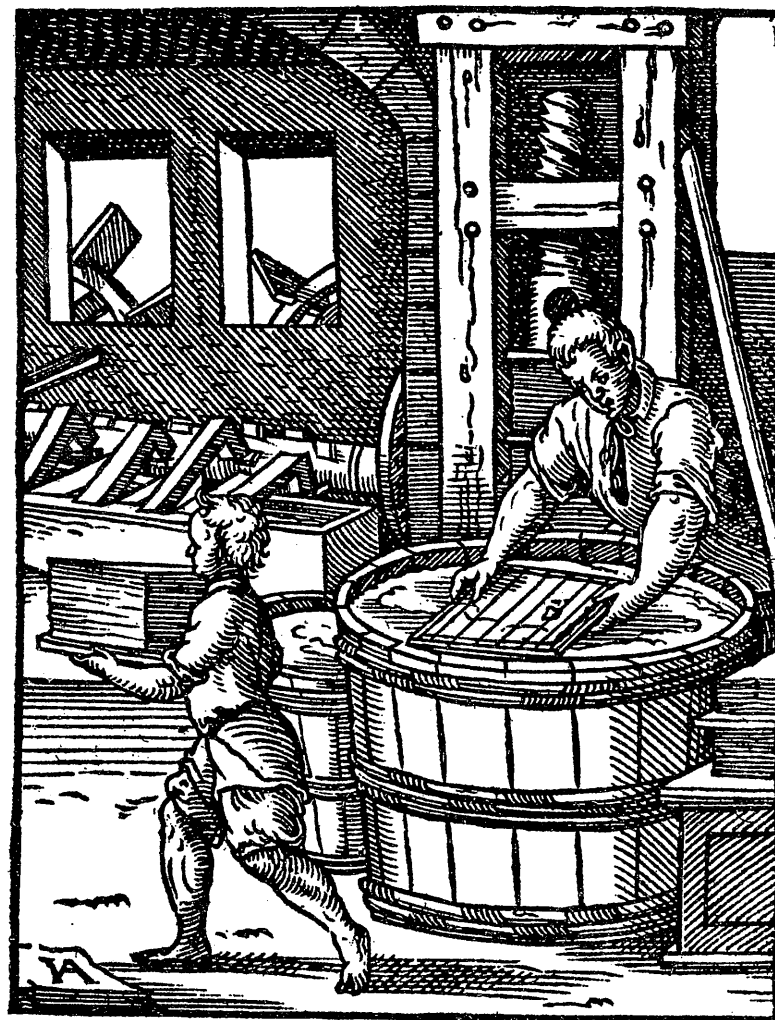


GUILD OF BOOK WORKERS JOURNAL

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(Editor of this issue: George M. Cunha)

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The Cover: Woocut by Jost Amman showing a sixteenth-century paper maker at work with his assistant and the machinery of his trade. Reproduced from Schopper, Hartman, *Panoplia Omnium Illiberalium Mechanicarum aut Seditiarum Artium Genera Continens . . .* etc. Frankfurt-am-Main; Sigismund Feyerabend, 1568. For a description of paper making by hand 300 years later but by the same methods and essentially the same machinery see page 17.

Following a long period of ill-health John Baron Corderoy died at his home on December 12th, 1971.

John Corderoy was the Senior Lecturer in Charge of Bookbinding classes at Camberwell School of Arts and Crafts, London, England where he had been a member of the full-time teaching staff since 1953. He developed classes in fine hand bookbinding, book restoration and more recently was responsible for the introduction of the full-time course in Archive Preservation and Repair. This course was the first to offer instruction in all aspects of paper conservation and thereby reduce the shortage of trained restorers.

In 1967 John Corderoy joined the British Restoration team, as one of its original members, who worked in Florence following the flood disaster. During his many subsequent visits he assisted in the planning and equipping of the Restoration System of the Biblioteca Nazionale di Firenze.

John Corderoy began his career as an apprentice bookbinder with the firm of W. H. Smith & Sons with whom he stayed until service in the Royal Air Force in the 1939-1945 war. After the war he accepted a post as part-time lecturer at Epsom and at Brighton Colleges of Art. During this time he taught on the Librarian and Art Teachers Certificate courses.

In 1965 he wrote 'Bookbinding for Beginners' which has since been reprinted in several languages and has become a standard work for those completely new to bookbinding. He also designed the 'Camberwell' typeface for bookbinding use.

To all his work John Corderoy brought those qualities of craftsmanship which are greatly admired. He was unable to compromise his skill yet was tolerant of the learner. He will always be remembered with affection by his colleagues and many many students from many countries to whom he was a friend.

*Mr. Akers is a member of the teaching staff in bookbinding at the Camberwell School of Arts and Crafts; and was a colleague of the late Mr. Corderoy.

JOHN BARON CORDEROY AS A TEACHER /
Natalie Robinson Sirkin*

Mr. Akers wrote me on April 23, 1972 about Mr. Corderoy's death, in what I thought was an appropriate obituary. He said, "It is my very sad task to inform you that John Baron Corderoy died just before Christmas. He had a long illness lasting over a year and displayed great bravery in continuing his duties at the school to the end. The staff and students miss him and his accumulated experience will be difficult to replace."

Mr. Corderoy's former students will miss him too. They will attest to his warmth, his sense of humor, his articulateness, his approachability. He was a wonderful story-teller, and his stories, told with the old B.B.C. touch, had points.

I am sufficiently close to being a teacher myself and to appreciating the problems of pedagogy that I can appreciate how good he was as a teacher. I once asked him a question, the answer to which I could have ascertained by looking it up. He laboriously, in his beautiful hand, proceeded to calligraph the seven steps of the answer. He did not intend to make me feel small, but I never again wasted his time so. His explanations were always complete, never hurried, always precise and clear, and he always had enough time for you. To use the awful cliché, he "cared." He always had models to show. And his bookbinding laboratory—or rather the school's (the Camberwell School of Art)—though large, and though used by large numbers of students, was so efficiently run, and the students were so well disciplined, that I do not recollect ever hearing anyone complain that he couldn't find something.

When I first went to see Mr. Corderoy to inquire whether I could become a part-time student, it was my intention to give bookbinding the same "school" time as I gave it in New York, which was two or three hours a week. Mr. Corderoy asked whether I could give it a whole day a week, and with pleasure I agreed,

*Mrs. Sirkin is a former GBW member. At my request she consented to our publishing these additional remarks about Mr. Corderoy which are excerpted from a letter to me. It was through the efforts of Mrs. Sirkin that we received Mr. Akers' article for which we are grateful. Laura S. Young.

though I had come to London for another purpose and was deeply involved in another project. Mr. Akers, who was in charge of the evening classes, then talked me into taking the evening class too, so I was at Camberwell for twelve hours a day, every Thursday, from the beginning of the session in September until I left England, in mid-January.

Mr. Corderoy turned his students, where they were at all motivated, into dedicated binders with a respect for painstaking quality. One of his students he was most proud of was another American who is now doing binding working in London, Sally Lou Smith.

Mr. Corderoy, as Mr. Akers says, "brought those qualities of craftsmanship which are greatly admired. He was unable to compromise his skill." He was no doubt also unwilling to. When I thought I had quite perfectly rounded the spine of my *The Mackenzie Collection, Catalogue of Col¹. Colin Mackenzie's Indian Manuscripts, Coins, Maps, &ca. &ca. &ca.*, I little knew that I would be rounding it for another six hours, and that Mr. Corderoy would be too. I never saw or felt anything like the back of that book when we were finished with it. It had no cloth or paper on it, but it had about seven layers of paste (or so it seems to me now). When it was finally covered in leather, it was so flexible that you could turn it "inside out," touch the covers back to back throughout, and the spine would readily reverse itself into a smooth curve and without resistance. Subsequently the book was on display at the Y.W.C.A. in New York for two weeks, with the two covers touching throughout, and with no apparent injury to the spine. Unlike my other hand-bound books, this book can be opened to any page at all, and it will lie flat, without being at all coerced.

Mr. Corderoy was a perfectionist. In our time it is still possible, in a world of quantity, to be a man of quality. In another decade or two, perhaps it will not be. As it is with perfection, so it will be with hand bookbinding too. It too may pass away in another few decades, unless there are people like Mr. Corderoy who are incapable of taking short cuts.

