GUILD OF BookWorkers

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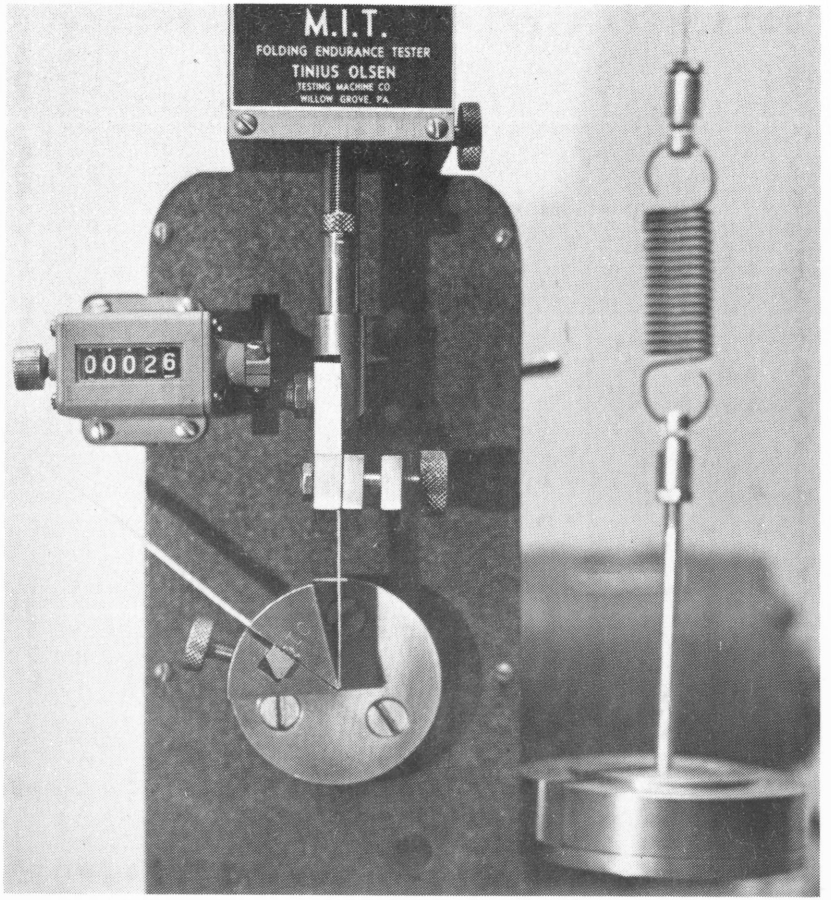

The Cover: Paper Conservation Laboratory, New York University Conservation Center of the Institute of Fine Arts, 1 East 78th Street, New York City. Courtesy Dr. N. S. Baer.

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Inquiries about the Guild and the Journal
may be sent to the Guild at the above address

(Editor of this issue: Carolyn Horton; assisted by Laura S. Young)

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REPORT ON THE SEMINAR ON BOOK CONSERVATION HELD AT SEDONA, ARIZONA, SEPTEMBER, 1971 / Nancy Storm

The Seminars in Book Conservation held in Sedona, Arizona, in 1970, 1971, and again in September, 1972, are designed to teach the subject to rare book librarians, binders interested in learning about restoration, collectors who need to know what to do (and what *not* to do) with the books in their care, and other interested people who are concerned about book conservation. We teach that conservation and restoration of rare books—a broad subject—is the concern of the restorer-conservator who must, first, be a well rounded, experienced binder. He must, in addition, know binding styles and techniques through the centuries; know safe, tested, modern materials and how to use them; and know safe methods of handling fragile materials. He must know the values and scarcity of the rare books he is treating, the bibliography of the books, and the significance of their provenance. (A binder with less knowledge than the preceding should be considered a repair binder, not a restorer.)

The general outline of the first Seminar in 1970 was preserved for the second Seminar in 1971, but the descriptions of methods were scaled down and the resulting extra time was used for more demonstrations. Again, Colton conducted the morning sessions, starting with a statement on the needs of conservation and what is possible and advisable in restoration and repair of old books. He continued the morning sessions with definitions of terms, descriptions and displays of equipment, materials, and styles and techniques of binding. He also spent two mornings on the restoration of leather bindings, including the steps of rebacking a leather bound volume. Each step was illustrated with prepared examples. Off and on, through his sessions, he was answering bibliographical queries.

As in the 1970 Seminar, I took the afternoon sessions, devoted strictly to restoration techniques of text, and of cloth and paper bindings. As the restoration of a volume is only as successful as the restored condition of the text, a great deal of time was devoted to text restoration, including every conceivable ailment

and its cure. For instance, I had restored several small sheets of paper in various ways, showing what happens when too much adhesive is used, what happens when paper is not cleaned before repair, how to avoid dark lines on mended tears, what to do about a ridge, how to tissue a leaf, how to split paper . . . on and on and on, etcetera, etcetera, etcetera. The restoration of cloth and paper bindings was also covered, and there were demonstrations on the spot for those puzzled by explanations alone. In brief, I took them through the steps of forwarding from the restoration viewpoint.

The final session was devoted to a question and answer period covering the entire seminar. Following this, we gave a paste paper demonstration, running off a variety of patterns—enough for each member of the class to have one sheet. I also gave them the formula for the paste as I had worked it out years ago, to give depth, dark impressions, and sharp lines.

Repeated also from the first Seminar, on registration night, was a small get-acquainted reception at the Arts Center, a courtesy appreciated by the participants, for on Monday morning they knew one another, and felt very much at home. We invited half of the group (husbands and wives included) to our home one evening and the other half another evening. Binders and librarians alike were much interested in the bindery and the strictly hand equipment used by restorers.

Next September, 1972, we are offering the third and final Seminar. We hope it will be the best of the three. Then we shall have a belated vacation and take time to enjoy our own beautiful, lushly green area, nestled among the spectacular red, pink, and yellow rock mountains.

THE DESIGNER BOOKBINDERS' EXHIBITION AT THE PIERPONT MORGAN LIBRARY / Deborah Evetts

On 19 October an exhibition entitled "Modern British Bookbindings" opened at the Pierpont Morgan Library, 29 East 36 Street, New York.

This exhibition was organized by a group of British binders who call themselves Designer Bookbinders. None of them make a living from fine bindings such as those exhibited, but working as teachers and restorers, they enjoy creating their own designs and executing them either on commission or for exhibition. Their designs utilize many techniques, ranging from white puckered leather contrasted with dark-blue blind stamped rectangles, through natural vellum combining gold tooling with abstract calligraphy, to the traditional brilliant gold tooling on richly colored leather.

Philip Smith's "book-wall" and his two-volume set on American Indians, specially commissioned for this U.S.A. touring exhibition, decorated with "feathered" and "maril"[1] onlays contrast well with the bold designs and strong line of the bindings by Jeff Clements and Trevor Jones. Edgar Mansfield,[2] a past president of Designer Bookbinders, and Ivor Robinson,[3] the incumbent president, both use a linear approach but with very different results, as is well demonstrated by the eight examples of their work.

Other bindings worth special mention are Desmond Yardley's "ECCLESIASTICUS"; an incredible feat of tooling, it is bound in black morocco and has 72 lines of lettering in platinum, tooled on both boards and both doublures, with an average of 20 letters to each line. Bernard Middleton's "GEMS" has scintillating rosettes of gold tooling on purple leather.

Fourteen of the full members of Designer Bookbinders have contributed work for this exhibit which, after it closes at the Pierpont Morgan Library, will move to the Newberry Library in Chicago for one month (5 Jan.–3 Feb. '72), and the University Research Library, U.C.L.A. for a further month (1–29 Mar. '72) before returning to England for a final appearance at the Victoria and Albert Museum (14 June–16 July '72).

There is a well-organized catalogue with 31 pages of text, 31 illustrations; it includes biographical sketches of each binder, a forward by Mr. Ivor Robinson, a preface by Dr. Charles Ryskamp, director of the Pierpont Morgan Library, an introduction by Mr.

[1] Maril onlays consist of cross-sections cut from scraps of leather which have been stuck together under pressure.
[2] Author of "Modern Design in Bookbinding–The Work of Edgar Mansfield," 1966.
[3] Author of "Introducing Bookbinding," 1968.

John Harthan, keeper of the library, The Victoria and Albert Museum, and two "documents" on binding by Mr. Bernard Middleton and Mr. Philip Smith.

The catalogue is available from the Pierpont Morgan Library, 29 East 36th Street, New York, N.Y.

