ABSTRACTS OF TECHNICAL STUDIES IN ART AND ARCHAEOLOGY

1943 - 1952

Compiled by
RUTHERFORD J. GETTENS
AND
BERTHA M. USILTON

WASHINGTON
1955
FREER GALLERY OF ART OCCASIONAL PAPERS

The Freer Gallery of Art Occasional Papers, published from time to time, present material pertaining to the cultures represented in the Freer Collection, prepared by members of the Gallery staff. Articles dealing with objects in the Freer Collection and involving original research in Near Eastern or Far Eastern language sources by scholars not associated with the Gallery may be considered for publication.

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Freer Gallery of Art
Washington, D. C.
FOREWORD

Within the last quarter century a new and specialized literature has developed dealing with the application of science and technology to the related fields of art and archaeology. There are two main applications of this new approach. In the first place applied science has broadened our whole knowledge of the origins, the fabrication, the chronology of materials, and the authenticity of works of art. Secondly it has given us a new understanding of the stability of materials and structures, and in turn it has developed improved methods for conserving and preserving our cultural holdings. This literature, even knowledge of its existence, will benefit scholars in the field of art and archaeology, curators, conservators, museum administrators, and all who work professionally with objects of the past and art creations of the present.

Only a minor part of the literature appears in the few art technical publications. The greater part is scattered far and wide in writings and reports devoted more particularly to the fine arts and archaeology and some that is important is hidden away in technical journals that never see the inside of a museum or an art historian’s study. There is wide geographical distribution of these sources and there are the usual language barriers. The purpose of these abstracts is to learn the extent of all these scattered writings and to gather them together. The abstract method was chosen because it is the one method that can be set up as a cooperative project with resulting wide distribution of the burden.

In selecting the material to be abstracted the compilers have been consciously attempting to circumscribe a new branch of applied science. The table of contents roughly delimits this specialized field. It has been difficult, however, to know just where the boundaries lie. This has been especially true in selecting material from that part of the purely technical literature which is recognized to be even remotely useful in problems of examination and of conservation of objects of art and antiquity. They hope they have not gone too far astray. These abstracts deal mostly with artifacts—using that term in its broadest sense—and the materials from which they are made. Under Museology, subsection F entitled “Emergency Protection” is limited because that subject has been so adequately
covered by the bibliography compiled by Nelson R. Burr (see item 125). The items given here are not covered by Mr. Burr.

The 10-year period of coverage, 1943-1952, begins with the end of the decade that was covered by Technical Studies in the Field of the Fine Arts. In that journal, which was published for the Fogg Museum of Art, Harvard University (1932-1942), there were included many abstracts of papers in this field. In the present series there is a slight overlapping with Technical Studies abstracts but it ends abruptly with articles or books published prior to January 1, 1953. After that date the task of covering the writings in art technology will be carried on by a new journal, I.I.C. Abstracts, which will be published under the sponsorship of the International Institute for the Conservation of Museum Objects, London.

The abstracts given in French are the effort of the Belgian Working Party (vide infra). In the interest of accuracy it seemed better to leave those contributions in the language in which they were written.

Any assembly of bibliographical data like this contains items of widely varying importance. It is impossible to exercise critical evaluation except to give less space to articles of lesser importance and to indicate more important articles by incorporating in the abstract essential details and conclusions presented in the original paper. Unfortunately different abstractors evaluate differently. Popular articles are covered as well as highly technical ones. Only by inclusive coverage can the extent of interest in the field be judged.

This project could not have been carried out without the assistance of those who are listed here as "Contributors." These were organized as four "Working Parties," namely the British Working Party, which was headed by Mr. Stephen Rees Jones of the Courtauld Institute of Art, London; the Belgian Working Party under the direction of Dr. Paul Coremans of the Laboratoire Central des Musées de Belgique; the Japanese Working Party headed by Professor Kazuo Yamasaki of Nagoya University, Nagoya, Japan, and the American group by the compilers. Each member has unselfishly contributed time and personal interest. Dr. Harold J. Plenderleith of the British Museum Laboratory is owed an especial debt of gratitude for moral support and advice. Mr. Archibald G. Wenley, Director of the Freer Gallery of Art, has made this project possible. About one-fourth of these abstracts have been "lifted"
with permission from other abstract journals. These include: *Chemical Abstracts* of the American Chemical Society; *Abstract Review* of the National Paint, Varnish and Lacquer Association, Washington, D. C.; *Review* published by the Research Association of British Paint, Colour and Varnish Manufacturers, London; *Journal of the Iron and Steel Institute*, London; *Library Literature*, H. W. Wilson Co., New York. In many cases the abbreviated forms used in the original abstract have been kept.

Much of the early collecting was done when one of the compilers was on the staff of the Fogg Art Museum, Harvard University. The privileges granted there are much appreciated.

RJG
BMU

Freer Gallery of Art
March 1, 1955.
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<td>A. E. Werner, Research Chemist</td>
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<td></td>
<td>National Gallery Laboratory</td>
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<td>BMU</td>
<td>Mrs. Bertha M. Usilton, Librarian</td>
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<td>Washington, D. C.</td>
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<td>DG</td>
<td>Denise Goorieckx, Chemist</td>
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<td></td>
<td>Laboratoire Central des Musées de Belgique</td>
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<td>Brussels, Belgium.</td>
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<td>EHJ</td>
<td>Elizabeth H. Jones, Conservator</td>
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<td>ERC</td>
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<td></td>
<td>Department of Chemistry</td>
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<td></td>
<td>The Ohio State University</td>
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<td></td>
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<td>FD</td>
<td>Fernand Devreux, Chemist</td>
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<tr>
<td>HB</td>
<td>Harold Barker, Senior Experimental Officer</td>
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<td></td>
<td>British Museum Laboratory</td>
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<tr>
<td>HPS</td>
<td>Harold Philip Stern, Assistant in Japanese Art</td>
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<td></td>
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<td>Washington, D. C.</td>
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</tbody>
</table>
IG  Ione Gedye, Head of the Technical Department
     Institute of Archaeology
     University of London

JAP  John Alexander Pope, Assistant Director
     Freer Gallery of Art
     Smithsonian Institution
     Washington, D. C.

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     Brussels, Belgium.

KT   Kenzo Toishi, Curator
     Tokyo Bunkazai-Kenkyujo (Institute of Research for
     Cultural Properties, Tokyo)
     Tokyo, Japan.

KY   Kazuo Yamasaki, Professor of Inorganic Chemistry
     Faculty of Science
     Nagoya University
     Nagoya, Japan.

LB   Leo Biek, Head of the Ancient Monuments Laboratory
     Ministry of Works

MB   Mavis Bimson, Experimental Officer
     British Museum Laboratory

NLB  Nancy Lee Brown, Fulbright Scholar
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     Brussels, Belgium.

PC   Paul B. Coremans, Directeur
     Laboratoire Central des Musées de Belgique
     Brussels, Belgium.

RDB  Richard D. Buck, Director
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     Oberlin, Ohio.
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     Smithsonian Institution
     Washington, D. C.

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     Brussels, Belgium.

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     University of Pittsburgh
     Pittsburgh, Pennsylvania.

RMM  R. Margaret Medley, Librarian
     Department of Chinese Art and Archaeology
     Courtauld Institute of Art
     University of London

RMO  R. M. Organ, Experimental Officer
     British Museum Laboratory

SR  Stuart Raynolds, Junior Fellow
     Mellon Institute of Industrial Research
     University of Pittsburgh
     Pittsburgh, Pennsylvania.

SRJ  Stephen Rees Jones, Lecturer in Charge
     Technology Department
     Courtauld Institute of Art
     University of London
# PERIODICAL ABBREVIATIONS

Abbreviations arranged alphabetically

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Amer. J. Sci.  American journal of science; devoted to the geological sciences and to related fields. New Haven, Conn. 1818.


Amer. Paint J.  American paint journal. St. Louis, Mo. 1916.


American school of oriental research. See A.A.S.O.R. and B.A.S.O.R.


Anales real Soc. españ. fís. y quím.  Anales de la real Sociedad española de física y química. Madrid. 1903.


Anc. India  Ancient India; bulletin of the archaeological survey of India. New Delhi. 1946.


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<td>Antiques</td>
<td>Antiques; a magazine for collectors and others interested in times past. . . New York. 1922.</td>
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<td>Antiquité class.</td>
<td>Antiquité classique. Brussels. 1932. Contributions in French, Dutch, German, etc.</td>
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<td>Apollo (The Hague)</td>
<td>Apollo; maandschrift voor literatur en kunsten. Den Hague. 1945.</td>
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<td>Archaeology</td>
<td>Archaeology; a magazine dealing with the antiquity of the world. Cambridge, Mass. 1948.</td>
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Archiv Eisenhüttenw.  Archiv für das Eisenhüttenwesen (Verein deutscher Eisenhüttenleute und Max-Planck-Institut für Eisenforschung). Düsseldorf, Germany. 1927.


Art Digest  Art digest. New York. 1926.

Art Mat. Trade News  Art material trade news; news of the art supply trade. Chicago. 1949.


Artibus Asiae  Artibus Asiae ... devoted to Asiatic research. Ascona, Switzerland. 1952. Text in English, French, or German.


Bibliotekar’

Bijutsu kenkyū.

Bijutsu shi

B.F.M.A.

Bl. Bergshandt. Övbro

B.M.F.A.

B.M.M.A.

B.M.Q.
British museum quarterly. London. 1927.

Boer en Spade

Bol. min. ind. (Bilbao)
Boletin minero e industria (Bilbao). Bilbao, Spain. In Spanish.

Bol. Museu Nacional Arte Antiga

Bol. Univ. Santiago Comp.

Boll. ist. centrale restauro

Boll. ist. patologia libro (Rome)
Bollettino dell’istituto di patologia del libro. Rome. 1939.

Boll. soc. natr. Napoli
Bolletino della società dei naturalisti in Napoli. Naples, Italy. 1887.

B.P.V.
Review of current literature relating to the paint, colour, varnish and allied industries. London. 1928.

Brit. Abs.

British ceramic society
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Hartford, Conn. 1934.

Bulletin of the Institute of Paper Chemistry.
Appleton, Wis. 1930.


Bull. Natl. Arch. (U.S.)
Bulletin of the National Archives. Washington, D. C.

Bull. Roy. Ont. M.A.

Bull. soc. belge géol. paléontol. et d'hydrol.

Burl. Mag.
The Burlington magazine. London. 1903.

C.A.

Cahiers arch. hist. Alsace (Strasbourg)
Cahiers d'archéologie et d'histoire d'Alsace. Strasbourg.

Can. Paint Varnish Mag.
Canadian paint and varnish magazine. Toronto, Ont., Canada. 1927.

Carinthia II

Carnegie Mag.

C.E.

Ceramic Abstracts
Issued as part of the Journal of the American Ceramic Society, which see.


Chem. & Ind.
Chemistry and industry. London. 1881.

Chem. Eng. Dig.
Chemical engineers digest. (Kagaku kōgō shiryō). Tokyo.

Chem. Eng. News


Chemie, Die. Suspended publication with vol. 58, No. 5/6-7/8 (Feb. 1945). Resumed publication in 1947 as Angewandte Chemie, as vol. 59, No. 1.


Chim. peint. vernis Chimie des peintures et vernis. Same as Industrie della vernice, which see.


Chimica (Milan) Chimica; revista mensile per la diffusion della cultura chimica. Istituto Italiano di storia della Chimica. Milan, Italy. 1946.


Connoisseur The Connoisseur. London. 1901.


Discovery Discovery; the magazine of scientific progress. Norwich, England. 1920.


East and West East and West; quarterly review published by the Istituto Italiano per il Medio ed Estremo Oriente. Year 1, No. 1 (1950).


Endeavour  Endeavour; a quarterly review designed to record the progress of the sciences in the service of mankind. London. 1942.


Farben, Lacke, Anstrichstoffe  Farben, Lacke, Anstrichstoffe. Stuttgart? Name changed with vol. 5 (Jan. 1951) to Deutsche Farben-Zeitschrift, which also see.


F.P.L. Reprints  Forest Products Laboratory, Madison, Wis. Reprints.
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<td>Forest Products Laboratory, Madison, Wis. Technical note.</td>
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<td>Gieserei</td>
<td>Gieserei; Zeitschrift für das gesamte Giesereiwissen. Düsseldorf, Germany. 1914.</td>
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<td>Glass Ind.</td>
<td>The Glass industry; devoted to glass technology, engineering, materials and glass factory equipment and operation. New York. 1920.</td>
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<tr>
<td>Heating &amp; Ventilating</td>
<td>Heating and ventilating including air conditioning, piping, refrigeration and air sanitation. New York. 1904.</td>
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Ind. Finishing (Indianapolis) Industrial finishing; published in the interest of product cleaning and painting. Indianapolis, Ind. 1924.


Indian Archives Indian archives. Published quarterly by the National Archives of India. Queensway, New Delhi, India. Jan. 1947.

Ingenieur De Ingenieur; weekblad gewijd aan de techniek en aanverwante Wetenschappen. Utrecht. 1886.


Instituto para a alta cultura,
Lisbon
See Portugaliae physica
Interchem. Rev.

Interchemical review. Research Laboratories
of the Interchemical Corporation. New
York. 1942.

International criminal police
review.
See Rev. Inter. Police Crim.

Iron & Steel (London)


Iscor News

Iscor news. Iron and Steel Corporation. Pre-
toria, S. Africa. 1936.

Isis

Isis; an international review devoted to his-
tory of science and civilization. Cam-
bidge, Mass. 1913.


Journal of the American Ceramic Society.
Ceramic abstracts. Columbus, Ohio. 1918.

J. Amer. Chem. Soc.

Journal of the American Chemical Society.
Washington, D. C. 1879.

J. Amer. Leather Chem. Assoc.

Journal of the American Leather Chemists'
Association. University of Cincinnati,
Dept. of Leather Research. Cincinnati,
Ohio. 1906.

J. Amer. Oil Chem. Assoc.

Journal of American Oil Chemists' Associ-
tion. Chicago. 1917.


(Jinruigaku zasshi). Tokyo. 1884. Text
in Japanese. Title, contents page, and
summaries in English.

J.A.O.S.

(Supplements). Baltimore, Md. 1843.

J. Appl. Phys.

Journal of applied physics. American Insti-


Journal of chemical education. American
Chemical Society. Easton, Pa. 1924.

J. Chem. Ind.

Journal of the chemical industry. London.
Discontinued with vol. 69 (Dec. 1950).


Journal of the Chemical Society of Japan.
(Nihon kagaku zasshi.) Tokyo. 1885. In
Japanese with summaries in English.


1841.
J. Dec. Art  

J. Egypt. Arch.  


J. Gemmol.  


Journal of Industrial Hygiene and Toxicology. Baltimore, Md. 1919. Discontinued with vol. 31, No. 6 (Nov. 1949). Merged with Archives of Industrial Hygiene and Occupational Medicine.


Metallurgical Abstr.  

J. Iron Steel Inst. (London)  

J. Oil Col.  

J. Phys. Chem.  


J. Polymer Sci.  

J. Quekett Microscop. Club  


Kokka

Kokka; an illustrated monthly journal of fine and applied arts of Japan and other Eastern countries. Tokyo. 1889. Nos. 1–132 in Japanese; Nos. 133–181 have English title page with pls. accompanied by descriptive letterpress in English; Nos. 182–337 in English; Nos. 338– in Japanese with English summaries of important articles.

Lack-u. Farben-Chem.

Lack-und Farben-Chemie. Olten, Switzerland.

Leica Photo.


Lib. Lit.

Library literature; an author and subject index (with abstracts or digests for selected items) to books, periodicals, theses, and... librarianship. New York, H. W. Wilson Co. 1933.

Life

Life. Chicago. 1936.

Lisboa. Instituto para a cultura. See Portualiae physica

Los Angeles Co. Mus. Q.

Los Angeles County Museum quarterly. Los Angeles, Calif. 1941.

Maandblad Beeldende Kunsten


Mag. Art


Magyar Kém. folyóirat


Magyar Mernok Epíteszegylet Közlönye


Mannus-bücherei (Leipzig)


Metal Finish. Metal finishing; devoted exclusively to metallic surface treatments. Westwood, N. J. 1903.


Mineralog. (Portland, Oreg.) Mineralogist; devoted to mineralogy, gem cutting, and the collector. Portland, Oreg. 1933.


Minerva méd. legale Minerva médicolegale. Turin. 1880.


M.J. (Pakistan) Museums journal. Pakistan. 1948?


Museum News


Namurcum (Belgique)


Nat. Paint Bull.


Natural Hist.


Nature (London)


Nature (Paris)


Natur. Rundschau


Naturwissenschaften


Natuurw. Tijdschr. (Belg.)


Neues Jahrbuch für Mineralogie. Formerly Neues Jahrbuch für Mineralogie, Geologie und Paläontologie. Stuttgart, Germany. 1807.


Nieuwsbulletin van de Koninklijke Nederlandse Oudheidkundige Bond. Leiden.

Nihon bijutsu kōgei.

See Japn. Ind. art

Nihon kagaku zasshi.


Northwest Med.


Nova Acta Leop.


Nucleonics


Numismatic Rev.


Oil and colour trades journal Name changed with vol. 117 (Jan. 6, 1950) to Paint, oil and colour journal, which see.


Olie (Holland) Olie (Holland). No. 11 (1948).


Pacific Plastics
Paint Mfg.
Paint, Oil, Chem. Rev.
Paint Oil Col. J.
Paint Technol.
Paint Varnish Production
Palacio
Pam. a muz.
Pap. Ind.
Pap. Ind. and Pap. World.
  See Pap. Ind.
Paper makers' association of
  Great Britain and Ireland.
  Proceedings of the Technical
  Section
Paper Trade J.
Papers Robt. S. Peabody
  Found. Archaeol.
Pays Gaumais

Pacific plastics. Name changed with vol. 19
(May 1949) to Plastics Industry.

Paint, incorporating paint manufacture. Formerly Paint, colour, oil, varnish, ink, lacquer manufacture. London. 1931.

Paint, oil and chemical review. Formerly Paint, oil and drug review. Chicago. 1883.

Paint, oil and colour journal. Formerly Oil and colour trade journal. London. 1879.


Paint and varnish production, the technical magazine for manufacturers of paint, varnish, lacquer and other synthetic finishes. New York. 1910. Formerly Paint and varnish production manager.

Palacio, El; a monthly review of the arts and sciences of the Southwest. Archaeological Society of New Mexico. Sante Fé, New Mexico. 1913.


Name changed with vol. 31 (Feb. 1950) to British Paper and Board Makers' Association. Proceedings of the Technical Section, which see.


Peintures, pigments, vernis
Pharm. Weekblad
Phoenix (Amsterdam)

Pitture e vernici
Plastics (Chicago)
Plastics (London)
Plastics and Resins
Plastics Dig.
Plastics Ind.
Plastics Monographs
Plastics Reporter
Plastics Trends
Plastics World
Pontif. Acad. Sci. Commentationes
Porslin
Portugaliae physica
<table>
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<tr>
<th>Title</th>
<th>Description</th>
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<tr>
<td>Products Finishing (Amer.)</td>
<td>Products finishing; cleaning, plating, polishing, finishing. Cincinnati, Ohio. 1936.</td>
</tr>
</tbody>
</table>
Quart. J. Geol. Mining Met. Soc. India

Radex Rundschau
Radex Rundschau. Kärnten, Austria. 1952. Issued without a volume number.

Rayon & Synthetic Textiles

Recueil des travaux des chimiques des Pays-Bas. Nederlandse Chemische Vereniging. Amsterdam. 1882. Printed in English, French, or German.


Rept. Prog. Phys.

Research (London)
Research; science and its application in industry. London. 1948.

Rev. Archéol.

Rev. Arts

Rev. belge arch. hist. art

Rev. belge numismatique

Rev. gén. belge

Rev. Inter. Police Crim.

Rev. matériaux construction et trav. publ.


Schweizer archiv für Heraldik. See Arch. Hérald. Suisses


Science Prog.  Science progress; a quarterly review of scientific thought, work, and affairs. London. 1906.


Sheet Metal Ind. Sheet metal industries. Industrial Newspapers Ltd. London. 1927.

Sklářské rozhledy Sklářské rozhledy. Výzkumný Sklářský Ústav. Králové, Czechoslovakia. 1923?


South. Lumberman Southern lumberman. Nashville, Tenn. 1881.


Spectrochim. acta Spectrochimica acta; commentarium scientificum internationale. Berlin. 1939. Text in English, French, or German.


Sudan Notes & Rec. Sudan notes and records. Middle East Press. Khartoum, Egypt. 1918.


Surveyor Surveyor and municipal and county engineer. London. 1892.


Taxandria (Belgie) Taxandria (Belgie). Vol. 16 (1951).


Tech. Wetenschap. Tijd. Technisch-wetenschappelijk tijdschrift; or-
gaan van de vlaamse ingenieursvereniging.
Antwerp, Belgium. 1937.

Technicka (Budapest) Technicka, journal of technical sciences.
Budapest, Hungary. Suspended with vol.
25, No. 9 (1944).

Teintex Teintex; revue générale des matières colo-

Természettud. Közlöny Természettudományi Közlöny. Journal of
natural history. Discontinued with vol.
76 (Dec. 1944). Resumed publication as
Természettudomány (Natural history) with
vol. 1, No. 1 (1946).

Textil-Praxis Textil-Praxis; Berichte aus Betrieb und For-
schung für Spinnerei, Weberei, Strickerei,
Wirkerei, Flechterei, Bleicherei, Fäberei,
Druckerei und Veredlung. Stuttgart S,
Germany. 1946.

Textile Res. J. Textile research journal. Textile Research
Institute, Inc. New York. 1930.

Tijdspiegel Tijdspiegel; cultureel maandblad voor Lim-
burg, onder de bescherming van de Pro-
vinciale Overheid. Hasselt, Belgium, 1946.

Trans. Amer. Geophys. Union Transactions of the American Geophysical

Trans. Amer. Soc. Mech. Eng. Transactions of the American society of me-
chanical engineers. American Society of
Mechanical Engineers. New York. 1880.

Stoke-on-Trent, England, 1901.

Trans. Canad. Min. Inst. Transactions of the Canadian Mining Insti-
(Inst. Min. Metall.) tute. (Canadian Institute of Mining and

Trans. Chalmers University Transactions of the Faraday Society. To pro-
of Technology. mote the study of sciences lying between
Handl. 1903.

Trans. Hon. Soc. Cymmerodorion

Trans. Inst. Plastics Ind.

Trans. Newcomen Soc.

T.O.C.S.

Trans. Roy. Soc. S. Australia
Transactions of the Royal Society of South Australia. Adelaide, S. Australia. 1877.

Trav. Peinture

Trop. Woods
Tropical woods. Yale University. School of Forestry. New Haven, Conn. 1925.

Ulster J. Ant.
Ulster journal of antiquaries.

Univ. Calif. Los Angeles.
University of California at Los Angeles. Publications in biological science. 1933.


Valeurs
Valeurs; revue de critique et de litterature. Alexandrie. 1945.

Verfkroniek
Verfkroniek; official orgaan van de Vereniging van Vernis-en Verffabrikanten in Nederland. Amsterdam. 1928?


Kl. Wetenschap.

W.A.M. News Bull & Calendar

Workshop Notes Pap.


GENERAL LITERATURE


   Contents: Pt. 1. Review of the literature: Preface; Introduction; Microbiology; Enzyme action; Organic materials utilized by microorganisms; Prevention of deterioration; Testing for fungicidal efficiency. Pt. 2. Investigation of microbiological tests: Development of mildew testing at Bureau; Representative problems; Test methods; Experimental results and discussion; Summary and conclusions; References.


   Importance de "l'unité potentielle" des œuvres d'art en matière de restauration.


   Problèmes de conservation et de restauration chez les Grecs et les Romains. Référence aux sources littéraires.


   In a study of the pioneer work of Klaproth and of Pearson nearly 100 publications prior to 1875 have been located. In addition to being of historical value, many of these early papers provide data that are still useful. Thirty references are listed.


   Klaproth's (1743–1817) analytical methods are critically reviewed. Many of his analyses are given. In addition to pioneering in the analysis of Greek and Roman antiquities, he was the first to analyze an object from the Far East.

6. Centre national de recherches 'Primitifs flamands'. Les primitifs flamands. I, Corpus de la peinture des anciens Pays-Bas méridionaux au quinzième siècle. Fasc. 1 à 4: Le Musée Communal de Bruges par A. Janssens de Bisthoven et R. A. Parmentier. Anvers, De Sik-

Les données de l'histoire et de l'histoire de l'art sont complétées par une "description matérielle" des tableaux étudiés (15 pour Bruges, 5 pour Turin). Celle-ci comprend des caractéristiques d'ordre technique sur la couche protectrice, la couche picturale, la préparation, le support, et le cadre.


An account of the whereabouts and condition of a number of paintings in Italy based on a War Office Report. Includes a list of works stated to be missing from the Naples Gallery.


The main publications of A. Lucas are given.


Tables des matières: Invention et découverte; L'ère de la pierre; Le proche orient ancien; Les classiques, Grèce et Rome; Byzance et les Arabes; Le Moyen-Age; Les XVI et XVII* siècles; Le XVIII* siècle; Les XIX et XX* siècles. Bibliographie.


Contents: Man and nature; The dawn of history (before 3000 B.C.); The Great empires of the ancient Near East (3000–600 B.C.);

Contents: Introduction; Preface; Seeing, perceiving, pleasurable contemplation; Existence, appearance, objective interest in things; Art and symbol; Form, color, tonality, light, gold; The concept of "Pictorial"; Size and scale, distant view, and near view; On linear perspective; Movement; Truth to nature, artistic value, and style; Individuality and type; On beauty; On composition; On the picture categories; Religions and secular history in painting; the nude; "Genre" painting; Landscape; Portraiture; Still life; The artist: genius and talent; Art and erudition; The standpoint of the spectator; On the value of the determination of authorship; On the objective criteria of authorship; On intuition and the first impression; Problems of connoisseurship; The analytical examination of pictures; On the use of photography; On personality and its development; On the anonymous Masters, the medium Masters and the lesser Masters; The study of drawings; Influence; Artistic quality: original and copy; Deductions "a posteriori" from copies regarding lost original; Workshop production; On forgeries; On restorations; On art literature; Index.


Table des matières: Le plus lointain passé; Le monde d'Égypte et de Mésopotamie; La science magique et ses centres; La science logique et l'hellénisme; L'ancienne technique reste florissante; Épilogue du combat; Bibliographie.


A discussion of the structure and causes of deterioration in objects and monuments of stone, glass, bronze, tin, etc.


Contents: List of illustrations; Introduction; Lacquer and lacquered furniture; Paper-hangings, prints, and paintings; Paintings on glass; Porcelain; Painted (Canton) enamels; Carving in ivory, tortoise shell, and mother-of-pearl; Silk textiles; Appendices; Index; Bibliographical footnotes.


   Contents: Foreword, by Tenney L. Davis; Preface; Introduction; Alchemy; Metals; Salt; Ceramic industries; Lacquer and lacquering; Gunpowder; Colors and dyes (Chinese ink—Colors—Chinese stamp ink or *Yin-se*); Vegetable oils and fats; Incense, essential oils, and cosmetics; Sugars; Paper; Leather and glue; Alcoholic beverages and vinegar; Appendices.


   Contents: Introduction; Adhesives; Alcoholic beverages; Animal products; Beads; Building materials; Cosmetics, perfumes, incense, and fragrant woods; Inlaid eyes; Fibres, woven fabrics, dyeing; Glazed ware; Glass and glass manufacture; Metals and alloys, ores, metalworking; Mummification; Oils, fats, and waxes; Painting materials, writing materials; Pottery and potterymaking; Stones, precious and semiprecious; Stones, other than building stones and precious stones—stone vessels; Wood and woodworking, bark, silicified wood, charcoal; Historical summary; Chemical analyses; Index.


21. Marconi, B. Aesthetics and ethics in the conservation of art objects; polychrome painting and sculpture. *Pam. a muz.*, 1, no. 3 (1952), pp. 25–28. (Translated from the Polish.)


   The purpose of the 'Service' is to gather and study all available records, both written and photographic, connected with all the Louvre paintings and thus complete in an interesting way the normal inventory notes. Up to now all the information gathered on Jordaens' "Quatre Evangélistes," and Watteau's "L'Embarquement pour l'ile de Cythère" has been published with many illustrations. PC


   A list with 56 illustrations of paintings from the Kaiser-Friedrich-Museum believed to have been in the shelter on the eve of the fire which destroyed them. SRJ


A book for those not familiar with proper names and terms used in connection with the description of works of art.


This bibliography includes works on painting and the graphic arts, theoretical, historical, and technical. They are listed in three groups: (1) Anonymous printed books, (2) printed books by known authors, and (3) manuscripts, arranged according to the libraries where they may be found.


Contents: Foreword; The look of the antique; Where to find antiques; How to judge antique furniture; Old silver and its imitations; Antique porcelain and earthenware; American glass, pressed and blown; Pewter, brass, and copper; Prints of varied types and kinds; Refinishing antique furniture; Making drawers track and beds usable; Fixing tables and chairs; Proper hardware for antique furniture; Remedies for ailing and damaged glass; Care and treatment of old prints; Care of pewter, silver, and china.


Contains numerous articles on the preservation of buildings and monuments, especially the problems of conservation arising from the destruction in World War II.


Traces the development of ideas concerning the nature of matter and materials, with particular reference to Western alchemy originating in the Near East at the beginning of the Christian Era, and mentions the working notes of early forgers (A.D. 300), Paris alchemists in the early thirteenth century, and the imitation of lapis lazuli by blue glass colored with cobalt described on Assyrian tablets of 650 B.C.


Aims of treatment are defined and correlated with optimum museum conditions which are specified. Material from excavations is discussed in some detail under the two main headings of (a) Stone and other porous material, and (b) Metals, where the various forms of treatment of copper and its alloys, silver, iron and lead are concisely tabulated according to the condition of the find. The subsequent conservation of specimens resolves itself into protection from dust, mould and insects, and various methods suitable under different conditions are outlined. A knowledge of the nature of the chemicals and processes involved is assumed, and the necessity for expert advice on the treatment of works of art is stressed.


Contents: Preface; Pt. I. The terms of drawing and painting; Pt. II. Mode of presentation; Appendix; Bibliographical note; Plates.


These articles in the Shop Talk column review very briefly the types of repairs that can be made to glass, paintings, rugs, furniture, etc., and mention one firm for each type of repair. Very few details of materials and techniques used are given.


Contents: General and miscellaneous; Near East; Egypt; Pre-Hellenic; Greek; Greek and Roman; Roman; Byzantine and Western Medieval; Modern Greek; Later art.

No. 1, January 1951. Title-page and contents also in English. Some English summaries.

The association was founded for artistic research with representation from the disciplines by Taki Seichii in 1933. Offices are maintained at the National Museum, Tokyo, and the papers disseminate the findings of the association on the dating, authenticity, preservation and technology of art objects, which include sculpture, paintings, and crafts.


Original articles that are concerned with the theory and practice of conservation in art and archaeology.

37. TESTI, GINO. *Dizionario di alchimia e di chimica antiquaria*. Roma, Casa editone Mediterranea, 1950. 201 pp., illus.


The directory contains an introduction by Sir Leigh Ashton, an explanatory note, 654 pages of listings, a methodical table of contents, a list of countries, an index, and the text in both English and French.


"This annotated bibliography, covering several of the handicrafts, was prepared by the National Gallery of Art, Index of American Design, in cooperation with the Division of Vocational Education, Office of Education, Federal Security Agency. It is not in any sense a complete listing of books on any one subject, but includes publications in a number of craft fields which give information on the making as well as the designing of craft products . . ."—Foreword.


Contents include: Ch. VII. Technical methods. This chapter describes the technique of cleaning and preserving museum objects . . . Ch. IX. Historic house museums. Discusses protection of these museums. Bibliography. Index.

The author attributes on stylistic grounds the restorations of the Metropolitan Museum's "Dying Meleager," Roman, Second Century A.D., to Valerio Cioli, born in Settignano in 1529. Cioli, a pupil of Niccolo Tribolo, is known to have worked at the restoration of ancient sculpture in Rome in the 1550's and in Florence for Cosimo I from 1561. He was the sculptor of various figures in the Boboli gardens. Vasari mentioned Cioli and Montorsoli as restorers of ancient sculpture but neglected to mention the third eminent restorer Giovanantonio Dosio.


This publication contains a number of articles concerning museum laboratories. Written in Serbian or Croatian, they are followed by short résumés in French. The main subjects are: Conditions and problems of the Historic Monuments Department in Yugoslavia; Basic principles in restoration; Views on the protection and conservation of archeological sites and monuments; Conservation of fortified castles; Problems of conservation for ethnographical material; Conservation of museum objects; Cleaning and restoration of frescoes, icons, paintings, monuments, etc.; organization of the Historic Monuments Service in Croatia, Bosnia, Herzegovinia, Macedonia, Serbia, and Montenegro.

**MUSEOLOGY**

**A. INSTITUTIONAL ESTABLISHMENTS**


Announcement of the formation of the association. Membership is restricted to British-born subjects.


Lists the patrons and trustees, officers, activities of the association, and financial reports for the year.

The A. M. laboratory of the Ministry of Works in London is staffed by a scientist and three technical assistants who work in small but well-fitted quarters in Lambeth Bridge House. Much of the laboratory time is spent on research connected with the repair of ancient monuments and historic buildings. Examples are given of many interesting problems that arise in the preservation of objects and artifacts found in archaeological excavations about the monuments.

RJG


An announcement of the founding of the International Institute for the Conservation of Museum Objects with aims and purposes. Previous work in the field of art conservation is reviewed.

RJG


The Institute of Book Pathology has been designated by the Ministry of Public Instruction to coordinate the work of the various libraries in Italy in repairing and restoring books and manuscripts. It here reprints the letter sent to the libraries giving the general principles of restoration work and asking for information on their restoration services.

RJG


Aperçu de l'activité scientifique du laboratoire, avec mention des publications parues à ce sujet. Transposition de peintures murales, analyse de leurs liants et pigments; examen scientifique et conservation d'une châsses en argent doré.

PC


Editorial reference to the announcement of the foundation of the Association of British Picture Restorers.

SRJ


Describes the one-year course offered at the Institute of Archaeology, London. The practical side includes: Cleaning, mending, and restoration of pottery and bones and other materials; casting, modeling, and dioramas; drawing of archaeological objects; museum case fitting, layout and labeling; photography and survey. There are lectures and demonstrations on various subjects.

RJG


Appareillage scientifique et méthodes utilisées.


Among the resolutions adopted are those that relate to (1) exchange of restorers and (2) care of paintings.


The incorporation as a company under English law by the Board of Trade of the International Institute for the Conservation of Museum Objects is announced. "It is a professional body formed for the purpose of setting and maintaining a high standard of skill and competence in the conservation of all kinds of valuable material and artistic patrimony." The problem of conservation of museum objects, the need for scientifically trained personnel and a need for adequate standards of attainment are discussed.

The Institute is to have its headquarters in London. The members will be of two grades; fellows and associates (with the rank of honorary fellow available for persons of outstanding distinction). The Institute proposes to foster publication, to encourage training in the theory and practice of conservation, and to cooperate with other institutions with related interests.


A brief account of the founding of the Intermuseum Conservation Association under the joint sponsorship of the Albright Gallery, Buffalo; Columbus, Ohio, Gallery of Fine Art; Allen Memorial Art Museum, Oberlin; The John Herron Art Institute, Indianapolis; The Toledo, Ohio, Museum of Art; and the Davenport, Iowa, Municipal Art Gallery. The project (1) embraces the idea of conservation, a long-term plan for the maintenance of the structure and artistic integrity of museum objects, and (2) provides these services as a professional rather than a commercial enterprise. The laboratory at Oberlin, which is under the direction of Richard D. Buck, has been equipped with X-ray, microscopes, and other tools necessary for the examination of works of art.

The physics laboratory has been operating since 1934. It concerns itself with technical examination of paintings chiefly by means of X-radiography, colorimetry, and infrared photography. More recently a chemical laboratory has been established in which problems relating to the cleaning of paintings are studied. These include investigation of organic solvents suitable for use in cleaning operations, preparation of cross sections of paint specimens, identification of pigments and mediums, relining adhesives, surface coatings, and moisture barriers. Although much of the effort is directed to the solving of immediate problems some attention is given to the philosophical and methodological aspects of an objective approach to cultural matters. RJJ


The Lenin State Library in Moscow has carried on book conservation and restoration for over 10 years. Chemical and entomological laboratory workers study the causes of book destruction and learn thereby what conditions are best for book storage. The laboratory gives scientific counsel to other libraries.

59. Rome (City) Institut de pathologie du livre. l'Institut de pathologie du livre à Rome. Roma, 1952. 35 pp., illus.

Contents: Organisation; I. Le Musée—la Bibliothèque—la Photothèque—le Laboratoire de restauration; II. La Biologie—l'Entomologie—la Microbiologie (Mycologie et Bactériologie); III. La Chimie—la Laboratoire de chimie—la Chambre d'isolement et de désinfection; IV. La Physique—le Laboratoire d'optique physique—le Laboratoire de technologie; V. La Technologie—le Laboratoire de technologie—le Laboratoire de chalcographie—la Fabrique de papier. BMU


Brochure contenant une description de l'organisation et du fonctionnement.

