

CONSERVING AUDUBON'S BIRDS OF AMERICA, VOLUME I

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On 2 April 1852, the Library Committee of the Legislative Library at Fredericton, New Brunswick, authorized the purchase of the four volumes of Audubon's Birds of America from Little & Brown of Boston, Massachusetts, at a cost of \$800.00. It is one of five sets of Audubon's ornithology in Canada, and is one of the most handsomely bound of all the existing Audubon folios in the world. The purchase of these rare and impressive volumes was a wise investment. The value of such a set of four volumes was <sup>recently</sup> set at \$1 million in a ~~recent~~ Sotheby auction to be held in New York.

Approximately 200 sets, consisting of 435 prints each, of the Audubon works were printed; 134 sets are known to exist. Some sets were broken up and sold as single prints, and ten are known to have been destroyed by fire and war. According to Waldemar H. Fries, a specialist in Audubon prints, there are probably 70,000 prints from the original edition still in existence.

John James Audubon (1758?-1851) published the double elephant folio edition of Birds of America between the years 1827 and 1838. He had previously travelled through North America studying, drawing, painting the birds in their natural environment, in life-sized and life-like poses. In 1826 he went to Scotland and England to arrange for the publication of his drawings. William Home Lizars, a prominent engraver in Edinburgh, executed the first ten copper-plate engravings, printed them and directed his water-colourists in their hand-colouring. The remaining 425 plates

were executed, printed and coloured by R. Havell and Son, London.

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In 1978-79 I treated, for conservation purposes, the 109 prints of Volume I, of the four volumes owned by the Fredericton Legislative Library. The work continued over a period of four months and was done at the Atlantic Conservation Centre at Moncton. I was assisted there by my colleague, Robert M. McCarroll.

One of the main conservation problems facing library and archival collections today is that of acid paper. The period of good durable paper was from the twelfth to the seventeenth centuries. (I have examined paper from the 13th century in Germany, and found it to be in almost perfect condition.) In the late seventeenth century, alum (which breaks down to form acid) was introduced into the making of paper to harden the sizing. Over time, acidity in paper decreases the strength of the fibre, so that it becomes weak and brittle and is finally reduced to a powder.

The Audubon plates were printed on J. Whatman handmade wove paper. This is a heavy paper, about 10 mils, and each sheet is water-marked with either 'J. Whatman' or 'T.J. Whatman Turkey Mill', plus the date which ranges from 1825 to 1838. The major conservation problems stemmed from the chemical nature of the wove Whatman paper. Spot testing indicated a high content of alum, which would have contributed to the high acidity of the paper.

Another important physical feature of the book leaves is that the grain of the paper runs horizontally instead of vertically. As a consequence of this wrong-grain direction, the leaves do not open properly; that is, they fail to arch as each leaf is turned from right to left, and instead tend to break along the binding margin

as pressure is applied. Also, the method of whip-stitching individual prints into sections of four leaves prevents their opening flat to the inside gutter. This type of sewing, plus the wrong-grain direction, had resulted in the breakage of many of the leaves as they were forced open, especially at the front and back of the book. An additional problem was that the volume had been lined along the edges on the reverse side of each leaf with linen tape. In some instances the image had transferred to the back of the preceding leaf; that was especially noticeable in the large dark-coloured images. It was not clear whether this transfer was due to acid migration or to actual pigment-colour transfer. The colours of the image areas, however, had retained their freshness and brilliance.

Although there was some slight fading of the front board, the leather was in exceptionally good condition. The gold tooling was exquisitely done by J. Wright, a prominent London binder of the 1850s, and remained in an excellent state of preservation with little flaking and with exceptional brilliance.

My task was primarily to remove the acid from the prints with the utmost care and to store them in such a way as to prevent further deterioration.

After the photographic documentation of the binding and of each individual print was completed, the bookblock was removed from its binding. The backbone of the bookblock was heavily lined with cartridge paper. This I gradually removed by applying coats of wheat-starch paste which slowly softened the paper and old adhesive. Eventually the hardened animal glue of the backbone was gently removed with a bone folder. The removal of the glue and cartridge

paper revealed the sewing of the bookblock; groups of four leaves had been whip-stitched to form a signature. Each signature was then sewn around sunken cords. The first group of about five signatures and the last group had been oversewn to strengthen these areas of the bookblock, so that there were no slips to lace into the boards. The binding was, in fact, a case-binding. The lack of slips, the whip-stitching which prevented any leaf opening to the gutter, the heavily lined-up backbone, plus the over-sewing constituted weaknesses in the binding structure and had led to a weakening of the physical properties of the book.