On Mr. Corderoy's achievements and skill as a bookbinder, I as a student am not qualified to speak. But we have the testimony

of one who is. Mr. Akers, in his letter to me, refers to the tribute given "to the lasting contribution John had made to the Art of Bookbinding," by Mr. Ivor Robinson at the Annual General Meeting of Designer Bookbinders, at the Art Workers Guild.

MORE ON HURRICANE CELIA, AUGUST 3, 1970 /
Carl R. Wrotenbery

University of Corpus Christi

Post Office Box 6010
Corpus Christi, Texas 78411
August 29, 1972

Dear Mrs. Young:

Dr. Forrest F. Carhart, Jr. of the A.L.A. staff in Chicago requested that I detail the circumstances surrounding the call to A.L.A. for assistance following Hurricane Celia, August 3, 1970. He was of the persuasion that some elaboration might be printed in the *Guild of Book Workers Journal*. This letter is in response to that request.*

After the storm passed through the city during the afternoon, home repairs were made during the evening. The only radio station broadcasting was in Kingsville and its pleas requested people to remain off the streets because of debris on the roadways. When the staff arrived at the college campus every building on the campus was found to have some kind of damage which admitted water. The library damage resulted from 55 panes of glass being broken. Twelve double faced free standing ranges of books overturned and their contents were dumped in the water on the floor. Other books remaining on shelves had been drenched by the rains which were pushed by 180 mile-per-hour winds.

As the clean-up operations began there was little electricity in the city and none in the geographical area of the University. No

*This request was apparently prompted by a statement made at the Boston Athenaeum's Seminar as reported by Laura S. Young in Vol. IX, no. 3, p. 21, paragraph 2 of the *Guild of Book Workers Journal*.

calls could be placed or received from extensions and the task of restoring the entire university was undertaken with one telephone line functioning for calls placed at the switchboard in the Administration Building.

When the paper pulp, broken glass and water had been removed from the floor some thought was given to restoration. It was obvious by then that 50,000 volumes had been exposed to water and that electricity (and air conditioning) would be days in coming, but that the window openings might be covered by plywood within a week. With a poor environment for drying paper materials the threat of mildew became a major consideration.

In this context the first call to A.L.A. at the Chicago headquarters was made. The person receiving the call indicated that no one was available with the ability to respond to the need but that the call would be returned. Unfortunately the campus telephone equipment was not signaling incoming calls so no call could be returned. Later in the day and on the following days attempts were made to talk with someone who could arrange for assistance. However no one in the A.L.A. office who could receive the message and arrange for assistance was available even though the reasons they could not receive the call at that time were enumerated. The request that the call be returned when someone was available was left with the employee.

To my knowledge the call was not returned. It is possible that unsuccessful attempts were made since long distance calls were not being received and placed only with considerable difficulty during this period. No telegrams or letters were received from A.L.A. although various other agencies did respond with calls and actual visits which included volunteered assistance.

These are the additional factors associated with the statement made in a slide presentation describing the disaster and recovery presented to the Boston Athenaeum Seminar to the effect that almost one year later A.L.A. had not responded to the request for assistance. Two years after the storm, almost to the day, Forrest F. Carhart did complete a call from A.L.A. expressing concern for the background of this statement.

Fortunately we completed a call to the Binding Institute and they contacted Capt. George Cunha, Conservator for the Boston Athenaeum. He came to Corpus Christi, outlined our procedures,

secured adequate chemicals from New Jersey for the restoration and preservation process and remained with the staff until the procedures were obviously being correctly carried out. Through his assistance and with the labors of hundreds of volunteers from the region we have salvaged 35,000 volumes, losing some 15,000 volumes which were destroyed or damaged beyond economical restoration.

I believe the participants in the Boston Athenaeum Seminar understood the statement. Hopefully the readers of *Guild of Book Workers Journal* will now understand it also.

Sincerely,

Carl R. Wrotenbery
Dean

EDITORIAL / Laura S. Young

Which Authorities do *YOU* Trust?

I have been in the field of hand bookbinding and restoration work both as a practitioner and a teacher for nigh on to thirty years. For the first two decades in my experience there were a few recognized authorities, and with minor exceptions they commanded the respect of all lesser lights.

Today, however, particularly in the fields of conservation and restoration the number of authorities has burgeoned at an alarming rate.

Webster defines an authority as “an individual cited or appealed to as an expert”; and an expert as [one] “having, involving, or displaying special skill or knowledge derived from training or experience.”

There are a number of people around who qualify as authorities under this definition; there are a number around who fail to meet this qualification, but who by virtue of an impressive title or boundless enthusiasm and energy have made their mark on society as authorities; and there are the self-appointed authorities who are

always eager to express to a receptive ear an "authoritative" opinion.

How do we evaluate the opinions of these three groups; and perhaps more significantly how is the literate and interested layman going to be able to appraise intelligently these many voices of authority?

I, for instance, have heard directly very recently from two authorities who independently ran the PIRA test on a skin—the samples to be tested were cut from the same skin. One authority reported that the leather in question withstood the test beautifully; the other reported that the leather disintegrated completely—thus failing the test miserably.

A few months ago I heard one authority describe a certain paper chemist as one of the best chemists in his field; a few hours later I talked to another authority who told me that the chemist in question was notoriously known as a sloppy chemist.

I know all of the people involved in these two situations, and I am unable to draw an objective conclusion as to who is right or who is wrong. I am sure that many of you have been faced with a similar dilemma.

If as bookbinders and restorers we are to be productive, we cannot also be proficient chemists. Just as we hope that our fields of endeavour will be recognized as specialized ones, we should recognize the field of chemistry and its many facets as equally specialized.

Qualitative analysis in chemistry is relatively simple—if there is someone around to tell you which reagent to use. Its counterpart in our field would be the case binding of a one-signature book without a title—again simple with adequate instruction.

Quantitative analysis, however, is a whole different field, and might be compared in the field of bookbinding with the knowledge and skill required to produce a Bonet binding.

We could all doubtless be chemists if we wanted to devote the time and effort to this discipline. Obviously in the past we have not wished to do this, or we would be chemists and not hand bookbinders and restorers today.

This points up once again the desirability—in truth the necessity in the light of present-day trends—for us to work toward some standardization of authoritative information; and toward the

development of a cooperative testing service in which we can all place our faith.

If this is to be accomplished we all must subordinate our potential personal fame and work together for the common good of everyone in the field; and more importantly toward the proper preservation of the printed word in which is embodied our cultural heritage.

LIBRARY / Mary E. Greenfield

Since the Library has not acquired any new books in recent months, I shall again list some books and articles *not* in the Library but of possible interest to members:

Williams, John C.

“Chemistry of the Deacidification of Paper”

Bulletin of the American Group, The International Institute for Conservation of Historic and Artistic Works

Vol. 12, No. 1, 1971

This is a very interesting article which explains why much of the very early paper is in fine condition today, mentions the harmful changes in the paper making process, and explains the now numerous methods of deacidification.

Hollander, Annette

DECORATING PAPERS & FABRICS

New York: Van Nostrand Reinhold Company, 1971

This is an excellent book on marbled, fold and dye, wax resist, printed and paste papers. The directions are clear and easy to follow and Mrs. Hollander's papers are attractive and imaginative.

Dolloff, Francis W. and Perkinson, Roy L.
HOW TO CARE FOR WORKS OF ART ON PAPER
Boston: Museum of Fine Arts, 1971
46 pp, illus.

MEMBERSHIP COMMITTEE / Jerilyn G. Davis

January 5, 1973

In the interest of keeping the membership list as up-to-date as possible, the reports are current when the *Journal* goes to press, rather than the period covered by the *Journal*.