RL


The archaeological research laboratory established in 1950 in the Musée historique of Nancy has two purposes: to revive early craft techniques and to restore and preserve objects. Examination and treatment is described of objects including a 6th century vase and a Merovingian damascened sword. NLB
   Activities of Institut Mainini of the Louvre, Paris, and Istituto Centrale del Restauro, Rome, are described. KY

   The association was founded in 1933 by the late Dr. Seiichi Taki. It was reorganized in 1947 by the late Dr. Keita Shibata. KY

64. South African commission for the preservation of natural and historical monuments, relics and antiquities. *Report of the commission ... for the period 1st April, 1949 to 31st March, 1950.* 10 pp. (Annual report, no. 15.) Text in English and Dutch. BMU


   Mesures sur la coopération des États intéressés à la protection, conservation et restauration des antiquités, des monuments et des sites archéologiques ainsi que sur la possibilité d'établir un fonds international pour subventionner les travaux de conservation et de restauration.

   Several museums in Washington area are cooperating with Park Service in showing the class behind the scenes and demonstrating techniques. Contents: Schedule; The literature of museum work; Accessioning and cataloging; Problems of identification; Storage and use of study collections; Preservation of museum specimens; Making plaster molds and casts; Types of museum exhibits; Measuring the effectiveness of exhibits; Museum planning; Museum visits; Educational use of museum exhibits; Designing and installing a special temporary exhibit; Label writing; Trailside exhibits; The place of the museum in the National Park Service. Reviewed in: *ICOM news*, 5 (Aug. 1952), p. 30. BMU
B. Framing, Mounting, Exhibition, and Storage

   Historique du cadre et évolution de ses formes. PC

   Contents: Introduction; Protection required; Classification of records; Short-term storage—preparation for storage—fire protection—storage relative humidity—storage temperatures—chemical contamination; Archival storage—specification for archival storage; Moderate-term storage; Storage of sheet-film records; Storage of photographic-paper records; Handling film; Summary; Test references; Summary table; Tests for permanence; Bibliography. BMU


   Use of methyl methacrylate. IG

   The hanging policy in Italian museums is discussed and approved for its intelligence and taste, particularly in the use of dull pale colors as backgrounds. In the National Gallery, on the other hand, use is made of tinted walls and curtains, including pink in the Rembrandt room. SRJ

   Illustrated examples of the use of Perspex (acrylic resin) for mounting. SRJ

   After listing the characteristics of an ideal container, the advantages of a pressboard container clad inside and out with shiny aluminum foil are described. RJG


Covers briefly housing, storage, outsize maps, classification, cataloging, indexing, repair and mounting, and service.


An editorial recording the reinstallation after cleaning of Rubens' nine paintings for the Whitehall Banqueting Hall ceiling. The present lighting system is considered to be unsatisfactory owing to glare.

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C. **Control of Agencies of Deterioration** (Atmospheric Pollution, Dust, Humidity, and Pests)


In the new installation for Gallery XXIX temperature is maintained at 65°F. and r.h. at 58 percent throughout the year and 24 hours each day. There are six complete changes of air each hour; 90 percent of it is returned to the plant room for re-use. The air is cleaned by passing through a cloth screen and then through a water spray. Lighting is supplied by a bank of fluorescent tubes around the room; they are concealed within a system of deep louvres which form a pattern in the laylights.


Fourteen solutions reported for 15° to 30° C.; sixteen for 80° to 90° C. Seventy-seven solutions in all, ranging from 20.4 to 85.0 percent relative humidity and 15° to 90° C.


A review with 49 references.


Though the report deals with the stability of wood during manufacture, the discussion and the tables have a bearing on museum prob-
lems. Variations in relative humidity inside heated buildings are great between summer and winter conditions but may be moderated by use of suitable control equipment.

RDB


The number of medieval wax seals in the Swedish riksarkiv is estimated at about 30,000. A large proportion are damaged. The principal cause of the breaking up of seals is the activity of a ray fungus whose growing spores perforate the wax of the seal and form microscopic canals with a diameter of about 0.001 mm. Evidence of the fungus appears first as whitish-gold spots, which gradually spread over the seals. The wax changes to an opaque whitish-yellow substance which crumbles. A vacuum apparatus is described (with diagram) in which parchment documents can be placed and the seals, which hang from a parchment strap, are impregnated with a wax substitute. Formula of the substitute is 200 g. French turpentine, 10 g. linseed oil, 5 g. solution containing cobalt and linseed oil (c. 50 percent), 3 g. solution containing copper (c. 50 percent), 15 g. benzene, 5 g. Barnstens lacquer (ed. note: not identified).

RJG


The 5-year sojourn of the National Gallery collection in Manod slate quarry in Wales during the war demonstrated the beneficial effects of constant temperature and humidity in the preservation of panel paintings. This has stimulated the Ministry of Works to install in Gallery XXIX a complete air-conditioning system. “The design of the air-conditioning plant is based on the well-established pattern of the filtration of fresh air, mixed with recirculated air. The makers' guaranteed efficiency is 99.9 percent for particles down to two microns. The filtered air passes through a pre-heater battery, of the hot-water pattern thermostatically controlled by a dew-point element, placed beyond the humidifying chamber. This chamber with its finely divided water sprays is capable of controlling the amount of moisture in the air stream. When the heat content of the mixed air entering the washer exceeds the desired amount, the preheater is automatically 'cut' and chilled water from a refrigerating plant is admitted to the spray water, thus reducing the saturated air to the desired temperature. The saturated air stream is then warmed to whatever temperature is required in the gallery and regulated automatically by an element placed in the return air duct from the gallery.” Thus the air leaving the plant has been cleaned by filters, given its required amount of moisture and finally warmed to the desired degree for the comfort of the spectators and the welfare of the pictures.

RJG

Facts and figures about the penetration of dust into closed places caused by changes in temperature and in barometric and wind pressures. Data on various types of dust filters. Practical methods for dust-proofing museum storerooms, cabinet drawers, show cases, and framed pictures.

RJG


Information is given on those properties of silica gel and wood that are instrumental in controlling the relative humidity within a package or similar closed space. The influence of thickness, relative humidity, and pressure on the permeability constant of permeable barriers is also discussed. Many data are presented in tables and charts.

RJG


Discusses smoke effects on: Building materials; Metals; Fabrics; Leather; Works of art.

BMU


Contents: Introduction; Origin of fuel; Natural fuels; Artificial fuels; Industrial boilers; Power and electricity; Industrial furnaces; Domestic fires; Atmospheric pollution; Measurement of atmospheric pollution; Distribution of pollution; Changes in pollution; Effects of pollution; Prevention of atmospheric pollution; The law and its administration; Index.


BMU


Contents: Clothes moths and house moths; Carpet beetles; The nature of the damage caused by wool pests; Mothproofing with dyestuffs; Mothproofing with fluorides; Mothproofing with colourless dyestuffs of the triphenylmethane series; Mothproofing with Mitin FF; Mothproofing with pentachlorophenol; Mothproofing with DDT; Mothproofing with phosphonium compounds; Mothproofing with formaldehyde; The nutritional requirements of the clothes-moth larvae; Mothproofing by modification of the molecular structure of wool; Mothproofing during dry-cleaning; Infestation precautions and remedies; Breeding and rearing moths; Testing the mothproof; References; Name index; Subject index.

BMU
89. **Moss, A. A.** DDT *M.J.*, 46 (1946), pp. 21–22.

DDT, which is \( \text{Cl} \quad \text{CH} \quad \text{Cl} \) linked to chloroform residue and hence is not greatly different from materials which have long been used for museum disinfection purposes. It is a remarkably effective insecticide in low concentrations; it is computed that one billionth of a gram per square centimeter of surface will poison a moth, caterpillar, or fly. A proposed moth preventive spray has the following approximate composition:

- Pyrethrum extract (20 percent w/v pyrethrum) ................. 2 fluid oz.
- Sesame oil, active ........................................... 10 fluid oz.
- DDT Technical (not less than 70 percent DDT) .................. \( \frac{1}{3} \) lb.
- White spirit (kerosene) ........................................ 5 gal.

The pyrethrum extract activated by the sesame oil is incorporated on account of its “knock down” effect on adult moths. It is not considered that DDT in this concentration is harmful to humans. DDT is stable and does not decompose under the influence of light or by oxidation. It is reacted upon, however, by hot alkaline solutions and is decomposed by hot water to give hydrochloric acid. Under normal usage, however, it has been found by the British Museum Laboratory that it is unlikely to damage wood, metals, or fabrics. It is not known to affect adversely modern dyestuffs. What action it may have on ancient dyestuffs has not been determined; this is a matter for further study.

RJG


Dust scattered in the air of the National Museum of Tokyo was studied during November 11–29, 1948. Dust samples were collected in glass dishes containing glycerine which had been placed in the show cases. Several thousand particles per sq. cm. were collected during that period. Dusts consisted mainly of mineral particles with small amounts of fibres. Very few micro-organisms were found. The same experiments as in Part I were done in May 30–June 14, 1949, and February 7–22, 1950, in the National Museum of Tokyo. The number of micro-organisms increased in summer and decreased in winter. Dust particles in the air of the interior of the Shô-sô-in, Nara Imperial Treasure House, are fewer than those of the Museum of Tokyo.

KY

Relative humidities and temperatures in the storehouses of the National Museum of Tokyo were determined from May 1948 to August 1949, and the results are discussed.


Results with 47 chemicals are listed. Most promising from standpoint of effectiveness, moderate evaporation tendency, and a solid state at ordinary temperatures, as indicated by trials on wood, leather, malt-agar, and pressure tape, were p-dichloro-benzene, Insl.-X Volatile fungicide, and ethyl mercuric chloride.


The apparatus makes use of a wood-element hygrostat and heat-controlled evaporation of water. The water is evaporated by heat supplied electrically in response to movement of the wood element against a microswitch. It is capable of controlling the humidity in rooms of 600-cubic-foot capacity with well-sealed walls. This hygrostat will operate reliably over a period of years and will maintain control of relative humidity up to 70 percent with deviations of about plus or minus 2 percent. Detailed diagrams are given. Information may have application in design of museum storage areas and in experimental techniques.


This method of using paper impregnated with cobaltous salts offers a simple procedure for measuring humidity in small spaces. CoCl₂ is blue at low humidities, pale red at high humidities, with a graded series of lilac colors between. Correspondence between color and relative humidity (R.H.) is close, though the color is influenced slightly by temperature. Color is determined chiefly by the relative quantities of CoCl₂ and water in the paper. Preparation of CoCl₂ paper: Dried filter paper is immersed in a 2.165 N solution for 1 minute at 20°. The wet paper is pressed between 2 changes of desiccator-dried filter paper and allowed to dry slowly at room humidity. With care, R.H. can be measured with this paper within 2 percent in the 40–70 percent range, and to within 5 percent above and below this range (except low humidities at low temperatures). R.H. is estimated by matching the colors of the paper by eye against calibrated standard papers prepared as follows: KOH solutions are made up to give R.H. intervals over the desired range (cf. *C.A.*, 28, 7136). The KOH solutions are placed in rubber-stoppered bottles, CoCl₂ paper is suspended in each bottle for 2 hours at constant temperature; then the paper is immersed in liquid...
paraffin, doubled over to intensify the color, and mounted in liquid paraffin between opal glass and clear glass. Excess liquid paraffin is removed by pressure and the edges of the standard are sealed with a stiff solution of Na silicate. Standards so prepared keep for at least 4 months. Various substrates other than paper (e.g., mercerized cotton) cause the blue color to persist at higher humidities. Certain salts (e.g., KSCN, Na2SO3) produce a similar, but greater effect and stronger colors; their use affords greater accuracy at high humidities. Addition of ZnCl2 or certain other salts adapts the method for use at low humidities. Papers impregnated with Co(CNS)2.½ H2O are more suitable than CoCl2·6H2O for use above 50 percent R.H. Preparation and use of these papers are described.


Excellent data from 95 to 5 percent relative humidity using three common chemicals. Fifteen values also reported in four significant figures using a variety of compounds. Reported as activity of water (relative vapor pressure). Relative humidity is ordinarily taken as equal to this.

Rlf


In the Worcester Art Museum storage room $A$, which holds panel paintings, furniture, and other objects primarily of wood, is conditioned $52 \pm 3$ percent relative humidity. Storage $B$, which contains textiles, drawings, and prints, is kept at relative humidity $40 \pm 1$ percent. Storage $C$ for glass, ceramics, stone, and similar materials, is unregulated. If gallery conditions become unsuitable for a particular object, that object can be moved to the storage area that is appropriate. Dehydration in $A$ and $B$ areas is done with Carrier units (No. 53 Fr-179) controlled by a Minneapolis-Honeywell hair-element humidistat. The humidifier in storage $A$ is a Walton open-tank model actuated also by a humidistat. It is able to evaporate about 1 gallon of water per hour.

Rjg


Various methods that have been used for inhibiting mold, including periodic cleaning, sterilization, dehumidification, and fungicidal treatment, are reviewed. The experimental work showed that Cresatin ($m$-cresyl acetate) vapor was the only treatment that completely prevented mold growth in binoculars. The Cresatin, however, was corrosive to the copper-alloy prism shields. Sodium ethylmercurithiosalicylate permitted some mold growth. Silica gel desiccators kept the humidity low for too short a period. Thanite (fenchyl thiocyno acetate) did not prevent mold growth. Ultraviolet germicidal lamps used to sterilize the interiors of binoculars during assembly did not prevent
mold growth. Waterproofed binoculars became moldy about as readily as relatively poorly sealed binoculars. The magnesium fluoride-coated lenses were subject to mold growth.


M.T.S. (sodium ethylmercurithiosalicylate), incorporated in luting wax and black lacquer, proved a very active fungicide and fungistat. Results of laboratory exposure tests and field experience are given.


Contents indicated by title.


Optical glass rapidly deteriorates in the Tropics, owing to fungus growth on lenses. Volatile fungicides, such as metatolyl acetate and sodium ethyl mercuric thiosalicylate, are used as preventives but corrode metal and have a temporary effect. Radium sulfate and gold + barium sulfate foil, 0.003 inch thick, containing 15γ radium per square inch, as a collar about lenses, one-ninth the lens radius wide, prevented fungus fouling under severe testing conditions. The fungicidal effect is due to α rays; β and γ rays are ineffective. The treatment can be used on lenses up to 3 inches diameter, is effective against numerous fungi, is economically feasible, and, when used on binoculars, transits, etc., is without health hazard to operating personnel. It applies to concave and convex lenses, and theoretically could be extended to lenses of 5 inches diameter if Ra C', with more penetrating rays, were substituted for Ra D.


Rapid measurement of equilibrium humidity can be made in a simple, easily made manometric apparatus. Errors due to absorbed gases are avoided by measurement of the pressure exerted and after freezing out moisture vapor.
D. LIGHTING INSTALLATIONS AND THE EFFECT OF LIGHT ON OBJECTS


Interim observations by the ICOM Commission for the Scientific Study of Lighting Problems on some tests on the deterioration of paintings by light, which were started in March 1950 at the Laboratoire Central des Industries Électriques (Chantillon, Seine, France). Certain suggestions are made for enlarging the scope of the experiment and increasing the quality of the tests.  


During reinstatement of the war-damaged museum the opportunity was taken to improve the lighting. Thermolux (spun glass laminated between ordinary clear glass) was used in the laylight which is illuminated at night from above by mixed tungsten and fluorescent lamps. Measurements of chromaticity and distribution are given.  


Genard’s suggestion (C.A., 46 (1952), 9421f) that radiation from fluorescent lamps may cause more fading of some exhibits in museums than daylight or incandescent light is denied.  


In reply to claims that fluorescent lighting may be deleterious to museum objects the National Gallery Advisory Scientific Committee goes on record with the statement "no harm could possibly be done to the pictures, either on account of the emission of ultraviolet, or any other radiation."  


Wavelength characteristics of various sources of light are reviewed. The ultraviolet radiation characteristics of 96 new tubular fluorescent lamps of 43 different types and makes are tabulated. In general, after a tube has been used for 1,000 hours the extreme ultraviolet radiation is 25 percent less. Many tubes emit ultraviolet radiation extending as far as 280–290μ. Despite the low intensity of these radiations they
may over a long period accelerate the photochemical deterioration of materials.


The authors describe a museum display demonstrating some problems and technical principles concerned with lighting show cases.


Develops three elemental kinds of light effect which can be related to the art of painting for easier visualization: (1) Focal glow, (2) Ambient luminescence, (3) Play of brilliants. Lists numerous developments in artificial lighting over the past 25 years which affect the viewing of paintings.


This is the report of a discussion on museum and gallery lighting which took place during the Birmingham meeting of the British Association. Papers were read by W. E. Rawson-Bottom (Ministry of Works) and F. I. G. Rawlins (National Gallery, London). Efficient use of fluorescent lighting was stressed. Tests show the pictures possess reflectivities of around 10, 20, 35 percent of which 20 percent is by far the most common. Backgrounds are pleasing when they are of this order of reflectivity.


Some comments on the article by J. Genard in the April issue of the M. J. (See no. 106). Fugitive dyestuffs were exposed 12 inches distant from a warm-white fluorescent tube at 19.4° C. and 38 percent relative humidity for 24,000 footcandle hours under the following conditions: 1, Exposed to direct radiation from the lamp. No glass. 2, Same radiation but through ordinary window glass, 3 mm. thick. 3, Same radiation but through a glass filter opaque to all radiations <3,700 Å. Approximately equal fading occurred under all three conditions of exposure. The danger of fading of museum objects due to the normal use of fluorescent lighting is negligible.

For museum purposes the fluorescent “Daylight” lamps with color temperature approximating 4,500° (Kelvin) are the most effective for general use. Lamps with color temperature of 6,500° K. are effective in show cases where color rendering is of prime importance. Spot filament lamps are still useful for emphasis lighting. Fittings and special illumination problems are discussed.  


In a number devoted to Swedish museums, the text and numerous illustrations on the pages indicated are concerned with museographical techniques, including lighting and storage.

E. PACkING AND TRANSPORTATION


A report of a joint section meeting at the A.A.M. Convention in Quebec, May 1947, by George L. Stout, Charles M. Richards, and Robert S. Sugden covers: Construction of packing cases—cover attachment, waterproofing, interior partitions, separators, size, sculpture, large and heavy objects, large statuary, padding and wrapping, fragile frames, unframed pictures and fragile objects, and sculpture. “Good as it is, the best packing done today takes little advantage of technological developments made through applied science within the past century.”


The dangers in respect to physical damage attendant upon lending works of art is reviewed.


An international survey by various authors with an introduction by Grace Morley, which includes details of transport and package methods as well as exhibition technique. Sixty-six illustrations.


Illustrations only, with detail captions in French and English.
   Contents: Foreword; Paintings; Large objects; Small objects; Textiles; Works on paper.
   This is a primer on the subject; it is well illustrated. It gives definite instructions on handling museum objects in the form of "do’s" and "don’t’s."  
   RJG

119. Sugden, Robert P. *Safeguarding works of art; storage, packing, transportation and insurance...* New York, Metropolitan museum of art, 1948. 80 pp., illus.
   Contents: Introduction; Storage; Packing; Transportation; Insurance; Bibliography; Index.  
   BMU

F. EMERGENCY PROTECTION

[This subsection is limited because the subject has been so adequately covered by the bibliography compiled by Nelson R. Burr (See item no. 125). The items given here are not covered by Burr.]

   A short account of what happened to a few important Belgian works of art during the war, 1939–1945, and their recovery.  
   PC

   War damage to art treasures in proportion to the destruction of ordinary property and industrial installations was miraculously slight. Of 7,424 objects and structures registered as National treasures only 293 (or approximately 3.9 percent) were either destroyed or damaged, and this figure included many pieces which suffered only moderate damage. The more important losses are listed.  
   RJJ

   Dispositions prises aux Pays-Bas en vue de la protection des monuments historiques et autres biens culturels en cas de conflit armé.  
   BMU

A report by an international committee on the problems of protecting "artistic and historical monuments and sites and of archaeological excavations." The report is illustrated with examples of the various problems particularly in the restoration of war-damaged buildings.


Tabulates causes of damage and analyses the relative values of various materials and methods used in packing and storage. The usefulness of dry hygroscopic material is stressed, and conditions of storage at 60 ± 5 percent R.H. and 60 ± 5° F. are recommended.


An annotated bibliography with author index.


G. Fire Prevention


Contents: Foreword; Author's preface; Fire safety in the atomic age; Building in the atomic age; Continuing fire; Primary fire effects; Conflagration and fire storm; Fire fighting; Buildings and structures; Outdoor storage; Combustible buildings; "Occupancy" and fire loading; Fire-resistive buildings; Steel frame buildings; Top limits of fire loading; Compartmentation; Automatic sprinklers; The fate of cities; Bibliography; Index.


Contents: Preface; Introduction; Frame (or combustible) construction; Ordinary brick or non-fireproof construction; Mill construction (sometimes called); Slow-burning or heavy timber construction; Fire
resistive (but more commonly and incorrectly called) fireproof construction; Inspecting for fire underwriting purposes; Automatic sprinkler systems; Review of plans, fire resistive buildings; Fire resistance ratings; Appraisals; Students examination questions; Some terms used in building construction; Books on building construction. BMU


H. SALVAGE WORK IN FIELD EXCAVATIONS

133. Atkinson, R. J. C. Field archaeology. London, Methuen & co., ltd., 1946. 238 pp., illus., pls., diagrs.

Contents: Introduction; Field work; Excavation; Archaeological surveying; Recording; Photography; Interpretation; The publication of archaeological reports; Glossary of archaeological terms; App. I. The cleaning and restoration of finds; App. II. Treasure trove; App. III.
Experimental techniques; Tables I-II. Selected bibliography; Index. Description of plates.
BMU


Basic rules are: (1) Collection of intact specimens or the largest possible fragments; (2) recording of accurate data regarding the position of specimens in the site and the nature of the medium in which they are found; and (3) adequate preservation or storage of the material collected. Specific directions are given for the preservation of peat, seeds and leaves, wood and charcoal.
RJG


Contents: Prólogo, por Alfonso Caso; Generalidades; El arqueólogo en el campo; Estratigrafía; Exploración de tumbas; Tratamiento de las objetos; Exploración de edificios; Documentación fotográfica; Levantamiento de croquis; Reconstrucción de edificios; El arqueólogo en el laboratorio; Apéndices; Bibliografía; Índice de figuras; Índice de láminas; Índice general.
BMU


A description of the use of acetic acid and sodium hydroxide to dissolve the breccia. "Tornesite," a chlorinated rubber varnish to protect exposed parts of the bone.
IG

137. HEIZER, ROBERT FLEMING (ed.) A manual of archaeological field methods, rev. ed. Prepared for use by the Archaeological Survey and the Department of Anthropology of the University of California at Berkeley. Millbrae, Calif., National press, c1950. 85 pp., illus., maps.

Contents: Preface; Introduction; Aerial site survey; Interpretation of data; Preparation for excavation; Methods of excavation; Recording excavation data and collecting artifacts; Features; Excavation and recording skeletal remains; Structural remains; Recovery and significance of unmodified faunal remains; Stratigraphy and chronologic methods; Photographic records; Care and preservation of archaeological specimens; Field catalogue; Typology; Cultural classification in Central California; Recording local collections; State and federal regulations concerning archaeological sites; The names and distribution of recent California Indian tribes; Chronological methods; General reference bibliography; References cited in text.
BMU


Contents: Foreword; The meaning of archaeology; The framework of archaeology; Fields of archaeological work; How to become an
archaeologist; The technique of field work—Excavating; The technique of field work—Recording; The technique of field work—Dealing with finds; Field work—Field surveys and air photographs; Appendices: I. Bibliography; II. Archaeological training in universities. III. British schools of archaeology; IV. Archaeological posts. V. Archaeological societies; Index.

BMU

139. MOHD, KHAN BAHADUR, and ULLAH, SANA. Notes on the preservation of antiquities in the field. *Anc. India*, no. 1 (Jan. 1946), pp. 77–82.


RJG


Covers in detail the process developed for the stripping and separating of superimposed layers of painted adobe plaster on kiva walls. Gives formulas of the plastic stripping solution used for applying facings; describes the technique employed in pulling the paintings and in transferring them to separate and independent Untempered Masonite Presdwood supports.

RJG


Describes the use of polystyrene in ethyl acetate to strengthen and protect the bone and acetic or formic acid to remove the matrix. (*See* no. 136.)

IG


Wet objects in archaeological sites, like wool and bone, can be hardened with a 20 percent wt./vol. polyvinyl acetate in toluene emulsified with 25–40 percent of a wetting agent like "Teepol." The method of application is described.
I. Relations to the Physical Sciences


Committee formed by the Royal Anthropological Institute to investigate problems of ancient mining and metallurgy. It is at the service of archaeologists and will advise and sometimes carry out analyses.


Généralités. Nécessité de l'exécution de l'examen scientifique avant restauration, de la réunion d'informations techniques et de la formation des restaurateurs.


A statement of the policies and the new approach to restoration which are being carried on under the direction of Cesare Brandi at the Istituto Centrale del Restauro at Rome.


The chemical examination of ancient materials and objects can contribute much to archaeology. Examples are given of the identification of materials, of the determination of their sources, and of the application of chemical data to the dating of objects and the determination of their uses. Problems of chemical changes during burial and methods for restoration and preservation of antiquities are discussed. It is proposed to call this field of investigation "archaeological chemistry."


A knowledge of the chemical composition of such materials and objects is interesting to the chemist and useful to the archaeologist. A very considerable number of specimens of ancient metals, alloys, pigments, ceramic materials, and even organic materials have been analyzed. The information obtained by these analyses has often been useful to the archaeologist in establishing the exact identity of materials, the technique employed in the manufacture of objects, the cultural or economic status of ancient peoples, and the dating of materials and objects. A knowledge of their composition is often useful for restoring or preserving them for study or for exhibition in museums.
Much remains to be done before our knowledge of the chemical composition of ancient materials and objects reaches a satisfactory state.


Short note on Mr. Rawlins' work in the National Gallery since 1934.


Contents: Introduction, by James B. Griffin; Recent advances in surveying techniques and their application to archaeology, by Albert C. Spaulding; The use of earth-moving machinery in archaeological excavations, by Waldo R. Wedel; Collaboration among scientific fields with special reference to archaeology, by Frederick Johnson; Recent developments in the treatment of archaeological textiles, by Junius Bird; Principles in the conservation of mural paintings, by Rutherford J. Gettens; Chemical analysis of fossil bone, by Sherburne F. Cook; Metallurgical analyses and their aid to archaeology, by William C. Root; Applications of X-ray to archaeology, by Paul F. Titterington; Carbon14 dating, by Donald Collier; Ceramic technology as an aid to cultural interpretation—techniques and problems, by Frederick R. Matson; The
use of mathematical formulations in archaeological analysis, by George W. Brainerd; The use of IBM machines in analyzing anthropological data, by Frederick P. Thieme; Final session; Participants; Selected bibliography.


Généralités.


An illustrated account of the work of F. I. G. Rawlins at the National Gallery. Examination of the individual coats comprising a painting gives information as to its age, authenticity and the technique used by the painter.


A general discussion of scientific methods which have been applied to the care of objects of art.


Chemical changes occurring in various types of artifacts are discussed and many illustrations given.


Popular article describing mainly examples of scientific examination and conservation in art at the Fogg Museum of Art.


Gives examples of the dependence of archaeological research on data provided by physical science.


An account of scientific studies of objects in metal, wood, ceramics, and stone carried on with the aid of collaborators from various fields.


A radio talk given Dec. 22, 1946, under the sponsorship of the U. S. Rubber Company.

Contents: L'introduction et les notes préliminaires aux quatre parties de l'ouvrage ont été rédigées, par A. Laming; La photographie aérienne, par G. Bailloud, et P. Chombart de Lauwe; Méthodes électriques de prospection, par R. J. C. Atkinson; Le détecteur électro-magnétique, par A. Laming. Pt. II. Le milieu préhistorique: L'étude des sédiments, base de la reconstitution du milieu physique—le sol, les eaux, le climat; Étude des vestiges zoologiques, par A. Leroi-Gourhan; L'étude de la flore, par G. Lemée. Pt. III. Le cadre chronologique: L'analyse des cercles de croissances, par A. Laming; La datation des os fossiles par l'analyse de leur teneur en fluor; par K. P. Oakley; Le C 14: La datation des matériaux archéologiques et géologiques par leur contenu en carbone radioactif, par Hallam L. Movius; L'aimantation thermorémantine des terres cuites, par A. Laming (avec la collaboration de E. Thellier); Pt. IV. L'étude des vestiges de l'industrie humaine: L'identification pétrographique des instruments de pierre, par J. F. S. Stone; Les micro-organismes du silex, par A. Laming (avec la collaboration de G. Deflandre); Reconstruction des techniques—la poterie, par H. Balfet—le métal, par A. France-Lanord; Conclusion, par A. Laming; Appendices: Notes bibliographiques et renseignements pratiques; Index.

BMU


Discusses the application and role of science in the judgment and authentication of works of art. The closing paragraph reads: "But it is always important to remember that scientific instruments are no substitutes for taste and judgment. They are accurate, dependable, and precise, within their proper limitations, but we must know what questions to ask of them. And the answers, at best, are only a part of what we need to know. We can approach the truth only when we have assembled all the evidence, and this evidence must always include wise judgments in the fields of history and connoisseurship, along with the subjective technical data. After assembling our data we must still employ, moreover, discrimination and selection. Each work of art is a complex and unique entity, involving not only the three simple dimensions of space, but others less easily measured and tabulated, such as aesthetic content and existence in time. All of our most important decisions must recognize these intangible as well as the material dimensions."

RJG


An examination of the methodology of "Science in the Service of the Arts": the use of laboratory tools cannot answer questions of style and taste; to answer questions of attribution a greater emphasis upon ex-

A consideration of the relation between the methodology of science and stylistic knowledge and insight. In this context natural science is auxiliary to the fine arts. The equipment of the National Gallery Laboratory is described and examples are given of the results obtained and their interpretation.


An announcement of the establishment at the National Gallery, London, by the Nuffield Foundation, of two graduate scholarships, one in chemistry and one in physics, with an assistant for a period of three years under the direction of F. I. G. Rawlins. The main theme will be the chemistry and physics of diffusion and swelling of paint and varnish films by solvents. The long-range purpose is to establish the optimum conditions for the easy and rapid removal of undesired overpainting and deteriorated varnishes from paintings.


A relative humidity of 58 percent and a temperature of approximately 64° F. are the optimum environment for paintings in order to prevent stresses and strains in the support of wood or canvas and to prevent blisters and flaking of the paint itself. X-ray diffraction studies of the grounds of classical Italian paintings reveal the use of mixtures of anhydrite and gypsum, never plaster of Paris. Sections are devoted to the use, in the study of paintings, of ultraviolet, infrared, densitometry of X-ray films, tintometry, measurement of gloss, identification of pigments by spot tests and by a modified metallurgical technique, use of new materials in conservation (e.g., synthetic adhesives in the "transfer" or reattachment of a painting to a new support) and as surface coatings (e.g., synthetic resins), and long-term research on such problems as "cleaning" of paintings and the composition of natural resins.


Contents: Physics of locomotion; Communication physics; Physics and pottery; Physics and the culinary arts; Physics on the farm; River hydrology; Physics down the mine; Physics in fine arts and archaeology; Physics of building materials; Architectural physics; Science and the musician; Textile physics; Physics of detection; Index.

The advancement of archaeology in the future will depend largely on the application of other sciences, both for the study of materials already collected as well as those newly brought to light. Even the proper removal of certain objects from excavations and their preservation may depend on a knowledge of the composition and properties of ancient materials. Laboratory investigation of objects and materials may be necessary for the proper understanding of discoveries. Of particular interest are applications of statistics and other mathematical tools to the interpretation of archaeological data.

**J. IDENTIFICATION OF FAKEs AND FORGERIES**


An account of the nineteenth-century Florentine sculptor whose works in the manner of the quattro-cento passed into the market as antiques. Well illustrated with ten reproductions of his works, mostly in the Victoria and Albert Museum. Deals superficially with the ethical question.


The author lists four types of Egyptian forgeries: (1) Skilled copies or adaptations usually made in Paris or Egypt in the twentieth century, (2) partial forgeries involving the addition of desirable details, produced since the beginning of the nineteenth century, (3) tourist trade forgeries, usually of Egyptian origin, (4) replicas or fine copies, usually made in France in the nineteenth century. During the closing of the Egyptian galleries in 1949 some questioned pieces were carefully examined. Strong light, low magnification, and solvents were found to be the most useful examination tools. Ultraviolet light was of little use when applied to Egyptian antiquities. Six objects that had been extensively restored or altered are discussed with details of their previous histories, examination, alteration, and possible dates of reworking.


Since the fall of 1948 some interesting new discoveries bearing on the well-known van Meegeren forgery case have been made. Most impor-
tant is that "The Last Supper" owned by a private Dutch collector was painted over an old painting of a "Hunting Scene" by A. Hondius. van Meegeren bought this old painting from an Amsterdam art dealer in 1940. The dealer was able to describe the circumstances of the sale and to produce a photograph of the painting. The details of the "Hunting Scene" match details shown by X-rays in the underpainting of "The Last Supper." Secondly, another and earlier "Last Supper" similar to the one privately owned has been discovered in the artist's studio in Nice. This explains certain discrepancies in the evidence in the files of the Dutch Justice. This was painted over a painting of "Children in a Carriage" by G. Flinck. It was not artificially aged.

Thirdly, another part (the lower left) of the cut-down stretcher of the "Disciples at Emmaus" was found in the Nice studio. Previously only the cut-out part of the upper right corner was known.


Contents: Introduction; Methods in the examination of old paintings; Methods applied in the examination of the pseudo-Vermeers and De Hooghs; van Meegeren's working technique; Verification of van Meegeren's technique; (The faked Vermeers and De Hooghs—and history) H. A. van Meegeren's biography and works; History and detection of the forgeries; Psychological aspect of the Vermeer-van Meegeren case; The forgeries—History of art and technique; Esthetic examination of the forgeries; Conclusion; Plates.


Récapitulation des résultats scientifiques obtenus dans l'examen des faux Vermeer. L'objectivité scientifique prime l'impression artistique. JT


Arguments scientifiques prouvant la modernité des "Disciples d'Emmaüs." JT


Compte rendu de l'expertise scientifique des faux Vermeer et de Hoogh par H. van Meegeren. Méthodes physiques et chimiques; résultats obtenus. PC

Discussion with aid of many detailed photographs of genuine and false early Chinese figurines, mostly from the collection of the Honolulu Academy of Arts. Laboratory studies indicate that the gloss on the objects considered authentic Hui-hsien ware must be attributed to lacquer.  


Editorial calling for vigilance in regard to the expected restitution under peace terms of works of art looted by the Nazi chiefs. It is alleged that skilfully faked replicas of many valuable and well-known paintings have been prepared. Every use must be made of scientific methods and the specialized reference libraries containing reproductions.


An editorial introducing a letter from Martin S. Soria which establishes the identity of an unrecorded French primitive (Bunt: *Connoisseur*, 116 (1945), p. 98) as a fake. Two other works by the same hand are reproduced.


Writing on the theme that fakes which come to be rejected as the result, for example of the testimony of the faker or some anachronisms other than stylistic, the editor of the *Connoisseur* claims that such works are not entirely devoid of merit as works of art. The fact that they are at first accepted by eminent authorities supports this view. An interesting illustrated account of a number of outstanding cases of forgery and copying follows.


Contents: Art and forgery, by George Swarzenski; Some notes on fakes, by W. M. Ivins, Jr.; The laboratory detection of fraud, by Sheldon Keck; The stylistic detection of fraud, by Julius S. Held; Paintings, by W. G. Constable and Paul B. Coremans (3 articles); Sculpture, by John D. Cooney and Gisela M. A. Richter (2 articles); Drawings, by Agnes Mongan; Ceramics, by Nathalie Zimmer, Sheldon Keck, and Samuel K. Lothrop (2 articles); Prints, by Una Johnson; The need for objective examination, by George L. Stout; Legal remedies for art forgeries, by Wolfgang S. Schwabacher.


