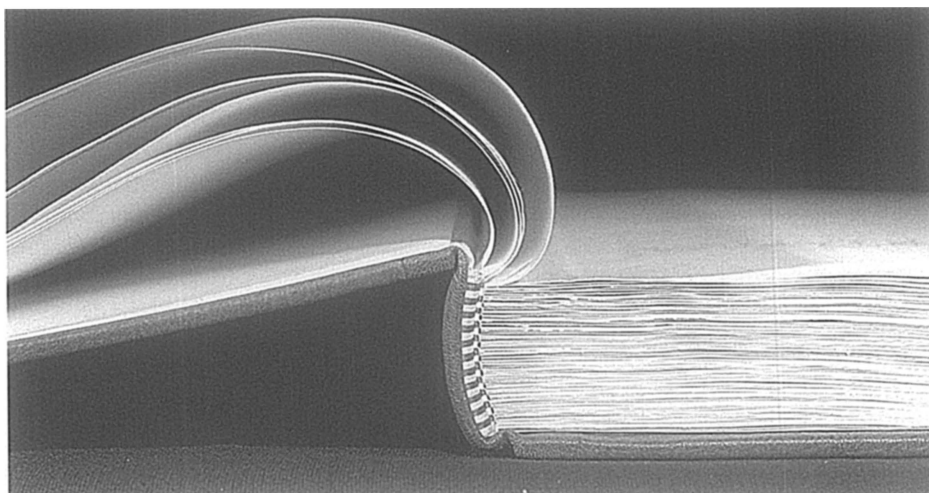


Fig. 5. After treatment

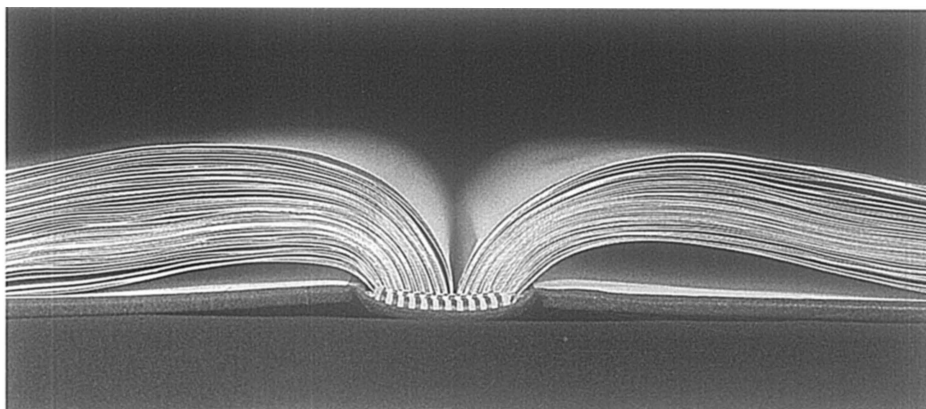


Fig. 6. After treatment

and back again to most polar. You probably remember that “electrons in covalent bonds are not necessarily shared equally by the atoms that they join together. If one atom has a greater tendency to attract electrons toward itself than the other, the electron distribution in the bond is said to be polarized...” (Carey, *Organic Chemistry*, p.13). A Teas chart was consulted to determine polarity. Choosing the least volatile and most available solvents first, we chose, in order, ethanol, acetone, toluene, xylene, and then in reverse, xylene, toluene, acetone and ethanol. It worked. With very little fiber disruption, these same solvents that had individually failed, when applied in sequence according to their polarity, succeeded. Once separated, pH 8 ammonium hydroxide was applied to the verso of each leaf to further soften residual casein adhesive. Then working from the front, the remaining residue was removed manually with a scalpel under magnification. The process took approximately ten hours for each of the twenty six pairs of leaves adhered together.

With the pages finally separated, and back again on familiar territory, the rebinding of the two remaining volumes began. First the separated folio pages were guarded together again using kurotani heavy, a 100 % kozo paper purchased from Sampho in Boston. The choice of the guard was critical to the success of the binding, because the scrapbook leaves were of substantial weight; 10 microns. Choosing a paper that was too skimpy would make the gutter of the bound book thinner than the text, and would make rebinding awkward at best. Kurotani, which also measures 10 microns thick, was an ideal weight match. The adhesive chosen was a thick zin shofu wheat starch paste, 20 grams of adhesive to 200 ml of water. Initial attempts with thinned zin shofu produced mends that did not hold when the heavy pages were flexed. Gatherings of Mohawk Superfine, an alkaline buffered paper, were then cut slightly larger than the scrapbook leaves and were assembled into gatherings with them, alternating scrapbook paper and interleaving paper. The interleaving was cut larger than the original so that users

would naturally turn the leaves of the book by handling the interleaving rather than the original document.

The volume is packed sewn on double linen cords, which were then laced into high density alpha cellulose board. The spine was lined with numerous layers of Japanese tissue, airplane linen, and Barcham Green’s Edinburgh, all applied with zin shofu. The two-color double endbands are silk applied around a rolled, allum tawed goat core. The bindings

were covered in three pieces of goat skin, one for the spine, and one for each board, because skins large enough to cover the volumes in one piece were priced at \$600. apiece. The joints were placed so that blind tooled lines would obscure them.

In the nearly two years that it took to complete this wonderful project, there were many conservators, interns and volunteers who lent their expertise. Among those who deserve special thanks are Dianne van der Reyden, who provided advice, solvents and even her intern, Holly Anderson. Lois Price was instrumental by providing advice about the removal of casein. Nicholas Pickwoad provided input on the appropriate binding style, and gave me the courage to forge ahead with the separation of the pages needed for exhibition. Volunteers and chemists Ralph Miller, and Jahanvi Desai provided the expertise needed for the identification and removal of the adhesives. But most of all, Yasmin Khan, who took on most of this project during her internship year while I worked on the exhibit du jour, not only found the solution to our problem, but also did the lions share of the treatment work. Thanks to all of them, the Upcott scrapbook will uplift many more scholars and exhibit-goers.

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