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The sewing threads were cut with a sharp scalpel and then using a bamboo spatula, each leaf was gently raised and removed one by one from the bookblock. This for the most part was done without any breakage or tearing except for those leaves which were already broken along the gutter (owing to the wrong-grain direction), and for the exceptional leaf where the original animal glue had crept between the signatures when the backbone was glued up.

Historically, the years 1827 to 1838 when the drawings were first hand-coloured in England was an interesting period in the development and use of certain pigments. Therefore, it was felt that an analysis would contribute to the knowledge of the history and development of pigments, especially if the analysis could eventually cover the entire period of eleven years. Thirty-eight samples were taken of the pigments used in the colouring of the images; these particles were removed by a sharp scalpel under a microscope, then placed into small glass vials and sent to the Canadian Conservation Institute in Ottawa, where they were studied and identified.

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All of the image colours were tested for their solubility in water. A drop of distilled water was placed on a specific colour, allowed to stand for about thirty seconds and then a small square of blotter was pressed against the moistened area. The blotter surface was then examined to determine whether or not there had been a colour transfer. Forty-three of the 109 prints had one or more colours which were soluble in water. Some colours were highly soluble, others only faintly. In addition, some of the prints had been glazed with a varnish-like substance. These glazed areas were also tested; the water had no effect on them and did not dull them in any way.

Because several of the image colours were soluble in water, it was decided to fix them with 10 per cent methyl cellulose in water. This was evenly applied to the front surface of the image area with a soft-bristled oriental brush and allowed to dry overnight. When dry, the fixed surface had a slight sheen.

As a preliminary to washing, the linen tape was mechanically removed by peeling it off dry. Each Audubon print was then supported on a sheet of 'Reemay', a polyester material, sprayed off with distilled water and then placed in a large sink for washing. The prints were washed in groups of five in constantly changing luke-warm water for forty-five minutes. The washing not only removed additional dust but also made possible the removal of the residual linen-tape adhesive. The remaining animal glue on the back edge of each plate was softened and could be removed by the use of a bamboo spatula and soft brush. After washing, the prints were removed from the sink, still on their Reemay supports and placed image side up on terry cloth. The excess moisture of the image was blotted dry with sheets of chromatography paper, and air-dried.

The prints were then deacidified by immersing them in an alkaline solution of magnesium bicarbonate for forty minutes. The prints were deacidified in groups of five, each group in a fresh solution of 25 litres of magnesium bicarbonate solution. These were removed and dried in the same manner as the washed prints. It is to be noted that on drying there was no apparent trace of methyl cellulose on the paper surface, and the glazes were left unaffected.

Prints where there was a possible problem of bleeding of specific colours were deacidified with a non-aqueous deacidification solution, applied to both the front and back of the prints. Before the prints were completely dry, they were placed between blotters and placed in a large press and pressed lightly overnight. The final alkalinity, measured with a flat-headed surface electrode, was within the accepted range (of 8.5-9.1). Since the fixative was applied only to the front surface of the image area it is thought that washing occurred from the reverse side and that as well the deacidification solution easily entered the paper from the back side. During the washing and deacidification there was obviously some softening of colours, although no bleeding of colours was detected. During the blotting with one exception there was no transfer of colours to the blotting paper.

All mending was done with Japanese oriental paper using wheat-starch paste as an adhesive. The paper was torn into long strips by the use of a water brush to ensure long fibres; a strip was applied to the reverse of the fore edge of each print. The mending of small tears was done with a tacking iron, which was applied at a low heat to the mend through a sheet of Reemay. Because of the weakness and many tears and losses of the Turkey print it was backed overall with oriental paper

After consultation with the librarian of the New Brunswick Legislative Library it was decided not to incorporate the 109 prints back into the binding, as the Whatman paper would not withstand turning of the pages without consequent breakage. Instead each print was inserted into a seven mil Mylar envelope; *these were* ~~and~~ stored in two large Solander boxes which were lined with acid-free paper.

The final procedure was the treatment of the binding. First the paper lining of the boards was removed. The corners of the binding, which showed considerable wear, were lifted and the heavy millboard corners injected with an approved conservation buffered white glue to strengthen the boards. The worn corners were strengthened with new leather which was applied with wheat starch paste. The spine was reinforced by lifting the leather along the spine and head cap areas and then pasting in a strip of leather which was the same length of the spine but about an inch wider.

Finally, the spine was lined with acid-free paper and new paper applied to the inside of the boards. The leather was treated with *a solution* properties of potassium lactate, allowed to dry for 24 hours, and then a lanolin and leather dressing of neats foot oil was applied. When this had dried the binding was buffed with soft terry cloth. A special storage box was constructed in which the binding would be stored flat, face up.

The conservation of the prints was now complete; with proper storage, environmental controls and handling their life span would be considerably lengthened.