CONSERVATION OF RESEARCH LIBRARY MATERIALS / Virginia M. Ingram

For four weeks—July 19 to August 13, 1971 some 25 people gathered daily in Newberry Library's Fellows' Lounge to attend University of Illinois' course, Conservation of Research Library Materials. Like the lecture room itself, the instruction, the course content, the physical facilities, the students and their backgrounds were richly varied. The instructor for the course was Paul Banks, Newberry's Conservator, supported by guest lecturers Carolyn Horton and David Woodward. Field trips were made to Chicago Paper Testing Laboratories, Lakeside Press, Bindery Corporation of America, University of Chicago's Printing Department, Spinner Brothers Bindery, and Dard Hunter Museum in Appleton, Wisconsin. The students were from Long Island to Hawaii and Ottawa to Virgin Islands; their specialties ranged from rare books to medical books, collectors to binders, archivists to school librarians; and their previous library experience from none to a decade or two of practice.

Mr. Banks has long campaigned for a sound training program for book conservators, and this course marked a beginning. There was no attempt to do in four weeks what should be done in four years, but we were certainly introduced to the necessity of an academic approach to library conservation in addition to the the more practical apprenticeship approach. The first five days of lectures from 9:00 to 4:00, for example, were spent on paper: history, manufacturing methods, chemistry and physics, and testing procedures. Basically the course was theoretical in approach supported by extensive bibliographies and augmented

with slides, films, and perceptive questions from students of the varying backgrounds.

Having a background as typographer, binder, and since 1964, conservator, Mr. Banks is an established authority leading our discussions of *the book*—its materials, structure and technology; its enemies; its protection and care; and its physical treatment. (Manuscripts, maps, and other archival materials were included, but this was distinctly a library course.) His knowledge was based on experience, and the experience arose from a questioning, tenacious, testing approach to the fundamental problems of conservation. In addition, David Woodward, Newberry's map librarian, discussed maps and their problems, while Carolyn Horton demonstrated some of the things librarians could do in the way of basic dry cleaning, shelf maintenance and minor book repair. Norvell Jones, Newberry's assistant conservator, also demonstrated some basic mending techniques and some testing procedures.

The books on our reading list were set aside in a special shelving arrangement for our convenience. In addition, Newberry provided the lecture room, tours through the building, at-cost Xeroxing of materials, and even a social hour with the director, Dr. Towner. In general the library staff provided the cooperation which was essential for the smooth functioning of the class.

I would describe this course then, as a fundamental one. Here at Ohio Historical Society we are developing a conservation laboratory on an in-service training basis, and we have been learning procedures and techniques, practicing them, evaluating, then going out to learn some more by visiting various laboratories around the country and by reading current literature. The course was excellent for our purposes in that it gave me a basic set of notes to work from, it gave us direction for developing our laboratory, and it gave us some sound principles by which to critically evaluate other procedures as we discover them. The course was not designed to produce conservators, but to orient librarians on a sound conservation course. Hopefully it marks the beginning of a sound program for training tomorrow's conservators.

EDITORIAL / Laura S. Young

Further Thoughts on our Proposed National Conference on Workshop Techniques

At the Annual Meeting of the Guild in June, 1971, I proposed that we give some thought to the Guild's sponsoring a Workshop Conference on techniques in our fields of interest.

Prior to this proposal I had discussed this idea with the Executive Committee, and with several people who were in a position to offer their facilities. Both the Executive Committee and the "several people" had responded favorably.

The expressed interest at the Annual Meeting led us to believe that the idea was worth pursuing further.

This we did in the form of a questionnaire which was mailed to the membership over my signature in Nov. A handful of members responded with enthusiasm; but the response in general was not good enough, in the opinion of the Executive Committee, to justify carrying the plan to fruition.

I, your president, had envisioned this conference as an opportunity for our members to meet personally, to see demonstrations of techniques executed by our professional practitioners, followed by discussions and evaluations of their variations.

I had further hoped that from these meetings we could develop a set of standards for each technique demonstrated. And in turn that these standards would supply us all with basic guide lines in good and acceptable practices.

The failure of this proposed conference to materialize is a great disappointment to me. I believe strongly that some uniformity in the quality of work produced by our professional members is highly desirable; a meeting of minds, a pooling of information and experiences, and working together for the good of the profession is, in my opinion, the best way to bring this about.

The owners of books, both institutions and private collectors, are becoming increasingly aware of the need for an organized program of conservation and restoration; and these same people

are also making the effort to become informed about the techniques and practices used.

There have, of course, always been knowledgeable custodians and collectors; but their number is increasing at a much greater rate than are the number of knowledgeable, competent binders and restorers.

It behooves the Guild and its members to give the present trend serious thought. We represent the practitioners, and we must be prepared to meet the demands that unquestionably are going to be placed on us.

The Guild has been largely responsible for keeping the hand book crafts alive and thriving in this country; and it has played a significant role in stimulating the present interest in conservation and restoration.

In the face of what might well be the greatest opportunity that hand book craftsmen have ever had in the history of the Guild, or in the history of the country to come into a respected and useful place in present day society, let's not muff it.

In closing this exhortation to all of you I can think of no better way than to quote a frequently used expression of my maid on the Eastern Shore of Va., where I spend my summers. Mrs. Arinthia Satchell has worked for and with me for some twenty-five years. She is a person with limited education, but one with great human understanding and perception. Her philosophy and advice for minority groups—of which we are surely one—is to "pull together."

LIBRARY / Mary E. Greenfield

Books *not* in the Library but of possible interest to members:

Glaister, Geoffrey A.
GLOSSARY OF THE BOOK
London: George Allen & Unwin Ltd., 1960.
484pp, profusely illustrated. $15.12

It contains 2,600 definitions of terms used in paper making, printing, book binding and the book trade. It is available from Foyles, 119-125 Charing Cross Road, London WC2.

Thomas, Alan G.
FINE BOOKS
New York: G. P. Putnam's Sons, 1967.
120pp, profusely illustrated. $5.95.

An attractive book, concerned almost entirely with book illustration.

Winger, Howard W. and Smith, Richard Daniel, editors.
THE DETERIORATION AND PRESERVATION OF LIBRARY MATERIALS
Chicago & London: The University of Chicago Press, 1970.
200pp.

Papers originally published in THE LIBRARY QUARTERLY, January, 1970.

Hewitt-Bates, J. S.
BOOKBINDING
Leicester: The Dryad Press, eighth revised edition, 1967.
127pp, illus.

Percival, G. S., and Graham, R. A.
UNSEWN BINDING
Leicester: The Dryad Press, 1964.
40pp. illus.

MEMBERSHIP / Jerilyn G. Davis

October 2, 1972

In the interest of keeping the membership list as up-to-date as possible, my reports are current when the *Journal* goes to press,

rather than the period covered by the *Journal*.

We welcome the following new members who have joined the Guild since May 1, 1972: Miss Gwendolyn Blackman, Mrs. Samuel B. Ellenport, Mrs. Virginia Gannon, Mr. Edward C. Garvin, Mr. Arthur F. McClure, Mr. William D. Minter, Miss Margaret Muller, Mr. Elliot Offner, Mr. Fred H. Shihadeh, & Dr. Richard D. Smith. We also welcome Mr. Murray Lebwohl, who has rejoined the Guild.

Resignations: Miss Andrea Clark, Miss Beatrice R. Lockhart, Mr. Frazer Poole, Miss Ruth E. Setterberg, & Rev. William W. Yardley.

Death: We sincerely regret the death of Mrs. Mary K. Moulton on April 7, 1972.

Total Membership: 212

PROGRAMS / Mary C. Schlosser

An Informal Evening with Roger Powell / Deborah Evetts

On Wednesday, 20 October, Roger Powell, the well-known British bookbinder gave an informal talk to the Guild and invited guests at the A.I.G.A. Mrs. Laura S. Young opened the meeting and Mrs. Mary C. Schlosser introduced Mr. Powell.

The talk was not confined to any one aspect of bookbinding so that those who attended enjoyed a discussion which ranged from papermaking, marbling, restoration practices to "arched sewing."

The first eighteen slides were taken at the Barcham and Green paper mill in Kent, England, a long-established mill making fine handmade paper including the Dover and Middleton papers with which we are all familiar. With Mrs. Powell operating the projector and Mr. Powell explaining each slide we were taken

through the steps involved in making paper by hand. Starting with the rag-chopping machine we saw the cotton rags being reduced to small snippits before passing into the beater to be reduced to pulp from which sheets of paper are formed. Then the dipping of the "stuff" from the vat with a mould and deckle and the passing of the soggy sheets from the mould onto felts. Then a pile of these newly formed sheets, still between felts, were pressed to remove the excess water before being placed between fabric and passed through the size tub and, after being pressed again, they were taken to the drying loft. In olden days they were left to mature for a much longer period than is now the case. Mr. Powell remarked that this might affect the quality of the paper. The hand-sorting of the paper into "goods" and "rejects" is done by examining each sheet against a strong light to detect flaws or unevenness. Finally we saw Barcham and Green's collection of moulds and watermarks.