New Members:

Dr. Robert L. Beare
University of Maryland
McKeldin Library
College Park, Md. 20742

Mr. Radley H. Daly (B, RC-A;L)
152 Sterling Memorial Library
Yale University
New Haven, Conn. 06511

Mrs. Charles Child
Lumberville, Pa. 18933

Mr. James G. Stephens
6502 Glendora
Dallas, Texas 75230

Mrs. Ruth L. Straus
353 E. 83rd St.
New York, N.Y. 10028

Address Changes:

Dr. Lamar A. Byers
P.O. Box 750
Kerrville, Texas 78028

Mrs. Mary Lou K. Lamont
317 Bolton Rd.
East Windsor, N.J. 08520

Miss Sheilah F. Casey
155 Jackson No. 406
San Francisco, Calif. 94111

Miss Heinke Pensky
433 W. 24th St.
New York, N.Y. 10011

Mrs. Maggy Magerstadt Rosner
13 Bank St.
New York, N.Y. 10014

Mr. Fred J. Shihadeh
106 E. Athens Ave.
Ardmore, Pa. 19003

Dr. Richard D. Smith
Wei T'o Associates, Inc.
5830 36th N.E.
Seattle, Wash. 98115

Resignations:

Mrs. Betty Lou Beck, Mr. Ernest W. Brunner, Mr. John Diebold,
Mr. Herbert L. Frankel, Mrs. Marcia K. Marshall, Mr. Robert M.
Slover, & Mr. Elmer E. Yelton

Deaths:

We sincerely regret the death of Mr. Thomas W. Patterson on
October 16, 1972 (Necrology will follow in Vol. XI, No. 1), and
the death of Mrs. Sarah C. Engert.

Total Membership: 208

PROGRAMS / Mary C. Schlosser

A VISIT TO THE SCHIMMEL COLLECTION

On Tuesday, February 29th, the Guild was invited to spend
an informal evening at the New York apartment of Mr. and Mrs.
Stuart B. Schimmel to see their collection of modern fine bindings
and calligraphy. Although binding is not one of Mr. Schimmel's
major collecting interests, which lie more in the field of press
books and literary forgeries, beautiful printing is often enhanced

by beautiful bindings so there were many items to suit the special interests of Guild members.

It is obvious to anyone entering the Schimmel apartment that the book arts form an integral part of their lives. On the walls hang a variety of calligraphic specimens—illuminated manuscript leaves, lithographs, and hand-carved alphabet stones. Outstanding are a large stone by David Kindersley, Eric Gill's last pupil, as well as a wooden plaque by Will Carter. Along the stairs are framed hand-colored lithographic alphabets by Kindersley, and the living room mantle carries a display of original woodblocks used in printing books illustrated by Eric Gill. As a background, many of the rooms utilize fabrics and wall paper reproduced from William Morris designs.

Mr. Schimmel had set out a selection of bindings and smaller calligraphic works for our inspection both in his dining room and in his library upstairs. To mention only a few high spots, these included a blue morocco Cobden-Sanderson binding on Tennyson's *Poems, Chiefly Lyrical*, a Doves binding on a Doves Press Ruskin, several special bindings for the Gregynog Press, and some more modern designs by the French binders, Paul Bonet, P. L. Martin, and Levitsky. Among the calligraphic offerings was an especially beautiful little volume, *The Birds of Britain*, hand-written and illuminated by the English artist Margaret Adams.

Members and guests who enjoyed the fine hospitality of Mr. and Mrs. Schimmel included: Mrs. Hanka Ablin, Mr. Duncan Andrews, Mr. Charles Antin, Miss Jerilyn Davis, Mrs. Betsy Eldridge, Mrs. Margot Gerson, Miss Jean Gunner, Mrs. Elaine Haas, Mr. and Mrs. Louis Harrow, Miss Ursula Hofer, Mr. Donald Jackson, Miss Mary Janes, Mrs. Marie Kaufman, Mr. Alfred LaManna, Mrs. Jeanne Lewisohn, Miss Frances Manola, Mr. Richard Minsky, Mrs. Hisako Nakazawa, Miss Heinke Pensky, Dr. Sarah Ratner, Mrs. Maggy Rosner, Mrs. Mary Schlosser, Mrs. Ruth Stein, and Mrs. Laura S. Young.

PUBLICITY AND NEWS NOTES / Grady E. Jensen

Robert O. Dougan, Librarian at the Henry E. Huntington Library and Art Gallery in San Marino, California, has sent some information about the work of the Library's bindery. His letter

stated as follows:

“Most of the work of the bindery is concerned with simple repairs and bindings and the making of book-boxes for the preservation of our rare materials. Our head binder, Mr. George Skousen, retired last month (November 1971) after working here for forty-two years. He was occasionally called upon to do some bookbinding in leather but these occasions were comparatively rare. We have managed to replace him with a younger man but there are only three people altogether working in the bindery, which is now in the charge of Mr. Earl Schneider. The binding of our modern periodicals is done by a commercial firm, so that our staff may concentrate on the rare book materials.”

The December 25, 1971 edition of the *Pittsburgh Post-Gazette* carried a long article about Mr. Patterson, with a photograph of a 1563 Flemish herbal he had restored. The article reviewed his work over the years, and mentioned the Guild of Book Workers.

The January 1972 issue of *Town and Country* magazine included an article on “Antiques.” A considerable portion of this article was based on an interview with Carolyn Horton, on the subject of preservation and restoration of books, documents, manuscripts, watercolors and screens.

On February 16, 1972 Leonard B. Schlosser, husband of GBW member Mary C. Schlosser, spoke on the “Heritage of Paper” at the Mechanics Institute in New York City in the Spring series of lectures on the Heritage of the Graphic Arts. (In the past this series of lectures was held at Gallery 303 of the Composing Room in New York, and was popularly known as the Gallery 303 Lectures.)

On March 8, 1972 GBW member Carolyn Horton gave an all day program on book preservation and restoration for students at the New York University’s School of Fine Arts Conservation Center.

George Cunha, the conservator at the Boston Athenaeum and Vice-President at Large of the Guild is now a member of the Library Binding Institute’s Advisory Panel and The Library Advisory Board of The Pilgrim Society, Plymouth, Massachusetts.

Guild members who wish to further their knowledge of

conservation are referred to this notice which appeared in *IIC News*, Vol. 17, No. 1 (February 1972).

“NEW SCHEME FOR ‘SHORT-STAY’ STUDENTS OF CONSERVATION IN LONDON

In order to cope with the increasing numbers of overseas students who apply for short periods of advanced training in conservation of museum objects, the Institute of Archaeology of London University and the British Museum have decided to offer a short practical course in selected topics of conservation, which will be preceded by a fortnight of formal lectures of a general nature and visits to laboratories and workshops in the London area. Students will then select ONE of the following topics for a period of four weeks’ practical training:

1. Conservation of metals
2. Conservation of ceramics and stone
2. Making of reproductions by moulding, casting and electroforming
4. Conservation of prints and drawings
5. Conservation of library and archival materials
6. Conservation of organic and ethnographical materials (including waterlogged wood)
7. Archaeological wall-paintings

Normally this course will start in the middle of January each year and last until the end of February. In 1972 ONLY, the course will be held from 24 April until the beginning of June. Applications for future courses must be received by 1 October each year. There will be no fee for the course but participants will pay for their accommodation and travel. Further information may be obtained from:

Miss Elizabeth Pye, Rome Centre Liaison Officer
Department of Conservation, Institute of Archaeology
31-34 Gordon Square, London WC1H 0PY (UK)”

The Guild members outside the New York area who are not able to take advantage of the interesting and informative programs arranged by the Program Chairman and benefit by frequent opportunities to meet and talk with other book workers can take heart from what is happening in Dallas. Mariana Roach, one of our members in that city reported in a recent letter of the formation there of the Texas Book Arts Guild a small organization (mostly members or former members of her classes and some of whom are GBW members) of individuals brought together to share an interest in the arts and crafts of fine bookmaking. Included are private printers, book designers, bookbinders, illustrators, calligraphers and paper makers. Their objective is to sponsor workshops; to visit libraries; to hold regular meetings for fellowship; to disseminate news of the book crafts and to share their know-how with fellow craftsmen. It is hoped that Guild members elsewhere in the country will emulate the TBAG and form their own local groups auxiliary to the Guild of Book Workers for the same benefits.

THE ART OF MAKING PAPER*



THE ART OF MAKING PAPER as at present practised, is not of very ancient date; paper made of linen rags appears to have been first used in Europe towards the beginning of the thirteenth century, but of its origin nothing can with certainty be affirmed.

The ancients, as substitutes for paper, had recourse successively to palm-tree leaves, to table-books of wax, ivory, and leaves; to linen and cotton cloths, to the intestines or skins of different animals, and to the inner bark of plants. In some places and ages they have even written on the skins of fishes, on the intestines of serpents, and in others, on the backs of tortoises. There are few plants but have, at some time, been used for paper or books, and hence the several terms, bibels, codex, liber, folium, tabula, &c. which express the different parts on which they were written; and though

*From the BOOK OF ENGLISH TRADES AND LIBRARY OF THE USEFUL ARTS (1835). This article is reproduced in the *Journal* only as an item of historic interest. Some of the procedures or techniques described are not now considered good practice.