Introduction. X-ray examination. Macroscopic and microscopic examination. Chemical and physicochemical examination. Conclusion. PC


A Frans Hals in the Groningen Museum (Holland) entitled "A Boy Smoking" was proved to be a forgery when on analysis by partition chromatography the medium was found to be gelatine. SRJ


The author discusses in some detail a brace of North Italian snap-haunce pistols from the Walters Gallery and a brace of Brescian flint-lock pistols from the Metropolitan Museum. It is believed that they were damaged by fire and skilfully restored. Since the artists' names have been forged on the locks of one from each set, these two pistols may be termed forgeries. The author points out the importance of studying the mountings of a pistol, piece by piece. The production methods of such pistols are discussed (different craftsmen worked on the separate parts of a pistol), as well as the mechanisms and history of the craft. Distinguishing genuine from false is primarily a question of a thorough familiarity with all kinds of workmanship and an ability to appraise the ensemble as well as the details. EHJ


A short article, mainly nontechnical, with six photographs. MB


Letter calling attention to the existence of a large number of forged drawings by H. B. Brabazon. SRJ


An account of a forgery by William Henry Ireland (1777-1835) in the form of a painting of the Globe Theatre done on an old piece of parchment. SRJ


Contents: L'appel de la peinture; Le jeu des attributions; Graphologie et iconographie; De l'original au faux en passant par la réplique et la copie; Restaurations et retouches; L'art et la rhétorique; Amateurs et collectionneurs; La peinture et la richesse; De saint Luc à Ambroise Vollard; La survie. BMU
188. **Ivins, William M., Jr.** Ignorance, the end. *B.M.M.A., n.s.* (1943/-44), pp. 2–10, illus.

The author discusses the statement that while a forger can fool his contemporaries he cannot fool his grandsons because he builds into his handiwork the contemporary ideas of how an old object should look. The point is illustrated by 10 engravings made over a period of 400 years and two photographs by different men of the head of the Laocoön, each version being quite different. As the same object appears differently to men of different nationalities and eras, so we cannot know what was the true "original condition" of an art object. There is little ultimate difference except in original intent between museum restorations and skillful forgery. Restoration is the willful alteration of an object to put it in a condition we prefer to that in which we found it, and our practice in this respect is illogical. The author points out the philosophical difficulties in the study of art and decides it is best not to think about such problems.

**EHJ**

189. **Kurz, Otto.** *Fakes, a handbook for collectors and students.* London, Faber and Faber, ltd., 1948. 329 pp. +95 illus.

Contents: Preface; Painting; Classical paintings and mosaics; Illuminated manuscripts; Drawings; Prints; Stone sculpture; Terra-cotta; Sculpture in wood; Ivory carvings; Bronze sculpture; Chinese bronzes; Goldsmiths' work; Pottery and porcelain; Glass; Furniture; Tapestries; Bookbindings; Fakes without models; Conclusion; Index.


**BMU**


Généralités sur les faux en art et archéologie.

**PC**


Illustrated accounts of modern forgeries made by craftsmen in Siam, one of whom the author visited in his workshop. Apart from the solubility of the patina the criteria are entirely stylistic.

**SRJ**


An incomplete set of chessmen purporting to be those designed by Flaxman and first produced by Wedgwood in 1783 appeared on the New York market. They were unmarked and in white and blue of hues unlike true Wedgwood. Comparison with genuine chessmen ascribed to 1783 and a new set made from the original molds revealed discrepancies in size (the counterfeit ones were 8 to 12 percent smaller than the originals) and in various details of modeling. It is presumed that either pressings were taken of true Flaxman chessmen or they were modeled from the original figures and the smaller size resulted from the shrinkage caused by the firing of the imitation figures.

**EHJ**

Discussion of two works (one drawing and one painting) spuriously given Goya’s name.

PC


In an article on an unpublished painting which the author considers to be by Dürer reference is made to revelations made during the cleaning process: a cross-staff held in the right hand “dissolved under the action of the cleaning fluid.”

SRJ


A paper read at the Museums Association Conference at Oxford in July 1952, to coincide with the opening of an exhibition of “Forgeries and Imitations” at the Ashmolean Museum. Many examples are cited showing instances where the scholar and the scientist have worked effectively as a team in detecting forgeries.

RJG


This compilation lists 859 titles, including books, sections of books and articles, and covers by sections all the important classes of art. “It furnishes the scholar, the museum curator with a record of books and periodical literature published from 1848 to 1948.” In addition, there is a long bibliography of articles from the *New York Times*, 1887 to the present. Author index.

BMU


RJG


The article opens with a plea for the creation of a “Hall of Fakes.” A permanent exhibition of this type would be of great service to scholars as well as the public. The author then proceeds to illustrate the distinctions between forgery, legitimate restoration, and reproduction in the case of woodcraft. Ten examples are reproduced.

SRJ

The author discusses some characteristics of forgers and techniques of forgers.


A Chinese bronze bell of the type *chung 鐘* or *po 錶* in the Royal Ontario Museum of Archaeology in Toronto bears two inscriptions; on one side are two original characters which are cast; on the opposite side the original characters were chiseled away in ancient times and two new characters were crudely incised into the surface. From literary evidence it was learned that “the original inscription on the altered side of the bell was Ta-shêng 大晟”. It was removed and replaced with the present inscription by court officials in 1174 because it violated the personal name of a former Chin ruler. The bell was cast in all probability in the year 1105 or 1104.


An illustrated account of the works of Anton Konrad, “one of the most ingenious forgers of arms and armour who has ever existed.” Konrad died in 1938. His work passed through the leading salesrooms and found its way into several important collections.


The difficulty of detecting forged Indo-Greek coins, especially in the field is pointed out by an illustration concerning two tetradrachms of Hermaios which were seized from the forger while still hot in the molds. These coins were regarded as genuine by British authorities. Shortt discusses and finally tabulates twenty characteristics—referred to their occurrence in genuine coins and in forgeries of various types both ancient and modern.


The faking of Egyptian antiquities goes back to the first decades of the nineteenth century. The earliest fakes were so poor that they were readily recognized as forgeries. Sometimes new inscriptions have been added to genuine pieces in order to enhance their value. There are a large number of forgeries sold every year, some of them very cleverly done. Some of the centers for the production of such forgeries have been located. The author appends new information about pieces in the Walters collection which has been received following the publication of the catalogue of Egyptian sculpture.

Washington, D. C., Govt. print. off., 1948. 32 pp. illus.

Contents: How to know counterfeit money; What to do about it; How to guard against forged government checks.

207. **WALKER, RAINFORTH ARMITAGE.** *How to detect Beardsley forgeries.*
Bedford, R. A. Walker, 1950. 31 pp. incl. 7 pls.

Contents: Beardsley forgeries; Published drawings; Unpublished drawings; Appendix.

208. **WIJDE, INGE, pseud.** *Klachten en drama's in de kunsthandel.* 2d ed.
Leiden, Uitgeversbedrijf van Wetenschappelijke Uitgaven N.V., 1944. 110 pp., pls., illus.

Contents: Inleiding; Waarin duidelijk blijkt, dat de Nederlanders een kunstminnend volk zijn, want ziet ze maar eens sjouwen!; De "Kitsch,"—Waarin Mijnheer N. een schilderstuk van Jaap Daris kocht, hetwelk zijn vriend R. reeds bleek te bezitten, echter met één kip meer, en van een kunsttentoonstelling, waar bijna niets verkocht was; Van een kijkdag, waar men een giraffennek moet bezitten om te kunnen kijken en van een koopman, die een schilderstuk niet goedkoop kwijt raakte, maar wel duur; Van een verzamelaar, die 3 Rembrandts had en er geen nieuwe meer bij nam, en van een ander, die een gesmokkelde Jan Steen kocht, die geen Jan Steen was; Van een Rembrandt die geen Rembrandt en toch weer wel een Rembrandt was, toen een Rubens werd, waar een v. Dijck onderuit kwam en nu weer een ? is; Van een expertise, die niets waard was, van een, die zeer veel waard was, en van een schilderij zonder expertise, dat nog meer waard was; Restauratie en restaurateurs.

; ; Van een fabrikant-philantrop, die met een penseel een goudmijn exploiteerde en bijtijds de doos insprong; Van een collectie Haagsche School, die geen collectie was, en van een Mauve voor f 9,50, die men terugbracht, omdat hij te echt was; Van een erfgenaam, die geen erfgenaam was, en een particulier, die geen particulier was; Van een mijnheer, die een Mauve kocht en hem niet nam, omdat het een Ter Meulen was, en van een ander, die van de "Franschen" hield, een bijzonder mooie kon koopen, doch hem liet gaan, omdat . . . het een Hollander was; Van een middenstander, die een "Kunsthandel" opzette en met een "puinhoop" eindigde; Van een wijnhandelaar, die het "bekeken" had en een Mijas, waarvan je de zee kon ruiken . . . ; Twee dagen uit het leven van een kunsthandelaar; Van een amateur-expert, die met een speld, een "critisch oog," een sterrenkijker, zijn nagels en zijn "kennis" de kunst dient . . . ; Van een Potter uit Java, twee ouderwetsche Ten Kate's, een "Prent" en de "Rembrandt-man."; Een pleidooi voor de kunst en een veroordeeling van de klungels; Slot; Plates.

Informal discussion of faking in objects of pottery, gold, copper, obsidian, hard stone, and native paper going back to the early 19th century.


Contents: What is a fake?; The economics of fraud; The black market for fakes; The glorified antique; Detecting furniture frauds; Hardware as a guide to age; The problem of restoration; The growing problem of reproductions; Beware of glassware; Cheating in chinaware; Silverware and Sheffield plate; Fakes in pewter; Fakes among the timepieces; Fake antique jewelry; Lamps and lighting fixtures; Silhouettes, profiles and miniatures; Old prints and paintings; Fakes and reproductions in cast iron and brass; Protection for the buyer; Index.

**MATERIALS, CONSTRUCTION AND CONSERVATION OF OBJECTS**

**A. STONE, BUILDING STONE, AND STONE ARTIFACTS**


Un nouvel essor pourrait être donné à la construction en pierre en Grande-Bretagne, par l'intervention de la science dans le choix judicieux des pierres.


Experiments in making Clactonian flint cores and flakes.


Taking adjacent flake series as a criterion of intentional production, specimens from the Miocene age are held not to be natural.

Abstracts, Art and Archaeology, 1943–1952 75

No. 2

A summary of characteristics of flint implements from Corton, Hoxne, and Runton in Norfolk, indicating methods of production. LB


Gun-flint knappers use angles of 120–150°, although they employ an iron hammer and anvil. Out of the 1800 measured, only 1.1 percent of the angles on ancient artifacts exceed 110°, and only 18 percent (maximum of several series) exceeded 90° the rest being acute. Eocene flakes show 54–62 percent of angles above 90°; Tertiary flakes 62–70 percent; thus the latter are classed with the former, where human agency is ruled out by age, and are thought to be due to soil movement under pressure.

LB


Flint and other materials used for the tools, early accounts, preparation of the platform and use of anvil, etc.

IG


Further to previous correspondence (Ibid., 152 (1943), pp. 663–664), the criterion of intentional production is considered to fail in the case of Eocene specimens. Cores with angles near 90° are in their “reject” stage, acute-angle flaking being easier. No correspondence between age and content of obtuse angles is evident.

This is refuted: recrudescences of rough work being admitted, no early industry shows a low number of obtuse angles.

Although occasional resemblances may be found, there are essential differences between Eocene specimens and those of a later date described as eoliths. Steep flaking cannot be taken as a criterion of intentional work.

LB


The author relates how he taught himself to make arrowheads and other simple artifacts from stone by the process of flaking employed by primitive man. Materials, tools, and methods of working are described with illustrations.

RJG


Contents: List of plates; Selected bibliography and abbreviations; Types of evidence; Roman building materials; Stone walls in Italy;
Squared stone construction in cut-stone work; *Opus incertum* and *opus reticulatum*; Sun-dried and semi-baked bricks; Brick and tile construction; Mortar and similar mixtures; Concrete; Indexes: A. Sites other than Rome; B. Rome; C. Types of evidence; D. Materials used in building; E. Subjects; Plates.


Les pierres de construction utilisées en Hollande; origine géographique, description, importance, exemples d'utilisation. Une description détaillée des outils utilisés pour la taille.

FD


A dark gray granite head is identified on the basis of style and facial resemblance as Amenhotep Son of Hapu, a distinguished official of Amenhotep III. Its size and material suggested that it may have belonged to one of two now headless statues of this subject. Another head in quartzite is identified as the Chief Steward in Memphis, Amenhotep, who lived in the time of Amenhotep III. The material and indications of the costume suggested spectrographic and petrographic comparisons with a headless statue of the same subject, now in the Ashmolean Museum. The tests indicated that the two pieces originated in the same quarry and in particularly close vicinity to each other. A section of the two spectrograms is illustrated, showing their great similarity.

EHJ


A systematic study has been made of a type of decay frequently found in stone buildings in Western Europe. The decay results from the conversion of calcium carbonate to calcium sulphate. It affects especially the calcareous mass that binds together the calcite crystals in stone. The sulphuric ions in rainwater are rarely directly responsible for decay. There must be an accumulation of water saturated with salts. Attack is aided by an aerobic bacteria which is oxidizing and autotrophic. A series of experiments which were made with the aim of verifying the different phases of the mechanism are described and numerical data are given.

RJG


Une étude de marbres d'Elgin montre qu'un récent grattage des surfaces a eu pour conséquence d'enlever la patine et l'enduit original qui les recouvraient.

FD

Natural flaking agencies are thought to have been far more active in the Pleistocene era. Figures given by Barnes *ibid.,* p. 477 in support of natural formation are re-interpreted in terms of development of human skill. Further references are given and Barnes's conclusions are regarded as premature.


Description du cycle du soufre; Danger des sulfates dans le sol, dans les nappes aquifères et dans l'atmosphère; Altération des briques; Conseils généraux.


Mechanism of alteration of natural building stones and especially of limestone by the action of coal fumes and water. Effects on several old buildings of Brussels.


Lithologie; Description géologique du gisement; Emploi des pierres de Tournai—Désignation des pierres utilisées en construction; Géливité du calcaire de Tournai; Description détaillée des carrières intéressées à la production des pierres de construction; Résumé et conclusions; Notice bibliographique; Planches.


Mechanism of the alteration of Egyptian sculpture in limestone containing soluble salts. Appropriate treatment. PC


The building materials discussed include stone, mud, gypsum, lime mortar, and bitumen. Information concerning their use in antiquity has been drawn from these sources: (a) contemporary drawings, sculptures, and inscriptions; (b) recent excavations; and (c) primitive techniques still in operation. The technique used in Roman times of mixing mortar and sieving the ingredients are described. AEW


Dr. Phemister reports "the axe is composed of basalt in which there is an abundance of pyroxene pigeonite and a small account of interstitial quartz." Thus the affinities of the axe lie across the North Sea and it is possibly an import from Scandinavia. IG

232. Giot, P. R. A petrological investigation of Breton stone axes. *P.P.S.*, 16 (1950), p. 228. IG


The difficulties of defining the physical properties of the stone materials used by primitive man for tool and weapon making are discussed. "... Such terms as hardness, toughness, and resiliency are but blanket labels generally understood to cover a complex of characteristics that can be made manifest only by doing something to the material." Values are tabulated for measurements of density, hardness (Rockwell and Shore Monotron), resiliency (Shore Scleroscope), and toughness (Paige Impact Tester) on limestone, silicified tuff, obsidian, quartzite, chert, fossil wood, and various kinds of flint. RJG


Propriétés, gisements et mise en œuvre des roches utilisées jadis dans la construction des monuments anciens et provenant des dépôts quaternaires et tertiaires. RL


Expansion coefficients of 48 samples of domestic granites averaged 6.2 x 10⁻⁶ per deg. C. Moisture expansion, upon saturating specimens with water, averaged 0.004 percent. Relation of these facts to weathering of granite briefly discussed. RLF

The calcareous stone is attacked by nitrifying bacteria by using carbonate as a source of C, and also by the HNO₃ and HNO₃ formed from the air by these bacteria. The salts are washed away by the rains.


Types of flakes used, processes involved in the manufacture. Quartering, flaking the core, percussion, and pressure flaking. IG


L’examen microscopique d’échantillons de marbres ayant pour objet la détermination des restes d’un enduit ancien. FD


Most of the marbles used in Greek antiquity for sculptures and architectural works came from southeastern Greece, and the Aegean islands. There are some structural differences which make it possible to recognize the degree of metamorphism and hence the origin of the marbles. The standard Parian marble is made of equant calcite grains, \( \frac{1}{2} \) mm. in diameter. This arrangement is the reason for the great transparency of this rock. In best Pentilikon marble the texture is formed by grains of unequal size, which causes decrease in transparency. Some of the less altered rocks contain remnants of fossil Foraminifera. Bibliography. RJG


Ideal preservatives penetrate the porous surface adequately and uniformly, do not stain or react with it, and have a similar coefficient of thermal expansion. While giving a water-repellent finish they should not seal moisture inside the stone. Oil paints have insufficient life because of aging characteristics; deposition of preservatives in the pores by metathetic reaction is possible but impractical.

242. **Penn, William S.** Silicic ester plastics. *Australian plastics*, 2, no. 23 (1947), pp. 36–38, 40–43; *C.A.*, 42 (1948), 8021g.

The most important silicic ester is Et silicate. Typical applications are as a binder for refractory materials to make moldings and as a
hardening agent for plaster of Paris, sand, stone, etc. Typical trade names are Silester O (Et silicate), Kexacrete (a siliceous liquid), and Silesters 1 and 2 (partially hydrolyzed liquids). These commercial products are discussed as well as the making of a Silester mold, mold filling and stripping, air drying and baking, mold surface hardening, patching lubricant, casting, and suitable mixtures.


Inoculation of stones (containing small amounts of H₂S) with certain bacteria, capable of oxidizing S⁻ and S₂O₃⁻ to sulfate, followed by slow drying of the cultures produced a material which gave X-ray spectrum of crystallized gypsum. The latter was not formed in the absence of H₂S.


It is postulated that sulfates are reduced to sulfides by anaerobic Desulfovibrio and Clostridium species in the soil below the foundation. The sulfides move up the monument by capillarity, and are oxidized to sulfate by aerobic Thiothrix species. Experiments in the laboratory support this theory.


One of the most frequent types of alterations seen on city monuments is an exfoliation of the superficial "calcin" layer, which swells, then comes off, leaving a fine yellowish-gray powder. The amount of gypsum in the injured parts is considerable. Many hypotheses have been given to explain the formation of CaSO₄. City atmospheres are rich in SO₂, less rich in SO₃, and, in Paris, contain traces of H₂S. The oxidation of SO₂ into SO₃ occurs in the atmosphere under rays of the sun, and it could be that "calcin" may play a catalytic role in this reaction. Salt solutions containing N in ammoniacal form and S as sulfate, FeSO₄, or H₂SO₄ thus formed which attacks the stone. Also the Na₂S₂O₅, and also silica gel plaques impregnated with saline solution containing Na₂S₂O₃ were used as media. To all were added pulverized particles of the sick stone taken from Notre-Dame-de-Paris. No cultures were obtained with media containing SO₂ or S₂O₃; however, in H₂S media an immobile, gram-neg., aerobic cocco-bacillus was found. It uses N in the forms of NH₃, NO₂, and NO₂, but S only in the H₂S form, which it oxidizes to SO₃.

Bacteria, which are capable of oxidizing dithionites to sulfates, are isolated by extracting damaged stone with a saline solution containing traces of S; N is provided in form of KNO₃. Flasks are charged with saline solution of Winogradsky, 3·6 g. of KNO₃ per 1., and bits of sound stone. Some flasks are sterilized and some are not, and some are inoculated with the bacteria. Air, with or without small amounts of H₂S, is bubbled through all flasks. After one month it is shown that only those inoculated flasks, through which air and H₂S had been bubbled, were acid. The pH of flasks without H₂S and with bacteria and with H₂S and without bacteria, was unchanged. These findings appear to support the hypothesis that these bacteria play a role in the disintegration of stone.


A general discussion, illustrated by 82 photographs, of the weathering of building stones in Switzerland. Part II will contain data on the physical and chemical changes during weathering. The effects caused by various agents such as ground moisture, atmospheric gases such as SO₂, or frost, are discussed. The physical forms of weathered surfaces (scaling, sanding, cracking, etc.) are described and illustrated. Surface incrustations, especially of gypsum and sulfates of Na and Mg, are described. Generalizations are given of the resistance of various types of Swiss rocks used in buildings to weathering processes.


Physical and chemical factors are discussed. In cities the physical effects of soluble salts such as NaCl, Na₂SO₄, and MgSO₄ are important in breaking down building stones.


Production of flakes 1–2 inches long and wide (maximum) at angles of 100–140° between striking platform and residual scar on parent block, using a quartzite hammer head.


Prodromes; Apogée: Dénouements géographiques, Formes en architecture religieuse, en architecture publique civile et architecture domestique; Décadence.

Material employed in making celts, p. 36; The making of celts, p. 44; Making of biconically pierced stones.


Comparison of ancient quarries of Actium and Piraeus, with theories for the dolomitic formation due to partial substitution of Mg for Ca in \( \text{CaCO}_3 \) deposits. The chem. alteration was more advanced in the surface layers, becoming less evident with increasing depths, the \( \text{CaCO}_3 \) percentage increasing with samples from lower beds. Thus analyses of stones in the Acropolis give evidence of \( \text{SiO}_2 \) infiltration and formation of silicate coverings of the deposits.


Foundations of the Acropolis are either Hymettian limestone or Piraeus dolomite as judged from similarities of grain, color, and general appearance. The first are of much more ancient design, used long before the dolomitic in the oldest Acropolis monuments. S. describes petrographical features, chemical components, natural local measures used for mortar, theories for the coloration, and the ancients' reasons for choice of materials.


A white crystalline efflorescence observed on lime rock specimens in the Museum of Natural History at Brussels was found to be a double salt corresponding to the formula \( \text{CaCl}_2 \cdot \text{CaAc}_2 \cdot 10\text{H}_2\text{O} \). The fine fibrous colorless needles of this salt are 0.03 to 0.16 mm. in thickness and occasionally reach a length of 3 cm. The rock specimens had been kept for several years in flat oakwood cases with glass tops. Internal volume of the case was 0.03m\(^3\). Even after dry removal of the crystals they reappeared after a few months. The salt is soluble in water. Analysis gives Ca 17.6%, Mg trace, Cl 15.4, Ac 25.5, \( \text{H}_2\text{O} \) 39.5 (total,
98.0). Microscopically the crystals show low relief and high birefringence; they show parallel extinction and appear to have rhombic symmetry. Indices of refraction measured in Na light are \( \alpha = 1.468, \beta = 1.484, \gamma = 1.515 \). Elongation is positive and \( \epsilon = \gamma \); Angle \( 2V_N \) (determined on Federoff stage) is \( +80^\circ \). On the other hand, synthetic calcium chloro-acetate has different optical properties and is monoclinic. Analysis of the soluble salt extracted from the rock interior shows molecular proportions \( \text{Ca}:\text{Cl}:\text{Ac} = 1:1.7:0.4 \), while that in the salt efflorescence is \( 1:1:1 \). The acetate constituent then appears to be concentrated on the rock surface. Since this efflorescence does not appear when the specimens are stored in glass vitrines, but only in wooden cases it is suggested that the acetate ion originates from the wood. The author proposes the name calciacite for this efflorescent salt. \( \text{RJG} \)


The weathering of stones on buildings is shown by many examples. Both the chemical and physical processes have to be considered in the prevention of damages.


The cause of calcium nitrate efflorescences at the monastery of Sopočani was determined chemically and treatment recommended. NLB

258. **Weatherhead, A. V.** *Petrographic micro-technique; a practical handbook for the preparation of thin sections of rocks for use with the petrological microscope.* London, Arthur Barron Ltd., 1947. 98 pp., 94 illus.

Contents: Introduction; Preliminary treatment; Preparation of thin sections; Thin sections; Special methods; Heavy residue mounts; Photomicrography with the petrological microscope; Index. \( \text{BMU} \)

**B. Gems, Semiprecious Stones, Jade, and Minerals**


Contents: Preface; Sect. I. *Introductory chapters*: The author, Pliny the Elder; Authorities cited by Pliny; Pliny as a mineralogist and gem
expert; Roman jewelry; Roman jewelers and lapidaries; Geographical sources of gems; Geographical sources of gems (table); Historical summary of the ancient commerce in precious stones; Value and relative rank of precious stones in Pliny’s time; Gem mining in Pliny’s day; Treated and false stones; Industrial uses of gems; Identification of Pliny’s precious stones with those of our day; Table A—Pliny’s gems and minerals with their modern equivalent; Table B—Gemstones, minerals, and substances with Pliny’s name; Sect. II. Translation: Foreword to Section II. 37th Book of the natural history of the world, by Pliny the Elder—a modernized version of Philomen Holland’s translation; Appendix: 36th Book of the natural history of the world. Sect. III. Notes: Notes, the 37th Book of the natural history of the world; Notes, Appendix to 36th Book of the natural history of the world; Index.

BMU


MB


Examples are given of late Egyptian quartz beads coated with colored glass in imitation of semiprecious stones. The conclusions are based on examination with the microscope. An extensive table of data and a plate are included.

ERC


Analysis of the material eliminates bone and ivory. Dr. F. A. Bannister’s examination by X-ray diffraction of the white inlay around the jewels in eight bronze brooches show a variety of materials including cristobalite, magnesite, calcite and others. It appears that the original inert materials were ground down and mixed as a paste.

IG


Hardness estimation with a sharp steel point is not satisfactory for distinguishing nephrite and jadeite from similar looking minerals because of physical alteration and surface decomposition of jade during long burial. X-ray diffraction methods are the most reliable for distinguishing nephrite from jadeite and these in turn from the jadelike minerals. Powder patterns of nephrite, actinolite, jadeite, and serpentine are shown juxtaposed.

RJG

The introduction gives an account of the tools and methods used in working jade.


Contents: Preface; Principal Chinese Dynasties; Preliminary; The material; Sources of supply of the jade stone; Methods of jade carving; Progress of the craft in China; Bibliography; Index.


Dr. Moss reports on the various inlays on a bronze brooch. In one case 'a white stone, of the nature of tufa or travertine,' in another "certainly not coral, 'paste,' not tufa but presumably shell, possibly dentalium."


Identification of gemstones in antique jewelry offers special difficulties because the jewel cannot be removed from the mount. Each of the principal tests used to identify gemstones is described. These range from simple tests on heat conductivity, hardness, fracture, luster, dispersion, double refraction, and inclusions which may be carried out with no greater aid than an ordinary lens. The simpler gemmological instruments are next described. They are: Chelsea filter, dichroscope, spectroscope, refractometer, and microscope. Most inclusive method of differentiating stones is the determination of refractive index by immersion in liquids of varying refractive index.


The ring and pendant, supposedly smoky quartz set in Au, date back to the 11th century. Optical determinations show the stones to be corduroid with inclusions of rutile. Spectrographic determinations show the metal to be Ag alloyed with 5-10 percent Cu and covered with Au. Also found were Hg, probably from the gilding process, Sn, Pb, Zn, Pd, and Pt, also Ca, Al, Mg, and Si. Few occurrences of Pd-bearing Au are known; the Caucasus is a possible source.


Contents: Foreword. Part I. A cavalcade of gems and jewellery; The mysterious attraction of gems; The gold-smith-jeweller of Egypt; Jew-
ellers of Phoenicia and Greece; Jewellers of Italy; Early jewellery of the British Isles; Jewellers of the Middle Ages; Jewellers of the Renaissance; Jewellers of the 17th century; European jewellery, 18th and 19th centuries; The New World; Part II. Gem materials: Hard, rare, and of great beauty; Gem crystals and forms of gem cutting; Part III. Gemstones: Precious stones; Semi-precious stones; The quartz gems and various ornamental stones; Marine gems; Appendix I: Summary of gemstones; II. Birthstones; III. Selected bibliography; Glossary; Index.

BMU


Occurrences and properties of New Zealand nephrite are given. New determinations gave \( n = 1.60-1.65\), \( \text{sp. gr.} = 2.902-3.024\), hardness 5\( \frac{1}{2} \)-7.


Damp speeds the decomposition of pyrite. Treatment of decomposing pyrite with ammonia gas.

IG


The small Cu content is considered insufficient to account for the blue color of turquoise. Analyses of impure turquoise matrix show presence of C and N (detd. by Kjeldahl method with Hg catalyst) which are attributed to some complex Cu NH\(_4\) ion or amino Cu ion.


The microscopic examination of synthetic gemstones.

MB


A short article on the material from which scarabs have been made.

MB


The physical properties of the three minerals which are termed jade are described. Nephrite, most used and prized by the ancient Chinese,
is tough, compact, and fibrous. It has Moh's hardness 6 to 6.5 and sp. gr. 2.96 to 3.1. Jadeite has vitreous lustre, is crystalline rather than fibrous, has hardness 6 to 7 and sp. gr. 3.3 to 3.5. Chloromelomite, a dark green to almost black variety of jadeite, contains iron up to 10 percent. Although specific gravity measurements can distinguish jadeite from nephrite, the method has limitations in respect to archaic specimens, because jade deteriorates on long burial usually with a lowering of specific gravity value.

The principal forms of archaic jade are described; a brief description of the modern working of jade is given.


Contents: Jade, the many colored jewel of heaven; The jade of ancient China; Dragons, phoenixes, and other creatures; Taoist symbols; Gods and immortals; How Buddhism influenced Chinese carved jade; Salutations and inscriptions; Bowls, cups and other containers; Beads, buckles and other articles of adornment; Various objects carved from jade.

The first chapter of this work discusses jade as a mineral, mentions the places where it is found, the colors in which it occurs, the minerals that resemble jade, their colors and specific gravities. It ends with brief remarks on jade carving in China.

C. Ceramics and Ceramic Glazes


The first part of this paper, written by the first author listed, deals with the description and chronology of the pottery as derived from the examination of sherds and larger fragments, and the second part, by the other two authors, deals with the ceramic techniques.

All the ware belongs to the class of heavy-duty red clay pottery, for light pieces are rare, and no thin ware is represented. Most of the ware was tempered with small fragments of limestone about the size of fine to coarse sand, but sometimes the tempering material was quartz sand. Kiln tests showed that the proportion of limestone was less than that in the pottery from Tell Beit Mirsim and that most of the ware had been fired below 900° C. All ware was shaped by hand, there being no evidence of the use of the wheel. When slip was used, it was well made and sometimes burnished. No indication of painting was observed.

A revised and expanded copy of a lecture delivered to the Joint Meeting of Classical Societies at Oxford in September 1942.

BMU


The types of blue used in the manufacture and the periods in which they were in use.

RMM


After describing the condition of certain vases in the Louvre resulting from nineteenth-century restoration technique (miscellaneous assembly of fragments, extrusive overpainting, etc.) the authors give an account, illustrated with examples of their technique for cleaning and correct reassembly. The adhesive is "cellulose gum"; filling is done with tinted plaster, and copper reinforcement where necessary. Inpainting is done in oil and wax polish is applied.

SRJ


IG


The clay materials studied were shales from western New York State. Test procedures are described. The sulfates of Mg, Ca, Na, K, and Al were the most common efflorescing salts. Chlorides seem to play little part in efflorescence. Insoluble sulfides in clays are common sources of S from which sulfates are formed. Barium compounds do not prevent the formation of alkali sulfates during firing but can prevent formation of the alkaline earth sulfates. "The migration of a salt solution through a ceramic body is the direct cause of efflorescence. The salts accumulate on an exposed surface where relatively rapid evaporation takes place. At the points of greater evaporation these salts are precipitated from solution when the saturation point is reached. This migration of a solution through a ceramic body is a function of the absorption of the body." A ceramic body with zero absorption does not effloresce. Slightly soluble, as well as extremely soluble salts, will cause efflorescence. Twenty-two photomicrographs of soluble salts grown from solutions are shown, 107 references.

RJG

De nombreuses craquelures dues à l'âge devraient enlever tous les doutes concernant l'authenticité.


Each of eight sherds examined was coated smoothly with a clear, glossy, brownish-yellow glaze inside and with a less transparent, glossy, dark-green glaze on the exterior. The exterior glaze of a ninth sherd showed extensive decomposition by chemical action during burial. Scratching with a W carbide pencil was used in sampling. Analyses given suggest that the green glaze is a Pb silicate glass containing both Cu and Fe silicates to explain the green color. The yellow glaze is essentially a Pb silicate glass colored by a higher proportion of Fe silicate. A hypothetical ancient working formula for making green glaze is presented. The high proportion of Pb present might serve in distinguishing between genuine ancient Pb-glazed ware and modern imitations thereof. The use of Pb glazes in Asia Minor in Roman times appears to be established.


The author describes briefly how he produces celadon effects on modern pottery. Certain celadon type glazes were produced by iron oxide alone or with ferruginous clays. Other celadon effects were gained in experiments with copper oxides in glazes fired in an oxidation kiln making use of iron and cobalt to modify the green color. Chün type glaze effects were obtained by (1) applying a glaze containing copper over an iron glaze and then firing in a reducing atmosphere which causes blue or green to be produced with red and purple markings; also (2) by using more copper than iron despite the fact that some Sung glazes show, from spectrographic analysis, more iron than copper; rigid control must be exercised in firing. Comments are made on the production of crackle effects.


Contents: Includes these chapters—System of pottery classification; Description of the pottery . . . Pottery forms by periods and phases . . . Index.


Twelve photomicrographs of sherds are given with accompanying diagrams to describe the important features. Pottery of local manu-
facture contains certain rock and mineral types native to the region drained by the Menderes River. Certain of the different horizons at Troy have unique rock and mineral types as the coarser elements of the materials used in their pottery. There is a definite progression in the internal texture of the sherd from a coarse porous aggregate of clay and "tempering" material having no preferred orientation of fragments within the paste in the later horizons to a fine-grained, dense, thin-walled sherd in the earlier horizons. "Foreign" sherds can be distinguished from those of local make. The degree to which the different sherds were fired can be estimated.


The cracking of several figurines in the Royal Ontario Museum of Archaeology in Toronto is caused by the rusting and expansion of iron armatures. Practical potters regard use of such armatures impossible because of expansion of the iron during firing. Space for expansion might have been provided by wrapping the iron rods with strips of thin paper or other material which could be absorbed during firing. Many questions remain unanswered.


A detailed and profusely illustrated account is given of all the techniques employed in the manufacture of pottery by contemporary descendants of certain Indian tribes.


Contents: Preface; General considerations; The iron story; The copper story; Other glaze effects; Glossary; Selected bibliography; Index. Reviewed in: \textit{O.A.}, 2 (1949-50), pp. 126-128, by William Willetts.


A summary of a Wednesday evening discourse at the Royal Institution mentioning the blue to green coloration obtained by the solution of cupric oxide in more or less basic glazes and the \textit{sang-de-boeuf} and peachbloom glazes due to reduction of cupric oxide to more or less finely divided metallic copper.


Types of ware produced in China during the 1,500 years preceding the Ming dynasty, established in 1368, are discussed and illustrated.


(a) On-glaze copper. An interesting and accidentally reduced copper-on-glaze effect . . . (c) Note on a *sang-de-boeuf* brush pot. The restoration of a badly scratched glaze by polishing.


Use of inner and outer templates and clay core.


Description of shape and methods of making Hebridean Craggan pots.

298. **Honey, William Bowyer.** The ceramic art of China and other countries of the Far East. London, Faber and Faber limited, and the Hyperion press limited, 1945. 238 pp., illus. (incl. map), 195 pls. (part col.).

Contents: Introduction: Historical outline and technique; China; Indo-China; Corea; Japan; Appendices: A. Note on the spelling and pronunciation of Chinese names. B. Marks. C. Glossary of Chinese names for shapes, colors, etc. D. Patterns and subjects used in the decoration of Chinese porcelain. E. Forgeries and copies; Bibliography; Tables of Chinese dynasties; Index.


A description of the use of an electric furnace in the restoration of imperfect Babylonian clay tablets is given as part of this news section.


The pottery from Rhosus mentioned by Cicero is identified with a distinctive and colorful lead glazed ware of east Mediterranean origin that probably dates from the first century B.C. A list of find spots is given. The presence of lead in a sample of glaze from Tarsus was indicated by index of refraction. (Cf. Caley, *Amer. J. Archaeology*, 51 (1947), pp. 389–393, for quantitative analyses of two samples of such glaze from Tarsus.)

Tests to determine the temperature at which Samian was fired, the composition of the "glaze" and the effect of higher temperatures on the "glaze." IG


The third part of this archaeological report is concerned with the technique and materials of the prehistoric pottery shapes described in the previous parts. Blackening was caused by smoking, painting, "black slip process," and by burnishing and blackening. Construction is variable. Types produced are: (1) laminated ware, (2) thin ware with black core, (3) nonlaminated, (4) slipped wares, (5) homogeneous bodies, (6) coarse reddish wares, (7) coarse gray ware, (8) Yin-yao made by the imbibing process. Qualitative spectrographic analysis reveals that the clay used in all parts of such bodies is approximately the same. Quantitative analysis of a typical sherd shows that the dark core and intermediate gray slip both contain about 4 percent of iron; hence the iron does not enter into the problem of coloration. On the same sherd carbon content of the black slip is 3.2 percent while the gray intermediate slip contains 0.9 percent. The black core contains 1.1 percent carbon and 1 to 1.5 percent phosphorus. The latter indicates use of bone charcoal or burned bone in the clay. Soda ash and potash were absent. Some experimental firings are described in connection with study of the laminated bodies.


Section I of this extensive article deals with the general techniques used in manufacturing ancient Palestinian pottery as illustrated by the ware and sherd found at this site, and Section II gives the results of a detailed technical study of the various types of pottery.