The next group of eight slides showed the Cockerell method of marbling paper. The combs, the troughs of ink, the application of the ink to the size, the combing of the design, the laying down and picking up of the paper and a whole group of finished papers hung up to dry.

The remaining twenty-four slides covered a variety of binding techniques, books that had had very interesting bindings and how they looked after they had been "butchered," Mr. Powell's word for an unsympathetic rebinding. Particularly noteworthy were some unglued bindings attached to wooden or horn spine strips with "tackets." Two slides showed what looked like two books when photographed from the spine but the second slide revealed that it was one book that had been sewn so tightly it had caved in on the spine.

He showed us the mitred corners as found on the Stonyhurst Gospel, the earliest known European binding; an alum-tawed pigskin thonged headband, and how it was apt to cut the leather through which it was laced and how the top spine corner of the leaves had been cut away to accommodate it; a 14th century all-over leather chemise with stitched corners; tabs for lifting books out of the chests in which they were usually kept until bookshelves came into use; a neat little dove-tail joining two halves of a wooden book board; evidence, discovered in the St.

Chads Gospel of Litchfield Cathedral, showing that the scribes of those days wrote and illuminated with the leaves held together by a simple sewing which was removed before the main book sewing and not leaf by leaf as had previously been assumed.

Mr. Powell then went on to describe "arched sewing," sewing on double bands usually of alum-tawed pig- or goat-skin in which the band is completely covered with thread. This is achieved by encircling the band two or three times whenever a section is sewn on, with the result that the band cannot bend sharply and the spine of the book arches gently when the book is opened, thus preventing any strain on the leaves. Mr. Powell illustrated this theory with drawings made on the spot.* He started to demonstrate this sewing method but had insufficient time; however, he did show us his ingenious tool for stabbing sections with sewing holes enabling him to use a blunt needle so that he would not spike the bands. He also gave tips on tieing up a full leather binding in order to avoid string marks on the boards: one stands it on a board which has been clamped to the bench and ties over the book spine and under the board.

Mr. Powell expressed his concern about 19th century techniques, still used today, that evolved from a search for a more refined appearance without regard to the leaves of the book.

After a round of questions the meeting closed.

Members and guests attending included: Mrs. Ablin, Mrs. Altshul, Mrs. Burnham, Mrs. Coryn, Mrs. Eldridge, Miss Evetts, Mr. Stephen Paul Ferrari, Mrs. Gerson, Mr. and Mrs. Granger, Mrs. Greenfield, Miss Elizabeth Greenhill, Miss Gunner, Miss Janes, B. N. Jones, Mrs. Haas, Mrs. Henderson, Miss Ursula Hofer, Mrs. Lewisohn, Miss Lockhart, Mr. Minsky, Miss Sharon Mortimer Mrs. Rita Powell, Dr. Ratner, Mrs. Mary Reiman, Miss Sarah Rosenbau, Mrs. Rosner, Mrs. Russell, Miss Schilling, Mrs. Schlosser, Miss Sally Lou Smith, Mrs. Ella-May Snyder, Mrs. Stein, Mrs. Tayler, Mr. Thenen, Mr. Thompson, Mrs. Weil, Mrs. Weiss, Mr. Welsh, Mrs. Wick, Mr. Wilking, and Mrs. Young.

*Editor's note: a description and diagram of this technique can be found in: Franck, Peter. *A Lost Link in the Technique of Bookbinding and How I Found It.* Gaylordsville, Conn. 1941.

During the week of July 4–10 the New York State Historical Association presented its 24th annual "Seminars on American Culture" at Cooperstown, New York. GBW member Harold W. Tribolet, head of the Graphic Conservation Department of R. R. Donnelly & Sons Company in Chicago, again led the seminar on "Conservation of Valuable Books, Manuscripts, Prints, and Related Materials." Also, as before, Mr. Tribolet was assisted by GBW member Carolyn Horton.

During June and July, 1971, the Society of Bibliophiles at Brandeis University (Waltham, Massachusetts), presented A Loan Exhibition from the Collection of Leonard B. Schlosser. Entitled "Paper: Bearer of Ideas and Images," the exhibition was held in the Rapaporte Treasure Hall of the University. A handsome printed history of paper and papermaking, prepared by Mr. Schosser, was available to viewers, as well as a companion, printed listing of the 95 books and objects comprising the exhibition. Items on display were grouped as follows: The First Printing in Paper; Palm Leaves to Papyrus; Illustrations and History Before 1700; The Eighteenth Century; The Search for New Materials; The Industrial Revolution; Handmade Paper and History; Hunter, Mason and Morris; The Orient Through Western Eyes; Pre-Columbian Paper; and The Invention of Lithography.

The August 22, 1971 edition of *The New York Times* included a block "Help Wanted" ad by the Library of Congress, for a "Hand Bookbinder." The ad specified that applicants must be thoroughly familiar with sewing, forwarding, finishing and all other operations in hand bookbinding. Should know and be able to execute the principal binding styles of the 18th and 19th centuries. Should be thoroughly familiar with bookbinding materials and tools and capable of instructing apprentices in the craft." The salary specified was $5.63 per hour, equivalent to $11,710 per annum.

During the Fall of 1971 Gallery 303, The Composing Room, in New York, presented the 13th of its annual series of "Heritage of the Graphic Arts" lectures. Among the 13 lecturers were Paul Standard "Calligraphy Past and Present" and Karl Kup "Books

from the Orient for America." The 1971 series was designated as the "Melvin Loos Memorial Lectures," in honor of the well-known typographer and director of the printing division of the Columbia University Press, who died in early Jan. 1971. Mr. Loos handled the printing of the *Journal* for a number of years.

GBW member Leah Wollenberg and her husband went to Europe during the summer of 1971 and, during their travels, visited the Centro del Bel Libro at Ascona, Switzerland, the Gutenberg Museum, and the Klingspor Museum at Offenbach-am-Main. They also met binders in Paris and Copenhagen and, upon returning home, showed slides taken by Mr. Wollenberg to a group of San Francisco binders.

GBW member E. A. Thompson, of San Francisco, has sent us two reprints of newspaper articles about him and his work. The January 24, 1971 edition of the Santa Barbara *News-Press* included an illustrated article about Mr. Thompson's work and historical information about his 40 years as a book restorer. He does the rare book binding for the Los Angeles Public Library and recently worked on a first folio of Shakespeare, with a 1626 binding by Roger Payne. The second article was from the October 19, 1971 edition of the Van Nuys *News*. Of particular interest was the information on the restoration work he did on books of the San Fernando Valley State College Library, damaged in the February 9, 1971 earthquake.

In October 1971 GBW member Deborah Evetts sent out a mailing to announce the "opening for business" of her bindery in New York. An "open house" on October 21 formally launched the bindery. Other portions of the mailing reviewed Miss Evetts' training and background, and listed the courses she planned to offer in bookbinding and Traditional Marbling. Miss Evetts is binder at the Pierpont Morgan Library.

On October 19, 1971, the Grolier Club held one of its periodic "small dinners," with Roger Powell as speaker. A small exhibition of Mr. Powell's bindings owned by Grolier Club members was on view to accompany the "small dinner."

The October 1971 issue of *Allegemeiner Anzeiger fur Buchbindereien* carried an article about Mr. Gerhard Gerlach and the Guild's Gerlach Memorial Exhibition held at the Grolier Club in New York, June–August 1971. GBW member Mrs. Lotte Burg

translated this article and it seemed to be in substance a German edition of the article written by Laura S. Young which appeared in Vol. VII, no. 1 of the *Journal.*

On April 2, 1971 GBW member Carolyn Horton participated in an all day program on book and library conservation at the Annual Meeting of the Council on Botanical and Horticultural Libraries, held at the N. Y. Botanical Gardens Library. The presentation included slides and a two-hour demonstration.

AN EVALUATION OF ADHESIVES FOR USE IN PAPER CONSERVATION

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SHELF LIFE OF COMMERCIAL POLY(VINYL ACETATE) EMULSIONS FOR USE IN PAPER CONSERVATION

by

N. S. Baer, N. Indictor, and W. H. Phelan

The following is a revised version, incorporating new data, of a paper presented at the IIC-AG Annual Meeting 1971, and published in the IIC-AG Bulletin II pp. 58-75 (1971). It is reproduced here with the permission of the authors.