Book of Trades

in Europe all these disappeared upon the introduction of the papyrus & parchments, yet in some other countries the use of them remains to this day. In Ceylon, for instance, they write on the leaves of the tallipot; and the Brahmin MSS. in the Tulinga language, sent to Oxford from Fort St. George, are written on leaves of plants.

The paper which had been used for a long time by the Romans and Greeks, was made of the bark of an aquatic plant called papyrus, whence the name *paper*.

The internal parts of the bark of this plant were the only ones that were made into paper, and the manner of the manufacture was as follows:—

Strips or leaves of every length that could be obtained being laid upon a table, other strips were placed across, and pasted to them by means of water and a press, so that this paper was a texture of several strips; and it even appears that in the time of the Emperor Claudius, the Romans made paper of these layers. The Roman paper received a size as well as ours, which was prepared with flour of wheat diluted with boiling water, on which were thrown some drops of vinegar; or crumbs of leavened bread diluted with boiling water, and passed through a bolting-cloth, being afterwards beaten with a hammer.

Paper made in this manner with the bark of the

The Paper-Maker

Egyptian plant, was that which was chiefly used till the tenth century, when cotton was used for making paper by pounding it, and reducing it to a pulp. This method, known in China some ages before, appeared at last in the Empire of the East, yet we are without any certain knowledge of the author, or the time & place of this invention.

Father Montfaucon says, that cotton paper began to be used in the Empire of the East about the ninth century. There are several Greek manuscripts, both on parchment and cotton paper, that bear the date of the time in which they were written; but the greatest part are without date. The most ancient manuscript on cotton-paper, with a date, is that in the library of the King of France, numbered 2,889, written in 1050: another in the Emperor's library, dated 1095.

Chinese paper is of various kinds: some is made of the bark of trees, especially the mulberry-tree and the elm, but chiefly of the bamboo and cotton-tree. In fact, almost each province has its several sorts of paper.

The inventor of the linen-rag paper, whoever he was, is entitled to the gratitude of posterity, who are enjoying the advantages of the discovery. The cotton-paper, though an improvement, was but a rude and coarse article, unfit for any of the nice purposes to which paper is now applied. The perfection of the art of paper

making consisted in finding a material which could be procured in sufficient quantities, and would be easy of preparation. Such paper is now in use, the manufacture of which we shall endeavour to describe.

Linen, such as our shirts are made of, is spun from flax which grows in the fields; and from linen rags, that is, from shirts, and other articles of dress, when worn thread-bare, fine white paper is manufactured: of course every piece of rag, however small, should be preserved, and not thrown into the fire; and latterly, indeed, from the increased use of *calico* as an article of clothing, cotton rags are become of almost as much importance as linen rags, and should have equal care devoted to their preservation.

The first thing to be done towards the formation of paper, is to put the rags into a machine or cylinder formed of wire, which is made to turn round with great velocity, to whirl out the dust; they are then sorted according to their different qualities: after which they are put into a large cistern or trough, perforated with holes, through which a stream of clear water constantly flows. In this cistern is placed a cylinder about two feet long, set thick with rows of iron spikes. At the bottom of the trough there are corresponding rows of spikes. The cylinder is made to whirl round with inconceivable rapidity, and with the iron teeth rends

The Paper-Maker

and tears the cloth to atoms, till, with the assistance of the water, it is reduced to a thin pulp. By the same process all the impurities are cleared away, and it is restored to its original whiteness. This fine pulp is next put into a copper of warm water, and here it becomes the substance of paper, and ready for the mould; for which purpose it is conveyed to the vat. This vat, of which we have a representation in the plate, is made of wood, generally about five feet broad, and two or three feet in depth. It is kept to a proper temperature by means of a charcoal fire.

The mould which the Paper-Maker has in his hand is composed of many wires set in a frame close together, and of another moveable frame equal in size to the sheet of paper to be made. These wires are disposed in the shape of the figure which is discovered in a sheet of paper when we hold it up to the light.

The workman holds the frame in both his hands, plunges it horizontally into the tub, and takes it up quickly; the water runs away between the wires, and there remains nothing but the beaten pulp, in a thin coat, which forms the sheet of paper.

Another person, called the *coucher*, receives the mould, and places the sheet of paper on a felt, or woollen cloth, during which the workman makes another sheet. They proceed in this manner, laying alternately

a sheet and a felt, till they have made six quires of paper which are called a post: such is the heap on the right hand of the vat. When the last sheet of the post is covered with the last felt, the workmen employed about the vat unite, and submit the whole heap to the action of the press, which is on the Paper-Maker's right hand. After this operation another person separates the sheets of paper from the felts, laying them in a heap; and several of these heaps collected together are again put under the press. They are turned and pressed several times, and then the sheets are hung up three or four together, on lines, to dry.

The paper is now to be *sized*, because in its present state it will not bear the ink. The size is made of shreds and parings collected from the tanners, curriers, and parchment-makers; and, immediately, before the operation, a certain quantity of alum is added to it. The workman then takes a handful of the sheets, smoothed and rendered as supple as possible, and dips them into the vessel containing the size; and when he has finished ten or a dozen of these handfuls, they are submitted to the action of the press; the superfluous size is carried back to the vessel by means of a small pipe. The paper is now to be hung sheet by sheet to dry.

When the paper is sufficiently dry, it is carried to the finishing room, where it is pressed, selected, examined,

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folded, made up into quires, and finally into reams. It is here submitted twice to the press; first when it is at its full size, and secondly after it is folded.

Every quire of paper consists of twenty-four or twenty-five sheets; the larger number refers to paper made use of in printing: and each ream contains twenty quires.

In the manufacture many sheets are damaged; these, in the sorting room, are put together, and two of the worst quires, containing only about twenty sheets, are placed on the outsides of the ream, called *outside* quires. The reams are tied up in wrappers made of the settling of the vat, and they are then fit for sale.

Some paper is made smooth and glossy, by means of hot plates; this is called hot-pressing. The process of paper-making takes about three weeks.

Pasteboard is made in a similar way to that of paper and when it is wanted very thick, it is made by having sheets pasted one upon another. There is, however, a kind of thick paper, called *millboard*, used for covers of books, which is made at once: it is composed, like brown papers, of very coarse rags, old ropes, &c.

Blotting paper, and paper used for filtering fluids, is paper not sized, into which, therefore, the ink readily sinks. The best filtering paper is made of woollen rags, chosen for that purpose.

Wove or woven paper is made in moulds, the wires of which are exceedingly fine, of equal thickness, and woven or latticed one within another. The marks, therefore, of these, are easily pressed out, so as to be scarcely visible.

The greatest modern improvement in paper-making is the bleaching of the rags. This enables the manufacturer to produce the finest paper, in point of colour, from any kind of rags. He has therefore only to find such materials as will make a paper of a strong texture, and a fine even surface, knowing that he can produce colour at pleasure. Bleaching is conducted by different methods, either by bleaching the rags immediately after they are sorted, bleaching them in half-stuff, that is, after they have been once ground in the washing-engine, or while they are in the engine. For the first of these methods Mr. Campbell obtained a patent in 1792. It consists in having a chamber which is air-tight, into which the rags must be introduced, and with proper retorts, containing a mixture of manganese, sea-salt, and sulphuric acid, heated to a certain extent; a gas will be discharged from the mixture, which destroys all the colour that the rags may contain.

Another important alteration has been recently made in the art of paper-making, by the adoption of machinery for fabricating it from the pulp, & at one operation

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pressing it between the felts, and rendering it fit for the second pressure, by which an immense saving of labour is made, and the quality of the paper improved. Messrs. Fourdriniers have a patent for these machines, of which they have erected a great number in different parts of the kingdom.

Paper has been occasionally made of straw, & other materials not commonly in use, & Mr. Koop, in 1802, obtained a patent for making straw-paper, but we have not heard that the use of this article is become common.

Paper is subject to heavy excise duties, the particulars of which we have not room to enumerate; and the manufacturer of paper must also take out an annual licence.

The Process of Marbling Paper



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NOTE

This is one of a series of pamphlets making available the results of the cooperative research and operations program now carried on by the Government Printing Office and Printing Industry of America, Inc.