Laboratory kiln tests showed that most of the pottery was made from a red clay, though the pottery itself has a wide range of color. The reasons for this wide range include differences in the original chemical composition of the clay, differences in temperature of firing, the presence of an oxidizing or reducing atmosphere in the kiln, and the application of carbonaceous material which either reduced the iron when the ware was fired at a high temperature or left a deposit of carbon when it was fired at a low temperature. The great majority of the pottery was made from a clay tempered with crushed limestone, apparently because suitable silica sand or flint was not available. Deductions are made as to the probable entire procedure followed in preparing the clay.

The earliest pottery was shaped by hand, but the wheel came into use about the nineteenth century B.C. Slightly later, ware was also
turned, and press-molding was used for certain kinds of objects, such as figurines. Casting was apparently little employed, as only two objects apparently produced in this way have been found.

Glazes were never used at Tell Beit Mirsim. The most common type of decoration was a red slip. Such a slip was ordinarily prepared from a finer portion of the same clay that was used in fashioning an object. However, the best slip was made from a very fine levigated clay of high iron content, and red ochre was apparently sometimes added. No white clay slip was observed on any native ware. The pottery was also frequently burnished by various techniques. Less commonly, ware was decorated with incised lines in various combinations, and painting was also practiced.

Porosity tests on representative sherds show that the porosity of the ware is in general rather high. The lowest apparent porosity was 11.03 percent, the highest 15.75 percent, and the average 12.88 percent. Kiln tests on sets of sherds showed that none of the ware was fired as high as 1030° C., that only a small proportion was fired as high as 970° C., and that most of it was fired below 890° C. In general, foreign ware was fired at higher temperatures than the native ware.

Measurements of the capacities of juglets showed a tendency to produce these in standard sizes. Measurements of the capacities of cups and pitchers showed a fair correspondence to the units of ancient Hebrew liquid measure. Detailed accounts, based on the examination of representative specimens, are given of the techniques probably employed in the production of all the different types of pottery objects.


"Stucco was used for the embellishment of prehistoric Mexican and Central American pottery in various ways: as a coating, tinted in plain colors, for whole vessels or parts of vessels; as a surface upon which more or less elaborate designs were painted; and as a background of which parts were cut away and filled with colored substances—paint cloisonné."

Some pieces of stuccoed pottery from the lower measures of thick stratum of rubbish on Finca Miraflores in the southwestern part of Kaminaljuyu exhibit a fourth process. A thin red wash was first applied to the pottery and over this a background coat of grayish-white clay. Over the continuous background the design was applied in three operations: first a thick and relatively coarse base-layer was applied; this was then covered with pigment; and finally the edges of the base-layer and of its thin surface layer of pigment were straightened and trued up with a blunt pointed implement. A diagram of the layered structure is shown.

Two blue (I, II) and one purple-red (III) Chun-type shards were analyzed spectrographically and gravimetrically with the hope that the glazes might be duplicated with modern formulas. The compositions were:

- I: SiO$_2$ 69.84, Al$_2$O$_3$ 16.76, Fe$_2$O$_3$ 1.88, CaO 7.03, MgO 1.28, K$_2$O 2.31, Na$_2$O 1.02, MnO 0.01, TiO$_2$ 0.50%, PbO —, and CoO —;
- II: SiO$_2$ 66.05, Al$_2$O$_3$ 8.53, Fe$_2$O$_3$ 1.68, CaO 7.23, MgO 1.08, K$_2$O 4.14, Na$_2$O 1.30, MnO 0.01, TiO$_2$ 0.02, PbO 9.09, and CoO 0.06 percent;
- III: SiO$_2$ 70.05, Al$_2$O$_3$ 8.21, Fe$_2$O$_3$ 1.78, CaO 8.14, MgO 1.43, K$_2$O 5.21, Na$_2$O 1.86, MnO —, TiO$_2$ 0.60, PbO 2.73, and CoO 0.10 percent.

Efforts to duplicate I and III were unsuccessful. Under reducing conditions at cone 10 the following formula produced a glaze much like II: Albany slip clay 23; Keene feldspar 29.5; window glass 4; whiting 10; magnesia 0.3; flint 30.5; white lead 16; and CoO 0.06 percent.


Notes on glazes relative to Chinese and Japanese underglaze blue and its cobalt content, and on experiments with wood ashes in connection with Yüan and Chun glazes.


Material and technique of manufacture of Chun yao and the use of copper in the glazing effects.


The techniques of manufacture and decoration employed by the potters living on the Plain of Antioch from about 4500–2000 B.C. are summarized on the basis of evidence obtained from laboratory study of pottery remains and the local clays.


Introduction; préparation de l’argile pour la poterie, ses propriétés physiques et sa composition chimique; la forme, travail de la pâte, décoration et glaçure; le séchage; la cuisson; conclusion; résumé.


Contents: Nature of glazes; Composition of glazes, engobe, ferrous oxide, opalescence, ferric oxide, Temmoku glaze, green glaze, colloidal copper, cobalt. . .


This article written in Japanese describes the application of gold in the period Chia-Ching, the glaze of Chun ware, and Japanese Seto.

Five analyses of lavender blue Chiün glaze and celadon glaze show that the ware does not owe its coloring to copper. The bluish color is the result of opalescence, and it was fired in a reducing atmosphere.

RJG


Description of the many types of ceramic wares of different periods presumed to have come from Changsha. Chemical analyses (by Richard Terry) are given for the potassic salt glaze on a Han green-glazed ware and of the glaze and body of a T'ang piece.

RJG


Three chemical quantitative analyses are given of brownish green glazes on so-called Ya-chou ware, which was made in the T'ang-Sung period. One is an alkaline potassic glaze much like a salt glaze; the other two are calcium and aluminum silicate glazes.

RJG


Two recently excavated Chou dynasty [1122–249 B.C.] ceramic jars from Changsha were observed to have a peculiar dark greenish brown "glaze" which showed a wrinkled and a creased appearance and in places straight edges. It appears that the jars were covered originally with a layer of thin (c.0.05 mm.) tinfoil stuck on with a kind of varnish or resinous adhesive and lightly burnished. The surface then may have been treated with a sulfide solution to give it the color of bronze. During long burial the tin was converted to hydrous tin oxide. This discovery indicates an early knowledge of elemental tin in China.

RJG


Hemp cloth impressions on the ancient tiles were reproduced on the paper by pressing and inking and the reproduced figures were photographed. By this method the number of threads of the cloth was determined. Number of threads which run lengthwise and crosswise was found to be mainly 6 and 6 per cm.

KY

Hemp cloth impressions on the surface of ancient tiles of eighth century were reproduced on the papers by pressing and inking and the papers were photographed. From these photographs the thread count of the cloth was easily studied.


Reviews general practices. Gives details of procedure used at the University Museum, Philadelphia, for preheating, firing, washing, and coating clay tablets.


Firing tests showed that the probable firing temperature was 1050–1150° C; spectrum analysis resembled closely that of ball and fire clays. The ware is best described as a fairly light stoneware.


Use of plaster of Paris mixed with iron cement, sand, and/or calcined flints to restore missing portions of pottery.


A brief history of the two factories is given. Little reliance can be placed upon marks in separating the production of the two factories, one near Naples and one in Madrid, from each other and from similar contemporary pieces or modern pieces made from the old molds. Contributions must be made on characteristics of size, shape, style, the composition of the paste and the painting. Various characteristics of the original and the later pieces are listed. The author warns of the pitfalls, especially in the larger, more showy pieces.


Accidental red glaze was usually produced when the glaze was protected in some way from contact with the reducing gases of the kiln, such as by the method of stacking, though sometimes it was produced in other ways. Intentional red glaze was probably produced, according to a theory suggested to the author by Theodor Schumann, by a double glazing and firing process. In the first step only those areas of the vases intended to be black were painted and fired, first in an oxidizing and then in a reducing atmosphere. Then the vases were allowed to cool, taken out of the kiln, and the areas intended to be red were painted. Finally, the vases were fired in an oxidizing atmosphere. The newly painted areas came out red, but the previously painted and reduced areas remained black when the glaze was sufficiently thick. Examination of a number of Athenian vases by the author and her colleagues confirmed this theory, for black glaze never overlapped the red, though sometimes red glaze overlapped the black.

Contents: Brief history of pottery; What are ceramics?; Clay; Composition of bodies; Shaping processes; Drying and dryers; Firing; Temperature recording; Setting or placing the ware in kilns; Ceramic colours; Bricks and tiles; Refractories; Stoneware; Earthenware and faience; Porcelain and china; Sanitary ware; Insulator porcelain; Low loss ceramics; Exports of the British pottery industry; Glossary; Index.


Contents: Introduction; Preface; Book I. Illustrated talks (Topography, history, lay-out, staffing and practice at Ching-tê-chên); Book II. The Imperial porcelain factory of the Ch'ing dynasty; Book III. Particulars of the pottery business (manning, decoration and glazes); Book IV. Pottery procedure (terminology, varieties of materials, kiln control); Book V. Kiln wares of Ching-tê-chên during various dynasties; Book VI. Antique wares produced in the town; Book VII. Ancient kilns; Book VIII. Literary extracts (Notes of special subjects); Book IX. Literary extracts (Notes of pieces of pottery); Book X. Additional remarks; Postscript; Appendices; Index.


Short note on microscopic examination of four sherds with ferruginous polished slip.


Contents: Prefatory note; Introduction; I. Style of plumbate ware; II. Significance of plumbate anthropomorphic effigies; III. Technology of plumbate ware; IV. Criteria for identification; V. Geographic distribution; VI. Excavated plumbate; VII. Wares associated with plumbate; VIII. Plumbate problems, a recapitulation; Appendices; References.

This monograph illustrates the important relationship between knowledge of ceramic technology and archaeological research. By means of petrographic analysis, microchemical and spectrographic analysis applied to potsherds, Miss Shepard has been able to determine the geographic origin of many of the varied types of prehistoric pottery originating in the Rio Grande Valley in New Mexico.


Fragments of sixty pottery vessels were sectioned; forty-two contained either volcanic ash or volcanic sand as temper. (Mineral components are described in detail.) Basalt and sand and schist temper were observed in occasional pieces. The paste of several fragments has the texture of untempered clay. Although the recognized trade ware of the Kaminaljuyu tombs includes a number of distinctive pastes as observed petrographically, not enough is yet known about geographic occurrence of the various tempers noted to trace geographic origin of the pottery. The data collected raise many questions still to be answered by further archaeological and scientific research.

Pigments identified include samples from stuccoes, pottery, miscellaneous artifacts, paintpots. They were: Reds: oxide containing crystals of specular hematite, red ferric oxide, ferruginous clay, cinnabar, pinks, cinnabar and calcite, cinnabar and diatomaceous earth, ferruginous clay or ferric oxide and calcite. Green: malachite, unidentified copper mineral, malachite mixed with unidentified copper mineral and impure azurite. Yellows: ochre with cryptocrystalline calcite. Black: charcoal and white clay, carbon and calcite.

Stuccoes were of two kinds—argillaceous and calcareous. Examples of the use of clay in place of lime have been found in widely distant regions. The soft opaque calcareous stuccoes are composed of cryptocrystalline calcite and are in all probability made from slaked lime. The hard translucent lime stuccoes seem to have been cemented by calcareous solutions after burial. All painted stucco appears to have been done in secco technique.


Microscopic, X-ray, and chemical investigations were made of seven types of sherds: northern celadon, olive green; Tenmoku, black or brown; northern yellow Sung; white Sung or Ting type; Ch'ü, pale green to blue green; T'zu Chou with white decorated upper side and dark green below; and blue-white Ying Ch'ing. The results of the chemical analysis and spectrographic determinations are given.


Black substances adhered to some prehistoric clay figures found in Tohoku district were found to be asphalt. The origin of this asphalt may be traced to the petroleum field in Akita prefecture, Tohoku district.


Evidence is produced that the iron armatures found in sixth to seventh centuries Chinese grave figurines (Ming ch'i) were first wrapped in some kind of fibrous vegetable material before the clay was applied; on firing and carbonization of the organic material the necessary room for the expansion of the iron during firing was provided.


A plastic clay or lute useful in restoring pottery and sculpture is made by mixing vinyl acetate (25 percent solution in methylated spirits) and a filler of dry sand, gypsum, whiting, kaolin, or other suitable inert which is ground to at least 200 mesh. The vinyl acetate solution is poured into a ring of the inert on a glass palette and mixing is done with a spatula until the product can be picked up without sticking to the fingers. The putty can be stored in an airtight container with an alcohol-saturated cloth. Before applying, the edges of the surface, to which the putty is to adhere, should be coated with several applications of vinyl acetate.


J. W. Crowfoot reviews the report citing a description of the materials technique with the technological notes and analyses of the glaze by F. R. Matson.

In addition to covering attributes under form and design covers also technical aspects of surface, paste, and methods of construction. RJG


Contents: Introduction; Technique; Seventeenth-century potters; James Kettle's shard pile; The provincial potters of Charlestown; A potter’s daybook; A woman introduces stoneware; Redware potting from Boston to the Cape; Excavations on the Bayley Sites of 1723–1799; The Osborns of Danvers and other Essex county potters; The Quaker potters of Bristol county; Stoneware pottery in Eastern Massachusetts; Some potteries of Central and Western Massachusetts; The Whately and Ashfield group; Pioneer craftsmen of New Hampshire; The Clarks of Lyndeboro and Concord; North of Concord; Redware potters of Vermont; Vermont stoneware potteries; Early Maine potteries; The Maine industry after 1800; Early Connecticut redware and the Goshen group; Potters of New London group; The States family of Greenwich and Stonington; Potters of New London county; Hartford and New Haven potteries; Pots and dishes of Norwalk; Rhode Island; Bennington and kindred developments; The art potteries; Redwood forms; Appendices: 1. Documents relating to the Parkers of Charleston. II. Checklist of New England potters. III. Bibliography; Index.

BMU


Current opinions on the nature of the clay-water relationship are reviewed. Difficulties in accepting the idea that the adsorbed water has the structure of ordinary ice are outlined. The association between water and nonplastics is discussed; implications in the literature that such materials are not solvated cannot be sustained. If von Buzágh's findings on interparticle forces can be validly extended to plastic clay they suggest that long-range attractive forces exist in this system and accompany a resistance to approach arising from the lysospheres around the particles. For a typical earthenware body in the plastic state a relationship is established between moisture content and dry porosity; this is explicable in terms of a varying degree of particle orientation. Differences in moisture content produced by compression or centrifuging of unconfined specimens are related to Reynolds' dilatancy. This dilatancy is manifested by the nonplastic content of the body, but is not obvious in the ball and china clays. Short-term aging of certain test pieces in saturated air does not yield a more even distribution of water even where aqueous migration occurs. The relationship be-
Abstracts, Art and Archaeology, 1943–1952


Spectrographic estimates are presented (in chart form) for the common elements found in 45 samples of glaze from Chinese pottery mainly of the fourteenth century.


Three fragments of pottery found in the immediate vicinity of Shōsō-in, a T'ang period repository at Nara, Japan, were compared with fragments of T'ang and Ming pottery. Comparison data are presented on specific gravity, glaze hardness, glaze thickness, optical characteristics, color reflectance, and spectrochemical composition. Weight of the evidence indicates that the Shōsō-in pieces originated within the T'ang period.

D. Glass


Endeavour, 6 (1947), pp. 112–118.

Étude des composés chimiques produisant la coloration dans les verres.

FD


Archaeological finds indicate that glass making in Russia started in the ninth to tenth century. Results of analysis of a glass bracelet relating to the twelfth century are presented.

The production of mosaic glasses, their chemical compounds (with tables of analysis), and their resistance to atmospheric influences are treated historically. The paper includes photomicrographs of various samples of glass and photographs showing the mounting of mosaic stones and the appearance of defective work. Practical tests showed the alkali content of German glasses to be 12–20 percent, that of Bohemian glasses about 16 percent and that of Italian glasses 20 percent. Leaching and weathering tests on various products indicated the general lines to be followed for the production of resistant melts.


Historical development of glass painting technique, kinds of glass painting, apparatus, preparation and use of glass colors, mechanical directions and practical experience in painting, painting with opaque enamels; recipes and instructions, relief painting, a new type of painting with accurately limited contours with the help of glue; recipes and chemical constitution for enamels in the following colors: bright red, crimson (with Al, Mg or Sn), blood red, chrome green, bright yellow, Naples yellow, green, blue, brown, ochre and black; opaque and mottled enamels; ovens, grinding machines for colors, grinding and mixing of colors; transparent enamels; details on working with fused, watercolor type colors; painting with metals and metal compounds (recipes and working directions).


Topics discussed include: glazes, yellow glazes, reproduction of Venetian glass, the burning of colors onto the glass, various reproduction techniques for the painting and etching of glass, etching and color printing of plates, transfer designs, silvering and matting of glass objects, polishing, etc. Recipes are given for glazes, for coatings to protect the areas not to be etched, and for silvering and matting baths.


Contents: Preface; Origin and development of glass; Ancient Chinese glass; Ancient Korean glass; Ancient Japanese glass.


The destruction of glass in air is due essentially to interaction of glass and gases. The adsorption of gas is preliminary to its solution in
glass and to the final chemical reaction and the destruction of the glass. Lowering of temperature and increase of pressure shift the equilibrium in the direction of formation of decomposition products. The destruction in air starts with water adsorption, which continues as an increased hydration and is succeeded by carbonate formation. The rate of destruction is a function of the alkali content of the glass and is affected by temperature and humidity. The effect of indifferent gases is negligible. Degassing experiments on a piece of antique glass at 20, 150, 280, 400, and 560°, together with experiments on the destruction of glass rich in alkali by water vapor, confirm previous theories of the importance of glass composition and the role of water vapor in its destruction. Glass of any composition constitutes with air a thermodynamically unstable system, which must decompose eventually. A protective layer of transparent resin, as suggested by G. E. Pazurek ("Kranke Gläser," Reichenberg, 1903), is good only when applied after degassing in vacuo at slightly raised temperatures, and cooling in vacuo.


The decay of ancient glass can be considered as a problem of the action of the gases present in the atmosphere on the glass. It is a question of both chemically active and chemically inert gases, especially carbon dioxide and water vapor. Through absorption these gases form monomolecular films on the glass. As ancient glass is generally rich in alkali a leaching process takes place, and finally only a framework of silica is left. The destructive process can be stopped by the following method. The glass object is first treated with carbon tetrachloride in order to remove fatty substances from the surface. The reaction products from the attacks of carbon dioxide and water vapor are then removed by submerging the object in dilute nitric acid (5 pC.). After washing and drying, the object is placed in an evacuating chamber until a vacuum of 10⁻⁶ mm. mercury is reached. The chamber is then slowly filled with lacquer and equally slowly drained. The glass object will then have acquired a uniform film of lacquer, and is left to dry. The choice of resin as well as of solvent for the lacquer is most important. The lacquer must have a low viscosity even in concentrated solution in order to fill the pores and capillaries in the glass, and it must be color-fast and have a suitable refraction index. After investigating a number of substances it was found that polymethyl methacrylate best fulfilled the conditions.

349. Honey, William Bowyer. . . . Glass; a handbook for the study of glass vessels of all periods and countries and a guide to the museum

Contents: Introduction; Ancient Egyptian glass; Roman glass; Medieval European and Islamic glass; Venetian glass; German and Bohemian glass; English glass; Netherlandish glass; French glass; Spanish glass; Chinese glass; Scandinavian and American glass; Indexes.


Excellent technical article by National Bureau of Standards (U.S.A.) scientists concerning the nature of the glass produced by this early American industrial plant. Documented with photographs, analyses; 15 references.


A complete summation of the analytical work on ancient glasses covering the last hundred years. Included is a table giving eight typical analyses of Egyptian, Roman, and Babylonian glass, with comments on each composition. Twenty-seven references.


The Arabs had a unique use for glass: they used it in making standards to check the constancy of weight of metal coins. This was done in a sort of Arabic Bureau of Standards in Cairo called the Dar al-Ayar, where all scales and weights were tested. In this rather complete discussion of glass checkweights, much technical information is given on composition, fabrication, and the physical properties of numerous samples of early Arabic glass weights and stamps. Several complete glass analyses are listed.


"Both play a role in the formation of ceramics and enamels; both have interesting mechanical properties that appear when they are
ground or when their mechanical strength is under consideration; problems of opacity and light scattering arise when pigments are used in paints or when glasses are used in opal or ruby form; both may be darkened or decomposed by the action of visible or ultra-violet light.”


Pigment materials are selected on the basis of light absorption and refractive index properties. Pigments of high hiding power must have high refractive index. While pigments must be transparent as massive materials, whereas colors must have intense and highly selective absorption. Given a suitable base material, the preparation of a pigment from it is a problem in particle size control. Highest hiding power value is obtained by preparation of critical particle size of the order of the wavelength of light.


“To describe a substance as being in the glassy state, it must have taken on its properties of a solid merely by being cooled down from a fused condition, the increased rigidity by cooling must have been secured without recrystallization of the material, the substance should be capable of being carried back and forth from the fused or molten state to the glassy state merely by lowering or raising the temperature without appreciable change in the material when brought back to the same state, and when in the glassy state, should be a brittle, amorphous solid exhibiting conchoidal fracture.” The present picture of atomic arrangement in glass has developed from various kinds of information; the laws of crystal chemistry, the X-ray diffraction study of glass, the various measured physical properties of glass, and the kinds of materials and ranges of composition in which glass forming properties exist.

Henry Green. The physics of pigments in dispersed systems. *Ibid*, pp. 611–622. There are four fundamental types of consistency curves: Newtonian, dilatant, pseudoplastic, and plastic. Newtonian and pseudoplastic suspensions are usually clear liquids and show no structure under the microscope. Dilatant materials are always crowded systems. The pigment will be found in Brownian motion and consequently deflocculated. Plastic suspensions are always found to be flocculated. Photomicrography of examples of each of the suspensions named are shown each with its consistency curve.


The 200-inch mirror of Mount Palomar is made of glass for its mechanical properties alone. “In this case we are concerned with permanence of shape, freedom from ‘creep,’ freedom from elastic hysteresis, freedom from warping and from thermal distortion.” The properties of glass in respect to brittleness, strength, fatigue, variation of strength with temperature, tendency to crack, and effect of moisture are described.
C. Robertson. Glass-pigment systems. *Ibid.*, pp. 635–638. Pigmenting of ordinary glass is infrequent because the pigments do not remain as such during long meltings. Most glass used for coating purposes is pigmented. There is no intrinsic difference from the viewpoint of physical optics between a pigmented glass layer and a pigmented paint vehicle layer. There tends to be some pigment destruction even in glasses used as coatings and to the extent to which this occurs, it greatly complicates any mathematical development. A table is shown of typical compositions of glasses of various types and also one showing typical compositions of pigments for ceramic use.


Covers the darkening of inorganic materials like alkali halide crystals, silver bromide, zinc sulfide, and lead chromate. In these certain of the electrons contained in the materials are excited by absorption of radiation. In the excited state, secondary processes occur which allow the electrons to remain in an excited state and absorb wavelengths which differ from those they absorbed originally. The darkening process frequently can be reversed by application of heat since this allows the excited electrons to return to their original state.


A review of the early knowledge of glass from Classical writings. Contends that the glassmaking formula was not an accidental discovery of Phoenecian seafarers but was developed by the Egyptian potter. After Alexandria, Byzantine Greece became the center of glass manufacture and finally through Venice the art spread westward. In early times the Greek word *hyelos* and the western equivalent *glassa* or *glæsum* did not apply specifically to silicate glasses but were used to designate transparent gums, tree-resin tears, fossil resins, or most any product that hardened from the viscous state. Early writers even considered crystalline stone and rock crystal as glass. Gumglasses, which were used by the Egyptians in embalming and for the protection and decoration of coffins, eventually came to be called *veronikia*, from which we get our modern term “varnish.”


The dark blue and nearly opaque beads from the site of Arikamedu near Pondicherry and dated first century A. D. analyze: SiO₂, 73.6 percent; Al₂O₃, 19; FeO, 2.0; Fe₂O₃, 1.1; CaO, 3.9; MgO, 1.4; K₂O, 13.4; Na₂O, 2.1; MnO, 0.4; Total 99.8. The color of the glass is caused by the iron, and the ratio of ferrous to ferric is 1.82. The small amount of Mn may also have contributed to the color.


An attempt was made to confirm by scientific analysis the stylistic attributions of 38 American pressed-glass cup plates to sources east or
west of the Allegheny Mountains. The lead content of a given piece of glass has been recognized as a possible means of identifying its provenance. The tests consisted of observations of fluorescence and specific-gravity determinations. It was decided that cup plates having a specific gravity of over 3.100 and a basic bluish reaction under ultraviolet light are of eastern manufacture and that plates having a specific gravity of under 3.090 and producing a yellowish or other than bluish fluorescence are of western make. The stylistic and scientific attributions were in agreement in 81 percent of the plates considered.


Decayed Roman glass can be preserved and made more attractive by dipping in a 25 percent solution of polyvinyl acetate in \( \text{C}_6\text{H}_5\text{CH}_3 \). \( n \) of the plastic coating is 1.467 which is sufficiently close to the \( n \) of the glass to make the object nearly transparent.


The discovery, location, probable history, and chemical analyses of various ancient glasses are given.


Two kinds of glass bead, A and B, found in the Hakusay-yabu tomb near Nagoya city (Aichi Prefecture), were analysed. A is pale green and opaque, while B is blue and transparent. The density \( d_{\frac{25^\circ}{4}} \), refractive index \( n \) and chemical composition of both beads were given in Table 1. They are composed of soda-lime glass colored mainly with

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>( d_{\frac{25^\circ}{4}} )</td>
<td>2.40</td>
<td>2.49</td>
</tr>
<tr>
<td>( n )</td>
<td>1.502</td>
<td>1.505</td>
</tr>
<tr>
<td>( \text{SiO}_2 )</td>
<td>60.47</td>
<td>65.60</td>
</tr>
<tr>
<td>( \text{Al}_2\text{O}_3 )</td>
<td>12.04</td>
<td>4.01</td>
</tr>
<tr>
<td>( \text{Fe}_2\text{O}_3 )</td>
<td>0.13</td>
<td>0.24</td>
</tr>
<tr>
<td>( \text{TiO}_2 )</td>
<td>0.34</td>
<td>0.09</td>
</tr>
<tr>
<td>( \text{MnO} )</td>
<td>0.56</td>
<td>0.004</td>
</tr>
<tr>
<td>( \text{CaO} )</td>
<td>6.68</td>
<td>7.18</td>
</tr>
<tr>
<td>( \text{MgO} )</td>
<td>0.42</td>
<td>2.43</td>
</tr>
<tr>
<td>( \text{Na}_2\text{O} )</td>
<td>14.91</td>
<td>15.63</td>
</tr>
<tr>
<td>( \text{K}_2\text{O} )</td>
<td>3.67</td>
<td>3.47</td>
</tr>
<tr>
<td>( \text{PbO} )</td>
<td>0.27</td>
<td>0.07</td>
</tr>
<tr>
<td>( \text{CuO} )</td>
<td>0.42</td>
<td>0.24</td>
</tr>
<tr>
<td>( \text{CoO} )</td>
<td>0</td>
<td>0.003</td>
</tr>
<tr>
<td>( \text{SO}_3 )</td>
<td>0.17</td>
<td>0.44</td>
</tr>
<tr>
<td>( 100.13% )</td>
<td>( 100.24% )</td>
<td></td>
</tr>
</tbody>
</table>
copper. The high content of alumina in A indicates the probable use of clay or feldspar as raw materials. The age of Hakusan-yabu tomb is supposed to be of fourth century.


Procedures are given for spot tests using organic reagents according to the technique of Feigl (C. A., 32, 84). To obtain a sample without destroying or damaging the principal surfaces by an etch, the edge of the specimen is rubbed against a roughened or sanded flat plate of rock crystal or silica glass. One rubbing will yield about 0.1–0.4 mg. of material—the rubbing can be repeated until an adequate sample is obtained. To insure removal of HF before making the spot test the following procedure is used: The finely powdered sample is mixed in a platinum vessel with 10 percent HF solution (containing 10 percent H$_2$SO$_4$) and evaporated to dryness. The solution is repeated several times and finally the residue is taken up in 5N H$_2$SO$_4$). Detailed procedures are given for Ca (with dihydroxytartaric osazone as reagent), for Pb (with carminic acid), for Ba (with Na rhodizonate), for P (with (NH$_4$)$_2$MoO$_4$), for B (with the flame test), for Ti (with H$_2$O$_2$), for Al (with alizarin), for Zn (with a 2 percent H$_2$O solution of K$_4$Fe(CN)$_6$ and a solution of 0.5 gram diethylaniline in 200 cc. of sirupy H$_3$PO$_4$), for Mn (with Titan Yellow), and for K (with Na$_4$Co(NO$_2$)$_6$).

E. CEMENT, PLASTER, MORTAR, AND BRICK


Sulfates and chlorides are most commonly observed in salt efflorescence on masonry; MgSO$_4$ and MgCl$_2$ are the most dangerous; gypsum and CaCO$_3$ disfigure the masonry. The tendency to form efflorescence is not directly proportional to the salt content of the building materials; not even a minimum amount of salts necessary for provoking efflorescence can be stated. Essentially important are the porosity and capillarity of the bricks and the intensity of the moisture effects. CO$_2$-containing rain water is particularly detrimental if its action takes place without long interruptions by dry weather. Moisture penetrates from the surface to the plaster on the inside of the wall, through wallpapers and paint carrying with it dissolved lime and soluble salts. Mold and bacterial colonies often appear. Coal smoke carrying CO$_2$ and SO$_2$ in the atmosphere is the principal reason for corrosion and efflorescence
even on century-old masonry. The foundations of the buildings are
damaged by sulfate-containing underground waters; gypsum and Cande-
lot's salt \(3\text{CaO} \cdot \text{Al}_2\text{O}_3 \cdot 2\text{CaSO}_4 \cdot 3\text{H}_2\text{O}\) are formed, which is par-
ticularly detrimental for portland cement, especially under the in-
fluence of \(\text{MgSO}_4\) in sea water. \(\text{NaCl}\) is detrimental if associated with
\(\text{MgCl}_2\); the salt carried by the west winds on the Swedish coast is
deposited on the masonry, is very hygroscopic, and impedes a thorough
drying of the walls. High firing temperature of the bricks may be
useful for suppressing efflorescence in the masonry but is not effective
if gypsum is present. Admixtures of \(\text{Ba}\) compounds are recommended
in this case. Fluosilicate application or painting the walls with bitumen
reduces the moisture from penetration in the masonry and therefore
suppresses efflorescence and frost damage. The best remedy, however,
is good workmanship and careful handicraft in the production of the
building materials and the construction itself. Glazed bricks with
water-tight cement joints are profitable.

363. Bishop, Dana L. Function of carbon dioxide in producing efflo-

Hydrated magnesium sulfate identified as the principal constituent of
efflorescence on plaster. The magnesia occurs in cements and in lime
used in finish coats of plaster. Moisture and carbon dioxide are in-
volved in the proposed chemical reactions.

RLF


A review of the esters of silicic acid which discusses physical prop-
erties, methods of manufacture, hydrolysis, alcoholic solutions, rates of
reaction, and uses. The Et-silicates, the most widely used esters, are
described in detail. These esters are useful in adhesives for investments
in precision casting, binders for ceramics, gelling agents for alcoholic
fuels, sources of finely divided amorphous silica, weatherproofing, and
in the preparation of glass-adherent lacquers.

7156a.

For depositing a useful silica film \(\text{Si(OEt)}_4\) should be blended with a
mutual solvent in addition to the water necessary for hydrolysis. From
35 percent \(\text{EtOH}\), 8 percent \(\text{H}_2\text{O}\), 57 percent \(\text{Si(OEt)}_4\), 17.5 percent of
\(\text{SiO}_2\) is deposited. For higher percentage deposition partially hydro-
lyze, and at least 8 hours before use add more water to complete the
hydrolysis. Then evaporation of water and solvent gives the deposit.
The partially hydrolyzed solution can be stored indefinitely and the
completely hydrolyzed solution for at least a month. A common un-
distilled grade known as "condensed" Et silicate contains some poly-
ethyl silicate, increasing the original \(\text{SiO}_2\) content from 28.8 to 31.5
percent. Et silicate 40 contains SiO₂ 40 percent. Hydrolysis is slow in neutral solution, rapid when alkaline, but controllably rapid when 0.3–5 percent of HCl is added. An application is for preservation of architectural stone against the elements. Hardness is increased and porosity decreased. As an adhesive it binds comminuted materials, as in making metal molds. Films are brittle and lack adhesion unless pigmented with an inert, and filled, as with micronized mica. Gels formed with an alkaline catalyst are useful solid fuels.


Photomicrograph and electron micrograph (up to 15,200x) studies were made of the setting of plaster of Paris. The hydration of plaster of Paris appears to be a solution-recrystallization process in which the hemihydrate dissolves and then crystallizes as needlelike gypsum crystals. The same type of crystals are formed in the solid set mass of plaster of Paris that are formed in dilute suspensions. The addition of the set-accelerating and set-retarding materials used affects the rate of solution of hemihydrate. No visual evidence was found of intermediate gel formation in the process of setting or hydration.


L'état des connaissances des Romains en matière de ciment, notamment en ce qui concerne l'emploi des pozzolanes naturelles.


Plaster of Paris is impregnated with furan, phenolic, urea, and melamine resins to produce a material with properties comparable with ceramics.


Ethyl silicate may be hydrolyzed in the presence of alcohol and acid to form a coherent adhesive form of silica possessing unusual heat stability and durability. Such a product finds use as a concrete or stone hardener, preservative, and weatherproofing agent. In the matter of weatherproofing, modified Si esters have proved to be superior to linseed-oil emulsions, chlorinated rubbers, and fluosilicate base materials.


Molds for metal-casting at temps. up to 1600° are made by the lost-wax process from sillimanite and Si(OEt)₄.

Trois types d'efflorescences: alcalis libres, nitrates, chlorures; leur formation et leurs méfaits. La preuve expérimentale de leur existence est fournie par des analyses exécutées sur des supports "d'Eternit." FD


The adverse effects of different paints on plaster and cement surfaces are discussed, and precautions for avoiding such failures which are invariably associated with the existence of damp conditions in either plaster or atmosphere are detailed. Contributory factors are (1) chemical action, e.g., between alkaline plasters and the oil or certain pigments in the paint; only "lime-fast" pigments should be used; (2) loss of specific adhesion caused, particularly in dense CaSO₄ plasters of the Keene's type, by access of H₂O to the paint-plaster interface or, as exemplified by flaking and peeling of water paints and distemper, by repeated wetting and drying of the glue film; (3) efflorescence arising from outward movement of soluble salts in the bricks, sand, and cement of the mortar, plaster undercoat, or, more rarely, the plaster finish itself; tendency of plaster to effloresce depends more on size and distribution of pores than on their total volume, and may be minimized by suitable control of the plastering time-schedule; (4) defects in the plaster, e.g., particles of unslaked CaO which may subsequently cause "popping" or excess of H₂O in hemihydrate plasters causing early "sweating out"; dry-out and delayed expansion may occur in certain anhydrous plasters which have hydrated incompletely through too rapid drying in the early stages; and (5) mold growth, favored by dampness or presence of SO₄⁻-reducing bacteria; remedial measures comprise stripping and drying the infected area followed by treatment with 1 percent aqueous C₆Cl₃ONa or NaOC₆H₄CONHPh. Suitable porous coatings (distempers; flat oil-paints; cement, silicate, and "plastic" paints) are suggested for the early decoration of plaster and cement surfaces to obviate risk of failure through entrapment of excessive H₂O. The specific requirements of portland cement, lime plaster, and CaSO₄ plasters as bases for priming and finishing coats of paint are summarized. Properties of CaSO₄ plasters which affect painting most are chemical action, porosity, rate of hydration, and type of surface finish produced; optimum procedures for painting the various types are detailed. A list of available British proprietary CaSO₄ plasters is appended.

A chemist explains to foundrymen what Si esters are and why they act as cements for refractory aggregates. Hot Si and Cl react to form SiCl₄, which reacts with dry absolute ethyl alcohol to form Si ester or Si (OC₂H₅)₄. In order to obtain a binder, the ester must be hydrolyzed. If a small amount of H₂O is used, such as that present in commercial alcohol, condensation takes place producing a series of complex ethyl silicates. When fully hydrolyzed the liquid is unstable and jells in a short time. The jelling time can be adjusted by the addition of alkali. In foundry practice the liquid is partially hydrolyzed and will set in about 15 minutes when commercial alcohol is added. The setting time can be varied between 5 minutes and 5 hours, according to the amount of H₂O added and the concentration of the condensing agent. The chemical is used in mold making in the manufacture of precision castings, but it can also be used to improve the surface of large castings. For economy, a composite mold having a varying thickness of the comparatively expensive mix at the surface meeting the metal would be backed up by cheaper materials.


Includes papers on “swelling and shrinkage of porous materials and the role of surface forces in determining the technical strength of artifact materials” and on cracking of plastic clay articles during drying, setting, and expansion of plasters.