AN EVALUATION OF ADHESIVES FOR USE IN PAPER CONSERVATION[a]

N. S. Baer,[b] N. Indictor,[c] and W. H. Phelan[d]

INTRODUCTION

At the Conservation Center of the Institute of Fine Arts of New York University, we have recently embarked on a research program for testing materials commonly used in paper conservation. This report is a summary of studies presently in progress: impregnating agents; poly(vinyl acetate) emulsion adhesives; pastes; and glues (1-3). The impregnating agents tested were soluble nylon, poly(vinyl alcohol) and Regnal, an acetal copolymer. Ten commercially available poly(vinyl acetate) emulsion preparations were tested. Four methyl cellulose preparations, nine wheat and rice derivative formulations, and three glue formulations were examined. Two of the adhesives tested were mixes whose recipes were obtained from paper conservators. One mix contained poly(vinyl acetate) emulsion and methyl cellulose; the other mix contained rice starch and poly(vinyl alcohol). Our observations include measurement of mechanical properties by folding tests; surface pH measurements; objective color and reflectance; reversibility (solubility) in various solvents.

EXPERIMENTAL

Materials and Methods of Application. All paper samples were a buffered wood sulfite paper, Gracie & Sons Acid-Free Lining Paper - Lot 3, supplied by Charles R. Gracie and Sons, Inc., New York, New York 10022. Samples were all cut in 1/2 x 6" strips in the machine direction. Impregnating agents were of three different types; soluble nylon, Zytel 61, used as 5% 90/10 methanol/water solution; poly(vinyl alcohol), of three different molecular weights, used as 5% aqueous solutions; Regnal (an alcohol soluble copolymer). Adhesives tested were: poly(vinyl acetate) emulsions; various pastes and glues. Table 1 lists both impregnating agents and adhesives and their sources. All pastes and glues were formulated according to common recipes (4). Other adhesives and impregnating agents were used as supplied without modification.

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a. This article is a revision, incorporating new data, of a paper presented at the IIC-AG Annual Meeting 1971; Oberlin, Ohio; and published in International Institute for Conservation - American Group Bulletin 11 (2) 58-75 (1971).

b. Conservation Center, Institute of Fine Arts, New York University; 1 East 78th Street, New York, N. Y. 10021

c. Department of Chemistry, Brooklyn College, City University of New York; Brooklyn, New York 11210

d. Museum of Modern Art; 11 West 53rd Street, New York, N. Y. 10019

TABLE I - DESIGNATIONS AND SUPPLIERS OF MATERIALS TESTED

Impregnating Agents	
Soluble Nylon	E. I. Du Pont
Poly(vinyl alcohol)	J. T. Baker
Regnal	World Patent Development
Poly(vinyl acetate) Emulsions	
403	Jade Adhesives
5714	S. Schweitzer
436	S. Schweitzer
454	Jade Adhesives
R131	Manhattan Adhesives
A1023	Process Materials
Sobo Glue	Slomons Labs
Elmer's Glue All	Borden
Texicote VJC 555	TALAS
Elvacet 81-900	E. I. Du Pont
Mix	Private Conservator
Pastes	
Methyl Cellulose (CC)	City Chemical
Methyl Cellulose (P)	Process Materials
Methyl Cellulose (BM)	ICI America
Methyl Cellulose (SC)	Standard Chemical Products
Wheat Flour (formalin)	General Mills
Wheat Starch (eugenol)	General Mills
Wheat Starch (thymol)	General Mills
Wheat Starch	General Mills
Rice Flour (formalin)	Byrd Mills
Rice Flour (formalin, alum)	Purchased locally in Japan
Rice Starch (thymol)	Manhattan Adhesives
Rice Starch (gelatin, glycerin, thymol)	TALAS
Rice Starch (poly(vinyl alcohol))	Manhattan Adhesives
Glues	
Yes Stikflat	Gane Bros. & Lane
Ganes Flexible Glue	Gane Bros. & Lane
Sta Flat	S. Schweitzer

The procedure for applying the impregnating agent to the paper consisted of brushing the impregnating solution on a single side of the test paper and permitting the solvent to evaporate in controlled atmospheres for 24 hours. Two procedures for applying adhesives to the paper were employed, depending on the viscosity of the emulsion. For the poly-(vinyl acetate) specimens, unless otherwise indicated, the paper sample was laid for one minute on top of a portion of adhesive in a watchglass. For samples of the more viscous emulsions, referred to as brushed samples, a loaded 3/4" brush was brought back and forth over the paper sample for a total of 5 strokes. For the preparation of adhesives on glass slides and for all paste and glue specimens, only the brushing procedure was used.

Aging of Samples. The treated and untreated samples were placed in an oven at 100°C for periods of 1, 5, 9, 16 days (5). On the completion of each aging period 6 replicate paper specimens and specimens on glass slides were removed and equilibrated at 21 ± 1°C, 65% relative humidity for 24 hours before testing.

Folding Endurance Tests. Measurements were performed on a Tinius-Olsen Model No. 2 instrument (also known as MIT folding test meter) according to ASTM method D2176-63T on samples cut in the machine direction. A dead weight of 1-1/2 pounds was used in all tests. Results are reported as the average of six measurements together with standard deviation. All tests were performed in a constant temperature/humidity room (21 ± 1°C, relative humidity 65%).

pH Measurements. For impregnating agents, duplicate readings were taken on both sides of the test strips with a Beckmann #39182 Flat Bulb pH combination electrode with a 2-minute equilibration period (6,7). Results are reported as the average of eight readings on two test strips. These averages have an uncertainty of ± 0.2 pH units. For poly(vinyl acetate) results are reported as the average of six readings on the adhesive side and the average of two readings on the paper side. These averages have an uncertainty of 0.2 pH units on the paper side and 0.3 units on the adhesive side. For the pastes and glues, indicator solutions were employed; the uncertainty was ± 0.5 pH units.

Color Changes. The color of the test strips was compared with that of the standard Munsell colors under incandescent "Tensor lamp" illumination (8).

Reflectance. The reflectance was measured at 457 nm with a Bausch and Lomb Color Analyzer Reflectance Attachment on a Spectronic 20 Colorimeter. Results are reported as the average reading for at least three samples. These averages have an uncertainty of ± 2% units (9).

Reversibility. Qualitative observations of the reversibility of the aged impregnating agent or adhesive mounted on glass slides were made in several solvent systems. The specimen was immersed in the solvent for 1, 2, 24, and 48 hour periods, removed, and probed with a glass rod. The solvent temperatures were maintained at 21 ± 2°C.

RESULTS

A. IMPREGNATING AGENTS

Folding Endurance Tests. Table II presents the numerical data for the folding tests on artificially aged Gracie papers treated with impregnating agents. The results clearly indicate that oven heating at 100°C has no measurable deleterious effect upon the fold-strength of the Gracie paper within the time span of our experiments. The apparent imperviousness of the Gracie paper to oven temperatures of 100°C enables us to attribute diminished performance of the impregnating agent-paper or adhesive-paper system entirely to the impregnating agent or the adhesive.

pH Measurements. Table III presents data for the measurement of surface pH of the untreated paper and the impregnated paper.

No trend in pH values could be detected when compared with artificial aging times. Surface pH values were essentially independent of impregnating agent. Each of the impregnating agents left the acidic properties of the paper unchanged and appear to have no effect even upon aging.

Paper impregnating systems were successfully buffered with magnesium acetate buffer solutions. The buffering action was retained throughout the artificial aging.

These results indicate clearly no correlation between surface pH data and fold-strength data. It suggests, in fact, that here the surface pH change is an insufficient criterion of paper deterioration; for example, in another study it has been shown that newsprint strips could be successfully buffered to pH comparable to that of Gracie paper without improvement of fold-strength (1). These data suggest that although the acidity in paper may be an important cause of deterioration, as other investigators have proposed, this property may be altered without substantial improvement to the paper's ability to withstand artificial aging. The relationship of pH to paper strength is undoubtedly a complex one. Acidity criteria for paper acceptability cannot possibly be applied without attention to strength properties.

Color Changes. For untreated Gracie papers, no detectable color change at 100°C over the 16-day heating period was observed. Gracie papers treated with impregnating agents heated at 100°C all showed slight intensification of the yellow-red coloration during the course of the artificial aging. According to the Munsell designation, the changes appear to be small. Distinctions among the impregnating agents on the basis of color evaluation could not be made. All impregnating agents seemed to be equally acceptable in terms of color stability. The color effects of these impregnating agents on the inks, dyes, or pigments attached to paper ought to be taken into account before treatment. In particular, the effects of the various solvents from which the impregnating agents are applied must be considered.