These reports of tests and studies being made and projected will provide a reference library covering many technical and operational phases of the printing industry. It is, therefore, suggested that they be filed in a binder or in some other permanent manner which would assure preservation and ready accessibility. Indexes will be provided as developments warrant.

THE PROCESS OF MARBLING PAPER was prepared by Morris S. Kantrowitz and Ernest W. Spencer, of the Government Printing Office. It has been reviewed and approved by Printing Industry of America's Research Committee, consisting of Frank F. Pfeiffer, *Chairman*, William G. Albrecht, Jr., James R. Brackett, Stanley C. Hlasta, Russell J. Hogan, Joseph M. Siegel, Bernard Snyder, and Francis E. Street.

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The Process of Marbling Paper

HISTORICALLY the venerable art of marbling papers extends back for more than 350 years into the sixteenth century. There is a tradition that marbled paper was invented at the close of the sixteenth century and that it was first used in the forwarding of books by French bookbinders. One of the earliest existing specimens known was found in an *Album Amicorum* (Album of Friends) bound in the year 1600 for Jean de Bauchamps, containing 24 leaves of marbled paper of rather poor quality when compared with specimens of this art in its much later development. A much better example may be seen in the book bound by Le Gascon in about the year 1616. This volume is now in the British Museum and displays marbled paper of the wavy or combed pattern. In the National Gallery in London there is a collection of 34 different varieties of marbled paper, dating from the same year, most of which are of the conservative combed pattern without much display of originality. All of these early examples are thought to be of Turkish manufacture.

Macé Ruelle, a Parisian stationer, living about 1606 to 1638, is usually given the credit for the discovery of the manufacture of marbled paper in France. This product was first known in England about the year 1625, but was not used for the forwarding of books until the latter half of the seventeenth century. At that time the best marbled paper was made in Holland and, about the middle of the seventeenth century, Dutch marbled paper in the size of foolscap was exported to England, wrapped around small parcels of toys and thus passed free of duty. When the paper was taken from the toys, it was carefully pressed and sold to English bookbinders for use in their finest bindings. In some of the old English bindings, it is quite apparent that the end-papers had been crushed and wrinkled before being used for the purpose of binding.

At the beginning of the eighteenth century, a Frenchman named Le Breton was considered to be one of the best makers of marbled papers in France and he became widely known for his skill in producing beautiful specimens.

Colored printed paper was also used, especially in southern Germany, for the forwarding of books. It was once made in Augsburg with worn blocks which were discarded by the calico printers of that city. Paper with patterns in gold and colors, which began to be used for the binding of books in the seventeenth century in south Germany and northern Italy was, in the eighteenth century, introduced into Holland and thence to England. There has never been much marbling done in America. Most of the paper of this kind used in this country has been imported; some representing prisoners' labor in Belgium and Germany.

Concerning this venerable art, which has now become decadent in America to the point of almost passing entirely out of the picture, there have been quite a number of books published in English, Dutch, French, and German either directly on the subject of marbling or upon bookbinding in general and containing chapters relating to the marbling process, but these books are almost entirely descriptive in character and lacking in technical treatment of details. A bibliography of marbled paper was prepared in 1921 for the Technical Association of the Pulp and Paper Industry by the renowned paper maker and connoisseur of fine papers, Dard Hunter of Chillicothe, Ohio. This bibliography includes 69 books treating the subject directly or indirectly. It is printed as published in the April 28, 1921, issue of the *Paper Trade Journal*. (See p. 8.)

General Description

The process of marbling book edges and papers for use as end-sheets in bookbinding is simple in its general principles, but quite complicated in its application. From its induction it has appeared to be more of an art than a science and almost wholly dependent for its artistic success upon the taste and skill of the individual doing the work. As indicated by the number of books which have been published upon the subject, there have been developed over many years a great variety of techniques and procedures in the practice of the art. As might be expected, much traditional secrecy is still maintained in the application of the art.

In May of 1884, Josef Halfer, a distinguished bookbinder of Budapest, made a distinct contribution to the art by reducing it to somewhat of a science through the study of the technical scientific principles involved in the process, and he wrote a book which is one of the most comprehensive on the subject, entitled "The Progress of the Marbling Art." This work was translated from German into English by Herman Dieck of Philadelphia, and copyrighted in 1893 by Louis H. Kinder, who was also an author of a book of Formulas for Bookbinders, which volume contains some good formulas for the marbling process published in 1905, while he was acting as head bookbinder for the Roycroft Shop of East Aurora, N. Y. This book by Josef Halfer, containing some excellent examples of hand marbling of the most typically employed designs, served not only as a model but also as a stimulus and working guide to the further precise development of the art in Germany and England whence it was introduced to the United States. In England and later in the United States, the work of Halfer was developed into a definite method of marbling through a series of lessons published by W. C. Doebbelin, who represented the Halfer Marbleizing Co., Inc., of Salem, Mass., which was apparently an offspring of the Halfer Co., Ltd., of Orpington, Kent, England. This work on the art of marbling, which is a very practical guide containing 26 examples of hand-marbled designs, was published in London in 1910. At about that time, the Halfer method and materials employed became the standard for use by marblers in the United States, and Halfer's marbling colors and Halfer's marbling outfits were imported and sold by Louis Dejonge & Co. of 71-73 Duane Street, New York City.

This period appears to have witnessed the climax of the art in this country and England but, in America particularly, it now appears to be on the decline in popularity. It is true that dictionaries and some other technical books still make use of marbled edges as a protection against handling during use, and this pragmatic purpose seems to have completely overshadowed the artistic applications of the process.

It may be said that the almost infinite variety of patterns and colors, some of which are outstanding in their beauty, should commend this art to perpetuation of its use for decorative purposes not only in bookbinding but possibly in packaging or other artistic designing. It has already been applied to cloth fabrics as well as papers and, in rare instances, neckties and other wearing apparel have been effectively decorated in this manner. Marbling has also been applied with a vari-

ant technique to the decoration of vases and other pottery forms. It is, therefore, to be hoped that this art may be revived by some of its admirers who may have the patience and endurance to perpetuate its use.

The essential materials employed are neither expensive nor difficult to obtain. A shallow trough is required to hold the mucilaginous solution upon which the pigment colors are floated and combed into the various patterns desired. Such a trough may be made of the desired dimensions and to hold about 2 or 3 inches depth of the gum solution. This is supplemented by a few so-called combs which may be made by the operator himself from strips of binders board between which are glued at varying intervals steel needles which may be used to penetrate the surface of the bath to rake the colors floated on its surface into the intricate patterns sought. The drawing of the needles or a single stylus through this surface layer of color produces, because of the physical inertia of the flowing solution, a series of catenary curves of flowing liquid lines which would be quite impossible to obtain by other mechanical means. Supplementing this simple equipment, there are needed some broomcorn whisks and simple brushes for dropping the color upon the surface of the gum bath while forming the patterns and these may also be home-made.

The art of marbling, like the art of painting or music, is not easily communicated through directions in books. It is not widely practiced and so not easily attained through apprentice instruction, but requires considerable experience and skill in the preparation of the gum bath and the execution of the designs made upon it. The mucilaginous bath is formed by dissolving a suitable gum or gums in water and cooking the solution in a steam- or hot-water-jacketed kettle for several hours with a small quantity of potassium carbonate, commonly called pearl ash, added. When gummed, this stock solution is carefully strained through cloth and thinned with water until the proper viscosity is obtained, and then neutralized to litmus paper by the addition of a small quantity of oxalic acid.

Pigments which have been ground to a very finely divided state, together with a small quantity of oxgall, are floated upon this mucilaginous solution placed in a shallow trough of from 2 to 3 inches' depth. This gum-bath solution may be made from karaya gum, commonly called gum hog, from gum tragacanth, or goat-thorn gum, or carrageen moss, commonly known as Irish moss. This latter, Irish moss, produces the finest veined patterns obtainable, but is more difficult to get and more expensive than gum hog, which is

commonly used for commercial marbling in the Government Printing Office.

Mineral color pigments, which are not soluble in water, are ground into a suitable vehicle containing ox gall until a very fine state of division is obtained so that the pigment will float upon the surface of the gum bath without uniting with it. Each color is then placed in a separate jar and diluted with a solution of oxgall and methylated spirit commonly known as wood alcohol, until it will disperse or expand suitably when dropped upon the bath in an arrangement to form the color scheme desired. The procedure from this point may vary in a number of ways. For a fine combed design, for instance, the colors are mixed upon the bath surface by drawing a special fine-tooth comb over it in two directions to form the pattern.