Two samples of mortar from Roman ruins in Hungary contained particles above 2 mm., 81.08–86.40 percent; 1–2 mm., 3.05–5.15 percent; 0.5–1.0 mm., 2.60–3.14 percent; 0.25–0.50 mm., 2.68–2.84 percent; below 0.25 mm., 2.63–10.43 percent. A Roman brick contained SiO₂ 55.02, Al₂O₃ 21.67 percent, Fe₂O₃ 11.39, CaO 8.32, and MgO 3.37 percent; loss on ignition was 5.43 percent. Roman bricks and modern Hungarian bricks were crushed to grain sizes 0.5–2.0 mm., moistened with water, treated with lime paste, and made into small bricks. These were stored for 27 months alternately in dry air and in air saturated with vapor. Examination showed that 100 g. CaO had dissolved from the brick 1.28–3.93 g. SiO₂ and 4.45–11.04 g. Al₂O₃. The SiO₂ and Al₂O₃ may have diffused into the lime paste and become bound as Ca silicate and Ca aluminate; this makes the whole mass impermeable to water.

The layer of the black substance was found between the mortar layer and the clay which forms the floor of the interior of the pagoda of the Hōryūji Temple. This was found to contain 55.50 percent MnO₂ and is supposed to be manganese wad. The panel stones of the upper platforms of the pagoda and the Golden Hall were also coated with black substances which were found to be manganese wad. Their MnO₂ contents were 38.12 and 50.52 percent, respectively. The reason for the presence of these black substances is unknown.

F. Metals and Metallurgy

1. History


The report of a discovery of a cast iron ring which claims to revise drastically the previously held belief that iron casting was not discovered until the fourteenth century A.D.


Chemical and microscopic examinations of ancient art objects show high purity of bronze and sound microstructure.


The tones of bells of 106 old Japanese bronze clocks preserved in the National Science Museum, Tokyo, were studied and found to be pitched to tunes of Japanese music. Samples from two broken bells contained zinc, silver, bismuth, magnesium, calcium, titanium, antimony, and silicon in traces.


The methods by which the elaborately decorated steel sword hilts of the past were produced are discussed. The writer considers that many of them were wrought but that some were cast by the lost-wax process at an early stage in their manufacture.

A short report is made on a metallographic examination of some eighteenth-century sword ornaments.


Manufacture of tinplate commenced about 1600 in central Europe. An Englishman, Andrew Yarranton, studied the process in Bohemia and brought back plans to England for producing tinplate in Wales, based on local tin and the ores of the Forest of Dean and Irish coal. His plans did not succeed, and it was not until 1720 that John Hanbury started up a plant at Pontypool. Spain began the production of tinplate in 1892 at the La Iberia works now belonging to the Altos Hornos de Vizcaya.


Conférence faite par l’auteur et dans laquelle il aborde certains problèmes qui se posent à l’observation des techniques anciennes. DG


The author reviews the history of Damascus steel and its introduction into Russia. He describes the manufacture and qualities of this steel and gives a short bibliography.

385. BIRINGUCCIO, VANNUCCIO. *The Pirotechnia of Vannuccio Biringuccio*. Tr. from the Italian, with an introduction and notes by Cyril Stanley Smith and Martha Teach Gnudi. . . . New York, American institute of mining and metallurgical engineers, 1942. xvii, 476 pp., illus.

Contents: Introduction; Bk. I. Every kind of mineral, in general; Bk. II. The semiminerals; Bk. III. Assaying and preparing ores for smelting; Bk. IV. The separation of gold from silver; Bk. V. The alloys that are formed between metals; Bk. VI. The art of casting in general and particular; Bk. VII. Methods of melting metals; Bk. VIII. The small art of casting; Bk. IX. The procedure of various works of fire; Bk. X. On certain artificial combustible materials, and the procedures followed in making fireworks to be used in warfare and for festivals; App. A. Figures; App. B. Weights and measures; App. C. List of editions of the Pirotechnia; App. D. Bibliography; Index.


Discussion of the use of "dummy" rivet holes.


The manufacture of iron by native Africans is surveyed. An intensive iron industry which had developed from the eight century A.D. was still flourishing in the days of the Portuguese explorers. In marked contrast to the honored status enjoyed by smiths among the Bantu and Sudanese, metalworkers are generally despised among Hamitic-peoples of the north and the northeast who look down upon physical work of any kind. Early brands of iron were highly phosphoric and brittle. The ores were first roasted in the open air to oxidize the sulfur to sulfuric acid. The iron was cooled very slowly in African smeltings, a crust of graphite and iron carbide being precipitated. The Africans normally produced iron more suitable for forging than for casting. The temperature reached in native furnaces was not high enough to effect proper smelting of the ore which merely formed a spongy mass, gradually losing the excess carbon and becoming an amorphous, cindery iron lump. In some regions, e.g., Togoland, furnaces are 7 to 10 feet high so as to cause a draught through the stack without the use of bellows.

Most "large" African furnaces are based on the principles applied in Europe up to the eighteenth century. They are built of clay and usually do not survive more than one or two smeltings.


Historical data on mining and metallurgy of Sn, Cu, Pb, Fe, and Au. II. Non-metals. *Ibid.*, 59 (1948), pp. 65–76; *C.A.*, 42 (1948), 2895g.

Clays, coal, and precious stones are discussed.


Attention is called to an analysis of a pale yellow-green glass tessera from a Roman mosaic reported by J. J. Manley of Oxford University many years ago ("Analysis of Green and Blue Glass from the Posilipan Mosaic," *Archaeologia* 43 (1912), pp. 106–108). This glass contained 1.5 percent of uranium dioxide which appears to account for its yellowish-green color. It is more probable that a uranium mineral was intentionally added to the glass batch than that the uranium was derived from use of anuraniferous sand.

A Helladic needle from Corinth was found to contain 2.52 percent As. Similar proportions of As have been found in early Cu objects from other sites but not in Sn bronzes of later date.


Description and spectrographic analysis of the metal in the anvil by Dr. Morsrai Ritchie. It is a rich bronze.


Description of the manufacture of bridle-bits and plates and rivets.


Contents: I. Native copper and the ores from which prehistoric non-ferrous metals were obtained. II. Discovery of nonferrous metals in antiquity. III. Sequence of the metals. Analysis and metallography as means of distinguishing the various metals. IV. Mechanical properties of copper and bronze. V. Casting process: furnaces, bellows and crucibles. VI. Methods of working the metals. VII. Results of metallurgical examination. VIII. Examination of specimens from the Pitt Rivers Museum, by Voce, E. IX. Bronze castings in ancient molds, by Voce, E. X. Analyses of native copper and artifacts. XI. Note on specimens in the Pitt Rivers Museum illustrating *cire perdue* casting; seventy references; index.


With aid of diagrams traces course of the development of primitive copper metallurgy as indicated from finds at Tepe Sialk near Kashan in Mesopotamia. The first clear evidence of true bronze intentionally made occurs in the Royal tombs at Ur where we suddenly find a sophisticated bronzeworking technique.


Renseignements historiques et techniques dans le corps des chapitres et à la bibliographie. Les chapitres sont: Age du bronze; Age du fer; période belgo-romaine; orfèvrerie barbare; les siècles pauvres de l'orfèvrerie; le XIIe siècle ou l'âge d'or mosan; orfèvrerie du XIIIe; travail du cuivre du XIVe au XVIIIe siècle; le régime corporatif; la ferronnerie d'art; l'étain; le plomb en art. Glossaire.

Fragments of gold leaf contained 80.25 percent Au, 12.45 percent Ag, 0.001 percent Cu, and 7.3 percent impurities. A silver ring contained 60.48 percent Ag and a trace of Au.


Homer mentioned a metal κασσίτερος which was later designated by Pliny as "plumbum album" and was evidently Sn. The author discusses the history of Sn, its use in white enamels, alloys, etc., the development of commerce in cassiterite and the names for Sn in various languages.


An article on Sheffield plate, with an account of the method of manufacture.


The author traces the history of the metallurgy of iron and the methods of manufacture from the earliest times. The second part of the paper deals with the history of the metallurgy of iron and steel.


About 50 iron castings from Belgium and Luxembourg made in the period 1500-1920, 11 from France made between 1547 and 1738, and some sixteenth century British castings have been examined; the changes in C/Si ratio over these periods are discussed.


Spectrographic analyses were made of 11 copper and bronze objects from Kerma (above the Third Cataract) and 8 from Middle Egypt. Of these 19 pieces, 15 are copper (contain less than 2 percent tin) and 4 are bronze (contain more than 2 percent tin). Although the number of specimens dealt with is too small to warrant drawing definite conclusions, it seems that no very conscious discrimination was made between copper and bronze (copper-tin alloy) in respect to the functions to be performed by the metal object.

Contents: Introduction; Acknowledgments; Names of early American silversmiths, 1650–1850; Marks of early American silversmiths, 1650–1850; Location of silversmiths' shops; Bibliography.

BMU


Description of three V-shaped lumps of iron, possibly "prepared blooms" split before cooling. Also a description of the macrostructure and microchemical analysis of drillings from the lumps and a spectrographic analysis.

IG


Au point de vue technique et historique: La métallurgie du Fer au Pays de Liège jusqu'au 16e siècle; Les fontes anciennes comparées aux modernes; Les fontes de moulage ordinaires, d'affinage, de minerais imprégnés, les poteries; Les fontes pour pièces massives et pour pièces dures; Du fer des bas-foyers aux fontes de moulage modernes; Les fonderies des Vennes (Belgique) et l'évolution technique. En annexe: un essai de détermination de l'âge des pièces en fonte avec tableau d'analyse de quatorze objets datant du 16e au 19e siècle.

DG


Analysis of a plate of metal found at Athens along with coins and other objects dating from the fourth to the second centuries B.C. showed it to be nearly pure Zn. Though the plate may be of later date, the structure indicated that it was not produced by modern methods.


Discusses the Bronze Age in particular.

407. FORBES, ROBERT JAMES. Materials that were known 3300 years ago. Chem. Weekblad., 37, no. 6 (1940), p. 43; C.A., 36 (1942), 4577.

An Egyptian diplomatic document that gives some information on the metallurgy of the time is described.

408. FORBES, ROBERT JAMES. Metaal en metaalbewerking in mythe en maatschappij. Mensch maatschappij (Amsterdam), 18e jaar., no 1, 30 pp.

Historique du travail du métal: les forgerons en Afrique, en Indonésie, leurs traditions; arrière-plan technique du forgeage; la découverte des minerais; la situation sociale du forgeron, sa position dans le
Moyen-Orient et en Egypte; raccord entre la mythologie et l’histoire; la migration des forgerons du fer; origines d’après les données archéologiques. 65 références.

409. FORBES, ROBERT JAMES. Metallurgy in antiquity; a notebook for archaeologists and technologists. Leiden, E. J. Brill, c1950. 489 pp., 98 illus.

Contents: A note to the reader; Synopsis of early metallurgy; Short historical survey of early mining; The evolution of the smith, his social and sacred status; Tools and methods of early metallurgy; Gold in the ancient near east; Silver and lead in antiquity; Tin, antimony, and arsenic in antiquity; Zinc and brass in antiquity; Copper in the ancient near east; The early story of iron; Old methods and new tools; Index. Includes bibliographies at end of each chapter.


Some incidents revealing the early history of the production and use of metals are described. With regard to iron it is stated that a storehouse containing about 160 tons of forged iron bars, most of them up to 6 inches thick and up to 20 inches long, was found in the ruins of the palace of an Assyrian King, built about 710 B.C.


By the macro- and micro-examination of longitudinal and transverse sections of a "damascened" sword and comparison of the appearance of the surface with those of other swords of these periods, the author was able to establish that the ornamental pattern was not produced by welding a filigree pattern on to the surface but was the external trace of the laminated structure of the steel itself. The laminations consist of pure iron and light carburized iron, and the mode of manufacture by welding together these strips of surface carburized iron to form a sandwich and then folding back and forth to form close loops, rewelding, forging to shape, and finally welding on the (un-patterned) cutting edges is described.


Attaques macrographiques et reconstitution des procédés de fabrication du damas soudé. La cémentation niturée, l’historique des lames d’épées. Caractéristiques principales des épées damassées et moyens d’investigation.

Contents: Introduction; Chronology; Bibliography; List of plates; Bronzes listed in numerical order; Catalogue; Index.


A factual treatment with map and selected bibliography. Lists are given with place names of mines and mineral resources, mounds, and caves. The Balkans are richly mineralized and there is abundant evidence of a metallurgy going back to the end phases of the Neolithic Period.

RJG


Mise en évidence des damasquinures d’argent sur des boucles en fer de l’époque franque. DG


A study of examples of Classical metal reliefs showed that hammered relief was used throughout antiquity in Greece and Italy. Repoussé was apparently discovered in the second half of the fifth century and remained in use until at least the third century. Cast low relief was used at all periods, but hollow cast relief was used only in Hellenistic and early Roman times. Cast reliefs were made in imitation of hammered reliefs with the aid of matrices that were also molds, and from repoussé with the aid of clay impressions.

ERC


Prior to the sixth century B. C. metal vases were produced solely by hammering. At about the beginning of the sixth century cast bases,
rims, and handles were sometimes attached by riveting or welding. By the fifth century the bodies of vases were also frequently cast. Casting of bodies was not always by the cire perdue process, for sometimes the parts of a vessel were cast separately and then joined. Cast vases were usually finished by turning on a lathe, both for the purpose of imparting decoration and for polishing. It is doubtful that metal vases very often served as prototypes for pottery vessels of similar shape.


A brief description is given of the discoveries at Norton, Sheffield, indicating prehistoric smelting of iron. The finds include three slag mounds and a smelting pit. These are of high archeological significance.


The authors give an account of their examination of a 300-year-old cast-iron cannonball. They examined the nature and reason for internal unsoundness, the chemical composition and gas content of the iron, and carried out metallographic examinations.


The author presents evidence that the ring of the sixth century B.C. was not cast but was drop-forged in dies in two halves and then fire-welded.


In 1948 remnants of smelting furnaces and a workshop were discovered in a Scanian forest. Bog iron ore was used as a raw material for weapon manufacture in those areas some four centuries ago.


The following technical processes are described: "In the first a wire or suitably shaped piece of the inlay metal was beaten into a previously prepared hollow in the body." This is the case with the Winchester knife. "In the second a sheet of inlay metal was beaten into the body, which was previously scored with the pattern, and then cut away so that the body surface underneath showed up the design."

The principal cinnabar mines in Spain are at Almaden del Azogue in the province of Ciudad Real south of Madrid. These are among the oldest worked mines in the world. They were taken from the Celt-Iberian aborigines by the Carthaginians and in turn by the Romans who worked them with slave labor. The deposit is of great extent and in over 2,000 years of continuous operation it has hardly been touched. After seven centuries of operation by the Moors the mines have passed through many hands. They are now a state monopoly. Modern ore roasting methods have been installed with the result that poisoning of workers by mercury vapors has been much reduced. In 1939 exports totaled 53,400 76-pound flasks.


Through the courtesy of R. J. Frank, vice-president of the Copperweld Steel Co., and L. C. Whitney, metallurgist, an adz head and a mace head from this site were analyzed chemically and studied metallographically. Both were found to be nearly pure copper. The adz head was evidently produced by casting with subsequent hot and cold working. The mace head had a coarse cast structure with no indication of working. Excellent photomicrographs illustrate the structure of these objects and the extent of corrosion.


The author briefly traces the various civilizations in Spain and their effects, leading up to the introduction of mining and metal working from the East, and outlines events in Guipuzcoa from the fourteenth century. Slags from the ancient ironworks, found by the author in the mountainous regions, confirm the existence of these works mentioned in old Basque documents. The slags are not spongy but vitreous, and appear to have been exceptionally fluid. The Guipucaons probably used charcoal for smelting and added a flux. The development of the organization of metallurgy in Guipuzcoa is subsequently described up to the beginnings of the nineteenth century.


A hoard of prehistoric bronze objects and fragments of such objects is described. Their total weight amounted to 12.5 kilograms. The nature of the collection and the inclusion of fused cakes of metal indicated the hoard of a metalworker. Quantitative analyses of metal from three of the objects were made for the author by the Laboratoires P. Dubois of Paris. The bronze was found to vary much in composition, since the tin content ranged from 2.92 percent to 10.18 percent, and the lead content from 0.31 percent to 3.01 percent. Various impurities were found.

A comparative description is given of various types of swords and daggers of various ages from different parts of the world, with particular reference to irregularities and the designs on their blades.


Analyses are reported for 44 specimens of bronze from the Yin and Chou periods (1401–249 B.C.).


Spectrographic estimates are tabulated for 23 elements in five samples of lime-encrusted iron implements from Palestine that are believed to date about the seventh century B.C. Quantitative analysis on a plough share gave: SiO₂ 0.58; MnO 0.023; P₂O₅ 0.077; S 0.032; (as SO₄ or S) C (as CO₃) 0.45; Fe₂O₃ 90.76; Al₂O₃ 0.36; NiO 0.12; remainder mostly CaO. The low Ni and Co content indicate that the iron is not of meteoric origin. All samples are slightly magnetic indicating that the Fe is nearly completely oxidized.


Structural design and development of early bronze swords in China and their importance as a means of dating.


Contents: Introduction; Objects of sheet gold from the Cenote of sacrifice; Artifacts of gilded sheet copper; Artifacts of cast copper; Objects of cast gold; Discussion; App. I. Metallographic examination of gilded sheet copper and wirelike bells, by William Harvey; App. II. Metallurgical tools and materials; References; Index.


Contents: 1. History: Primitive smelting, Early uses, sources; 2. Physical and chemical properties of the metal: Physical characteristics, Allo-


Description of possible methods of casting.


The development of the craft of the metalworker in antiquity is traced from the simple processes of sinking, raising, shaping, turning, spinning, riveting, welding, sintering, and soldering through the more complex processes of decorating like tracing, engraving, inlaying, and repoussé. The processes are illustrated with diagrams. Examples are drawn mainly from Europe and the Near East. The author discounts shaping of bowls by hammering over a turned or carved wooden pattern; he does not believe that repoussé was hammered over carved designs in wood. He points out that contrary to the beliefs of many archaeologists copper and its alloys cannot be pressure welded either cold or hot. So-called welded joints are often over-fired soldered joints. The subject of soldering is discussed with the aid of phase equilibrium diagrams.


The several silver dishes in the Mildenhall Treasure (British Museum) were examined for methods of technical execution. They form a fairly closed group. The dishes were formed from a cast circular ingot about one-tenth inch thick and the design was not done in repoussé from the back but was modeled and chased from the front. The surface of all works had been scraped before polishing. The beads of the beaded edges are hollow and were formed by driving up from the back with a round-headed punch. The general methods of fine metal working are reviewed.


Description of the reconstruction of the helmet and methods of fabrication. Details of decoration and casting and materials used—iron, silver, gilt, niello, etc.


Evidence for the reconstruction, etc.

An examination of the scale on the blade and the technique used in making the inscription. Also identification of fresh-water algae (Zygnemaceae) found on the blade, by F. E. Zeuner.


A detailed report of metallic specimens excavated from the site of Susa, near the head of the Persian Gulf. A number of the specimens are illustrated. Evidence suggests that vases, plates, mirrors, weapons, and ornaments made of copper date from 2800 to 2500 B.C. A representative sample from a horse harness contained 98.5 percent copper, with 0.12 percent nickel, 1.34 percent iron and traces of tin, arsenic, antimony, and silver. Molds for casting lance, spear, and arrowheads were excavated (1500 B.C.). At about 2700 B.C. bronze appeared, probably imported; specimens analyzed contained 8 to 12 percent tin. Gold ornaments (2300–2200 B.C.) were unearthed; and articles of silver were found, belonging to about the same period. Lead appears to have been used at the same date as gold and silver with a purity of 99.8 percent. At about 1000 B.C. iron appeared in Susa (arrowheads and rings), but was rare, though of high purity. The technical achievement of the metal workers of the town of Susa which changed hands and suffered sieges and pillages many times is discussed.


The marble columns of this famous temple were held together by iron dowels. Square rods were also used. These were reported on by Hallbauer (*Stahl u. Eisen* 1894, 984). The iron was presumably made in a blooming hearth. H. reports that it could not be rolled and that it broke under the hammer. It is not homogeneous and resembles a mixture of steels rather than wrought iron. A dowel, when cut, polished and etched appears as a very pure wrought iron with some spots that contain C. Its Brinell hardness corresponds to a good wrought iron. A hard spot showed pearlite and cementite corresponding to about 1.2 percent C. The bar broken by the hammer showed part made up of ferrite with slag inclusions; the other part, slag free, contained ferrite and pearlite. The slag appears to be iron silicate supersaturated with oxide (cf. *Archiv. Metallkunde* 3, 7 (1949). The ancient Grecian dowel was compared with a chisel-type tool found at Annaburg, near Wittenberg. The chisel showed very fine slag inclusions, fibrous in form, due to forging. The chisel showed about 0.25 percent P, in agreement with other prehistoric irons found in north Germany, but prehistoric irons from central Europe show very little P. Difference in P content is attributed to differences in the ores of the two sections.

Description of the method of manufacture of a gold bird and of the solder used.

443. OLDEBARG, ANDREAS. *Metallteknik under förhistorisk Tid.* Lund, 1942–43. 2 vols.


The ancient history of cast metals is discussed, reference being made to the distribution of finds of prehistoric moulds in the British Isles. The history of founding is reviewed with special mention of work in cast iron and the use of coal before the Christian Era and with reference to the modern developments of casting centrifugally, continuosly, and in dies.


Composition et propriétés des alliages préhistoriques à base de cuivre. Evolution de la technique métallurgique.


Rapport entre la délimitation des périodes de l’âge du bronze d’après les données typologiques et la classification adoptée par l’auteur se basant sur la composition d’un grand nombre d’objets. Importance de la recherche simultanée dans les deux domaines.


Historique des analyses durant le siècle dernier. Classification des alliages de cuivre utilisés dans la préhistoire d’après leur composition chimique.

448. OTTO, HELMUT et WITTER, WILHELM (and others). *Handbuch der ältesten vorgeschichtlichen Metallurgie in Mitteleuropa.* Leipzig, J. A. Barth, 1952. 222 pp., 30 illus., 33 pl., 5 cartes.

Examen chimique, dans le passé, d’alliages de cuivre préhistoriques; nouvelles voies d’investigation par analyse spectrale; valeur des preuves d’origine de la découverte du métal de la préhistoire; examen métal-
lographique; tableaux d’analyses (1300 échantillons); description des méthodes spectrographiques et discussion des résultats.


A description is given of the contents of a remarkable sixteenth century document in Czech. It was written by Kirck and is concerned with the manufacture of guns, pumps, and bells.


This is a review of knowledge on the working of gold, copper, bronze, iron and cast iron by the people of the Near East, Egypt, and China. There are 41 illustrations of archeological subjects.


The Chinese bronze mirror is not only an efficient reflector of light but is also a symbol of the Light Supernatural. In this review of mirrors, principally of pre-Han examples, the author describes various technical aspects including alloy used and casting and finishing techniques. An analysis of a typical late Chou mirror showed Cu 72.1, Sn 26.2, and Pb 1.4 percent (total 99.7 percent). In mirrors of the Han period, an increase in the amount of Pb—up to 5 percent—is sometimes noted. No evidence of mercury is found analytically in spite of numerous references to its use in Chinese literature. Some mirrors were cast by the “lost wax” process, but stone molds were also used (a photograph of a stone mirror mold is shown). In the finished mirror evidence of “gates” or points of entry of the molten metal seldom exist. Close examination reveals clear evidence of numerous methods of abrasion, tooling, and burnishing. In design the mirror was twofold; the obverse or polished reflecting side was functional and secular; the reverse bore ornament of symbolic religious meaning. There is not only symbolism of plan but symbolism of ornament. (The article is richly illustrated by photographs of details and by drawings.)


Modern electroplating, a relatively recent development, has roots which are traced back to the time of the ancients.

The technique used by the craftsman of the Tuareg for the working of iron, silver, and copper is described.

454. QUIRING, HEINRICH. Geschichtede des Goldes; die goldenen Zeitalter in ihrer kulturellen und wirtschaftlichen Bedeutung. Stuttgart, Ferdinand Enke Verlag, 1948. 318 pp. illus., tables (part cold.), map.

Contents: Kulturschwankungen und Goldzeiten; Bronzezeit (2100–1200); Eisenzeit (1200–50) und romanische Kaiserzeit (—50 bis +500); Mittelalter (500–1492); Neuzeit (seit 1493). BMU


Historique de l'extraction et de l'utilisation de l'or en Afrique, en Asie Mineure, aux Indes et en Europe. L'auteur s'attache principalement à l'Egypte et passe en détail les périodes depuis la prédynastie. DG


Various metals and alloys were known in India as far back as the Indus Valley civilizations of 4000–3000 B.C., as revealed by excavations at Mohenjo-daro. Gold, silver, and electrum were used for jewelry. Copper was used for ornaments and utensils, and lead and tin were also known, although the latter was usually in the form of bronze in which the percentages of tin ranged from 6 to 13. Some of the copper objects contained nickel, one example being found in which the percentage of nickel was 9.38. An alloy of copper with 3 to 4.5 percent arsenic was also used at Mohenjo-daro in place of bronze.

Bricks, pottery, faience, and terra cotta have been found in abundance at Indus Valley sites. The most abundant ceramic objects are of brown glazed pottery. Some specimens of polychrome pottery have been found.

Brass, iron, and steel were in use in India before the beginning of the Christian Era. Brass vessels belonging to about the first century B.C. have been unearthed in excavations at ancient Buddhistic stupas, and brass coins were in common use at about the same time. Iron implements and weapons have been found in excavations of burial sites in the Madras Presidency under conditions that indicate a date prior to the fourth century B.C. Iron clamps of the Bodh-Gaya temple and iron slag found in the excavation of the foundation of the stupa at the same place furnish definite evidence of iron manufacture as early as the third century B.C. The famous iron pillar at Delhi of about the fourth century A.D. and later large iron pillars show the high degree of skill in the working of iron. In the garden temple at Puri of about A.D. 1174 there are 239 iron beams ranging up to 17 feet in length and 6 inches by 6 inches in cross section. These consist of highly pure wrought iron as shown by the following analysis: Fe =

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99.64 percent, \( P = 0.15 \) percent, \( C = \) trace, \( S = \) trace, \( Mn = \) none. True steel was made on a small scale by the crucible process, and was used, for example, in the manufacture of surgical instruments.

Many kinds of minerals and artificially prepared metal compounds were used as pigments and in medicinal preparations at various periods in ancient India.


Quotations relating to metals, copper, and bronze in particular, from the Iliad are discussed. The Trojan war was in the early days of iron and Homer, in the Iliad, indicates that he is familiar with iron as a commodity and as a metal for making agricultural implements, including axes; it was evidently not produced in a quality sufficiently good for weapons of war.

458. **RIEFSTAHL, ELIZABETH.** Doll, queen or goddess (and) Appendix II: Examination of a bronze figurine (Egyptian), by R. J. Gettens. *Brooklyn Mus. J.*, (1943/44), pp. 7–23, plates.

A late Egyptian bronze figure of a nude girl is described and is compared with similar figurines in other collections. Technical examination showed that the metal was copper-tin alloy (bronze) with lead. Inlay material of the left eye is calcium carbonate (Egyptian alabaster). Inlay of the pubic triangle is glass set in a bedding of Egyptian blue frit. In the hollow rectangle and medallions of the crown are remains of colored inlay; blue is Egyptian blue frit and orange red is glass colored with cuprous oxide. A brown material in certain rectangles tests for lead and suggests that these formerly contained some kind of leaded glass or paste. Other hollows are filled with copper corrosion products, chalky earth remains, and fragments of charcoal. **RJG**

459. **RIETH, A.** *Die Eisentechnik der Hallstattzeit*. Leipzig, J. A. Barth-Verlag, 1942. 178 pp. 97 illus. (Mannus-Bücherei, Bd. 70.)

Contents: Preface; Introduction; The technique of forging; The technique; Annex; Analysis of Hallstatt iron objects; Examination by metallography; Literature; Chronology. **P.C.**


Contents: Introduction; Métallurgie du cuivre; Métallurgie de l’or; Métallurgie de l’argent; Métallurgie du plomb; Métallurgie du platine; Métallurgie du fer; Métallurgie du zinc; Font et coulage; Placage; Soudure; Durcissement par martelage a froid; Revêtement métallique; Dorure sur bois; Rivetage; Assemblage par couture; Assemblage par bouton; Repoussé et éstampage; Plaques a contours découpsés ou ajourées; Conclusions générales; Bibliographie; Index des matières; Auteurs, collections, personnages, historiques et mythologiques. **BMU**

In pre-Columbian times Indians of Colombia and Panama invented an alloy of gold and copper called "tumbaga." This alloy was gilded by a process called *mise en couleur* in which the object was alternately treated with corrosive vegetable juices and heated. This process dissolved out Cu and enriched the Au at the surface. Only polishing was necessary to give the effect of solid Au. Application of Au leaf to surfaces was also practiced.


Contents: Sources of metal; Mining; Smelting; Working of metals; Hammering, embossing, and engraving; Casting; Annealing; Welding; Soldering; Bimetallic objects; Metal inlays; Gilding and coloring; Metallurgical regions; Historical development; Bibliography.  


Two hundred and seventy-two chemical analyses, mostly quantitative, are reported on a variety of gold, silver, copper, and alloy objects. Some observations are reported on the metalworking methods of hammering, embossing, engraving, annealing, casting, soldering, welding, and gilding. The development of metallurgy from the early Paranan period through the Inca period is traced.


Spectroscopic analysis of objects, mostly bells, from Tajumulco showed they were made from very pure copper, sometimes containing a trace of silver. The most likely region from which the pure Tajumulco copper was obtained is Chiapas on the highland of Guatemala. Ninety-five copper objects from neighboring regions were also analyzed in the same manner, but they do not run so consistently of high purity copper as do the Tajumulco objects. More analyses will have to be made before the region of pure copper objects can be delimited. (Analytical results are given in two tables.) The bells and a filigree ring were cast by the *cire-perdue* process. There is no example known where filigree or wirework involved welding or soldering, and none of the objects showed any sign of gilding.

The growth and flourishing period of the Iron Industry in this region are outlined. Ore, wood, and water formed the basis on which it was built, and their importance is discussed in connection with the various production methods (direct, blast furnace, sintering), and with the working-up into sheets. The production techniques, the social structure and organization of the mining and metallurgical industries of the Oberpfalz afford a completely new picture of a vanished major industry which in the later Middle Ages and early modern times was of great importance, both near and far.

466. **Salin, Édouard.** *Le haut moyenâge en Lorraine d'après le mobilier funéraire; trois campagnes de fouilles et de laboratoire.* Paris, Paul Geuthner, 1939. 335 pp., illus., map. (Rhin et orient, v. 1.)

Contents: Preface; Introduction; Archaeological data on the sites and the excavated objects (IV to VIII cent.); Technique of excavation; Restoration of objects discovered; Application of laboratory methods to archaeology; Examination of the techniques of goldsmith's work; Index; Literature.


Bref aperçu du traitement des fers au Musée de Nancy. Origine et empirisme de la métallurgie ancienne. Examen métallographique d'une épée de la Tène, de trois épées d'Alise (1er siècle v. Chr.), de fers gallo-romains, d'armes mérovingiennes, alamaniques et germaniques. La technique des tranchants, le martelage, la trempe, le durcissement de l'acier par l'azote, le damas oriental. Description de quelques casques, les courants d'influence.


Contents: Corrosion and procédés de conservation des fers; méthodes d'analyse, la structure et la composition; métallurgie et techniques artisanales; Le fer dans l'armement et dans la parure, La damasquinure sur fer: les plaques de ceintures et autres applications; Le fer dans l'équipement et dans la vie domestique. Restes organiques conservés par la rouille. Synthèse des faits nouveaux. Références bibliographiques.


The history of the manufacture of iron and steel in Great Britain is traced from the Roman occupation up to the present time.

Analyses of bronzes found at Byblos and Ras Shamra indicate the intentional alloying of tin and copper as early as the end of the third millenium B.C. The discovery of unfinished objects indicates that the bronze was of local manufacture. On the basis of seven original analyses the tin content of these ancient Syrian bronzes was found to average about 11 percent. Lead, iron, and zinc were present as the principal impurities.


About A.D. 670 the manufacture of cutlery attained a very high standard in the kingdom of Northumbria. Twenty-six references.


Contents: Introduction; Prehistoric development of the metal; Far Eastern foundry development; Casting development in the Mediterranean Basin; Melting and molding methods of the Renaissance; Casting of bells and guns; Sand castings of direct blast-furnace iron; The early iron foundry; Colonial foundries in the New World; Metals and melting in the nineteenth century; Development of foundry mechanization; Recognition of source material; Illustration sources; Bibliography; Index.


The discovery of remnants of ancient direct-reduction furnaces is described, and an explanation is given of the functioning and chemical processes in these furnaces which were operated at only 700–900° C. Ores containing 45–48 percent of iron and 10–30 percent of silica were broken up into 15–25 mm. pieces which were mixed with an equal volume of charcoal. This mixture was charged into the furnace in quantities of about 70 cu. dm. at a time. Such a charge yielded 2.5–5.8 kg. of iron, and 5–12 charges were necessary to obtain about 30 kg. of iron, for which a time of 12 to 24 hours was required. To withdraw the iron it was necessary to break open the lower part of the furnace wall, which was then repaired so that the operation could start afresh.

Four Cornish ingots and two other objects of unknown origin were examined and found to consist of Sn of the order of 99.9 percent purity. Examination of several hundred Roman objects, 17 of which are described here, revealed that no pure Sn was used, the Sn being alloyed with Pb in simple proportions by weight.


Contents: Preface; "Dramatis personae"; Metals and civilization; How we get our metals; Making iron; Making aluminium; Alloys; Metals under the microscope; The inner structure of metals; The shaping of metals; The testing of metals; Corrosion; The metallurgy of iron and steel; The role of carbon in steel; Cast iron and alloy steels; Aluminium and its alloys; Magnesium and its alloys; Copper and its alloys; Four common metals; Some minor metals; The joining of metals; Powder metallurgy; Metals in war time; The future of metals; Glossary; Index.


Description of primitive smelting with charcoal. The slag analysis given contains 0.5 percent Cu and contains olivine in a glassy matrix. The metal produced contains 98.8 percent Cu and only traces of Pb, Fe, As, and Sb, but malleability and ductility are poor, probably because 2.5 percent Cu$_2$O is present.


The sixth century B.C. bronze helmet found in fragments at the ancient Metapontum in South Italy is surmounted by a ram's head with large silver crest. The helmet and ram's head were hammered out of a single sheet of bronze, which must have been about 35 inches in diameter. There is no evidence of seams or soldering. Analysis of the alloy showed 84.42 percent copper and 14.88 percent tin. Details of the original construction of the helmet and of the methods and materials of reconstruction are given.


Examination of an ancient direct-process slag from Magdalensburg in Carinthia showed that it had the following approximate composition: wustite 25, fayalite 50, ferrite 1-5, glass 10–15 percent, small amounts of an unknown crystal phase and hercynite deposited in the wustite. Lumps of Fe that accompanied the slag consisted of eutectic
gray pig-iron containing the phases: graphite, secondary cementite, and pearlite. The output of metallic Fe by the bloomery-hearth process was computed at about 54 percent.


Analytical data of the above finding prove that it is derived from bog iron ore.


Few know that granulation work in jewelry was done in China, perhaps going back to the early Han Dynasty. The technique seems to have been derived from the West. Several examples of Far Eastern granulation work are mentioned.


Sources of tin, analysis of tin content of Therni bronzes.


Discussion on the accidental and intended smelting of copper and tin.


Evidence for smelting of copper and tin.


Nubia and Ethiopia have a plentiful supply of iron ore, and at one time there was also timber for making charcoal. No iron was used in Ethiopia in the eighth and seventh centuries B.C., but knowledge of metal iron was introduced by Aswan mercenaries in the sixth century. Before the middle of the first century B.C. at least one heap of scoriae from iron-smelting operations had accumulated at Meroë. At Meroë there is no sign that the iron industry lasted after A.D. 350. The making of iron arrowheads did not begin until the first century A.D.; then they increase rapidly until the third century, after which they cease. Lower down the Nile, however, in the royal tombs of Ballana and Qustul (about 300-600 A.D.) near the Second Cataract, iron objects, and even iron ingots, are abundant.


The growth of the Austrian iron industry, which is based on two main sources of ore in Carinthia and Styria, is traced from early Roman times to the present day, particularly in regard to the development of
the modern coke blast furnace from early reduction furnaces. Mention is made of the finery fires of the Middle Ages, which were gradually superseded by the puddling process. The effect of the invention of the Bessemer process was comparatively small, and this process declined and disappeared when the open-hearth process was invented. The electric-furnace process is also of great importance.

The main Austrian steel works are given, and the development of steel-fabrication and other associated industries with the economic development of the Austrian iron and steel industry is discussed. The growth of the Austrian tradition of quality and craftsmanship is mentioned, and examples are given of some of the works of art produced in the last two centuries.