TABLE II - FOLDING TESTS ON ARTIFICIALLY AGED[a] PAPERS TREATED WITH IMPREGNATING AGENTS

Aging Time Days	Soluble Nylon Zytel-61	Poly(vinyl alcohol) U228	5% Regnal unbuffered	5% Regnal 5% buffer	Untreated Paper
	Double Folds to Rupture[b,c]				
0	171 ± 23	77 ± 14	67 ± 18	70 ± 17	13 ± 2
1	147 ± 55	66 ± 11	72 ± 10	68 ± 8	15 ± 1
5	142 ± 42	64 ± 19	48 ± 6	32 ± 6	16 ± 3
9	89 ± 22	58 ± 15	34 ± 10	19 ± 4	17 ± 5
16	47 ± 11	35 ± 10	14 ± 2	8 ± 1	13 ± 2

[a] Oven temperature 100°C; all specimens equilibrated at 21 ± 1°C, 65% relative humidity for 24 hours prior to measurement

[b] Average and standard deviations for six measurements

[c] 1-1/2 pound counterweight

TABLE III - pH OF ARTIFICIALLY AGED[a] PAPERS TREATED WITH IMPREGNATING AGENTS

Aging Time Days	Soluble Nylon Zytel-61	Poly(vinyl alcohol) U228	5% Regnal unbuffered	5% Regnal 5% buffer	Untreated Paper
0	6.8	7.1	7.1	8.9	7.5
1	7.1	7.1	7.1	9.4	7.2
5	6.9	7.0	7.5	9.5	7.4
9	6.8	7.2	7.1	9.7	7.0
16	7.0	6.9	7.0	9.8	7.0

[a] Oven temperature 100°C

Reflectance. The reflectance measurements (%) at 457 nm of impregnated papers and untreated paper are presented in Table IV.

Both treated and untreated papers show a monotonic decrease in reflectance. Apparently these measurements are more sensitive to the effects of artificial aging than fold tests since the untreated Gracie paper showed essentially no change in fold test strength even after 16 days of heating at 100°C although an appreciable change in reflectance was observed. Soluble nylon and poly(vinyl alcohol) show less reflectance change than Regnal or the untreated papers.

The absence of correlation between reflectance values and fold test values is not surprising since reflectance is really a composite property encompassing both chemical and physical effects. In another study it was found that reflectance changes of newsprint were greater (as expected qualitatively) than for Gracie paper (1).

Reversibility. Reversibility of all impregnating agents was achieved under some set of conditions: soluble nylon - completely reversible in 90/10 v/v methanol/water, insoluble in toluene, difficultly soluble in water; poly(vinyl alcohol) - difficultly soluble in water, insoluble in toluene; unbuffered Regnal - very slightly soluble in water and toluene, soluble in 95% ethanol; buffered Regnal - insoluble in ethanol and toluene, slightly soluble in water.

B. POLY(VINYL ACETATE) EMULSIONS

Folding Endurance Tests. Table V presents the data for the folding tests on the paper-poly(vinyl acetate) systems reported as double folds to rupture (untreated papers are included for comparison). With the exception of the mix-treated samples all of the adhesives apparently caused a marked weakening of the system. For example, the systems designated 436 and Elmer's Glue, all ruptured after an average of 3 folds or less for all aging periods as contrasted with a lowest average of 13 folds for untreated aged paper. This weakening of the paper-support-system was the general case, as the paper ruptured (within the first 5 double folds) substantially before the adhesive. Of the commercially available emulsions, only 403 for the periods 0 and 1 days appeared not to weaken the system. In this case, the paper ruptured after an average of 15 double folds, considerably before the adhesive. The samples treated with a mixture consisting of methyl cellulose and a small amount of the adhesive 5714 (designated in all Tables as Mix) caused a substantial increase in the strength of the systems. Here the paper and adhesive invariably ruptured simultaneously. On the basis of these fold-strength data one must conclude that of the commercial adhesives only 403, for short aging times, does not substantially weaken the paper-support-system. The Mix shows promise of providing an adhesive which does not weaken the paper-support-system.

pH Measurements. Table VI presents data for the measurement of surface pH of the untreated paper and the paper-adhesive systems. The data are reported for both the adhesive treated

TABLE IV - REFLECTANCE (%) AT 457 NM OF ARTIFICIALLY AGED[a] PAPERS TREATED WITH IMPREGNATING AGENTS

Aging Time Days	Soluble Nylon Zytel-61	Poly(vinyl alcohol) U228	5% Regnal unbuffered	5% Regnal 5% buffer	Untreated Paper
0	81	85	83	83	86
1	80	82	81	82	81
5	73	78	75	76	79
9	73	77	73	71	77
16	72	76	66	64	72

[a] Oven temperature 100°C

TABLE V - FOLDING TESTS ON ARTIFICIALLY AGED PAPER - POLY(VINYL ACETATE) ADHESIVE-SYSTEMS

Adhesive / Aging Time Days	Double Folds to Rupture[a] 403	5714	436[b]	454[b]	R131	A1023	Sobo Glue	Elmer's Glue All	Texicote VJC555	Elvacet[b] 81-900	Mix[c]	Untreated
0	531±383	1556±696	N.S.[d]	N.S.	48±10	16,166±5131	1538±605	1±1	217±49	5±4	122±48	13±2
1	352±254	813±265	3±2	32±11	41±11	1467±721	1442±542	1±1	1±1	3±3	112±25	15±1
5	612±296	506±230	2±1	15±3	105±45	432±347	2094±483	1±1	0	3±2	34±8	16±3
9	1703±1105	65±96	1±1	12±2	122±75	1±1	315±1216	1±1	0	2±1	117±15	17±5
16	638±412	111±136	3±2	8±5	116±122	12±29	1±1	0	11±25	1±1	75±20	13±2

[a] Refers to rupture of the paper-adhesive system; in most cases the paper ruptured within 5 folds (see discussion section)

[b] Brushed samples

[c] Paper and adhesive ruptured simultaneously

[d] N.S. denotes no sample

TABLE VI - pH OF ARTIFICIALLY AGED PAPER - POLY(VINYL ACETATE) ADHESIVE-SYSTEMS

Adhesive	403	5714	436[a]	454[a]	R131	A1023	Sobo Glue	Elmer's Glue All	Texicote VJC555	Elvacet 81-900	Mix	Untreated
Aging Time Days												
0	6.6[b]	6.8	N.S.[d]	N.S.	6.1	5.6	7.1	5.8	6.4	7.2	6.4	7.5
	(7.1)[c]	(6.1)		(6.1)	(6.1)	(5.3)	(7.0)	(5.9)	(7.9)	(6.7)	(7.1)	
1	7.4	7.8	4.0	5.4	6.7	5.2	7.1	6.1	7.0	7.0	6.1	7.2
	(6.9)	(6.8)	(5.9)	(6.6)	(6.3)	(6.4)	(7.3)	(5.6)	(7.4)	(6.4)	(7.1)	
5	7.4	7.6	4.8	4.8	6.5	5.3	7.0	5.8	7.0	7.0	6.1	7.2
	(7.3)	(7.0)	(6.0)	(6.1)	(6.5)	(6.6)	(7.0)	(5.7)	(7.4)	(6.3)	(7.1)	
9	6.3	6.9	5.4	5.5	6.1	5.0	6.6	5.9	7.0	7.0	5.5	6.1
	(7.0)	(7.2)	(5.9)	(6.8)	(6.7)	(6.4)	(7.9)	(5.7)	(7.4)	(6.2)	(6.9)	
16	5.7	5.9	5.4	5.4	6.4	4.5	6.5	5.5	7.0	6.9	5.5	6.1
	(6.8)	(7.2)	(6.1)	(5.6)	(6.6)	(6.5)	(7.0)	(5.4)	(7.5)	(6.1)	(6.9)	

[a] Brushed samples

[b] The average of six readings on the adhesive side

[c] The average of two readings on the paper side

[d] N.S. denotes no sample

side and the untreated side of the specimen. The initial pH's of the unaged adhesive on the paper ranged from 5.6 to 7.2. The penetration of the adhesive acidity through the paper is indicated by comparability of the pH's measured on the treated and untreated sides of the specimen. It is clear that no great changes in pH occur with aging so that the specimens which are initially acid remain acid while the initially neutral systems remain neutral or become only very slightly acid. As observed also in the preceding section on impregnating agents, no correlations between the pH measured and the mechanical properties of the system are apparent.

Once again, the Mix was somewhat atypical in behavior as the untreated side remained neutral while the adhesive side became more acidic with time.