The design created upon the gum bath is next lifted from the surface by touching the ends of the books or paper sheets into the surface so that the pigment transfers from the gum bath to the paper for which it appears to have a greater affinity. This mucilaginous bath is extremely sensitive to variations in temperature, or air currents from open windows, scumming from dust which falls upon its surface, or contamination from the pigments themselves, and so requires most careful preparation and constant attention in order to insure the success of clean-cut results. It is, therefore, easy to conceive that this process has well earned its reputation as a difficult and highly specialized branch of bookbinding. While it is fast disappearing in this country in connection with bookbinding, we may say that it is still employed in England and in other parts of Europe because of its intrinsic values in artistically beautifying the work. There is no end to the variety of exquisite designs and color combinations that can be produced by this process, but at the Government Printing Office a few very practical and stereotyped standard designs are principally employed. Recently in this country the traditions of marbling were revived by binding, at the Government Printing Office, the presidential addresses of Franklin D. Roosevelt in specially designed volumes of quarter-bound vellum with hand-marbled sides. For this purpose a special pattern and color scheme were created, not of the stereotyped form, to suitably decorate the volumes.

General Principles Involved

From a technical viewpoint, the whole operation of marbling appears to depend upon a balance of relations between the chemical character and particle size of the color pigments employed and their relation with the

viscosity and surface-tension phenomena of the mucilaginous bath upon the surface of which they are suspended. If the pigment particles were not completely insoluble in water, they would mix with the water solution of the bath, staining it, and disappearing from the surface by sinking into the bath and contaminating it. If the pigment particles were not surrounded by a film of a substance such as oxgall, they would not be supported upon the surface of the bath nor thinly dispersed because of the repellent action of the ox gall solution to the bath and the particles would tend to sink beneath the surface because of their weight exceeding the buoyant power of the gum solution. So there must be a proper balance established here between the viscosity of the gum bath and hence its buoyancy power and the wettability and dispersion properties of the pigments employed. This balance can best be established by the experience of the operator. Certain chemical substances, such as oxgall or other glycols, solutions of soaps, and some other organic substances may be used to disperse the color upon the bath surface, while other chemical substances appear to react in the opposite manner to contract or coagulate the color into a condensed pattern. The judicious application of these chemicals to the pigments in the right proportions and at the right time results in the formation of many of the exquisite patterns of shape and color obtained.

Equipment and Utensils Required

A trough may be constructed of wood or lined with sheet copper or zinc large enough to accommodate the type of work desired. A practical size is about 18 by 36 inches and about 4 inches deep to permit a depth of about 2 to 3 inches of gum solution to be maintained. Back of this bath there should be arranged a second narrow compartment for holding a weak solution of oxgall in which a straight edge remains partially immersed for use in cutting the color design upon the bath surface and for dipping the combs by means of which the patterns are drawn out. There should be at the right of the bath a compartment coinciding with its width into which the scum and unused pigment may be scraped from the surface of the gum bath before each pattern is formed.

Brushes are employed for dropping the color upon the bath and small brushes are made from a fine bristle set in hard rubber with the bristles curved and quite flexible to permit a freer motion when dropping the color from their tips. Such a narrow brush, about 3/8-inch in diameter, may be curved by winding thread around the bristles about 1/2-inch from the handle, pull-

ing them over and fastening the thread to the handle in such a way that the bristles remain curved with respect to the handle direction. Then place the brush in hot water for a time, remove, allow to dry, and release the threads, and the bristles will easily maintain their curved position. For sprinkling water and applying ground color for special designs such as Turkish marbling, a whisk or hyssop brush is employed. It may be made from an ordinary whisk broom of corn straw or rice straw may be used, bound in a cylindrical form about 3 inches in diameter and 5 inches long with one end held together with adhesive and wire or cord for use as a handle.

A stylus may be made from a piece of hard wood about half a foot long, one inch in diameter at the top and tapering to a fine point at the bottom, or it may be a thin rod of ivory, or a plastic knitting needle may be used to produce special curves in the surface pattern. The combs used for drawing out the pattern to produce the flowing curves upon the gum bath surface may be made from two pieces of binders board about 2½ inches in width and sufficiently rigid to support needles of fine steel glued or otherwise fastened between two board layers and uniformly spaced at three-sixteenths-, one-eighth-, one-fourth-, or one-half-inch intervals for use in creating complicated patterns. Before the colors can be thrown upon the gum bath, the top must be skimmed to remove any oxidized film caused by evaporation or any contaminated color which remains from the previous marbling. Great cleanliness must be maintained for good results, and it is therefore desirable to use a skimmer consisting of a flexible rubber edge which may be drawn, slightly immersed under the surface, from one end of the bath to the other somewhat as a rubber squeegee is used to clean a glass window pane. Thus the surface of the bath will be free from scum and prepared for the next marbling operation.

The Gum Bath

The first necessity for marbling is the preparation of the size or gelatinous bath upon which the colors are floated. By size is meant a homogeneous glutinous mass obtained from vegetable sources which absorbs water and expands through rupture of its cellular structure upon boiling.

Mucilage is found in many plants, especially in the outer skin of seeds and in many roots, barks, stems, and leaves, but the solubility and viscosity of such gums is very much varied according to its source. Although mucilage is common in small quantities to all plants,

in some it forms the larger portion such as gum tragacanth, carrageen or Iceland moss, salep, the leaves of mallows or of coltsfoot or tussilage, the roots of marsh-mallow, seeds of plantago-psyllium, fleabane, linseed, and quinces. Of this number only a few are of special value in preparing the marbling bath.

The density of the size depends upon both the source and kind of the glutinous substance and the quantity of water in which it is dissolved. The consistency of the size is also affected by changes in temperature—the warmer, the more mobile; the colder, the more rigid. Marbling, therefore, should be done in a place of uniform temperature not subjected to air currents and, above all, free from contamination by dust from the air.

The consistency of the bath is also affected by chemical changes which occur during its aging. There appears to be a chemical transformation of the sugars and starches in the original mucilage into lactic acid or other organic acid which causes the size to become less viscous until finally an acid-reacting fluid results which has no more value for marbling purposes. Therefore, plant gums containing the least possible sugar and starch will much longer resist this disintegration.

A mistake commonly made in marbling is paying too little attention to the gum bath and its discoloration. Frequently, it is contaminated by the colors not being properly prepared for use to prevent their sinking into the bath, or it may be of the wrong consistency for supporting certain colors for producing certain patterns. The physical forces, the interplay of which produces the beautiful flowing designs by propelling and repelling reactions upon the pigments, are closely correlated with the physical characteristics of the mucilage selected. This fact is very obvious when Irish moss is used in preference to other gums in a bath for producing hair-vein marble patterns.

Carrageen Moss

This plant is also known as Iceland moss and Irish moss. Its proper name is *chondrus crispus* and it is a lichen, one of the common algae of the sea, growing upon the cliffs along the Atlantic Ocean and the North Sea and the rocky coast of Ireland. Like all sea-weeds, it contains a great quantity of mucilage and small quantities of salts of iodine and bromine. This moss is excellent for marbling purposes and has also been used from antiquity by linen weavers as a size for threads in finishing their cloth. Its principal drawback lies in its tendency to spoil quickly since it usually goes bad within a week or less. It is helpful to add a small

portion of borax to the water in which the Irish moss is boiled. This affects the gum bath so that the color floated upon it expands to a much greater degree than without the presence of borax. It is best to add borax to the water before boiling carrageen moss.

Gum Tragacanth

The name tragacanth means goat thorn. This gum has also been known as gum dragon and is the product of various species of *Astragalus* found in Greece and Turkey. The best gum for marbling purposes was once imported from Smyrna in the form of flat ribbon-like pieces of horn-like consistency. This gum is preferred by some to carrageen moss because of the consistency of its mucilage and its durability in use. It is not so delicate in its reaction to colors and, therefore, does not require quite the same degree of critical skill in its preparation and use as does the Irish moss. It is prepared in the same general manner as Irish moss by first soaking in water for some hours until it swells by water absorption, as tapioca might do, and it is then boiled without burning for a few hours until a homogeneous mass is obtained.