486. **Weiershausen, P. Vorgeschichtliche Eisenbütten Deutschlands.** Leipzig, Curt Kabitzsch-Verlag, 1939. 235 pp. 70 illus. (Mannus-Bucherei, Bd. 65.)

Contents: Introduction; W. Germany; S. Germany; E. Germany; C. Germany; N. Germany; Ostmark, Böhmen and Mähren, France, Belgium, Switzerland; Ventilation; Bronze, rough iron, steel and soft wrought iron; Iron bars; “Taleae ferreae”; Ores exploited; Summary on the discovery of metal; Analyses of slag; Analyses of iron; Literature; Index.


Supported by comprehensive metal investigations (spectrum analyses) of museum specimens which originated in the earliest periods of European metal ages, and investigations of actual metal deposits in place, the author follows the development of metallurgy of Cu and Cu-Sn alloys, and assigns the different metal groups (pure Cu, crude Cu, Cu containing Ag, tetrahedrite metals, Cu containing Sn, Cu containing As, Cu-Sn alloys, and Cu-As alloys) to the ore occurrences in central Germany.


Le dosage spectrographique quantitatif des impuretés caractéristiques est réalisé sur nonante anneaux en cuivre provenant de la région des Alpes Salzbourgeoises. Les teneurs sont comparées à celles de restes de fonderies trouvés dans la même région. L’auteur en déduit que certains cuivres ont été découverts en leur lieu d’origine tandis que d’autres ont été importés.

2. EXAMINATION AND TREATMENT


A combination of physical and chemical tests is applied for identification of various electroplated metals. For colored deposits, clean the surface and add an alkaline cleaner. If the deposit dissolves, it is Cd or Zn. If insoluble add a drop of HNO₃. If insoluble the deposit is Au. If it dissolves, spot-test with HCl. A negligible reaction indicates Cu, slow attack brass, or bronze. Brass can be distinguished by qualitative tests for Zn or Sn. For white deposits, clean the surface and treat with HNO₃. If inert, treat with NaOH. If the deposit dissolves it is Al. If inert to NaOH treat with HCl. If inert the deposit is Pt. If it dissolves, it is Cr. If the deposit dissolves in the original treatment with HNO₃, spot-test with dilute HCl. If inert the plate is Ag or Pb. If it dissolves slowly the deposit is Ni. If it dissolves readily it is Cd, Sn, or Zn. Sn can be identified by adding solid cacotheline to the HCl solution. A reddish violet color appears if Sn is present. Cd can be distinguished from Zn by dissolving in HNO₃, making alkaline, and adding 10 percent Na₂S. A white precipitate indicates Zn, a yellow precipitate indicates Cd. Pb can be distinguished from Ag by testing with K₂CrO₄. Pb will give a bright-yellow precipitate.


Chemical analyses were made on 20 out of 140 specimens recovered in sites in the Amouq in northwest Syria. Extensive chemical and
metallographic studies were also carried out. Results are reported in 15 tables. In phase F (about 3500–3100 B.C.) Cu tools made their first appearance. In these Ni and As are chief impurities. These elements originated as impurities in the Cu ores. In phase G (about 3100–2800 B.C.) a fairly elaborate metal industry flourished. Copper was hot-worked or annealed. There is good evidence that ore reduction was practiced. Deliberate alloying with Sn was done to produce bronze which was used only for making castings. From the study of several figurines it is believed they were cast by the lost wax process. This Syrian site is within the "fertile crescent" of the Near East where it is held by many that the smelting of metals had its origin.


Restauration d’ordre esthétique, nettoyage et consolidation d’une statue en bronze d’époque romaine.


A special method and equipment were developed at the Peabody Museum, Harvard University, for the treatment of over 500 iron artifacts from the Illyrian culture of northwestern Yugoslavia. This was based on reduction of iron rust by illuminating gas (chiefly hydrogen and carbon monoxide) at a temperature of 600°–700° C. in an electrically heated furnace made from 3½ inch diameter—39 inch length of seamless iron tubing. Complete details of furnace construction (with wiring diagram) and operating procedure are given. Time of reduction was three to four hours. Following furnace treatment the iron powder and other residues from the rust layer were removed with a scratch brush. The objects thus treated acquired a black metallic lustre owing, probably, to the formation of iron carbide. A final protective coating of vinyl acetate lacquer or of wax-resin mixture was applied. The method has advantage over electrolytic and alkali-zinc reductions methods in that no final washing is necessary and a superior finish is obtained. The author believes the method is safe even in the hands of nonchemists.


Trois importantes restaurations de portes d’églises en bronze du 11e ou 12e siècle sont exécutées à l’Istituto Centrale del Restauro. Sont décrits: l’historique, les traitements, les problèmes de remontage, les reconstitutions par fragments coulés à cire perdue.


A flattened sheet of metal with a repoussé design in Greek style, which apparently had once been the side of a cylindrical vessel, was
found in the bed of the Alpheus River in Greece and was first thought to be a bronze or copper object because it was covered with a grayish-green patina. However, attempts to clean it revealed that the surface of the bare metal had the appearance of silver. Further examination showed that the sheet was constructed of a layer of a reddish metal sandwiched between two layers of a white metal. Analysis showed that the reddish metal was essentially pure copper and that the white metal was composed of about one-half copper, one-third tin, and one-sixth lead. No other example of the use of an alloy of this composition in either ancient or modern times could be located. This object apparently had been made by hammering the repoussé design in a sheet of copper, dipping this into the molten white alloy, and finishing the surface of the heavily coated copper by tooling and polishing. The date of this object is uncertain, but it may have been Roman. ERC


A female statuette (I) and an animal statuette (II) were examined chemically and microscopically. No. I had a coarse, dendritic structure with the normal appearance of an ordinary cast Sn bronze. In the second there were a great number of globular and irregular particles of metallic Pb, indicating the presence of a high proportion of unalloyed Pb. The metal surrounding the Pb had a dendritic structure. In both statuettes the structure of the matrix indicated they had both been produced solely by casting. The first was found to be an ordinary bronze of the following composition: Cu 92.28, Sn 7.00, Pb 0.13, Fe 0.16, Ni 0.05 and Zn 0.22 percent. The second was found to be an alloy of low Sn and very high Pb content with the following composition: Cu 60.40, Sn 5.34, Pb 34.56, Ag 0.22, Fe 0.33, Ni 0.09, and Zn 0.40 percent.


The validity and ability of specific-gravity measurements as a means of estimating the composition of all kinds of ancient metal objects are critically discussed with numerous examples. It is useful for rapidly distinguishing objects composed of precious metals from those composed entirely of base metals. For estimating Au in an object it is reliable and sufficiently accurate when the proportion of Au is high but increasingly less so as the proportion of Au becomes lower. It is good for estimating Ag in Ag objects only when the Ag content is high. Specific-gravity measurements appear to be of no value for estimating the quantitative composition of ancient objects made of base metals or their alloys. Corrosion vitiates any estimate of composition based on sp. gr. measurements. RJG

The determination of the gold content of gold objects by means of specific-gravity measurements is one of the oldest methods of assay. The chief advantage of the method is that it makes possible an estimate of the fineness of gold objects which, because of their antiquity or artistic value, cannot be sampled in any way. From study of tables in which specific gravities and differences between the gold content from specific gravity and actual gold content are compared, it appears there is no justification for expressing the specific gravity of the pure metals to more than a single decimal place for the purpose of computing the composition of their alloys. On the average, therefore, a little more than 1 percent is the closest approach that can possibly be attained in respect to the composition of gold-silver and gold-copper alloys by this method. The method is only reliable for objects of high gold content and it becomes increasingly less reliable as the gold content decreases and it becomes very unreliable for objects of low gold content. There is no point in attempting to determine the specific gravity to more than the first decimal place nor is there any point in expressing the results to more than the nearest whole number in percent.

The uniformly very high gold content of the coins in the long series of Roman Imperial coins from Augustus to Diocletian extending over a period of three centuries is remarkable. It must be concluded that the Romans knew and applied a highly efficient process for the purification of native gold.


Références bibliographiques sur les phénomènes de corrosion et le traitements chimiques des objets de fouille. Méthodes utilisées dans les musées provinciaux d’Espagne. Liste de vingt-trois objets traités à Séville en s’inspirant des méthodes précitées.


Samples of definite area taken with punch and die. Solutions containing up to 10 micrograms in 25 milliliters were determined by o-tolidine.


Analyses chimique et spectrographique d’une châsse (Nivelles, 13° s.) en argent doré, incendiée en mai 1940. Diagrammes d’équilibre Cu-Ag.
Oxydation de ces alliages à basse et haute température. Examen métallographique de fragments. Le phénomène de démixture. Phénomène de surchauffe et perte de malléabilité.


Analyse spectrochimique quantitative d’une marmite en bronze et d’un bassin perlé en laiton du 5e siècle. L’auteur communique les méthodes des analystes et les résultats obtenus. De nombreux bassins perlés ayant été retrouvés dans la région de Namur, il souhaite pouvoir déterminer par des analyses comparatives si ces objets proviennent d’un même atelier localisé dans cette région.


Dissolve 4 milligrams of sample in HNO₃-HCl, allow the solution to be absorbed in a pure gray graphite electrode at 80°, and evaporate to dryness. For Cu, Sn, and Pb obtain the condensed-spark spectrum of a solution containing 1 percent of bronze and 2 percent of added Cu and compare the intensities of the line pairs Sn 2429.5/Cu 2441.6 and Pb 2833.07/Cu 2882.9. From the results, by means of standard curves, the content of all three metals can be determined with a precision of approximately 3 percent. For the minor and trace elements, obtain the Pfeilsticker interrupted-arc spectrum of a 3 percent solution of the bronze and compare the intensities of the lines Ni 3050.8/Cu 3073.8, Fe 2488.15/Cu 2400.1, Zn 3345.6/Cu 3349.3, As 2349.8/Cu 2400.1, Sb 2877.9/Cu 2882.9, Co 2407.26/Cu 2400.0, Au 2428.0/Cu 2400.1, Bi 3067.73/Cu 3073.80, Ag 3382.9/Cu 3349.26. Other line pairs are recommended for special situations. For these elements the precision is approximately 10 percent. Analyses of various bronze artifacts are included. The methods are also applicable to a variety of technical Cu alloys.


Two objects from the Museum’s excavations in the Sudan, found in apparently hopelessly damaged condition were restored by William J. Young. One, a bronze libation stand, was found in three main parts, crushed and broken. The moderately thin sheet bronze was, from the nature of the alloy and the effects of time, extremely brittle. It was restored to its original form by repeated shaping and annealing, with some patching. The second object was a folding stool of completely decayed ebony, the various bars of which had been sheathed at intervals with alternating bands of bronze and silver with terminals of bronze ram’s heads. The metal fittings were reassembled on a modern wooden framework.

Description complète d’une méthode d’analyse mixte par voie chimique et par spectrographie à l’arc. Application sur une hachette de la quatrième période de l’âge du bronze.

DG


The tests for Pb, Cu, and As are made on the surface of the cleaned sample. The test for Pb is the only one that is new for spot testing. The tests for Sb, Zn, and Al require the removal of the test drops at some stage. To detect Pb add drops of concentrated HNO$_3$ and when the reaction is over, add water and a little solid urea. Then stir with a few drops of 4 percent KI solution and look for yellow PbI$_2$. To detect Cu, treat with HNO$_3$, make the solution ammoniacal and test with a-benzoin monoxime, NH$_4$OH, and citric acid. To detect As, treat with 6N HCl saturated with Br$_2$ and apply the Gutzeit test under suitable conditions. To detect Sb, treat successively with HNO$_3$ and HCl. To the solution add a little solid KNO$_2$ and spot with a 0.01 percent aqueous solution of tetraethylrhodamine. To detect Zn, treat with concentrated HNO$_3$, add urea to the solution, and a few drops of ammoniacal solution of NH$_4$OAc and 10 percent K$_2$Co(CN)$_6$ solution. Stir, test with a 1.5 percent solution of diphenylcarbazone in EtOH, and wash with Me$_2$O and with iso-PrOH. To test for Al, treat with 2 drops of concentrated HCl which is saturated with Br$_2$, and when excess Br is gone, add four to five drops of 20 percent NaOH solution which has been mixed with three volumes of 10 percent KCN solution. Treat close-grained filter paper with a 0.1 percent solution of Aluminon in EtOH, dry with hot air, place over a beaker and add the solution to be tested dropwise. Place the paper on clean porcelain and cover with filter paper wetted with a solution obtained by mixing 20 percent NH$_4$Cl solution with an equal volume of 10 percent (NH$_4$)$_2$HPO$_4$. Press down well, return the original paper to the beaker, and after 5 minutes wash twice with a 20 percent NH$_4$Cl solution and finally dry. Look for a sharp, pinkish crimson, irregular ring.


After long burial in the soil objects originally composed of alloys of silver and copper often have the appearance of corroded copper or bronze. On attempting to restore them electrolytically the silver is found beneath the surface layer of reduced copper. In the corrosion of such objects the silver is not attacked until all the copper has been oxidized.

ERC

La restauration d’un casque en bronze et fer orné d’argent et de cuivre doré. La réalisation d’un procédé de conservation en vitrine étanche dans une atmosphère d’azote.


The corrosion products on a Chou period bronze vessel containing about 21 percent Sn and 4.5 percent Pb occur in unusually well defined layered structures. From the interior the order is: unattacked metal core; residual dendritic metal structure in which a mixture of cupric and stannic oxides have replaced the eutectic part of the duplex cast structure, CuCl; redeposited Cu; Cu₂O and SnO₂ mixture; mixture of basic chloride and carbonate of Cu. A series of chemical step reactions is proposed to explain the complex corrosion process.


Examen et coupes d’armes en fer de Hallstatt: analyse, interprétation, examens métallographiques.


Examen de deux clous en cuivre: recherche des éléments par spectrographie, recherche des phases en présence par diffraction de rayons X.


Values of 16.2 to 19.9 x 10⁻⁶ per degree C. obtained for various types of bronze: copper-tin, copper-tin-zinc, copper-tin-lead, copper-lead-zinc, copper-aluminum, and copper-silicon.


Old silver is sometimes electroplated to increase the weight and to hide repairs and alterations. The author shows how the action of heat causes the plating to blister and peel off. It is considered that this practice, for purposes of restoration, should be declared illegal.


This condensation of an article in Notes on Antique Silver, no. 5, by Commander G. E. P. How discusses the regulations of changes and
repairs of English silver by the authorities at Goldsmiths' Hall, London. It points out pitfalls for the collector in the detection of repaired or falsified pieces and discusses methods and disadvantages of legitimate methods of repair.


A coating mixture consisting of 40 percent lanoline, 7 percent paraffin wax, and 53 percent white spirit is recommended for new statues to be exposed outdoors in urban atmospheres. Directions are given for periodic cleaning of a bronze statue and also for treatment of a neglected statue before lanoline treatment.


Analysis of a hatchet-shaped, bronze object from the Inca period gave Cu 88.84, Sn 7.85, P 1.10, As 0.68, Zn 0.64, Sb 0.24, S 0.12, Fe 0.08, Si 0.001 percent, Au a trace, and no Pb or Bi. P, As, Zn, and Sb were probably introduced as impurities during the manufacture of the alloy.


Des sceaux en alliage plomb-étain provenant des archives vaticanes ont été enfermés dans des coffrets en chêne imprégnés d'huile de lin. Ils sont en état avancé de corrosion. L'auteur décrit ses méthodes d'analyse (microscopie et analyse chimique), il constate la présence de carbonate de plomb avec traces de nitrate et substances organiques acides. Il développe les hypothèses des causes de corrosion et conclut à l'altération par l'huile de lin. La restauration consiste en lavages et en imprégnation de vernis vinylique.


Décapage de miroirs étrusques en bronze argenté par l'acide chlorhydrique 25 percent. Récupération de l'argent contenu dans la patine et redéposition de celui-ci sur l'objet.


An excellent detailed description of the method of construction and an analysis of the gold and silver content of the metal.

The testing is done partly directly on the metal surface, partly on filter paper in a crucible or test tube where the drop is transferred after reacting with the sample. Concentrated HNO₃ forms a dark spot with a white precipitate of H₄SnO₄ (after 1–2 min.) on all high-Sn bronzes and brasses. The Sn bronzes can be further sorted into under and over 4 percent Sn by the density of the precipitate formed. Sn-free alloys give a bright spot without precipitate. They are further differentiated either by \((\text{NH}_4)_2\text{S}_2\text{O}_8 + \text{NH}_3\) which gives (in 10–15 minutes) a blue-shot black spot on brasses (except Si brasses), none on bronze, or in the presence of KF, with K₂[Hg(CNS)₂], resulting (in 1–2 minutes) in a green spot Cu [Hg(CNS)₂] on bronze, dark violet on all brasses (complex CNS salts of Zn, Cu, and Hg). The latter reaction is carried out on filter paper onto which a drop of HNO₃ that has reacted with the metal is deposited. In the high-Sn group, the P bronzes are identified by “selective blackening,” depositing a drop of HNO₃ (1:1) on the metal for 1–2 minutes, washing off, and drying with filter paper; the dark spots are evidently CuO. The remaining Sn bronzes are tested for Pb on a drop of HNO₃ (1:8) that has reacted with the metal, with 1 drop of 10 percent KI and 1 ml. H₂O. A gradually vanishing weak yellowish turbidity signifies a low-Pb bronze; a perceptible quantity of a bright yellow precipitate is formed with high-Pb bronzes in 5–6 minutes. Brasses are tested for Si by precipitation of SiO₂ by a drop of concentrated HCl + HNO₃ (1:1) (10 minutes), then for Pb directly on the metal; the Pb brasses are tested for Mn by Ag⁺ + S₂O₅²⁻ resulting in segregation of Pb and Pb-Mn brass. The remaining material is tested for Al in a drop of concentrated HNO₃ transferred from the metal to a crucible containing 2 drops of K₄Fe(CN)₆; add two drops of concentrated Na₂SO₃ and one drop of HCl (1:1), mix thoroughly, transfer to a strip of filter paper; the black spot formed should remain colorless on treating with NH₃ vapors, a blue color indicating presence of Cu which interferes with the test. Moistening with saturated alcohol alizarin solution gives a violet color changing to pink on heating or with 10 percent AcOH in the presence of Al to yellow in its absence. The test permits detection of 0.5 percent Al in 5–10 minutes; it is necessary to run a blank with the paper. Alloys with a positive reaction for Mn are tested for Ni: moisten the metal with a drop of a solution containing H₂SO₄ 10 ml., HNO₃ 10 ml., H₃PO₄ 10 ml., citric acid 10 g., and water 25 ml., let stand for 1 minute, remove the drop with a dry strip of filter paper saturated with citric acid 10 g., water 25 ml., and 1 percent alcohol dimethylglyoxime solution 10 ml., and moisten the spot obtained with KOH or NH₄OH; presence of Ni is indicated by a bright-red spot in not over 3 minutes. Sn-free bronzes are first segregated by their color into Al bronzes (including Si brass) (yellow) and other (reddish); in the first group, Si brasses are eliminated by tests for Si. The Al bronzes are tested successively for Pb, Mn, and Ni. The remaining material is tested successively for Pb, Mn, and Si. Complete schemes of qualitative separation are given. The percentage of erroneous results was 1 percent.

Refers to the cleaning and the impregnating of old iron objects still having a metallic core. Results (obtained by the different methods) normally used in museums are given. Several industrial products (Rodine 603, I pri 17 and I pro 93) of which the composition is not indicated, were used.


Silver sulfide tarnish is reduced by immersing in Na₂CO₃ solution in contact with Zn or Al (except for niello-decorated objects.) After successive washings in distilled water the object is dried at 50°–60° C. While still warm, objects are dipped in acrylate lacquer. Various questions as to the extent of cleaning are discussed.


The basic carbonate that is formed on an old lead object can be removed with satisfactory results if the object is placed in a glass vessel and packed with a suitable resin (like Amberlite 1R-120) in distilled water and kept at 60°–90° C. for several hours. Prolonged treatment attacks the Pb. Without washing the object is dried, brightened with a glass brush, and then coated by dipping in molten paraffin.


Analyses are tabulated for 32 out of 68 objects (Cu and Cu alloys) analyzed, mainly rings, spirals, daggers, and celts of the early Bronze Age in Europe. The alloy compositions may be grouped in two main classes: A as copper with 4–8 As; B1 nickel-free gray bronze with Ag to 1.5, As to 3 percent and Sb to 2 percent; B2, nickel-containing gray bronze with Ag averaging 1.5, Ni 1.5 percent, As 1 percent, Sb 1–5 percent, and varying amounts of Sn up to 13 percent. An attempt is made to relate metal composition to local early Cu ore sources.


In Appendices I and II (pp. 77–78), Desch shows by spectrographic analysis that a metal awl is composed of bronze, and Stoner shows that a bead is composed of calcite.

The article is mainly a study of the historical evidence that the doors were gilded. After removal to safety in 1943 the doors were closely examined. Analysis showed that "the layer of green beneath the successive varnishes was composed of calcareous matter obviously deriving from the dust of the street and ... atmosphere." The cleaning, which revealed the original gilding, is not described. Eight photographic details.

SRJ


Procédés de décapsulation par voie sèche: au moy den de meules ou de jet de sable; par voie humide: par électrolyse. Méthodes de consolidation et de protection. Description, technique et traitement de plaques de ceintures damasquinées.

DG


Analyses gravimétriques de bronzes et d'alliages d'argent sur des échantillons prélevés à des portes d'église du 11e et du 12e siècle. Méthodes et résultats.

DG


Concernant sept objets d'époque Hallstatt.

DG


The manual or mechanical method for cleaning ancient bronzes is advocated. This is done with small chisels and hammer and other hand tools. Advantage is taken of a natural tendency for the outer green copper minerals to cleave from the inner and more compact cuprite layer when struck with properly applied force. The restorer must be able to control the tools so securely that no tool mark is evident on the surface of the object. After removal of incrustations the object is given a bath in hot distilled water, and then patches of corrosion are tested for active disease and repeatedly washed and dried until the powdery substance has disappeared.

RJG


L'extraction des chlorures est pratiquée sur des objets en fer provenant d'une fouille à Wanenari. L'auteur mentionne la méthode de réduction au zinc et à la soude; l'imprégnation par la paraffine, le traitement "Marangi" pour les kris javanais et une méthode de conservation des fers par mélange benzine-vaseline.

DG

Directions are given for cleaning objects of Au, Ag, bronze, Cu, brass, tombac, Pb, and Sn partly by chemical solution and partly by reduction with nascent H.


Appendix on p. 27 gives a technical report on a small bronze roundel, by E. M. Jope, with a spectrographic analysis.

536. Weill, Adrienne R. Analyse aux rayons X de deux plaques d'or provenant de fouilles archéologiques. *Metallurgia Ital.*, n° 12 (décembre 1951), pp. 3-7, 12 illus.

Par diffraction de rayons X et par mesure de densité des objets, il a été possible de déterminer approximativement la composition et quelques détails de fabrication de deux plaques en or d'époque romaine provenant des fouilles de Kertsch.


La composition approximative de l'alliage d'un bijou en électrum est déterminée par mesures physiques de la densité et par diffraction de rayons X. Deux phases cristallines sont en présence. Il semble ne pas y avoir eu d'évolution vers un équilibre au cours des 4,000 ans d'âge, l'alliage présente toujours une forte hétérogénéité due à sa nature et au façonnage de l'objet.


La composition, l'hétérogénéité, les traitements thermiques et mécaniques de deux alliages d'or-argent-cuivre sont interprétés par les mesures de densité et du paramètre de la maille cristalline au moyen des rayons X.


Detailed directions are given for determining Ni, Cr, and Mo in metals and alloys.

The filmstrip illustrates the cleaning and treatment of archaeological metal objects.


A recently acquired sixth century Corinthian helmet was studied metallographically. Although deeply corroded, it has a typical annealed wrought structure which also shows signs of cold working. Spectrographic comparison was made with specimens from five other early Greek helmets. (Results are shown in tabular form.) In addition to copper and tin all specimens contain impurities which are characteristic of ancient metals. Lead varies from medium to trace; zinc and arsenic are present only in traces or is absent. Nickel is low or absent in all.

RJG

3. CORROSION


Except in coastal areas, dissolved CO₂ is the destructive agent in fresh air. City atmosphere carries SO₂ and tar acids. Bituminous paints give reasonable protection on clean metals, but are not satisfactory for repainting old work. A mixture of equal parts red and white lead is preferred for repainting. Galvanized ware has a short life at the seaside. Exfoliation is the most common form of attack on building stones. It may be due to crystallization of soluble salts beneath the surface skin, or to differential thermal expansion between the dense skin and the porous interior. Decay is hastened by using different kinds of stone in juxtaposition, e.g., limestone against sandstone. Similarly, repointing old porous masonry with dense mortar accelerates weathering.


L'influence de la pureté du fer sur son inaltérabilité. Quelques exemples de conservation de fers antiques.

DG


Les phénomènes d'oxydation à basse et haute température. Application à un alliage argent-cuivre d'une châsse du 13e siècle incendiée à Nivelles en 1940.

DG

Les impuretés, la structure, la patine des bronzes anciens et en particulier de provenance chinoise; notions brèves des critères d’authenticité. RMO


Corrosion of copper, lead, zinc, iron, steel, and certain alloys in various type soils discussed. RLF


Contents: Preface; Historical note; Electrochemical introduction; Film growth; Electrochemical corrosion; Corrosion by acids and alka-
is; Influence by environment; Effect of stress, strain and structure; Prevention of corrosion by soluble inhibitors; Prevention of corro-
sion by protective coverings; Statistical and mathematical treatment; List of abbreviations; List of references; Index.


548. Evans, Ulick Richardson. Metallic corrosion; passivity and pro-

Contents: Introduction; Simple examples of corrosion and passiv-
y; Study of thin films; Oxidation at high temperatures; Corrosion in moist or polluted atmospheres; Corrosion not involving the absorp-
tion of oxygen; Corrosion of ferrous materials involving the absorp-
tion of oxygen; Corrosion of non-ferrous materials involving the absorp-
tion of oxygen; Influence of stress, strain and structure; Influ-
ence of contacts and crevices; Protection by inhibitive treatment of water; Protection by chemical and electrochemical treatment; Protec-
tion by paints and enamels; Protection by metallic coatings; Testing; Appendix; Author index; Subject index. BMU


Absolute dryness is not essential for counteracting corrosion. Fur-
thermore, some moisture in the surrounding air seems necessary to


Paratacamite is identical in chemical composition with atacamite,
Cu₂(OH)₃Cl, but is a rhombohedral species dimorphous with ata-
camite. The crystals of a natural mineral specimen from Remolino,
Chili, are uniaxial positive without perceptible dichroism. Indices of refraction are \( \omega 1.843, \epsilon 1.849 \). Although the dimorphous substance atacamite is orthorhombic, the two substances are probably closely related structurally since the position and relative intensity of their stronger lines in their X-ray powder patterns are nearly identical. Paratacamite is formed as a corrosion product when brass or copper sheets are sprayed with sea water at a temperature of 85°F. It is quickly formed when cuprous chloride or the mineral nantokite is exposed to a moist atmosphere. Both paratacamite and atacamite were identified as constituents of the green patina and alteration crusts present on various copper and bronze objects from Egypt and the Near East in the collection of the Fogg Museum at Harvard. Other related basic copper chlorides are described; among these is botallackite, \( \text{Cu}_4(\text{OH})_6\text{Cl}_2\text{H}_2\text{O} \), which was also observed on an Egyptian bronze.


The hard patina of ancient Chinese mirrors was shown by X-ray diffraction analysis to consist mainly of \( \text{SnO}_2 \).  

552. GILBERT, P. T. Corrosion of copper, lead, and lead-alloy specimens after burial in a number of soils for periods up to 10 years. *J. Inst. Metals, Metallurgical Abstr.*, 73 (1946), pp. 139–174; *C.A.*, 41 (1947), 678.

Specimens of Cu, Pb, and Pb alloys containing small amounts of Sb and Cd or Te, buried in seven types of soils for periods up to 10 years, showed marked differences in the corrosiveness of the soils. The most corrosive soil, moist acid clay, caused approximately 50 times as much loss in weight as the least corrosive soil, chalk, and resulted in penetration of one ½ inch bore 4 lb./yard pipe in less than 5 years. It was not possible to correlate the corrosiveness of a soil in a simple way with one or more features of the soil analysis; however, sulfate-reducing bacteria are believed to play an important part in the action taking place in the more corrosive soils. The differences in behavior of different materials was much less marked than the differences between the soils. In the two most corrosive soils, moist acid clay and wet acid peat, it would be unwise to bury unprotected pipes of any of the materials. Complete data are given in tables and curves.


Describes tests on VPI 260 (dicyclohexylammonium nitrite) as a rust preventative for gun barrels. Both VPI powder and VPI impregnated paper gave good results. Protection is offered so long as the iron surface is bathed in VPI vapors.

Méthodes et résultats comparatifs d'analyses d'échantillons de rouille prélevés à diverses profondeurs: épée Viking, boulet, canon, pièces modernes. Méthode particulière pour la détermination simultanée d'oxydes ferreux et ferrique et de fer métallique en atmosphère d'argon.  

DG


A note on the use of wrapping materials impregnated with a substance "Shell V.P.I. 260" (Shell Chemicals Ltd.) to prevent corrosion of steel, cast-iron, aluminium, duralumin, and chromium plated objects.  

RMO


A brochure which describes properties and applications of a group of organic nitrite salts now used widely for protection of iron against rusting.  

RJG


DG

G. COINS AND COINAGE


The Mohammedans introduced the process of casting into coinage. Blanks were usually cast as small slugs in a string of beads or in clusters. In some countries blanks of better quality were cut from plaques hammered from ingots. The direct method of making stamps was to cut them directly in metals. This slower method was superseded in Mohammedan times by stamps made from a matrix in which was cast an impression from a direct-cut stamp. In certain countries copper coins of small denominations were cast, not struck.  

RJG

Attention is called to the chemical analyses by Flight, made some 85 years ago, of certain copper-nickel coins of Bactria. No other ancient coins, as far as is known, were composed of an alloy of nickel. Though certain tokens, such as those issued by Feuchtwanger, and many pattern coins, particularly of the United States mint, were struck in alloys of nickel before the middle of the nineteenth century, regularly authorized governmental issues of coins composed of such alloys were not issued in modern times until after the middle of the nineteenth century.


In contrast to the serious debasement of their silver coins, the gold coins of the Romans were maintained at a high standard of fineness throughout the Imperial Period. Although this is commonly recognized as true, very little specific information has been published. Specific gravity measurements afford a reliable means of estimating the gold content of coins of very high fineness without damaging them. The technique of measurement is described and a table for converting specific gravity to fineness is included. Results of such determinations of the fineness of 45 representative coins ranging from the time of Augustus to that of Julius Nepos are given. The average, and almost constant, high fineness of 990 of the coins from Augustus to Diocletian, inclusive, is remarkable.


Two different problems are discussed. One is the problem of determining whether coins of a given type were cast or struck. For the solution of this, there is usually available a representative coin that may be destroyed for the purpose of obtaining the answer. The other is the problem of determining whether an individual coin was cast or struck, and for this only nondestructive methods are usually applicable.

The first problem is best solved by means of a metallographic examination of the metal of the representative coin. An outline of the procedure is given. The solution of the second problem is less certain, but it may usually be solved by an inspection of the coin, a determination of its weight, specific gravity, or hardness, by an X-ray examination, or by some combination of these methods.


Fourteen Ag coins were analyzed to determine Ag, Au, Cu, Sn, Pb, Fe, Ni, and Zn. The specific gravities of the coins were also determined. Six bronze coins were analyzed for the amounts of Cu, Sn, Pb, Fe, Ni, and As.

Two coins of normal size, but of abnormally low weight and specific gravity, were investigated. One was an Alexandrian tetradrachm of Vespasian that weighed 7.16 grams and had a specific gravity of only 5.80. The normal weight of coins of this type is about 13 grams and their specific gravity, as calculated from their silver content, should be about 9.25. The other coin was a tetradrachm of Ptolemy XIII that weighed 7.98 grams and had a specific gravity of only 5.66, both of which are far below the figures for normal coins of the same type. The metal of both coins was found to have a spongy structure that accounted for their abnormal weights and specific gravities. It was concluded that these coins were originally of full weight and normal specific gravity, but that extensive intergranular corrosion occurred during long burial in the ground and that the corrosion products were subsequently leached out, probably on cleaning, thus leaving behind metal of spongy structure. In view of these observations, the weights of ancient silver coins of low fineness, which were originally much corroded and subsequently cleaned, should be used with caution in any studies of the ranges in weight of such coins or in calculating the average weight of coins of a given type.


Complete description of the electrolytic process for the restoration of old copper and bronze coins.


Data obtained by Head, Hunkin, and the author on the weight, specific gravity, and fineness of 10 specimens are tabulated and compared. The very high fineness of these coins and the small ranges of variation in their weight and composition are remarkable. This confirms the statement of Herodotus that Darius refined gold to the highest state of purity in order to have coins struck from it.


Description de monnaies en alliage cuivre-argent du 1er siècle av. Chr. L'importance du nettoyage pour la détermination du poids en numismatique.


All coins were struck with dies. There was no systematic relationship between the position of obverse and reverse. Muling is indiscriminate; there are many cases of the interchange of dies; that is, of the employment of several reverse dies with the same obverse, or vice versa. Obverse and reverse dies were always carefully paired. The number of dies must have been enormous. Punches were used in constructing the die. 


Histoire de la monnaie; qualités requises des alliages monétaires. Les phénomènes de liquation et de ségrégation sur les alliages cuivre-argent autres que l’eutectique, leur influence sur le titre. Les opérations de monnayage.


Variation in crystal grain-size and absence of deformation, indicated by photomicrographs of 120 coins, support Balmis’s theory re-
garding ancient minting processes. An alternative explanation of the results is suggested.


An article on a report by Prof. Birbal Sahni in *Memoirs of the Numismatic Society of India*, no. 1, Bombay, 1945, on a clay mold found at Rohtak near Delhi for casting a coin of the Yaudheya series dated about 100 B.C.

**H. PAPER, PAPYRUS, DOCUMENTS, AND BOOKS**

1. HISTORY AND FABRICATION


Very brief well-illustrated descriptive article dealing with establishments in the Ogawa region.


Contents: Preface; Acknowledgments; Philosophy of definitions; Classification and definitions of pulps; Classification of waste materials used in the paper and board industries; Definitions of papers, boards, and papermaking terms; Bibliography.


Contents: Preface; I. Influence of paper on the spread of printing and engraving; II. Definition of paper, its invention in China, and its manufacture in the Orient; III. Paper making in Europe: the oldest mills; IV. Origin of Western paper: Spain; V. Paper in Italy, France, Germany; VI. Causes of slow growth of the paper industry; VII. Watermarks and means of dating paper; Conclusion; Notes; Index.


Birch bark has for long ages been used as the material for books in Northwestern India and Central Asia. There are still preserved letters on birch bark from North America dating from the seventeenth century. The Buddhist manuscripts of the tenth century date or earlier, discovered in Bamiyan in 1930 and in Gilgit in 1931, are mostly on birch bark mixed with a lesser number of palm leaves and paper. Bark manuscripts which come from dry regions are best preserved, but those which have been subjected to damp have suffered. The bark is not softened by water, but often the sheets stick together and become extremely fragile. The layers cleave and fall to powder when unrolled or handled. Flat pieces may be preserved between glass or transparent plastic panels. In a process developed at the Bibliothèque National in Paris crumpled masses of bark manuscript from Bamiyan that were glued together with dried mud were softened and separated by immersion in warmed paraffin oil. The dried mud split up easily and allowed the bark fragments to be drawn out. Each piece was drained and laid on a sheet of glass. Each fragment was covered with a piece of glass smaller than that which carried it and the edges were sealed with paraffin.

RJG


Contents: Introduction by Dard Hunter; Foreword; Paper and civilization; The paper tribute; The twilight of the gods; Pietro Martire and the "American books"; Paper from the inner bark of trees; A good paper is made from metl; The paper clue of the Sumus; The Otomi papermakers; The fibers of the amatl; The geography of paper tribute; The paper-world of the Aztecs; Epilogue; The American fig tree, by Paul C. Standley; Appendix; Notes; Bibliography; Index; Illustrations.


Contents: Watermark—definition—purpose—classification; Watermarks by period and region; Miscellaneous; Short bibliography.

BMU

Contents: Preface; Art in the watermark; Index; Illustrations.

BMU


A brief account is given of the history and technique of papermaking. Paper used east of the Allegheny Mountains was often imported from Europe, but the excessive cost of transportation encouraged the local production of paper in the West during the early settlement period. The earliest paper manufactory west of the Alleghenies was set up in Georgetown, Ky., in 1791, the first in Ohio in 1807. The author discusses other early paper mills with illustrations of their watermarks.