Color Changes. Table VII presents the color designations for the artificially aged treated and untreated paper-adhesive systems. On the adhesive side, only the 403 and Mix did not show a dramatic yellowing. This was most pronounced in the specimens designated 436, 454, and Elmer's Glue All, which on aging for 16 days at 100°C turned a deep brown. The untreated side of the specimen showed substantial darkening only in the case of 454 and Elmer's Glue All which became tan and brown in color, respectively. For all other systems, the untreated side of the paper remained white. The discoloration is probably a combination of air oxidation and the chemical action of the many additives present in the adhesives. On the basis of the objective color evaluations, only the 403 and Mix demonstrated acceptable aging properties.

Reflectance. The reflectance measurements (%) at 457 nm of aged untreated paper and paper-adhesive systems are presented in Table VIII. The results are given only for the untreated side of the paper since any unevenness in the coating would have produced a significant error in reflectance readings on the coated side. In two cases, Elmer's Glue All and Texicote VJC 555, the adhesive had visibly seeped through the paper leading to a further reduction in the reflectance measured.

Comparison of the data for the paper-adhesive system with the data for the untreated paper shows a greater rate of decrease in reflectance for 436, 454, Sobo Glue, Elmer's Glue All, and Texicote VJC 555. The reduction in brightness is a combination of the results of oxidation and degradation of the cellulose and seepage of the adhesive through the paper. These effects lead to a darkening of the paper which render such adhesives unsuitable for paper conservation. The other adhesives, i.e., 403, 5714, R131, A1023, Elvacet, and Mix demonstrate a rate of reduction in reflectance sufficiently similar to that of the untreated paper to consider them acceptable.

Solubility (Reversibility). The generally accepted criteria for solubility of materials used in paper conservation require complete reversibility, that is, complete solubility of the aged adhesive in a suitable solvent. It should be noted that in some circumstances, paper conservators would prefer the formation of a gel rather than total solubility as the criterion of reversibility. If complete reversibility is required, none of the adhesives

TABLE VII

COLORS[a] OF ARTIFICIALLY AGED PAPER - POLY(VINYL ACETATE) ADHESIVE-SYSTEMS

Aging Time Days	0	1	5	9	16
Adhesive					
403	white	white	white	lt. yel.	lt. yel.
5714	white	lt. yel.	lt. yel.	yellow	N.S.
436[b]	N.S.[c]	brown	brown	brown	brown
454[b]	yellow	brown	brown	brown	brown
R131	white	lt. yel.	yellow	yellow	yel.-tan
A1023	lt. yel.	lt. yel.	yel.-brown	yel.-brown	yel.-brown
Sobo Glue	white	lt. yel.	lt. yel.	yellow	tan
Elmer's Glue All	yellow	brown-yel.	brown-yel.	brown-yel.	brown
Texicote VJC 555	yellow	yellow	yellow	yellow	yellow
Elvacet 81-900[b]	white	yellow	yellow	yellow	yellow
Mix	white	white	white	white	white
Untreated Paper	white	white	white	white	white

[a] Adhesive side observed under "Tensor" incandescent illumination

[b] Brushed samples

[c] N.S. denotes no sample

TABLE VIII - REFLECTANCE (%) AT 457 NM OF ARTIFICIALLY AGED PAPER - POLY(VINYL ACETATE) ADHESIVE-SYSTEMS

UNTREATED SIDE

Adhesive / Aging Time Days	403	5714	436[a]	454[a]	R131	A1023	Sobo Glue	Elmer's Glue All	Texicote VJC555	Elvacet[a] 81-900	Mix	Untreated
0	79	82	N.S.[b]	N.S.	86	83	83	N.S.	81	85	82	86
1	79	80	76	74	84	80	80	68[c]	73	84	80	81
5	72	75	69	62	81	74	77	63[c]	69[c]	81	80	79
9	72	72	64	59	70	71	70	59[c]	57[c]	78	70	77
16	70	70	60	60	67	68	63	55[c]	55[c]	77	67	72

[a] Brushed samples

[b] N.S. denotes no sample

[c] Seeped through paper

tested is completely satisfactory with water and toluene, commonly used solvents for poly(vinyl acetate).

It is interesting to note that the Mix which is made up of components which are ordinarily soluble in the solvents employed (methyl cellulose in water and 5714 in toluene) is nearly insoluble in either water or toluene. A possible mechanism for this consists of the encapsulation of the bulk of the Mix which is methyl cellulose by a film of poly(vinyl acetate). Thus, when water is used as a solvent the film of poly(vinyl acetate) protects the water soluble methyl cellulose, while when toluene is used as a solvent only the thin poly(vinyl acetate) film dissolves leaving the methyl cellulose behind. The use of a sequence of solvents or a mixed solvent may obviate this difficulty. Preliminary experiments indeed suggest acceptable reversibility by using toluene followed by water.

C. PASTES AND GLUES

Folding Endurance Tests. Table IX presents numerical data for the folding tests on artificially aged Gracie papers treated with pastes and glues.

The initial fold-strength for all tested pastes appears to be improved over that of the untreated paper. Furthermore, unlike the poly(vinyl acetate) emulsion adhesives, the paper support invariably ruptured simultaneously with the adhesive.

Among these adhesives the methyl cellulose preparations imparted the greatest initial strength to the system and even after 16 days of aging, the system appeared not to be weaker than the paper itself. The glues and rice and wheat derivatives usually performed less well. Fold-strength of several aged glue-paper systems was below that of the untreated paper implying deterioration of the paper-adhesive system. The glue-paper systems appeared to become noticeably brittle. The rice and wheat derivatives gave fold-strengths not significantly different from that of untreated paper demonstrating the limited strength of these adhesives. The single exception was rice starch with thymol which gave fold-strengths comparable to those of the methyl cellulose pastes. Both this rice starch formulation and the rice starch-poly(vinyl alcohol) mix showed little loss in fold-strength on aging.

pH Measurements. Measurements of pH with the surface electrode were generally unsatisfactory due to clogging of the electrode membrane by the water soluble adhesives. Estimates of pH by use of universal indicator solution (9) gave values above 6.0 for the methyl cellulose and wheat derivatives for all aging times. The specimens treated with rice derivatives and glues gave pH estimates of 5.5 on aging for more than 5 days. Preliminary experiments with cold extraction gave higher pH values (6.6-7.3) for all systems reflecting extraction of the buffer from the paper.

Color Changes. Table X presents color changes on the adhesive side of artificially aged papers treated with pastes and glues. An excellent qualitative correlation between these

TABLE IX

FOLDING TESTS ON ARTIFICIALLY AGED[a] PAPERS TREATED WITH GLUES AND PASTES

Aging Time Days	Double Folds to Rupture[b,c] 0	1	5	9	16
Adhesive					
Methyl Cellulose (CC)	33 ± 10	35 ± 11	46 ± 7	31 ± 6	27 ± 10
Methyl Cellulose (P)	29 ± 4	44 ± 11	27 ± 14	25 ± 6	23 ± 8
Methyl Cellulose (BM)	N.S.[d]	22 ± 3	17 ± 3	17 ± 2	14 ± 3
Methyl Cellulose (SC)	21 ± 6	20 ± 4	21 ± 6	21 ± 7	19 ± 4
Wheat Flour (formalin)	16 ± 3	18 ± 5	16 ± 3	14 ± 2	10 ± 2
Wheat Starch (eugenol)	18 ± 4	19 ± 3	20 ± 3	14 ± 3	13 ± 4
Wheat Starch (thymol)	18 ± 4	18 ± 2	15 ± 2	14 ± 3	12 ± 1
Wheat Starch	16 ± 3	20 ± 5	21 ± 3	17 ± 3	13 ± 2
Rice Flour (formalin)	17 ± 3	15 ± 5	15 ± 5	12 ± 2	13 ± 1
Rice Flour (formalin, alum)	15 ± 5	19 ± 4	17 ± 2	14 ± 3	11 ± 2
Rice Starch (thymol)	21 ± 3	27 ± 4	22 ± 3	20 ± 3	25 ± 5
Rice Starch (gelatin, glycerin, thymol)	16 ± 3	16 ± 1	14 ± 2	10 ± 4	8 ± 1
Rice Starch (poly(vinyl alcohol))	16 ± 6	17 ± 5	22 ± 1	17 ± 2	19 ± 3
Yes Stikflat	5 ± 4	14 ± 9	11 ± 5	14 ± 13	5 ± 2
Ganes Flexible Glue	7 ± 2	14 ± 9	9 ± 2	5 ± 1	2 ± 1
Sta Flat	3 ± 1	4 ± 2	8 ± 5	1 ± 1	3 ± 2
Untreated Paper	13 ± 2	15 ± 1	16 ± 3	17 ± 5	13 ± 2