Salep, Plantago-Psyllium (Flea-Bane)

Radix salep is the name applied to the dried tubers of several species of orchids, round, quite flat, yellowish white, horn-like, semidiaphanous, very hard, and without taste or smell. Salep was formerly imported mostly from Persia but now the tubers of orchids grown anywhere from the same species furnish a good quantity of gum used for finishing silks and medicinal purposes. It may be purchased in the powder form at drug stores. As a marbling size, radix salep possesses very excellent properties similar to carrageen moss, but its high price prohibits its general application. In preparing this size, use 6 quarts of water and 2½ ounces of powdered salep which must be well boiled for a long period until entirely dissolved and allowed to stand 24 hours before use.

Fleabane is a small seed containing a large quantity of plant mucilage. To prepare the size, use 4 ounces of fleabane over which 6 quarts of boiling water is poured and the mass beaten with a switch of wicker-rods until the gum is entirely separated from the seeds. The mass is then allowed to cool and after 10 or 12 hours filtered through a linen cloth when it is ready for use. This gum bath is suitable for producing thickly veined ordinary marbled edges. However,

fleabane is also more expensive than carrageen moss and so is not generally used.

The other plant formations, such as the leaves of marshmallow or coltsfoot or quinces or linseed, are not such prolific sources of mucilage and therefore are regarded as of less importance.

Karaya Gum

This is commonly known to the trade as gum hog. It offers a good source of mucilage for preparing the marbling bath and, because of its low cost and its availability, it is most generally used for commercial marbling. However, it does not possess the fine properties nor produce the excellent work of some of the other gums which we have previously mentioned. This plant gum is the least expensive and is the one adopted at the Government Printing Office for making marbling baths for commercially marbling the edges of books. It is not best adapted to fine pattern quality of work but with skillful manipulation will yield creditable results. The following is a formula for the preparation of such a gum bath:

Gum hog -----	ounces--	12
Water-----	gallons--	10

Soak overnight. After softening add 1½ ounces potassium or sodium carbonate, to assist effecting solution, and boil slowly for 4½ hours at approximately 215° Fahrenheit in a double boiler or steam-jacketed kettle until all lumps have disappeared.

Then cool and strain through cheesecloth doubled four times. The solution is now ready for use. Adapt to required viscosity by adding water. Add to this bath oxalic acid; 1 pint of saturated solution to 10 gallons of bath solution or until the bath is neutral to litmus paper test. Without the presence of oxalic acid the colors will not expand. This substance also prevents the formation of "shooting stars" due to sudden spread of the pigments upon the bath surface.

Functions of Oxgall

The bile of all animals contains certain peculiar organic acids containing nitrogen which, upon chemical treatment to free from sulfur and nitrogen compounds, yield a new chemical known as glycocholic acid. The gall of animals may be extracted with solvents, chemically treated and evaporated, resulting in colorless, cholic-acid esters, cholesterine, choline, glycocholic acid, etc. There is no doubt that this glycocholic acid, which is the principal constituent of

oxgall, is responsible for its behavior in the marbling process. It is to be noted that an alum salt is used in treating the book edges or other paper prior to marbling. When the pigment, enveloped with oxgall, is transferred to the paper a chemical reaction occurs between the alum—which is aluminum potassium sulfate—and the glycocholic acid resulting in the formation of aluminum glycocholate which salt is insoluble in water and therefore serves to bind the pigment permanently to the paper fibers. This action may be clear if compared with a similar one familiar to every observer. When soap is used in hard water, it forms an insoluble curd which sticks tightly to the porcelain of the washbowl. This curd results from the fatty acid of the soap which is an ester similar to glycocholic ester, combining with the calcium salts which make the water "hard," to produce an insoluble salt of the acid such as calcium oleate or calcium palmitate, depending upon the fatty acid from which the soap is made.

In the early days of marbling, ox galls, cow galls, or fish galls were extracted with alcohol and especially treated to produce the material used for dispersing the pigments upon the surface of the gum bath. It is no longer necessary to go through this traditional difficult procedure to get the dispersing agents. Oxgall may be purchased under that trade name in liquid or paste form, which can be diluted to a liquid. It is added to the jar of pigment and thoroughly stirred or, better yet, ground together with the pigment so that each particle of the pigment is individually enveloped with a film of oxgall. This film serves not only to disperse the particle in the manner to produce the desired patterns of marbling, but also because of changes in surface tension, tends to assist in the buoyancy of the particle and prevent it from falling below the surface into the gum bath itself which it would contaminate, resulting in smears and stains.

Other Dispersing Agents

Fatty bodies are themselves injurious to the gum bath with which they form a combination prohibiting the spreading of the colors, but certain fatty bodies may be converted into the form of emulsions which serve as propelling mediums for creating hair-veined patterns. Such natural emulsions are milk, the yolk of egg, and the milky saps of certain plants, such as milkweed.

There are also fatty bodies which may be emulsified with water to yield a milky mixture which may be employed as expanding or propelling mediums. Of this sort there are many oils; for instance, almond, poppy,

or hemp oils. There are also other substances which act similarly to gall. Rosin, and some other resins such as shellac, may be put into solution by the aid of ammonia or borax to produce a water solution which may be used to disperse the pigments. To produce them, pour a quart of water into a porcelain pan, warm, and add a half ounce of shellac or resin and a half ounce of borax and bring the mixture to a boiling temperature until the resin has dissolved.

Sprinkling Water

Sprinkling water is one of the newer discoveries in the art of marbling and deserves consideration because of its good properties. It is used to produce hair-veined edges and as an addition to the ground color. It has a greater expanding power than oxgall. It may be made from a good grade of soap such as castile. The soap may be dissolved in about 10 times its weight of water and allowed to stand for several weeks until undissolved particles are removed by sedimentation or after the sediment is formed it may be more rapidly removed by filtering. It may be spread with a hyssop in fine droplets upon the surface of the pigmented bath from the whisk brush in such a manner as to produce hair-like veins of color. It is much more intensive in its action than oxgall.

Alum Water

To obtain beautiful results, it is indispensable to treat the book edges or the paper to be marbled with concentrated alum water before marbling. It is prepared by heating 13 ounces of common alum (aluminum and potassium sulfate) in 2 quarts of water until entirely dissolved. This concentrated solution is cooled and bottled to prevent crystallization.

The book edge or paper to be marbled is wet with a sponge dipped into this cold alum solution and allowed to dry for about 10 minutes, after which the marbled pattern may be lifted from the surface of the gum bath. The use of alum water is very important, especially when many colors or heavy color designs are formed, for the reason previously mentioned that the alum salt deposited upon the paper combines with the glycocholic acid of the oxgall to form aluminum glycocholate which is essential to fix the color upon the paper fibers as an insoluble binder. The paper prepared with alum should be marbled within at least a half hour of its preparation to obtain this effect most efficiently.

Colors and Their Preparation for Marbling

Two types of colors which may be used are usually classified as mineral and lake colors. The lake colors usually consist of a color deposited upon a metallic base. The addition of oxgall and water to thin to the desired consistency is all that is necessary. The mineral colors, to be successfully used, must be selected because of their insolubility in water to prevent their discoloring the gum bath or bleeding to produce stains during their use. They should be very finely ground and require the addition of a gelatinous binder to assist the adhesion of the particles to the paper. For common and crude purposes, fish glue added in the proportion of about a teaspoonful per pint of pigment and water is sufficient, but for better grades of work it is desirable that the pigments be ground together with a special gum such as tragacanth or gum gatti to the condition of a paste which may then be diluted with water to suit requirements.

FORMULA FOR BINDER FOR COLORS USED UPON GUM-HOG MARBLING BATH

I.

Soak 16 ounces of gum gatti in 1 quart of hot water.
Add 1 ounce of salts of tartar (potassium carbonate).
Soak 10 ounces gum arabic in 1 quart of water. When thoroughly dissolved, cook over a slow fire or preferably in a double water boiler for 2 hours until the consistency of a sirup is attained.

II.

1 quart of water.
4 ounces honey.
1 ounce yellow prussiate of potash (potassium ferrocyanide).

Mix the above (I and II) together and allow to cook from 2 hours to 2½ hours.

Then add—

4 ounces refined beeswax (yellow).
Melt 2½ ounces castile soap (powdered).
1 ounce cumol (melted together).

Then stir the mixture together and allow to come slowly to a creamy color a little off the white. It is then ready for use upon cooling.