EHJ


Contents: Foreword; [The journey to the *Villages du papier, Yên-Thái and Lang-Buói, the ancient villages of Tonkin, Indo-China*]; The papermaking materials of Indo-China; Preparing the bark for papermaking; The lime treatment; The cooking process; Beating the bark for making it into paper; The material used in sizing the paper; The papermaking moulds of Indo-China; Forming the sheets of paper on the moulds; Papermaking by machine in Indo-China; Description of the photographs; Species of the *Daphne* tree.

BMU

583. Hunter, Dard. *Papermaking; the history and technique of an ancient craft.* London, Pleiades books, c1947. 611 pp., xxxvii pls., illus., plans, map.

Contents: Before paper: the writing substances of the ancients; Ts'ai Lun and the invention of paper—the influence of calligraphy upon paper and the influence of paper upon printing; Empress Shōtoku and her million printed prayers—the first text printing upon paper to be executed in the world; The hand-mold, the papermakers' most essential tool, upon which rest the two thousand years of papermaking history; The maceration of materials for papermaking from the primitive mortar and pestle of ancient China to the improved Holländer of Europe; Early papermaking processes and methods; Paper, a sacred material—the use of paper in the Orient for ceremonies and purposes unknown in the Western world; The paper and the papermakers of Europe and America during the early years of printing; Ancient watermarks, six and a half centuries of mystic symbols; Latter-day watermarks, the nineteenth-century development of watermarks into an artistic and technical achievement; Papermaking materials—with the eighteenth-century development of printing, Occi-
dental papermakers were forced to begin their search for vegetable fibres never before used; The paper-machine and its inventor, Nicholas Louis Robert. The paper-machine revolutionizes printing; Printing revolutionizes papermaking, and the world-wide quest for new papermaking fibres begins in earnest; The watermarking of machine-made papers and the use of watermarks in detecting forgery; Present-day papermaking by hand in Europe; Handmade papers vs. machine-made papers. Paper made by the ancient traditional methods still has limited use, but the paper-machine has altered every phase of life; Chronology of papermaking, paper, and the use of paper; Bibliography; Notes; Index.

“The present book embraces a selection of material from the expensive editions, but is issued in modest price. This compilation is not a reprint of any previous volume, but it draws from many of them, with a store of material not previously used.” Foreword. BMU

584. Kunisaki Jiheī 國東治兵衛, Kamisuki chōbōki 紙漿重寶記

Japanese text reproduced in its entirety. English and Japanese on opposite pages.

Contents: Translator’s preface; Author’s preface; The true paper mulberry; Cutting paper mulberry in winter; Selling paper mulberry; Steaming paper mulberry; Peeling the bark; Drying paper-mulberry bark; Marketing; Soaking the bark; Shaving off the thin bark; Removing astringency; Cooking the mulberry fiber; Second washing of the fiber; Varieties of the Tororo plant; The beating stick; Molding hanshi (I); Equipment; Molding hanshi (II); Drying the paper; Cutting hanshi; Making up hanshi; Baling; Packing out to the coast. BMU


Contents: Author’s introduction with list of contributors and list of sources; Dictionary and encyclopaedia of paper and paper-making . . . containing encyclopaedic articles on: edges, felts, marble, particularly, photographic papers, printings, sizes, standardization, wall-papers (illustrated), watermarks (illustrated), wrappings, writings; English index (of words and names other than catch-words) with separate indexes for French, German, Dutch, Italian, Spanish and Swedish. BMU

586. Paper Trade Journal. (Special number). The progress of paper with particular emphasis on the remarkable industrial development in the past 75 years and the part that Paper Trade Journal has been
privileged to share in that development. New York, The Lockwood trade journal company, Inc., 1947. 391 pp., illus., map.

Gives the history of paper from papyrus to parchment to paper.

RJG

587. RANGANATHAN, S. R. Social bibliography or physical bibliography for librarians. Delhi, India, University of Delhi, 1952. 348 pp. (Library science series, no. 4).


BMU


A review of the findings of several research organizations. The most important rules for durability are: (1) Good raw materials and (2) fine technical processing of materials.

RJG

589. TINDALE, THOMAS KEITH, & TINDALE, HARRIET RAMSEY. The hand-made papers of Japan. Tokyo, 1952. 4 vols., illus.

Contents: Vol. I. The hand-made papers of Japan; Bibliographical guide; Introduction by Dard Hunter; Complete history and descriptions of papermaking in Japan, supplemented with botanical drawings and a series of 32 full-page photographs of an ancient papermaking village by Francis Haar; The text includes a facsimile handcolored reproduction with translation of the oldest Japanese work on papermaking, "Kamiksuki taigai," compiled in 1784. II. The Seki collection: 187 actual mounted specimens ranging in date from the Nara period to the present day. III. The contemporary collection: A volume of whole-page samples of 139 different papers from 18 prefectures and the city of Kyōto. The name, materials, place of manufacture, and use of each paper are given. IV. The Watermark collection: A portfolio of 20 of the finest modern Japanese watermarks made in the mills of the government printing agency at Oji and Saidaiji. Samples contain elaborate land and seascapes, Noh drama masks, flowers, fruits, and other characteristic designs.

BMU

2. EXAMINATION AND TREATMENT

Résumé dans: *Boll. ist. patologia libro*, 10 (1951), p. 179 par A. Gallo.


Moisten, blot, and cover with a few drops of 25 percent 8-hydroxyquinoline in 6 percent HOAc, wash with water after a few minutes, and dry. Residual iron from ink is visible in daylight or ultraviolet light.


Aristotle, Horace, Ovid, and other classical writers mentioned the depredations of bookworms. Insects have destroyed more books and papers than fire and water. Ravens in warm and humid countries are much worse than in temperate zones. Book insects may be divided into three groups: (1) the true bookworms; (2) Surface feeding, i.e. cockroaches, silver fish and psocids, and (3) termites. There is great danger in shipping books from warm and humid climates to northern libraries. Control is best effected by storing in vermin-proof buildings with metal shelving, constant inspection, and periodic fumigation in vacuum vaults with ethylene oxide-carbon dioxide gas. **RJG**


Acid conditions which develop in old paper are the chief cause of deterioration. Decay may be arrested by immersing a document, first in 0.15 percent calcium hydroxide for 20 minutes and then in a solution of approximately 0.20 percent calcium bicarbonate. The precipitated calcium carbonate not only has a stabilizing effect upon the cellulose fiber but also acts as a buffer against the absorption of any acid at a later time. The neutralized paper may then be strengthened by lamination with cellulose acetate foil by first preheating between two electrically heated thermostatically controlled metal plates and then passing between two revolving calendar rolls which have a pressure range from 300 to 2,000 pounds per square inch. A complete cycle of heating and pressing requires about 35 seconds. **RJG**

These are time, fire, water, light, heat, dust, humidity, atmospheric gases, fungi, vermin, “acts of God,” and human beings. Brief note is made of their effects. Means for lessening or controlling are suggested.

RJG


Contents: Nonliving factors which bring about discoloration of paper; Fungi on paper; The iron content of paper; Iron and the growth of fungi in paper; Discoloration by pigment production; Sizing and filler with reference to growth of fungi on paper; Hydrogen-ion concentration of paper and fungous growth; Moisture and growth of fungi; Air conditioning in libraries; Histologic evidence of the presence of fungus in foxed paper; Digestion of cellulose by fungi; Fungicides with paper; Discussion; Summary; Literature cited; Explanation of plates.

BMU


Description et fonctionnement du “Laminator Barrow.”

RL


Description de l’altération chromatique sur carton moderne, dû à *E.p.* Description des caractères morphologique, de culture et physiologique. (D’après le résumé de G.B. et M.L.P.).

RL


Cas de détérioration d’un livre moderne par *T.m.*, qui peut être considéré comme un agent d’attaque accidentel du papier.

RL


After discussing the principal chemical components of the cellulosic fiber the author outlines the most satisfactory techniques in manufacture for insuring durability of paper. The fibers should be kept as nearly intact as possible, retaining “pure” cellulose. Refining should be kept at a minimum. Resins should have a positive polarity, only volatile organic acids being used, to obtain the required acidity in emulsions. In storage of paper (i.e., in archives) light (especially
ultraviolet light) and heat are to be avoided, and a relative humidity of about 55–60 percent is recommended (and in no case should the humidity drop below 40 percent). The deleterious effects of smoke, rodent, and insect attacks are mentioned.


Caractéristiques de culture, biochimiques, et morphologiques; identification du *R.m.*

603. CAMPOSANO, ANNA. Su alcuni caratteri morfologici e fisiologici di *Pullularia (Dermatium) pullulans* (De Bary et Loew) Berkhour. *Boll. ist. patologia libro*, 7 (1948), pp. 46–75, 12 illus.

Après le résumé de la bibliographie, l’auteur donne l’étude morphologique et physiologique du *P.p.* et conclut que celui-ci ne constitue pas, à proprement parler, un fungus du papier.


Mise en évidence sur un livre d’une nouvelle moisissure que l’auteur appelle Z.c.


Tests on rag paper and non-rag paper exposed to Gammexane (*gamma isomer of hexachlorocyclohexane*) smoke in doses of 2 oz. per 1000 cu. ft. show decided deleterious effect on tensile breaking strength and folding endurance. There is also slight decrease in the strength of dextrine-coated silk chiffon. Iron-gall ink fades slightly. These effects are caused by the acidic nature of Gammexane smoke. This powerful insecticide therefore is not recommended for disinfection of rare books and paper records but it could be used to fumigate empty stacks and storage spaces. Experimental details are given.


A letter from the Research Laboratory, National Archives of India, stating that tests prove that treatment with the No. 2 “Gammexane” smoke generator is definitely injurious to paper records of all kinds.


The lamination process for preserving paper records, which was criticized by D. L. Evans in a paper “The lamination process—a British view,” *Amer. Archivist*, 9 (Oct. 1947), is defended: (1) That it is undesirable because it is new is an unworthy argument; (2) that it has
not been tested by time is counter-balanced by reliable accelerated aging tests; (3) that the process is not reversible is not true; cellulose acetate lamination can be removed by simple immersion in acetone; (4) that lamination does not remove the cause of deterioration which may be inherent in paper or ink may be true but preservation is aided by lessening moisture absorption.


A sulpharsenical insecticide (made by mixing arsenious oxide with sodium sulphide in aqueous solution) which has been proposed as a book preservative, has been found to be injurious to paper. Accelerated aging tests show that immersion of paper in this solution lowers the tensile strength and bursting strength. Its use cannot be recommended.


The writer enumerates various dangers threatening books of a physical and biological nature and discusses ways of controlling insect pests and fungi. He mentions specifically experiments of the Leningrad public library with high-voltage currents for drying and disinfection of books.


The advantages claimed for the cellulose acetate lamination process as used at the U. S. National Archives and advocated by W. J. Barrow of the Virginia State Library are questioned on the basis of: (1) It is doubtful the treatment can be undone if necessary; (2) the cellulose acetate is an untried material; (3) it does not cure acidity, the fundamental cause of brittleness.


The director of the Istituto di Patologia del Libro in Rome reviews the gamut of afflictions to which books are subjected.  

L'auteur traite successivement de l'ambiance favorisant la conservation; des maladies du papyrus, des parchemins et peaux, du papier; des altérations biologiques, chimiques et des dommages par l'usage ou les accidents. Nombreuses références bibliographiques.  

   Dégradations et maladies, provoquées par organismes animaux et végétaux, des matières dont sont constitués les livres. Les papyrus, papiers, ficelles, toiles, parchemins, poils, colles animales, encres, fournitures métalliques sont diversément traitées suivant les conditions d'utilisation.  

Description du procédé et discussion des avantages, avec 18 références.  

Contents: Judging books; Removing and mending contents of books; Sewing contents of books ½ inch or less in thickness; Preparing and binding contents—Overcast method—Sewing clamp method; Preparing the case; Opening a new or repaired book; Description of equipment and essential supplies.  

The development of molds and bacteria upon cellulose depends to a great extent upon the moisture content and the temperature of the surrounding air. At high relative humidities the growth of molds increases, the maximum being about 95 percent; bacteria show no further development at relative humidities above 86 percent. The active enzymes in the cleavage of the cellulose molecule are cellulase (which hydrolyzes it to cellobiose) and cellobiase (which changes cellobiose to glucose). The resistance of cellulose to attack by bacteria and molds depends upon its polymerization degree. Regenerated cellulose is more readily attacked than native fibers.  


Distinction entre Anobiidae, Dermestidae, Liposcelidae, Lepismidae et Calotermidae et Termitidae.


Discussion de quelques propriétés des insecticides, surtout D.D.T.; bibliographic: 10 références.


Liste systématique, avec brève description des attaques produites.


Survey of the problems common to museums, libraries, and archives concerning the protection of paper documents and suitable remedies to prevent deterioration: cleaning and dusting, fumigation, insect repellents, flattening, glazing of documents to be exhibited, etc. . . . Facilities for practice training under expert supervision are provided by the Central Record Office N-W.F.P. (Pakistan).


Describes the increase in wet strength and decrease of water permeability of papers by this means.


Review of improvements in the cellulose acetate foil lamination process for paper, the mounting of maps, containers for unbound records, and the rebinding of bound records.


Instead of fixing pencil writing with skim milk and starch coatings, the writer advocates a fixative lacquer made by dissolving cellulose acetate plastic foil (5-6 percent) in methyl ethyl ketone, dioxane and alcohol (1:1:2). A solution of cellulose acetate foil (2-3 percent) in ethylene dichloride and alcohol (19:1) serves the same purpose. Chart shows behavior of graphite, red pencil, copying pencil and carbon copies to different treatments.
A letter detailing the use of characteristic X-radiation for the determination of the percentage loading of paper.

By keeping the exposed paper at a temperature near 30°C, the authors show that many previous reports were misleading. Light from 330 to 750 millimicrons in wavelength bleached many papers discolored with heat or age. The yellowing commonly reported in similar tests evidently was influenced by the heat of the ultraviolet lamp. The effects of water vapor, oxygen, lignin, rosin, and ink are discussed. Order of photochemical stability of papers given as: new-rag, refined sulphite, old-rag, soda-sulphite, and newsprint.


Enumération des différentes espèces d'insectes nuisibles; moyens de lutte contre les moisissures et les insectes. Bibliographie: 37 références.

Contents: Preface; Equipment; Materials; Basic operations; Binding a single-sectioned book; Preparing a multisectioned book; Case-bound books; Endpapers; Hollow-backed binding; Library style binding; Binding single sheets; Lettering a book; Appendix; Index.


Rapport d'examen d'un échantillon de papyrus carbonisé.

Calcul stoechiométrique donnant la quantité d'acide chlorhydrique pour la neutralisation du bain d'hypochlorite. En acidifiant le bain de chlorure stannieux, les hydroxydes d'étain ne précipitent pas.


L'enlèvement de taches brunes, dues à la présence de cuivre dans les couleurs d'aquarelle sur un atlas imprimé au XVII–XVIII S. a pu se faire par des immersions dans du KMnO₄ 2 percent, puis dans de
l'acide oxalique 4 percent. Les dernières traces de cuivre disparaissent après un second traitement d'immersion, cette fois dans de l'acide acétique à 10 percent, suivi d'un lavage à l'eau courante.  


Translation of title: Removal of grease and wax spots from paper.


Translation of title: Removal of writing and spots of white ink from black paper.

635. LONGO, LUIGI. Metodo per rendere trasparenti la carta e la pergamena. *Boll. ist. patologia libro*, 5 (1946), pp. 113–116, 2 illus.

Mouillage avec un liquide à indice de réfraction élevé: mélange de 3 parties de benzène et 1 partie de sulfure de carbone.  


Contents: The care of books in general; The care of books in the library; Some enemies of books; The repair and mending of books; The treatment of paper, vellum, etc.; The care of leather bindings; The treatment of cloth bindings; A list of references; Index.  


Clips and rubber bands are removed and papers opened and smoothed by hand. The pile is placed in a tray in a room maintained at 95 percent R.H. for 2–3 hours. The papers are then gathered in small piles and ironed with an electrically-heated hand iron. A pile of blotters serves best as an ironing surface. Mangles may be preferred for ironing large maps. Several practical suggestions and useful hints are given.
Current inspection, first aid, repair to maps and volumes, large scale rehabilitation, later salvage. 
RJG

Reduced pressure is effective for insecticidal methods. Heating of the objects under 20–40 mm Hg and the use of chloropicrin at 20 mm Hg were found to be most effective. II. Insecticidal action due to the decrease of humidity. *Ibid*, No. 3 (Jan. 1952), pp. 30–35. Relative humidities of 0, 17, 28.3, 43, 71, 88 and 100 percent were produced by saturated solutions of $P_2O_5$, ZnCl₂, CaCl₂, Ca(NO₃)₂, NaCl, KNO₃, and water. *Sitophilus oryzae* L. was tested in these relative humidities at 0, 5, 10, 15, 20, 25, 30, and 38 percent. Insecticidal action due to decrease of humidity became remarkable in cases of relative humidities less than 30 percent. 
KY

The author reviews the methods of Barrow, that of the British Museum (D. L. Evans), and Miss Minogue’s account. Concludes by summarizing his feelings on lamination as: (1) Lamination involving the use of heat and pressure is safe, but would rather try it out for some years before using it for important archives. (2) A roller press is to be preferred to the flat-bed type. (3) Mass production suitable for large quantities of material involves an outlay for equipment. It is quicker than silk gauze but there is a certain amount of preparation of each sheet necessary before lamination. (4) Requires certain amount of skill but nothing like that required for the older process. (5) Lamination with acetate foil does not greatly increase strength of document—makes it less prone to damage. (6) Lamination with acetate foil has advantages over materials such as silk gauze, which is subject to decay.
These experiences in America suggest strongly that the theories will work out in practice. 
BMU

Enumération et modes d’application de produits fongicides et insecticides, de produits de nettoyage des textiles et de matières plastiques de protection. 
RL

Grant (*C.A.*, 36 (1942), 5443) reviewed the methods available for deciphering charred documents, but here are some further obser-
vations: Carefully paint the remains with a 25 percent solution of gum arabic and then with a soft camel-hair brush apply pure TiO₂ in 25 percent gum arabic solution. In a desiccator containing strong fumes of Cl or Br, allow it to remain for 30 minutes and then "gas" in a desiccator containing (NH₄)₂S. This will cause the development of any Fe left as residue from Fe-gall ink. If necessary repeat the Br and moist-air treatments. Usually the document can then be photographed. Instead of treating with sulphuric, a light painting with 5 percent K₂Fe (CN)₆ often is effective. A modification of Murray’s method (Nature, 148 (1941), p. 199) has proved excellent with printings, typing, carbon copies, iron-gall writing inks, and lithographic prints. Immerse the paper in 5 percent AgNO₃ which has been treated with just enough NH₃OH to dissolve the precipitate that first forms. Keep at about 80–95°C. A silvery outline of the printed, typed, or written matter appears on the darker background, or the writing may appear black on a silvery background. The reproduced matter is best read or photographed while the document is immersed. The behavior of penciled writing in this test is very erratic.


An illustrated article on the work carried out at the restoration department of the Archives de France for the conservation of a precious document: The parchment attacked by moisture and mold is first placed between two sheets of wire gauze and dipped in a laboratory bath. It is immersed in two solutions, first of calcium hydrate, then calcium bicarbonate. These preparations neutralize the acidity of the paper and inks (it sometimes happens that the ink eats through the parchment). After drying several hours the document is placed on a sheet of special rag paper soaked in cellulose acetate. The parchment is fixed by means of a brush dipped in paste containing acetone. The "pieces" missing are cut out in the rag paper with a scalpel. After another sheet of rag paper has been applied to the other surface of the document it is then passed through a laminator where it remains for 25 seconds at a temperature of 150°C. The restorers then examine the document. The "pieces" which replace worn-away parts bear no writing but at least the manuscript is saved from further deterioration.

RJG


A page of photographs of the restoration at the Bibliothèque Nationale of charred remains of books. No technical details are given.

MB


Contents: The fundamentals of book storage; The storage segregation of much-used books; The Rube Goldberg chapter; Rolling and
hinged stacks; The factors involved in our conventional form of stack storage. Synthesis: More compact storage in our present stacks; Effecting a more compact book "presentation"; The relative economy of "compact storage"; Some objections advanced against compact storage; Some byproducts advantages of "boxing."

Two pictures which show clearly what "compact storage" accomplishes; 396 volumes conventionally shelved used 3½ tiers of shelf space—using "compact storage" the same books occupy 1¾ tiers.


An account is given of the precautions taken to save the objects and documents on parchment and paper of the Reading Museum. These were taken to a nearby limestone quarry, having a relative humidity of about 100 percent and a temperature of 10°C. Main enemies hence were humidity and mold. Experiments with and results given by naphthalene, paradichlorobenzene, carbon tetrachloride, paratrinitrophenol, and silica-gel are described.

PC


A survey of the methods employed for repairing paper records, books, parchment, manuscripts, and seals in the Public Record Office (London), University Libraries (Oxford and Cambridge), British Museum, County Archives (Bedfordshire, Suffolk, Norfolk), and National Library of Wales. Bibliography.

RJG


A survey of methods employed for records preservation at the Archives Nationales (Paris), Bibliothèque Nationale (Paris), Archives Générales du Royaume (Brussels), Algemeen Rijksarchief (The Hague), Preussisches Geheimes Staatsarchiv (Berlin-Dahlem), Reichsarchiv (Potsdam), Hauptstaatsarchiv (Munich), Haus-, Hof-, und Staatsarchiv (Vienna), Nationalbibliothek, Handschriften—Sammlung (Vienna), Archivio di Stato (Venice), Biblioteca Apostolica Vaticana (Rome), and several private establishments. Bibliography.

RJG


Contents: Covers; Physical components of records including paper, parchment, writing inks, lead pencils, printing inks, typewriter inks, carbon paper; Binding materials; Methods of rehabilitating records including lamination, silking and binding materials; Need for rehabilitating records; Criteria for selective rehabilitation, etc.

RJG

Aperçu bibliographique depuis 1939 avec 63 références. RL


L'étude entomologique de quelques A. prélevés sur des livres anciens a permis la détermination des quatre espèces: *Stegobium paniceum* L., *Gastrallus immarginatus* Müll., *Nicobium castaneum* Ol. var. *birtum* Ill., *Petalium (Gastrallomimum) unistriatum* Pic. RL

I. Wood


Discusses the movement of moisture in wood during the process of drying and the factors affecting this movement; presents formulas for the calculation of moisture content at midthickness of a board or plank and of the time required to dry different sizes of the same species of wood.


A basic theoretical discussion of the physical properties of cell wall material and their modification occasioned by the porous nature of wood cells. RDB


Contents: Introduction; Structure, sorption and swelling; Anisotropic elasticity; Swelling stress in elastic gels; Plasticity; Sorption hysteresis; References; Index; Symbols. RDB


The processes used by the Masonite Corporation in the manufacture of low- and high-density wood-fiber boards are described.

L’attaque d’un bois de sapin, attribuée à des termites est imputable en réalité à une espèce de fourmis, dont l’auteur donne la description. Comme moyen de lutte il préconise un appât empoisonné. **RL**


Innhold: Forord; Båtene fra de eldste tider; Båtgraver og skips-graver; Vikingeskipene; Sagatid og Middelalder; Register.


Test fence investigations during the past 22 years are reviewed, including treatment of wood surfaces with chemicals; antishrink treatments by acetylation, or impregnation with phenolic resins; coverings of paper, resin-impregnated paper or pulp board, and resin-bonded sawdust; and mechanical alteration of wood surfaces by striation.


The nature, composition, characteristics, and appropriate uses of water repellents, water-repellent preservatives, NSP preservatives, wood sealers, and preservative wood sealers are briefly described for nontechnical readers.


The reasons why some kinds of wood hold coatings of house paint longer than others are explained. The native woods are classified for paint-holding power. Suggestions are made for getting the best possible paint life on the less desirable kinds of wood.


The physical structure and chemical composition of wood, as they affect its paintability, are discussed. The normal way in which paint wears out on wood (under exterior exposure) and the influence of specific gravity, rings per inch, and angle of grain on the durability of paint coatings are described. Native species are classified for paintability.


Measurements were made on the response of 12 specimens of wood, ranging from one year to 3,700 years in age, to changes in relative hu-
midity from 20 to 80 percent. The oldest specimens behaved much like recent wood in respect to weight and dimensional changes. Hence dimensional stability is not a merit that can safely be attributed to old wood.


Rate of diffusion of water through wood compared with theoretical equations of Stamm. Various soft and hard woods compared. **RLF**


An outline is given of the advantages of, and reasons for, resin impregnation of wood, with data on tensile properties. **SR**


The apparently anomalous behavior of wood in longitudinal shrinkage can be explained by the theory that "cellulose is a continuous matrix of overlapping chain molecules which is perforated by a continuous system of intermicellar capillaries." Any loss in moisture below the fiber-satn. point is accomplished by contraction as the chain molecules approach each other and elongation as the affixed ends of the chain molecules are pushed apart. Changes in length along the grain of wood that accompany loss in moisture are the resultant of these two movements, combined with the effects of the angles (spiral pitch) made by the fibrils with the longitudinal fiber axis and the equalizing of the differences between summerwood and springwood. A mathematical proof of the validity of this shrinkage theory is presented.


Iron, bronze and flint sickles and axes and the influence of the material used for the blade on the method of hafting. **IG**


A page of drawings (by special artist, G. H. Davis, with the cooperation of the late Sir Geoffrey Callender) to illustrate the construction of a carvel-built canoe, 45 feet in length, and approximately 4 feet wide. **MB**

A survey is given of the Masonite process and some of its products, including Presdwoods, S-2-S products (hardboards), die stock (substitute for steel dies), reflector board for fluorescent lighting, loft board for aircraft and ship-building industries, Benalite, etc. The hemicellulose fraction can be converted to furfural, AcOH, HCO₂H, and other organic compounds.

   Methods of bleaching wood are described very briefly; a bibliography and a partial list of manufacturers of bleaching materials are included.

   Description of ancient repairs.

   Description of the construction of the dugout canoe.

   Describes how water is held by wood, amount of water in green wood, fiber saturation point, and the effects of moisture on the properties of wood.

   Description of the use of Cerric clear lacquer 2D204 and Cerric matt wax 7M33 to treat wood to prevent it becoming ingrained with dust.

   Neither Lyctus nor Xestobium normally occurs in beech, although serious damage can be caused by the common furniture beetle (Anobium punctatum) and, less commonly, by Ptilinus pectinicornis.

   Aperçu général de la question: description des insectes, historique, rôle de l'Instituto di patologia del libro, organisation de la lutte, prophylaxie et constructions antitermites, insecticides, travaux d'assainissement.


Méthode de traitement d’objets en bois provenant de fouilles, consistant en une imprégnation à chaud par une solution aqueuse d’alun. L’appareillage du Statens Historiska Museum de Stockholm est décrit.

RL


I. The hull. Part II. Mast and sails with details of construction.

IG


Microscopic examination of the buried beech stakes shows that the wood has retained its structure more or less intact. However, the material behaved very unlike normal wood in its reactions to 72 percent H$_2$SO$_4$ and other reagents when observed under the microscope. Microchemical studies of the stakes, their behavior when viewed between crossed nicols, and the X-ray analysis indicate that the cellulosic portion of the wood has suffered losses and that what cellulose remains is in an unoriented condition. Chemically, 75 percent of the dry tissue of the ancient stakes is lignin; recalculation of the analytical values shows that none of the original lignin was lost, nor was there any accumulation of "apparent" lignin by the alteration or decomposition of other constituents. Based on the original density of the wood, there has been some increase in the ash content and the alcohol-benzene-soluble extractives, whereas most of the pentosans (about 91 percent) and cellulose (about 95 percent) have been lost. The very high reducing power of the ancient wood, despite its low polysaccharide content, indicates that this small fraction of cellulose material is highly degraded; probably it is an oxycellulose with a high proportion of CO and CO$_2$H groups. It is also likely that the molecular chains are greatly shortened, as may be deduced in part from the X-ray analysis. The analysis of the ancient beech (oven-dry basis) is: d. 0.15–0.168, Cu no. 10.5, hydrolysis no. 18.2, ash 3.45 percent, alcohol-benzene-soluble 6.56 percent, pentosans 7.96 percent, lignin (ash-free) 74.68 percent, cellulose (lignin-free) 11.54 percent.


Phenolformaldehyde resin has been widely used to improve the physical properties of wood. It is applied by either (1) impregnation
and compression, (2) bonding of veneers with a resin film and compression, (3) liquid resin bonding with glue spreaders and compression. Process (1) increases water resistance, dimensional stability and strength. Processes (2) and (3) increase the strength and modulus of elasticity. The optimum veneer moisture content is 10 percent and temperature 330°F. for 30 minutes. Final product has a specific gravity more than 1.34. Process (2) imparts the greatest number of superior properties.


An investigation of the strength of plywood bonded with cold- and hot-set resins of the phenol-formaldehyde and the urea-formaldehyde type. Over 30 proprietary resins tested. High acidity of the applied adhesive caused a weaker bond to be formed.


In the Japanese cypress wood 250–1213 years old in the Horyuji Temple, Nara Prefecture, the density increased with age, but the chemical compounds changed very little. Absorptive power for moisture decreased with age, but the swelling due to moisture absorption in the direction parallel to annual rings increased, while the swelling in the direction perpendicular to annual rings changed irregularly. The amount of water absorbed on immersion in water for a short time is the greater the newer the wood, but the maximum swelling is shown by the oldest wood. There is little change in crystalline structure. The nitratibility of the cellulose was higher for older timber; the degree of polymerization decreased with age, especially at the outer portion. In general mech. strength increased with age. Heat of combustion increased first rapidly but then gradually with age.


A review of the guide to the first-aid treatment of objects found in bogs, especially wooden objects.


Construction described.

Discusses moisture content, fiber saturation point, moisture equilibrium, weight of wood substance and water per unit volume; volume occupied by wood substance, water and air space; and factors affecting shrinking, swelling, and specific gravity. Formulas and charts show methods for computing shrinkage, swelling, specific gravity, and other variables.

Types of wood used, tools, mitres, mortices, glue, and methods of construction.

The effectiveness of the treatment of solid wood with phenolic and urea resins on dimensional stabilization and hardness.


The minimum amount of sodium salt of pentachlorophenol (PCP) required for killing *Poria vaporaria* in the Petri dish was found to be 0.008 percent by weight. Blocks of heart wood of *Cryptomeria japonica* infused with PCP were used for determining the minimum amount of PCP showing toxicity against the same fungus and the value 7.3 mg per cc of wood was obtained. As Na salt of PCP is soluble in water, protection against rain or moisture is necessary when the wood blocks are used outdoors or in damp places. Blocks of wood, *Hinoki* and *Keyaki*, were immersed for 3 days in the solution of sodium salt of pentachlorophenol and the amount absorbed was determined by the weight increase. The depth of impregnation was 10 mm for *Hinoki* and 2–3 mm for *Keyaki* at the cross section of the wood. To make the absorbed salt insoluble, 2–3 percent copper sulfate solution was painted on the wood with a brush with good results.


After taking the bucket apart the water-logged staves of yew were treated in a bath consisting of ¾ part potash alum, 1 part glycerine, and 1 part H₂O (by wt.) at 95°C for 3 hours. After rapid rinsing in warm water to remove excess alum the wood was allowed to remain in open air 3 weeks before coating with a dilute solution of cellulose nitrate. The corroded bronze bands were reduced electrolytically in
a 5 NaOH percent solution at 1 ampere for 6 hours. The rusted iron handle was only mechanically strengthened. Details of assembly are described and illustrated.

RJG


Possible methods of early man suggested by the description of modern Stone Age man.

LB


Three pillars of the Golden Hall of Yakushi-ji temple, Nara, were destroyed by the mold *Meroilus lacrymans* (Wulf.) Fr. in 1947.

KY


Lumber should be seasoned to a moisture content in keeping with the average moisture content it will have during its useful life. Report presents charts and tables indicating average moisture content attained by interior woodwork in January and July throughout the United States.


Discusses the effect of wood structure on shrinkage, the moisture content-shrinkage relationship, shrinkage variability, and the effects of shrinkage. Also contains table of shrinkage factors for commercial species.


Materials and methods used in incorporating synthetic resins with wood to form objects with more desirable properties.

SR


Contents: Ch. I. Causes of decay. . . . Ch. VIII. Rots of timber in buildings and structures. . . . Ch. XI. Deterioration of composite wood and manufactured wood products. . . . Ch. XIII. Preservation of wood by chemicals.


Contents indicated by title.


The lesser radial shrinkage of wood as compared to tangential shrinkage is accounted for by the crystallite structure around the pits, which are predominantly in the radial wall. Data are presented that show that the ray cells do not restrain radial shrinkage.


Subsequent to *loc. cit.* 117 (1946), p. 95. Further examples. Discusses the appearance produced by natural as distinct from artificial wear in wooden objects.

SRJ


Describes method for making a tough compressed wood that contains no stabilizing resin within the cell wall structure but still does not recover from compression under swelling conditions, due to relief of internal stresses caused by a limited flow of lignin cementing material under the pressing conditions.


Wood preservatives consisting of either chlorinated phenols, Cu naphthenate or phenyl Hg oleate plus a water-repellent material dissolved in a distillate fuel oil, conforming to Bureau of Ships Specification 52P46, have no deleterious effect on the adherence or other significant properties of seam compounds; a 24-hour drying period must elapse between treatment of wood and filling of seams. The method of applying the preservative (brush, dip, or hot and cold bath) has no effect. Solutions of this type have little value as paint primers. Cu naphthenate shows a tendency to bleed through a paint film; bleeding is materially reduced by the use of a good primer.


In condensed style discusses the various methods of modifying the properties of wood, and for each of the more successful new products (impreg, compreg, staypack, staywood, acetylated wood, and formaldehyde-treated wood) describes processing, properties and applications, and cites literature.

Dimensional stabilization of woods may be influenced or attained in various ways: 1. With surface coatings. These do not prevent passage of moisture but retard it sufficiently so that under rather rapidly oscillating relative humidity conditions they do reduce swelling and shrinking effectively. 2. With internal coatings of the capillary structure. This can be done with wax carried into cell structure with ethylene glycol mono-ethyl ether to replace water. This retards rate of swelling but final swelling is unaffected. 3. With a hygroscopic treating agent like sugar or a salt. This is unsatisfactory for several reasons. 4. By heat treatment. This causes chemical changes with resulting darkening and loss of strength. 5. By chemical blocking of hydroxyl groups. By forming a phenol-formaldehyde resin throughout the cell structure, it is possible to reduce the hygroscopicity and equilibrium swelling of wood 25 to 35 percent of normal. Wood treated this way is conveniently termed "impreg." Treatment is best carried out on thin plys of green wood with phenol-formaldehyde resinoid in a chamber by different methods, some under pressure. Impreg. treatment also imparts to wood considerable resistance against decay and termite and marine borer attack. Compreg. is a name given by the Forest Products Laboratory to the stable form of resin-treated compressed wood which is highly compressed prior to the setting of the resin. It has higher density than impreg. 6. By causing the lignin- cementing material between cellulose fibers to flow sufficiently to eliminate internal strains. This is done by heat and the product is called "Staypak." 7. By heat treating the wood under non-oxidizing conditions. The wood is heated 500–600° F. for a few minutes in a bath of molten metal or fused salt. Hygroscopicity and equilibrium swelling are reduced to half normal. There is some loss in strength properties. This is the simplest and most economical method of modifying wood. Bibliography.


A comprehensive analysis of the passage of liquids through softwoods under both diffusion and pressure permeability conditions is given. The analysis is extended to the case of drying wood, taking into account free liquid, bound liquid and vapor movements. Theoretical diffusion constants are calculated.


A review of the principles of permeability and diffusion of materials through wood.

A brief survey of the present methods for stabilizing the dimensions of wood by bulking, chemical reaction with the hydroxyl groups, and cross linking.


The literature is reviewed on new developments (1949/51) in preservative and fire-retardant treatments for wood, strength properties of wood, wood structures, and production and properties of plywood, laminated wood, modified woods, and fiberboards from the standpoint of chemical engineering interest. A table of properties of fiberboards is given.


Revision brings the laboratory’s development of Compreg up to date.  
RDB


Methods for making dimensionally stabilized resin-treated compressed wood are given, together with modifications in properties and proposed uses.  
RDB


The different ways by which dimensional stabilization of wood has been attained are discussed. The dimensional stabilization of wood by acetylation is considered from the standpoint of various mechanisms. It is shown that the stabilization is primarily due to a bulking effect.


Fibers of pure cellulose and lignocellulosic materials such as wood can be directly penetrated only by polar liquids. These liquids, except for a small correction for adsorption compression, add their vol. to the vol. of the cell walls, indicating that they are not entering existing voids but are forming a solid soln. with the fibers. The extent to which a liquid will penetrate fibers and swell them appears to be dependent upon the ability of the liquid to form H bonds with the OH groups of cellulose and the lignin, and also upon the size of the liquid mol. Although solns. may penetrate the fibers much more slowly than the solvent in a no. of cases, they eventually swell wood more than does either component alone. This enhanced swelling can be explained on the basis of an equil. between sorption, soln. pressure, and structural resistance. Nonpolar liquids, which do not by them-
selves penetrate fibers, can replace polar liquids already in the fibers except for the unimolecularly held portion of the polar liquid. Only partially expanded aerogels can thus be made from cellulosic fibers.