[a] Oven temperature 100°C; all specimens equilibrated at 21 ± 1°C, 65% relative humidity for 24 hours prior to measurement

[b] Average and standard deviation of six measurements

[c] 1-1/2 pound counterweight

[d] N.S. denotes no sample

TABLE X - COLORS[a] OF ARTIFICIALLY AGED PAPERS TREATED WITH GLUES AND PASTES - ADHESIVE SIDE

Aging Time Days	0	1	5	9	16
Adhesive					
Methyl Cellulose (CC)	white	white	white	white	white
Methyl Cellulose (P)	white	white	white	white	white
Methyl Cellulose (BM)	white	white	white	white	white
Methyl Cellulose (SC)	white	white	white	white	white
Wheat Flour (formalin)	white	white	yel.-white	yel.-white	yel.-white
Wheat Starch (eugenol)	white	white	white	white	white
Wheat Starch (thymol)	white	white	white	white	white
Wheat Starch	white	white	white	white	yellow
Rice Flour (formalin)	white	yel.-white	yel.-white	yel.-white	yel.-white
Rice Flour (formalin, alum)	white	white	yellow	yellow	yellow
Rice Starch (thymol)	white	white	white	white	white
Rice Starch (gelatin, glycerin, thymol)	white	yellow	brown	brown	brown
Rice Starch (poly(vinyl alcohol))	white	white	white	white	N.S.[b]
Yes Stikflat	white	yellow	brown	brown	brown
Ganes Flexible Glue	white	brown	brown	brown	brown
Sta Flat	white	yellow	brown	brown	brown
Untreated Paper	white	white	white	white	white

[a] Observed under "Tensor" incandescent illumination

[b] N.S. denotes no sample

data and fold-test strength data may be observed. Methyl cellulose formulations remain substantially unchanged as does the untreated Gracie paper. The wheat and rice derivatives (except for the thymol stabilized rice starch formulation) tend to yellow and the glues all turn brown within the 16-day artificial aging periods.

Reflectance. Table XI presents reflectance measurements (%) at 457 nm of artificially aged papers treated with glues and pastes. Results are reported only for the treated side. Reflectance measurements on the untreated side in general showed no change from the behavior of untreated paper. In general, the methyl cellulose adhesives and the wheat and rice derivatives behaved close to the untreated paper. Only the rice starch formulation containing gelatin, glycerin, and thymol gave unusually low reflectance values implying that the additives served to accelerate deterioration of the adhesive. The glues all gave markedly lower reflectance values even upon artificial aging for one day implying considerable instability in the adhesive.

Solubility. All of the adhesives in this group showed no change in solubility characteristics on aging. Three of the methyl cellulose formulations (CC, P, and BM) were easily soluble in water while the fourth (SC) became gel-like and easily removable by mechanical methods but only sparingly soluble. The rice and wheat derivatives, in general, behaved in a manner comparable to the "SC" methyl cellulose. The glues remained difficultly soluble in water with noticeable improvement in solubility on warming of the water.

It may be noted in a few examples tested in this group that the presence of additives in the wheat and rice formulations produced little discernible alteration of the behavior of the adhesive-paper system. The presence of thymol or eugenol apparently prevented yellowing in the wheat starch after 16 days of artificial aging.

SUMMARY

Impregnating Agents. Evaluation of three kinds of impregnating agents applied to paper under artificial aging conditions (100°C oven exposure for up to 16 days) has been performed. Soluble nylon, poly(vinyl alcohol) and Regnal (a new alcohol soluble copolymer) were subjected to folding endurance tests, pH measurements, color change and reflectance evaluation, as well as reversibility tests in various solvents. Soluble nylon imparted the greatest initial strength although all impregnating agents showed marked decrease in strength properties over the test period. Under conditions of artificial aging none of the impregnating agents appeared to have caused deterioration of the paper.

Poly(vinyl acetate) Emulsions. The effects of accelerated aging on paper treated with ten commercially available poly(vinyl acetate) emulsion adhesives have been observed. Folding endurance strength, reflectance, objective color and surface pH of the systems have been measured as well as the reversibility in water and toluene of the adhesives applied to glass plates. None of the commercially available poly(vinyl acetate) adhesives is recommended

TABLE XI - REFLECTANCE (%) AT 457 NM OF ARTIFICIALLY AGED[a] PAPERS TREATED WITH GLUES AND PASTES - ADHESIVE SIDE

Aging Time Days	0	1	5	9	16
Adhesive					
Methyl Cellulose (CC)	85	82	79	73	71
Methyl Cellulose (P)	84	79	79	74	73
Methyl Cellulose (BM)	84	77	68	66	60
Methyl Cellulose (SC)	84	79	79	74	76
Wheat Flour (formalin)	85	81	77	71	65
Wheat Starch (eugenol)	84	79	76	72	73
Wheat Starch (thymol)	85	81	75	74	73
Wheat Starch	86	80	77	76	69
Rice Flour (formalin)	83	76	76	71	72
Rice Flour (formalin, alum)	86	80	74	73	73
Rice Starch (thymol)	85	84	82	81	81
Rice Starch (gelatin, glycerin, thymol)	84	70	61	52	52
Rice Starch (poly(vinyl alcohol))	86	84	82	78	79
Yes Stikflat	84	50	22	20	20
Ganes Flexible Glue	68	21	18	17	18
Sta Flat	71	43	40	29	30
Untreated Paper	86	81	79	77	72

[a] Oven temperature 100°C

for general use in paper conservation on the basis of observed properties upon accelerated aging. A mixture of poly(vinyl acetate) and methyl cellulose was satisfactory as an adhesive within the framework of our evaluative procedures.

Pastes and Glues. The effects of artificial aging on methyl cellulose formulations have shown them to be generally acceptable, although of limited strength, as adhesives for paper conservation. Most wheat and rice derivatives have more limited strength and tend to yellow upon artificial aging in the absence of phenolic inhibitors. Glues appear to be unsatisfactory on all counts under these conditions. Further investigations on the effects of varying artificial aging temperatures on glue performance are under way in these laboratories.

It should be noted that the testing procedure described here represents an extreme set of conditions corresponding to artificial rather than accelerated aging. For certain applications there may be no ready substitutes for these adhesives and impregnating agents. Transferring these evaluations to other systems should be done with caution.

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SHELF LIFE OF COMMERCIAL POLY(VINYL ACETATE) EMULSIONS FOR USE IN PAPER CONSERVATION

N. S. Baer,[a] N. Indictor,[b] and W. H. Phelan[c]

Desirable working properties of poly(vinyl acetate) emulsions have led to increased use in the conservation of books and other paper objects (1-5). In a recent study conducted at the Conservation Center of the Institute of Fine Arts, New York University, a number of commercially available emulsions were evaluated and found to be generally unsatisfactory for use in the conservation of valuable paper objects (6,7,8). It was noted, however, that for certain conservation problems, the range of pastes currently available does not give the conservator adequate physical properties and often a poly (vinyl acetate) or a paste-poly(vinyl acetate) mix is useful. In one of our studies (the emulsions examined are indicated in Table 1) the adhesive, Jade 403 (9), was observed to be least objectionable while a mix of methyl cellulose and poly(vinyl acetate) gave promise of providing acceptable aging characteristics and desirable physical properties.

In this note we wish to call attention to the recommended shelf lifetime of these emulsions and to indicate the proper conditions of storage for these materials.

Table 1 presents the shelf-lives and storage conditions as recommended by the supplier for the adhesives evaluated in our study.

As the data indicate, these emulsions should be stored at temperatures in the range of 70° ± 10°F for 9-12 months, at most. Once the container is opened, the contents should generally be used within three months.

It is further recommended that the conservator date all such adhesives on receipt, noting also the date of first use. On expiration of the indicated storage time the remaining materials should be disposed of.