When trouble is encountered in marbling, the amateur is prone to condemn the colors as old or unfit when, in most cases, the difficulty lies in the improper care and cleanliness in the preparation of the gum bath and the compounding of the colors. The colors were once ground by hand with mullers but may now be done in

disk mills or on friction-roller mills after the manner of making printing ink, with equal success and less labor.

Marbling Objects

The technique of the use of these materials to achieve the beautiful designs which have been obtained by the process cannot be conveyed by description but must be acquired through the skill born of patience and practice. However, there are some publications which may serve as guides to the beginner and stepping stones to his progress in the art. One of the best of these is a very brief set of five lessons previously referred to as "Halfer's Method of Marbling," published by W. C. Doebbelin in London, 1910. This publication, if still obtainable through purchase or the public library, will prove very valuable to the beginner.

To indicate that this process still remains more largely an art than a science, obtained only by practice which develops skill, we may quote from the work of that marbler who did much to promote the art by example and analysis of methods in his publication on *The Progress of the Marbling Art*. In this work Josef Halfer, the distinguished bookbinder of Budapest, in the introduction to his book, modestly wrote in May 1884, the following:

"What the marbling art is able to offer, a person can only judge, who has seen exemplary edges and to whom marbling is not a stranger. No kind of edge, to which color is applied, can be compared to the effective splendor of marbled edges. In thousands of variations it imitates nature and delights the eye by its products. Although marbling has hardly reached the middle rung of the ladder of its development, it today stands unrivaled.

"It is clear, that such an art should be fostered and nursed, if it is to grow to its full development. But here the investigation of one man is insufficient, a general interest is demanded and I hope that this will be aroused by my work."

It is hoped that this decorative art, added to printing and binding, may again by some sympathetic persons be revived to the high degree of artistic perfection it has enjoyed in the past rather than permitted to pass into oblivion through lack of interest.

Its common commercial use as a protection to the edges of reference books and blank books is about the only vestige of this art left in America. It might yet be well restored to an honored place among the methods of artistic bookbinding in the preparation of end-sheets and cover designs in book publications wherever the element of cost may be favorably subordinated to the interest of art.

A BIBLIOGRAPHY OF MARBLED PAPER

BY DARD HUNTER, of Chillicothe, Ohio

(Committee on Bibliography, Technical Association of the Pulp and Paper Industry: Published in the April 28, 1921, Issue of The Paper Trade Journal)

From the following bibliography it will be seen that writers have not neglected the subject; in fact, it is surprising that so much has been written on such an out-of-the-way art. For the student who wishes to delve into the mysteries of marbling the books of Woolnough and Halfer will be found the most comprehensive works in the English language.

Adam, Paul.

Das Marmorieren des Buchbinders auf Schleimgrund und im Kleistervverfahren. Halle a. S., 1906.
73 pp. illustrations. 8vo.

Marbling for bookbinders by the moss and paste processes.

Andes, L. E.

Treatment of paper for special purposes. A practical introduction to the preparation of paper products for a great variety of purposes. Translated from the German by Charles Salter. London, 1908.

Pages 116 to 134 are devoted to the marbling of paper by machinery.

Arnett, John Andrews.

Bibliopægia; or the art of bookbinding in all its branches. London, 1835.

Pages 35 to 53: Marbling and the surface coloring of paper.

Bierbaum, Otto Julius.

Künstlerische Vorsatz-Papiere. In: Dekorative Kunst, vol. 1, No. 3. München, 1898. 4to.

Artistic end papers.

Boeck, Jof. Phileas.

Die Marmorirkunst. Ein Lehr-, Hand-, und Musterbuch für Buchbindereien, Buntpapierfabriken, u. s. w. Vienna, 1880.

Contains 30 samples of marbled papers. Illus. 8vo.

The marbling art. An instruction, hand and sample book for bookbinders, paper stainers, etc.

Boetticher, Georg.

Vorsatzpapiere. In: Kunstgewerbeblatt, vol. 10, 21-32.

Leipzig, 1898.

End papers.

Bohniert, —.

Marmorieren. Vienna, 1908.

Marbling.

Bookbinding.

The whole art of bookbinding, containing valuable receipts for sprinkling, marbling, and coloring of paper. Oswestry, (England), 1811.

60 pp. 12mo.

Bosquet, E.

Guide manuel théorique et pratique de l'ouvrier ou praticien doreur sur cuir et sur tissus a la main et au balancier contenant dans toutes leurs parties, la dorure sur cuirs et sur tissus de tous genres, la dorure sur tranches, la ciselure et l'ornementation des tranches, la marbrure sur cuirs et sur tranches, etc. Paris, 1903. 12mo.

Practical and theoretical guide to the practice of gilding upon leather and other textures by hand. Also the gilding on book edges, the chasing of leather and marbling upon leather and book edges, etc.

Brade, L., and Winkler, E.

Het Geillustreerde Boekbindersboek. Volledig onderrigt in het Boekbinden. Waarin beschreven worden de nieuwste Fransche, Engelsche en Duitsche verbeteringen in dit vak, Met uitvoerig onderrigt in het vervaadigen van de verschillende marmer- en andere smeden en het vergulden, over het gebruik van de nieuwste machinerien. Met een aanhangsel bevattende 76 bijzonder goede recepten. Met vele Houtgravuren. Leyden, 1861.

The illustrated book for the bookbinder. Complete instructions in bookbinding, in which is described the latest French, English, and German accomplishments in this profession. With an extended instruction in the making of various marbled and other edges, also gilding. About the use of the latest machines. With 76 very good recipes and many wood cuts.

Brosenius, —.

Der Buchbinder, oder 70 Anweisungen in der Buchbinderkunst. Leipzig, 1847.

The bookbinder, or 70 exercises in the art of bookbinding.

Crane, W. J. E.

Bookbinding for amateurs. London, n. d.

184 pp. illus. 8vo.

Pages 93-113: Marbling and marbling colors.

Czeschka, O. C., and Moser, Kolomon.

Papierfächer. In: Deutsche Kunst und Dekoration. IX Jahrgang, no. 7, 452-453. Darmstadt, 1906.

Paper fans.

Day, Lewis F.

The art and craft of paper-staining. In: Good Words, vol. 36, 244-252 (April 1895).

de Haas, Hendrik.

De Boekbinder; of volledige beschrijving van al het gene wat tot deze kunst betrekking heeft. Volledige beschrijving van alle konsten, ambachten, handwerken, fabrieken, traficken, derzelver werkhuisen, gereedschappen, enz. ten deele overgenomen uit de beroemdste buitenlandsche werken; en vermeerderd met de Theorie en Praktijk der beste Inlandsche Konstenaaren en Handwerkslieden. Dordrecht, 1806.

22nd. part. 166 pp.

The bookbinder; or complete description of everything related to this art. Complete description of all arts, trades, labors, factories, traffics, their buildings, tools, etc., partly

- taken from the best known foreign works and augmented with the theory and practice of the best domestic artists and artisans.
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Die Tapeten und Buntpapier Industrie. Weimar, 1869.
The wallhanging and stained paper industry.
- Fichtenberg, M.
Nouveau manuel complet du fabricant de papiers de fantaisie. Papiers marbres, jaspés, maroquines, gaufrés, dorés, etc., peau d'âne factice; papiers métalliques; cire et pains à cacheter; crayons; etc., etc. Paris, 1852.
Complete new manual for the maker of fancy papers. Marbled, variegated, morocco, embossed, gilded and other papers; imitation of animal parchment; foil papers; sealing wax and wafers; crayons, etc., etc.
Thirty-two samples of surface colored papers are shown in this book.
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Die Fortschritte der Marmorier Kunst. Budapest, 1885.
Progress in the art of marbling.
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Die Fortschritte der Marmorier Kunst. Ein praktisches handbuch für Buchbinder und Buntpapierfabrikanten. Stuttgart, 1891.
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160 pp. 8vo.
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1066 pp. 4to.
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CORRECTION

In the Publicity and News Notes of Vol. X, no. 1, Fall 1971, p. 15 GBW member E. A. Thompson is listed erroneously as a resident of San Francisco; his residence is Santa Barbara, Calif. The same article states that he recently worked on a first folio of Shakespeare, with a 1626 binding by Roger Payne. It should have read first folio of Shakespeare published in 1626, with a binding by Roger Payne. Roger Payne was not born until 1739, so was hardly binding in 1626.

We regret these errors and appreciate their being called to our attention. We will always be grateful to our readers for reporting factual errors, and we will correct them as quickly as possible.