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a. Conservation Center, Institute of Fine Arts, New York University; 1 East 78th Street, New York, N. Y. 10021
b. Department of Chemistry, Brooklyn College, City University of New York; Brooklyn, New York 11210
c. Museum of Modern Art; 11 West 53rd Street, New York, N. Y. 10019

TABLE I - SHELF LIFE DATA FOR POLY(VINYL ACETATE) EMULSIONS

Adhesive	Supplier	Supplier's Comments
403	Jade Adhesives	Shelf life one year. Storage temperature 40°F to 120°F.
5714	S. Schweitzer	Shelf life 3-6 months. Storage temperature 70°F to 80°F. Should be used within 90 days after opening.
436	S. Schweitzer	Shelf life 3-6 months. Storage temperature 70°F to 80°F. Should be used within 90 days after opening.
454	Jade Adhesives	Shelf life one year. Storage temperature 40°F to 120°F.
R131	Manhattan Adhesives	Shelf life 6-12 months.
A1023	Process Materials	Shelf life 9-12 months. Should not be exposed to temperatures below 40°F.
Sobo Glue	Slomons Labs	Shelf life 2-3 years when stored capped at room temperature. Avoid extremes of temperature, especially freezing.
Elmer's Glue All	Borden	Shelf life up to one year. Storage temperature 50°F to 70°F.
Texicote VJC 555	TALAS	Shelf life at least one year. Storage temperature 40°F-90°F. Not light sensitive.
Elvacet Homopolymers	E. I. Du Pont	To be used within 5 months of delivery. Storage stability 35°F-110°F.

REFERENCES

1 B. Rabin, "Problems Related to the Conservation of Rouault Paintings," I.I.C.-A.G. Technical Papers 1968-1970 109-112 (1970).

2 P. N. Banks, "The Treatment of the First Edition of Melville's The Whale," I.I.C.-A.G. Technical Papers 1968-1970 175-180 (1970).

3 A. King, "Suggestions for Research and Testing Projects Related to Paper Conservation," I.I.C.-A.G. Bulletin, 9 (1) 29-30 (1968).

4 W. J. Barrow Research Laboratory, "Polyvinyl Acetate (PVA) Adhesives for Use in Library Bookbinding," Permanence/Durability of the Book - IV 33 (1965).

5 R. Muma, "Conserving the Leather Spines of Old Books," Guild of Book Workers Journal VIII (2) 25 (1969-1970).

6 W. H. Phelan, N. S. Baer, and N. Indictor, "Adhesives Used in Paper Conservation: A Preliminary Evaluation," I.I.C.-A.G. Bulletin 11 (1) 29-30 (1970).

7 N. S. Baer, N. Indictor, and W. H. Phelan, "An Evaluation of Poly(vinyl acetate) Adhesives for Use in Paper Conservation" (in press).

8 W. H. Phelan, N. S. Baer, and N. Indictor, "An Evaluation of Adhesives for Use in Paper Conservation," I.I.C.-A.G. Bulletin 11 (2) 58-75 (1971).

9 Jade Adhesives, Inc., 2929 No. Campbell Ave., Chicago, Illinois 60618

George and Dorothy Cunha's revised edition of *Conservation of Library Materials: A Manual and Bibliography on the Care, Repair and Restoration of Library Materials.* (Metuchen, N. J. The Scarecrow Press, 1971) is pervaded by the Cunhas' enthusiasm for their subject. Mr. Cunha's name and many of his activities are well known in the conservation field, and his efforts to bring conservation to the forefront of thinking among librarians, archivists and directors of countless historical societies in the New England area as well as nation-wide deserve great credit.

The second edition of this work is to be published in two volumes; only the first, the "manual," has appeared. The second volume will contain the expanded bibliography. In describing the first edition of this work, this reviewer stated that "Mr. Cunha . . . is the first author to address himself to a comprehensive monograph on the conservation of library materials, their nature, enemies, and repair and restoration. The extensive bibliography is a valuable contribution to the literature. His proposal for a regional cooperative approach to conservation merits attention."[1] While the second edition contains many additions and corrections, the most notable change seems to be an emphasis, at least organizationally, on the preventitive aspects of conservation, a most laudable intention.

It must be noted that the field of scientific conservation of library materials is in its infancy. While the idea of preserving these materials is an ancient one, only recently has the process of their conservation begun to emerge as a distinct discipline. In any attempt to cover such a field comprehensively, the best for which one can hope is an introduction to some of the problems, for solutions to most of them remain to be found.

The one specific disagreement which this reviewer found with the first edition and was not corrected in the second is the "manual" aspect of both the title and contents. This disagreement stems from two concerns; one is the inadvisability of such

[1] Friedman, Hannah B. and Wayne Eley. "Preservation of Library Materials; A Suggestted Reading List." *Bulletin of The New York Public Library*, Volume 74, pp 492-495 (October 1970).

uncontrolled dissemination of treatment techniques and procedures, especially without adequate warning, sometimes even with improper encouragement to the overly enthusiastic amateur, and the other is with matters of fact. There is no doubt that this encouragement stems from the Cunhas' enthusiasm for their subject and their awareness of the magnitude of the problems facing the library conservator. They must also be aware, however, of the number of times conservators are called upon to repair either amateur attempts at restoration or to salvage materials partially or totally ruined by the inexperienced and untrained. If we are to have a conservation profession, there must be some basis in the complexity of the tasks, the judgment required in the application of techniques and procedures, and the knowledge essential to proper decision making and execution. It is my opinion that such a basis is obvious.

The reader is advised on page 140 that "there are no more than a dozen people in the United States competent to work independently on the restoration (vice rebinding) of rare books, and not too many others competent to rebind them without precise guidance." While there will certainly be widespread disagreement with this figure as both high and low, it is patently contradictory to state that bleaching is a "minor restoration operation" (p 200), or to advocate washing black and white prints at 200°F or their bleaching with chlorine dioxide by "library personnel other than conservators" (pp 190, 191). Not only is chlorine dioxide noxious, toxic and flammable, under certain conditions it is explosive.

As a manual for conservation operations this work is woefully inadequate. When one considers Carolyn Horton's excellent manual on the cleaning and preserving of bindings and related materials,[2] a simple comparison of the amount of type and number of illustrations devoted to the coverage of several elementary treatments with the number of sophisticated operations, both theoretical and practical, which the Cunha book purports to cover, gives some indication of the much less than thorough description tendered in the latter.

[2] Horton, Carolyn. *Cleaning and Preserving Bindings and Related Materials*. Chicago: American Library Association, Library Technology Association, Pamphlet 1 of a series, second edition, revised, 1969.

There are many factual mistakes and misleading statements in this volume. While a complete listing would require more time than is necessary for this review, mention can be made of several. If "paper with a pH of 5.5 to 6.0 is extremely resistant to mold" (p 85), it would appear odd that one of the most common of the mycological culture media is buffered at pH 5.6 and supports the growth of most fungi. Anyone who sprays a delicate pastel, chalk or charcoal drawing with Krylon (pp 191, 192) should be publicly flogged. While it is true that "contrary to general impression, cloth backing on maps is not superior to paper," it is obviously not necessarily true that "cotton, linen and silk will deteriorate in twenty to thirty years, contaminating the paper to which the fabrics adhere." (p 123) If such were the case, it would appear somewhat contradictory to advocate the use of "rag" paper. A more careful investigation would indicate that acidic adhesives are almost always the cause of support deterioration, silk being particularly susceptible.

This would be a much more acceptable volume if it were retitled, perhaps as an introduction to conservation of library materials. It can conceivably be of value to those who wish some general source of information about the problems of the field. It is hoped that it will be read in this light and that those who would treat materials for conservation purposes or seek more than an introduction consult the professional literature and a competent conservator.

A HISTORY OF THE GUILD / Duncan Andrews

The Guild's Executive Committee has unanimously voted to authorize the writing of an official History of the Guild of Book Workers, which I have agreed to undertake to write. It is hoped that this will be completed in time for the Annual Meeting in the spring of 1973.

In the 65 years that have elapsed since the Guild's founding on November 14, 1906, the Guild's archives have passed through many hands, and much historically valuable material seems to

have been lost, or mislaid, or possibly deposited in other archives somewhere else. Needless to say, the more complete the source material, the better the final History will be.

This, then, is an appeal to any *Journal* reader—Guild member or not—for any material of whatever nature that might be helpful in preparing a history of the Guild: letters, pictures, Guild publications, exhibition lists, reports of Guild activities in the press or elsewhere, and, perhaps most importantly, personal recollections of those who have been active in the Guild over the years, particularly in its earlier days.

If you have any such materials to lend, or recollections to share, I'd be most grateful if you would write me at:

Duncan Andrews
1047 Lexington Avenue
New York, New York 10021

I thank you—and, in time, the Guild will, too.

PROCEEDINGS OF THE BOSTON ATHENAEUM'S SEMINAR / George M. Cunha

We believe that the following notice will be of interest to readers of the *Guild of Book Workers Journal.*

> "The Boston Athenaeum announces the publication of the proceedings of its 1971 Seminar on the Conservation of Library and Archival Materials. Orders will be filled upon request. Please make check for $8.00 payable to the Library of the Boston Athenaeum, 10½ Beacon Street, Boston, Mass. 02108."