The composition and structure of wood are briefly reviewed. Swelling is limited in the cell wall by the "hoop" tension of the spirally oriented micelles in the outer cell wall, a structure comparable to the corded carcass of a rubber tire. Loading cell walls with various materials, as resins, increases the volume by an amount equal to the volume of the loading material. Loading makes possible dimensional stabilization of wood, for although the dry dimensions of the wood are increased, the limiting water swollen dimensions are not affected.


A review with 15 references.


Describes a new method of stabilizing the dimensions of wood against swelling and shrinking by reacting wood with vapors of acetic anhydride in the presence of pyridine. Treatment gives the highest degree of dimensional stabilization thus far found without embrittling the wood, as with resin treatments.


Contents indicated by title.


Contents indicated by title.


Contents indicated by title.


Contains a table of shrinkage values for wood of numerous species. The cause and effects of shrinkage are discussed and recommendations are made for minimizing shrinkage of wood items in service.
Some 150 titles of general works with bibliographical data and occasional notes.

Contents: Wood finishing in general; Preparation of old and new surfaces; Stains in general; Factory prepared stains; Water stains; Chemical water stains, acid and alkaline; Color pigment water stains; Spirit stains—aniline and coal tar dye stains; Oil stains; Varnish stains; Stain mixing—brushes and procedure—weights and measures; The mixing and use of wood fillers; Varnish and shellac; Varnishing, rubbing, polishing; Varnish defects and their causes; Lacquers—pyroxylin nitrocellulose, shellac, Chinese and Japanese; Wax finishes and oilrubbed finishes; Painted interior wood trim; Enamed interior wood trim; Schedules of working operations; Interior trim woods—descriptions of characteristics; Brush graining; Decorative wood finishes by glazing and highlighting; Repairing damaged finishes; Index.

L’auteur traite successivement de la vie et des moeurs des termites, des mesures de protection en général, de la destruction des termites dans les édifices et les bois infestés, de l’emploi de bois résistant ou traité, des mesures à prendre contre les termites dans les nouvelles constructions et de la défense d’édifices existants.

Birch bark used for pots and floors and applied to pots as decoration.

Description of various methods of using straight or curved timbers to support a ridge pole.

The coefficient of thermal expansion of solid wood and untreated and resin-treated laminated wood and plywood is reported. Equations for computing the coefficient of thermal expansion for different densities, resin contents, and constructions are given.


Description of the excavation and salvage, details of the construction of the boats, timber and tool marks and reconstruction.

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**J. Fibrous Materials and Textiles**


Contents: Scope; Reference standards; Reagents; Apparatus; Considerations for sampling; Test specimens; Mounting specimens; Preliminary examination; Procedure for fibers with surface scales; Procedure for fibers with faint or pronounced cross-markings and swellings; Procedure for fibers with longitudinal striations; Procedure for twisted fibers; Procedure for fibers without markings; Appendix: Plates.


Contents: Introductory; Single crystal rotation photograph; Fundamental calculations based on the rotation photograph; Natural silk (Domestic); Natural silk (Wild); Native cellulose; ramie, jute, hemp, coir, cotton; Disoriented native cellulose; Native cellulose—flax; Regenerated cellulose; Mercerisation; Regenerated cellulose; Acetate rayon; Mammalian hair; Avian and reptilian keratin; Collagen; Comparison photographs—collagen; Artificial fibrous proteins; "Lanital"; Synthetic fibres; "Vinyon"—"Nylon"; Dyed fibres; Sector comparison photograph; Mineral fibres.


The basic techniques for each of the four principal fibers—linen, cotton, wool, and silk—woven alone are described. In Part II is described what happens when various fibers and techniques are brought together. Definitions of terms used in textile description are given. In Part III is traced the further evolution of loom set-up introduced by the wool weavers and which were subsequently adopted for silk weaving.

RJG


Powder and fiber diagrams, as well as the central diffusion method, have been used to study the solid state of bleached cotton in comparison with cotton heated to 185°, 242°, 257°, 284°, 314°, 340°, 430°, 465°, and 600°. Debye diagrams indicated for the first five samples, even when heated for 10 hours, the form of an oriented fiber with the same diffraction lines. However, the sixth to tenth samples gave diagrams characterized by a large ring, the center approaching the (002) line of graphite, as well as a ring corresponding to a spacing of 2.1 Å. Samples 6 and 7 had a more diffuse pattern than 8, 9, and 10, indicating a modification of the crystal structure. By means of the Guinier arrangement, low-angle diffraction was studied for samples 1, 3, 5, 7, and 10. Low-angle diffraction could not be observed for the 1st and 3rd of these samples, whereas the fifth showed slight diffraction, and the others gave an intense, sharply defined diffraction. It is concluded that: (1) The cellulosic structure is retained up to about 300° in spite of an important modification of the material; (2) an amorphous structure, appearing at about 300°, persists throughout heating to higher temps; (3) loss of the cellulosic structure is accompanied by the appearance of a micellar structure.


The technique of weaving and the designs as related to the other arts in China from about 200 B.C. to A.D. 200.

RMM


Description of the weave and possible reconstruction.

IG


The many causes of flag deterioration are reviewed. Prior to restoration photographic records should be made and even better water color sketches. These may outlast the original. Small tears are mended
with small patches of similarly colored silk attached with starch paste (or Kodak's white photopaste, from collapsible tubes, or made up from its powder). Fragmentary flags are pasted with this same paste to flags of artificial silk made up of the same design and colors. The restored flag is then fixed on a ground of cotton fabric in a frame with copper or brass tacks. The frame is backed with plywood which is impregnated with corrosive sublimate (mercuric chloride) 1:1000. Repair of flags by stitching to reinforce is not recommended. Suggestions are made for the display of old flags. Directions, illustrated by diagrams, are given for recognizing the "right" side of a flag based on the laws of heraldry.


A case history of the cleaning and mounting of a Near Eastern woolen textile is described. Following microscopic identification of the fibers and determination of direction of twist, ultraviolet examination to detect patchwork, and tests for fastness of the dyes, the fabric is placed between Lumite screening of cloth weave to serve as a support. Lumite is a plastic which is not affected by any of the solvents or detergents used in the screening process. Stoddard solvent is used for degreasing and stains are reduced with an enzymic digestive agent called Parazyme dissolved in distilled water, then flushed. Washing is completed in a detergent bath using Igepal CA extra, 1:200 parts in distilled water. After tamping to remove grit, rinsing in a 10 percent glycerine bath and drying, the textile is mounted on Lumarith for storage or exhibited between two pieces of Plexiglas. All steps are well illustrated with photographs.


Woven textiles, spinning, Bronze Age plain and patterned weaves. Raw materials, weaving and spinning appliances, basketing and other similar fabrics, matting.


Use of glycerine 59 percent, water 40 percent, formaldehyde 1 percent. Immerse cordage in tap water for 24 hours. Shake off water and immerse in glycerine solution for two weeks.


Contents: Foreword; Introduction; Flax; Ancient spinning and weaving; Linen during the Stone Age; The Phoenecian interlude; Linen in Egypt; Linen of the Hebrews; Linen in Greece; Linen in Rome; Linen in the Medieval twilight; Linen in Flanders; Linen in England; Linen in Ireland; Linen in Scotland; Linen in Colonial America; Ramie; Hemp; Sisal; Jute; Bibliography.

Contents: Foreword; Introduction; Fiber called silk; The silk moth and its cocoon; Wild silk moths; The mulberry tree; Silk in China; Silk in India; Silk in Japan; Silk in Persia; Silk in Egypt; Silk and the Arabs; Silk and the Hebrews; Silk in Greece; Silk in Rome; Silk in Byzantium; Silk in Sicily; Silk in Italy; Silk in Spain; Silk in France; Silk in England; Silk in Germany and the Low Countries; Silk in America; Notes on silk lace; Glossary; Bibliography.


Contents: Foreword (by Sylvan I. Stroock); Man learns about wool; Sheep and their ancestors; The Merino sheep; Alteration of fleece; Wool and its allies; Wool and worsted; Felt, an ancient fabric; Wool and Swiss Lake dwellers; Wool in Egypt and India; Wool and the Hebrews; Wool in Mesopotamia; Wool in Greece; Wool in Rome; Wool in Medieval Italy; Wool in Spain; Wool in France; Wool in Flanders; Monastery wool; Wool in England; Cloth guilds of Europe; English cloth guilds; Wool in Ireland and Scotland; Wool in America; Wool in Peru; Wool in Australia; Cashmere; Mohair; Camel; Llama; Guanaco; Vicuna; Alpaca; Hybrid cameloid fibers; Miscellaneous fibers and furs; Origin of the names of woolen fabrics; Bibliography.


A general discussion of $\text{H}_2\text{O}_2$ bleaching; its mechanisms; practical methods of use; its effect on the fibers; the role of metal catalysts, especially Fe and Cu; the formation of readily decomposed metal peroxides (e.g., $\text{Fe}^{++}-\text{Fe}_2\text{O}_5-\text{Fe}^{+++}-\text{Fe}^{++}$); the possibility of destroying the action of the catalysts by poisoning, as with HCN, HCNS, $\text{H}_2\text{S}$, and similar organic compounds; the interference of water glass, Na pyrophosphate or aliphatic alcohol sulfonates with the splitting off of $\text{O}_2$; the Fe and Cu content of the fibers, the danger of such content and its detection analytically; and the slight importance of catalytic injury with wool.


A comparison is made of the fungicidal activity of Cu naphthenate, Cu oleate, Cu "tallate," and Cu resinate. Cu naphthenate prevents rotting of cotton fabrics by mildew at a lower concentration than do the other compounds. This is due in part to the fact that naphthenic acid itself is a potent fungicide. Various factors which influence the rotting-preventative properties of the four Cu compounds are dis-
cussed. These include leaching, adsorption and chemical deactivation through hydrolysis and subsequent formation of insoluble Cu compounds in the soil. A comparison is made between the soil burial test for mildew and the laboratory tests using incubation with *Chaetomium globosum* and *Metarrhizium*. The effect of soil composition on the results of tests is studied by employing four types of soil with different chemical and mechanical properties.


Polyvinyl alcohol and acrylic resin were used for the preservation of old cloth, old papers, and the prevention of the loss of gold foil.

KY


Many practical suggestions are given for examination, washing, repair, display, and storage. In storage rugs should always be rolled against the pile, right side inward. They should be rolled on poles of well-seasoned wood three or more inches in diameter. Standard conditions are 70°F. and 65 percent relative humidity. They are most readily accessible if the poles are hung on skeleton rug racks built against the walls. Before annual building fumigation each rug is vacuumed back and forth, sprinkled with paradichlorobenzene flakes, approximately ½ lb. or two handfuls to a 4 x 6 rug, and then rolled on its pole. Storage fumigation is most effective at a temperature 90°–100°F. for 48 hours using 1 lb. paradichlorobenzene flakes per 10 cu. ft.

RJG


The "Taima Mandala," which represents the portraits of Buddha and his attendants, was found by microscopic examination, infrared and X-ray photographs to be a cloth woven like a tapestry.

KY


Contents: Preface; Foreword, by A. V. Kidder; The Chihuahua cloths; The fiber; Yarns; Colors; The loom; Loom procedures; Weaves and weaving procedures; Textures and thread counts; Stitchery techniques; Pattern; Abstracts of analytical descriptions; Summary; Appendix—Chemical notes on the coloring matter of Chihuahua textiles of Pre-Columbian Mexico, by Michael Kasha; Glossary; References.

BMU

747. POPE, ARTHUR UPHAM, and ACKERMAN, PHYLLIS. The most important textile ever found in Persia: a piece of two-faced silk serge
bearing the name of the weaver and the date—994 A.D. Technically it is in some respects the most remarkable piece of weaving found anywhere. *I.L.N.*, 202 (1943), pp. 48, 49, illus.

Each surface carries an entirely different pattern, woven simultaneously. The article gives a short account of the method of weaving used.


A technique for measuring preferential wetting of a fabric at oil-water interface is described. The factors in fabric cleaning and the principles of detergency are discussed.


Contents: Examples of: (1) unfigured cloth, (2) patterned cloth (silk twill and gauze), (3) brocades, (4) brocaded twills.


The energy of light of the wavelengths under 3,600 Ångström units suffices to destroy the macromols of fibers photolytically; the energy of visible light will only destroy fibers in the presence of H₂O and O or at high temps. With curtains the permeability of glass to ultraviolet light will be lowered by its Fe content. Under controlled conditions of exposure to light the following mathematical relationship is valid: \( F/F_0 = 10^{-at} \) or \( \log(F/F_0) = at \), where \( F \) is the tear resistance after exposure, \( t \) is time of light exposure, \( F \) is the tear resistance before exposure, \( a \) is a characteristic constant. \( Z \) is the time when \( F = F_0/20 \), when the fabrics will be practically useless. It is determined from \( Z = 1935 \log(F/F_0) = \log(F/F_0) \) where \( F_0 \) is tear resistance of the standard before exposure, \( F_0 \) is tear resistance after exposure, and 1935 is an empirical constant. For accurate measurements is used: \( \phi = F (1 - (D/100)) \). Where \( \phi \) is the tear resistance per square unit of broken surface, and \( D \) is the break extension in %. All tear experiments are conducted in the wet. If the lowering of the degree of polymerization of films is measured, the formula \( k = 1/t(1/p) - (1/p_0) \) will give the velocity constant, \( p_0 \) is the degree of polymerization before light exposure, \( p \) the same at the time \( t \), and \( i \) the time of exposure. These tests conducted on different types of fibers showed that polyvinyl chloride and polyacrylonitrile will stand continued weathering conditions best. In thick rope nylon can also be used because ultraviolet rays cannot penetrate into the core of the rope and will only damage the outermost layer. Cellulose acetate is the
most light-resistance cellulose fiber (useful for curtain material). Small amounts of Fe in the fiber will catalyze decomposition by light. This can be counteracted by $\text{H}_3\text{PO}_4$; $\text{TiO}_2$, which is used as a matting agent and causes destruction of the fibers by light, may be counteracted with Mn salts. Polyvinyl chloride fibers are light-stabilized with amines or metal compounds.


Contents: A, Cellulose decomposition in nature; B, Morphological, physical, and chemical features of cotton; Structural features of cotton fabrics; C, Causal organisms; D, Mechanism of degradation; E, Methods of prevention; Index of microorganisms; Subject index. RLF

752. SYLWAN, VIVI. Investigation of silk from Edsen-gol and Lop-nor and a survey of wool and vegetable materials. Stockholm, 1949. (Reports from the Scientific expedition to the Northwestern provinces of China under the leadership of Dr. Sven Hedin. Pub. 32. VII. Archaeology 6) x, 180 pp. pls. (part col.).

Contents: Coloring, dyes and dyeing, pp. 156–160; Weaving, looms, and methods, pp. 164–168; Cleaning of silks and articles of silk, pp. 175–176. BMU


Contents: Introduction; Manufactured fibres; Chemical properties; Physical properties; Method of cutting cross sections; Photographs of animal fibres; Density gradient tube; Photomicrographs.


The procedures include: 1, Microscopic analysis; 2, testing the colors; 3, Cleaning; 4, Blocking. A list of necessary supplies is given. RJG


Two small fragmentary pieces, tentatively attributed to the fifth century A.D. and probably woven somewhere in the eastern Mediterranean area, are both fine tapestry, about 15 warps to the centimeter, with designs woven in gold thread and a little color against a background of deep neutral purple. The warp of the smaller piece is linen, the weft gold thread, wool, and a little silk, while the warp of the larger piece is wool, the weft gold thread and wool. The gold thread
appears to be a natural alloy of gold with approximately 5 percent silver and 1 percent copper, wound directly on a silk core. The analysis is made with reservations since difficulties were encountered during examination of the tiny specimens available. The subjects, use, and technique are discussed and the fragments described.


Généralités sur l'examen, la conservation, la restauration et l'exposition des textiles. Les techniques utilisées au Musée National de Zurich.


Contents: Preface; Natural animal fibers—Wool—Specialty hair fibers—Minor hair fibers—Fur fibers—Silk; Natural vegetable fibers—Cotton and minor seed hairs—Bast fibers—Structural fibers; Rayon fibers—Filament and staple rayons; Protein and synthetic fibers; Mineral fibers (Asbestos and glass); Bibliography.


Leather samples representing three standard methods of tanning were studied histologically for evidence of fungus attack on the collagen. Vegetable tanned leathers supported more vigorous growth of mycelium than chrome tanned leathers. Examination of thin microtome sections failed to reveal evidence of attack on the collagen fibers of the leather, although a minor invasion of fungus hyphae may be observed in hair follicles and in the larger interstitial spaces between collagen aggregates. The vigorous development of mildew on fresh leather is at the expense of substances incorporated in the leather during tanning and subsequent treatment, not at the expense of the collagen matrix of the hide. The behavior of mold-infected leather is not comparable to that of infected wood, cotton fabrics, or other cellulosic material.


Hornbill ivory is derived from the solid casque or epithema above the beak of the helmeted hornbill (*Rhinoplax vigil*), a large arboreal
bird which inhabits Southeast Asia, Borneo, and adjacent islands. The solid ivorylike substance which forms the bulk of the casque is covered at top and sides—but not in front—by a sturdy and gleaming sheath of brilliant red, which also overlaps the skull proper. This substance has long been prized by the Chinese as a medium for small carvings as buckles, snuff bottles, and thumb rings and by the natives of Borneo for earrings, ear plugs, and other ornaments. Not until the Ming Dynasty does it definitely figure in the Chinese records. The material is called by the Chinese bo-ning 鳖頂, by the Japanese boden ホウデン. Hornbill ivory is yellow and somewhat less dense than elephant ivory. Frequently the red layer is worked into the design. Canton was formerly the center for working and distributing hornbill ivory, but only in Borneo does the work on this substance continue.


By using facsimiles of the original documents, which are inscribed on animal parchment, a method of procedure was worked out which embodied (1) a double laminated plate glass enclosure separated by a bronze frame and a Pb strip to which the glass is hermetically sealed with solder; (2) evacuation of the air from the document space and its replacement by pure helium gas with sufficient water vapor to give an r.h. of 25–35 at r.t.; (3) backing the document within the enclosure with pure cellulose all-rag paper; (4) incorporating within the frame detectors made of 0.001 inch-diam. platinum thermal conductivity cells; (5) exposing the enclosed documents under a laminated glass filter using yellow cellulose acetate sheet middle layer. The report is well illustrated. Data are given in respect to the effects of radiant energy on cellulose and the protective action of light filters.


Physical tests show loss of tensile strength, decreased stretch at breaking point and weakened grain surface. Decomposition of grease by molds appeared to be principal cause for change in physical properties. No appreciable deterioration of hide substance was indicated. A fungicidal oil containing paranitrophenol and pentachlorophenol resisted the growth of mildew under the test conditions.


Studies ranged from 0–96 percent relative humidity at 28°, 50° and 70°C. Collagen, hide powder, and four leathers investigated.

Both bacterial decay and insect damage to hides and skins can be prevented or stopped by dipping them, when freshly flayed, for 15 to 30 minutes in a one percent solution of Na$_3$SiF$_6$. After this treatment any recognized method of curing can be adopted. As Na$_3$SiF$_6$ is not a fungicide, organic mercurial compounds or some other suitable compounds should be used to eliminate fungi.


This paper contains Dr. H. J. Plenderleith’s technical report on the cleaning of one of these ivories.


The ‘Unwin leather dressing’ has incompatible components and the proportion of beeswax to lanolin is so great that it is a polish rather than a dressing and certainly not to be recommended.


Contents: Library problems—The seemingly haphazard deterioration of modern leathers; Scientific investigation—Causes and prevention of decay; The P.I.R.A. test for durable leather; The time test; Limited usefulness of leather dressings; Characteristics of protected leather—Cleaning leather bindings whether protected or unprotected; Can protected leather bindings be protected? Vellum bindings; Summary.


Two sets of samples from the butt area of a vegetable-tanned oxhide were kept at relative humidities (R.H.) of 74 to 98 percent for 10 months at 25°. The A samples were previously dried over concentrated H$_2$SO$_4$ for 77 days, while the B samples were wet with water just before being placed in the controlled atm. Controls for each series were treated with sufficient p-nitrophenol to prevent mold growth during the test. The A samples showed no mold growth up to 86% R.H. at which point the water regain value was 12%. All the B samples showed mold growth including those at 74% R.H., whose H$_2$O content was 13%. The controlling factor for mold growth is, therefore, the moisture content and not the R.H. of the
surrounding area. In this particular case a moisture content higher than 12% is necessary for mold growth within the R.H. studied. It seems probable that $H_2O$ in excess of that thought to be chemically and molecularly bound by the leather must be present in order to support mold growth.


Physical and chemical data on deterioration of skins. RLF

769. Unwin, Max, and Middleton, Bernard C. An improved leather dressing. M.J., 51 (1951), pp. 69–70. IG


Contents: Foreword, by Gordon Russell; Prehistory to Renaissance; Renaissance to industrial revolution; Industrial revolution to the present day; Craftsmanship and leather; Leather in literature. BMU

L. PAINTS, PIGMENTS, DYES, AND INKS

1. PAINTS


Contents: Preface; Fundamental considerations; Film-forming materials from natural sources; Synthetic film-forming materials; Physical film formation; Chemical film formation; Pigments; Coating film properties and their testing; Selected bibliography; Author index; Subject index.


A review dealing with interface and interference bronze in paints and inks. Development of formulas for calcn. of both types of bronze
is traced. Color effects described in the article are illustrated with 24 colored photographs. 19 references.


Factors governing the development of micro-organisms whether fungi or bacteria are discussed. Of particular interest is the production of hydrogen sulphide by certain anaerobes, and its action on pigments.


The technique used in proving the identity of two paint scrapings is described. The number, color, and thickness of the different coats are determined under the microscope and the elements present are identified and estimated spectrographically.


A study was made of 23 clear and 23 pigmented paint films, stored under a variety of conditions over a period of several months for changes in acid and saponification numbers. Each of the 23 pigmented films was also exposed in a Weatherometer for several months and was checked for pigment loss due to chalking. The pigment, in the pigmented materials, consisted of 75 percent rutile TiO₂ and 25 percent ZnO by weight. Four glass plates were covered with each paint and they were then held for one week at 50 percent relative humidity, 77°F, and constant illumination with a 15-watt daylight fluorescent lamp. The plates were then transferred, one each, to four aging cabinets of 50 percent relative humidity with no light; 50 percent relative humidity and 25 foot-candle daylight fluorescent light; 100 percent relative humidity and 25 foot-candle daylight fluorescent light; and 100 percent relative humidity and 25 foot-candle daylight fluorescent light; and 100 percent relative humidity with Hg-arc light, and all at 77°F. Each film was then sampled for acid and saponification numbers at the end of 1, 4, 7, 10, and 12 weeks. For the chalking tendencies of the 23 pigmented oils, films were cast on glass plates, dried for one week at 77°F and 50 percent relative humidity and 25 foot-candle daylight fluorescent light. The films were then transferred to a Weatherometer. At two-week intervals the plates were washed with H₂O and the washings analyzed for TiO₂ and ZnO. This procedure was followed for 16 weeks or until the breakdown of the film. The paint pigments formulated provided almost complete protection for the vehicle from ultraviolet light. The acid values of the pigmented oils did not show the sharp increases exhibited by the clear oils. The breakdown of the varnish films was ordinarily attended by an increase in the acid value. There was evidence that paints and varnishes tend to yellow in darkness and this may not be due ex-
clusively to linolenic acid and its esters. High humidity did not tend to hydrolyze the vehicles of the alkyd resins. Dipentaerythritol esters appeared to be somewhat more easily hydrolyzed than those of pentaerythritol. The alkyd resin vehicles showed remarkable resistance to the chalking of pigment. ZnO leached freely from the non-alkyds.


Improved methods for measuring the course of fading of paints are in demand. Two of the important evidences of the fading of paints, namely change of color and change of gloss, can be measured rapidly by photoelectric methods developed within the past few years. Photoelectric tristimulus measurements of color change and photoelectric measurements of specular-gloss change were used to follow the fading of several paint samples exposed both to outdoor weather and to two machine treatments A and B designed to weather the samples at an accelerated rate. With these measurements it was possible to compare numerically the rates of artificial and natural fading of the paints. For outdoor exposure, the panels were placed in racks facing south at 45° from horizontal on the top of a building at the National Bureau of Standards, Washington, D. C. Each accelerated weathering apparatus used a C-arc as a source of radiant energy and an H₂O spray which wet the panels at regular intervals. Operating schedules were arranged which allowed time for inspection and measurement of the panels as well as time for their rest during each week. During the 168 hrs. of a week, the panels in apparatus A were subjected to irradiation and intermittent wetting for 81.5 hrs., those in apparatus B for 106.5 hours. In computing the lengths of exposure only the periods of actual operation of the apparatus were used. The results show: (1) the treatment in apparatus A caused fading which averaged 20 times as fast as fading outdoors, but the speed-up factor varied from roughly 5 times for one paint to roughly 40 times for another; (2) the treatment in apparatus B caused fading which averaged 5 times as fast as fading outdoors, but the speed-up factor varied from roughly 3 times for one paint to roughly 20 times for another; and (3) for almost every paint tested, the factor relating the speed of fading from treatment in apparatus A to the speed outdoors was more nearly constant through the whole fading process than the corresponding factor for treatment in apparatus B. Thus treatment A not only faded paints faster, but it provided a preview of the course of fading which was usually a better representation of outdoor fading than that provided by treatment B. The paint finishes tested were chrome yellow and zinc oxide in linseed oil, white lead and zinc oxide in linseed oil tinted with Para Red, and 6 oleoresinous enamels.

The influence of the various components of oil paints, the substrate, and various fungicides on mold growth is discussed. For most situations an antiseptic, e.g., thymol, which prevents infection during drying and hardening of the films suffices, but under dirty, damp conditions more lasting protection with, e.g., mercury compounds, is required. Methods of testing fungicides and the treatment of discolored films are also described.


Contents: Hiding power; Examination of colors for tone and strength; Light reflection; Color; Color standards for liquids; Gloss; Ultraviolet light; Temperature and humidity control; Preparation and thickness of films; Drying time of films; Hardness, abrasion, impact, adhesion; Exposure tests; Accelerated weathering; Particle size and texture of pigments; Surface tension and interfacial tension; Oil absorption; Consistency; Miscellaneous testing devices and methods; Specific gravity; Examination of drying oils and oil seeds; Examination of driers and metallic soaps; Examination of volatile thinners; Examination of resins; Examination of shellac; Examination of varnishes; Examination of bituminous paints; Examination of waxes and polishes; Analysis of paint; Testing raw materials for cellulosic coatings; Physical tests on cellulosic coatings; Analysis of cellulosic coatings; Specifications; Agricultural tests on oils; Index.


An examination of the development of strain in colloidal films on drying. The surface is compared to a stretched membrane which Raleigh treated mathematically. The role of plasticizers, temperature, and moisture is discussed.


Contents: Faults which develop during storage; Faults developed during application; Failures developing shortly after application; Defects of coatings on the finished objects when in use; Postscript; Bibliography; Indexes.


The relative moisture permeability (R.M.P.) (i.e. water vapor losses through films/free evaporation of water under test conditions) was determined of clear and of pigmented films of Plexigum B50 lacquer, linseed-oil varnish, linseed-oil stand oil (0.1 percent Co.), China-wood-oil stand oil, nitrocellulose lacquer (containing Resin AW2, Palatinol C, and tritolyl phosphate), chlorinated rubber (Pergut N) plasticized with Clophen A60, and of a bitumen. R.M.P. was only affected by temperature changes. Various methods of determining moisture permeability (American cup, Demmler jars, Rossmann cup) are discussed. The R.M.P. of free films and in the open air was lower than that of supported films (on parchment paper), and inside a desiccator. The R.M.P. changed little with pigmentation until the pigment content (e.g. coke black, gas black, Fe oxide red) was quite high. However, film swelling indicated over-pigmentation began at 30–50 percent pigment. The R.M.P. was lowest with bitumen, chlororubber, and nitrocellulose, highest with linseed-oil varnish, and intermediate with the stand oils. Even though pigments did not lower the R.M.P., films containing them beyond certain low concentration showed much reduced rust-inhibiting action for steel and lowered anticorrosive action for Elektron metal (tested by salt or by water spray). The effect of pigments in various concentrations is shown in detail. The nature of film permeability is discussed.


Tests were carried out in a Panama jungle on nearly 100 toxic agents in one, five, and ten percent concentrations (a) in a clear phenolic tung oil varnish and (b) on alkyd-resin-modified nitrocellulose lacquer. Most of the toxicants studied, including many of the popular chlorinated phenols, were ineffective. The best in approximate descending order of effectiveness were: o-Hydroxyphenylmercuric chloride; Salicylanilide; Pyridylmercuric chloride; p-Toluene sulfonylamide; Uranyl nitrate; p-Aminophenylmercuric acetate; Phenylmercuric-o-benzoic sulfimide; p-Acetylaminophenylmercuric acetate; Hydroxymercursalicylic acid anhydride; Phenylmercuric phthalate. Each of the primary variables (vehicle, fungicide, concentration, and time) has a significant influence on mold growth. The choice of an individual toxicant (from among the best ten) is of less importance than the choice of vehicle. Retardation of mold varies directly with concentration of toxic agent. Concentration is the most important of the four variables.

The formation of films, their aging, and their deterioration are reviewed in detail, with extensive literature references. The lack of information on mechanical properties of paint films is pointed out and the importance of such information in predicting the ultimate life of the film is emphasized. Exterior film deterioration is brought about largely by ultraviolet light, moisture, and temperature changes. Each of these should be studied separately, so that the relative importance of each may be weighed. Data on moisture absorption and ultraviolet transmission of films are presented, both correlating well with known durability characteristics. The Federation Research Project on pure compounds is outlined, and the preparation of certain pentaerythritol esters and alkyls is described in detail. Some preliminary results on oxygen absorption, acetone solubility, and infrared transmission are given. 995 references.


The varieties of fungi on coatings are reviewed. Four varieties, obtained by transferring fungus scrapings from painted exterior surfaces to linoxyn (14 days old) and allowing them to grow four weeks (when they covered 50 sq. cm.), were further cultivated on various media. They were an ascomycete (Penicillium, green) and three fungi imperfecti (Dermatium, black; Monovercillium, yellow; and an unidentified fungus (I), white). The rapidly growing I was selected for study. Pin-point samples of I transferred to 5 x 5 cm. glass panels covered with films (10μ thickness) of various vehicles and placed in moistened Petri dishes, were studied for linear-growth rate for 48 days. The vehicles and the rate of growth of I on them were: dextrin, 2.90; phenolic resin, 2.90; modified phenolic resin (Albertol 347 Q), 1.90; oil-modified alkyd (Alftalat 423D), 1.90; Me cellulose, 1.70; nitrocellulose, 1.70; lacquer linseed oil, 1.20; raw linseed oil, 1.20; cellulose acetate, 0.97; Gilsonite asphalt, 0.97; plasticized urea-CH₂O resin (Resamin 316F), 0.97; linseed oil standoil, 0.73; oiticica oil,
0.65; polyvinyl acetate, 0.65; chlorinated rubber, 0.65; chinawood oil, 0.62; poppyseed oil, 0.34; Coumarone resin, 0.84; colophony, 0.31; damar, 0.27; shellac, 0.00. The growth progressed steadily at a uniform rate. The effect of pigments (2 percent in lacquer linseed oil) on the growth rate of I was studied next: Cr oxide green, 1.07; chalk, 0.83; barytes, 0.63; Mn black, 0.50; white lead, 0.50; Fe oxide red, 0.43; Bremen blue, 0.43; chrome yellow, 0.40; Scheele green, 0.33; Lenzin, 1.23; lampblack, 0.23; Naples yellow, 0.23, Cd yellow, Zn white, ZnS, Pb₃O₄, cinnabar, 0.20; Paris blue, 0.17; TiO₂, 0.07. A linoxyn film on which fungus had grown for two months became softer, less adhesive, and less elastic, much more (10 times) soluble in alkalies, and much more easily (70 times) swelled by water. Addition of fungicidal materials (0.2 percent) to lacquer linseed oil failed to stop the growth of I as shown by the growth rates: Na silicofluoride, 0.27; ZnCl₂, 0.43; benzoic acid, 0.50; salicylic acid, 1.00; p-chlorobenzoic acid, 0.27; phenol, 0.40 percent; the growth rate was not changed substantially by using 2 percent of these materials except with p-chlorobenzoic acid (0.17 percent).


Organic matter, vapors, and dust are conducive to mold growth but interfere somewhat with the testing of the mold-resistant properties of paints. Mold resistance of interior paints should be tested by applying the test paints to carefully selected sections of walls and ceiling on which water condensation is continuously taking place and which are found to be the most heavily contaminated area on the plan selected. The use of wooden panels may give erroneous results owing to the difference in conditions between them and the painted surfaces of the building. Without an adequate preservative, the paint with a cold-cut resin type of vehicle molded as readily as the paint with a vegetable-oil type of vehicle. Tetrachlorophenol and Zn tetrachlorophenate were found to be the most effective paint preservatives among those tested. Under extremely severe conditions, 3 percent tetrachlorophenol and 3 percent Zn tetrachlorophenate preserved both an oil and a cold-cut resin type of interior paint for two years. The field test confirmed earlier conclusions on the relative effectiveness of fungicides in oil paint as determined by the rapid laboratory method. Fourteen references.


An instrument is described by means of which coatings of uniform thickness can be laid on steel panels with different types of varnishes, paints or enamels. Coatings of various thicknesses over the normal useful range can be made by varying the rate of withdrawal or the viscosity of the coating or both. For a given withdrawal rate the film thickness depends more upon the viscosity than upon the solid content.
   Lecture. Review with diagrams on the mechanism of film formation from natural and synthetic products. It covers chemical composition, functionality of the film former, and the type and degree of polymerization.
   RJG

   A short account of the use of paint by the Indians and the early colonies.

   This first paper of the “Second Annual Review of Analytical Chemistry” reviews all the papers published mainly in 1949, on the analysis of organic coatings. Annotated bibliography with 105 references.
   RJG

   Raw linseed oil is an excellent medium for the growth of paint molds, six other oils tested varying in fungistatic influence. Fine, specially prepared zinc oxide was the most fungistatic of the zinc oxide pigments tested. Fungistatic power is inversely proportional to zinc oxide particle size. Zinc oxide should not be termed a fungicide. Heavy metal ions, including Zn++, inhibit respiration of fungi.
   RJG

   An illustrated discussion of the micrography of paint films. Swelling, or imbibition, is a process due to the absorption of a liquid, especially water, by a homogeneous solid without apparently affecting its homogeneous character. It is considered as the formation of a solid solution of water or other solvents, though valence forces may play a part. Sixteen references.

   Contents: Foreword, by Henry A. Gardner; Preface; Acknowledgement; Dictionary; Supplement; Index to Supplement; Index to advertisers.

794. Wulf, Heinrich. Farbwarenkunde. Oldenburg, Müller, 1950. 304 pp., illus., color charts.
Inhaltsverzeichnis: Allgemeines; Prüfung der Werkstoffe; Farbkörper; Bindemittel; Lackrohstoffe; Verdünnungsmittel; Trockenmittel; Hilfsmittel; Malmaterialien; Werkzeuge; Gesetzliche Vorschriften; Verzeichnisse.


In the blackening of white-lead house paints by waste gases, spots form especially in moist places. In many cases the blackening disappears after a time, but not evenly. The bleaching takes place through change of PbS into PbSO₄, the oxidation process being accelerated by moisture and accompanying H₂O₂.

2. PIGMENTS


Most of the organic pigments used in the printing-ink industry are reds. These present a problem in identification. Identification may be made by chemical methods or by study of the spectrophotometric curve shape. This latter method is illustrated with the following pigments: Bromo Toner, Rhodamine BX Lake, Naphthosol, Toluidine Red, Lithol Red, Lake Red C, Para Red, Permaton Orange and Lithol Rubine. Media used are pyridine, orthodichlorbenzene, sulfuric acid, and zinc oxide pull down. Four classes of curves are distinguished. Discriminatory tests are employed within the classes. Spectrophotometric curve ordinates are chosen so as to give curve shapes independent of concentration. Pigment mixtures or minor differences do not invalidate identification. The spectrophotometric method is rapid and requires only very small samples.

797. AREND, A. G. Cadmium yellow. Paint Tech., 8 (1943), pp. 91–100; Review, 17 (1944), 1.

The manufacture of CdS and CdSe pigments, and the effect of variation of techniques on their color, are briefly described.


Altération des pigments minéraux observée à des peintures murales anciennes (Simone Martini, Zingaro, Paolo Uccello, Signorelli, Cimabue, Giotto). Cause et allure du phénomène d’altération: transforma-
tion de l’azurite en malachite, du noircissement de l’azurite et du blanc de plomb, du jaunissement de la terre verte et de plusieurs pigments à base de fer.


Couleurs d’origine végétale et animale, laques, couleurs provenant de la carbonisation de substances végétales et animales, couleurs minérales: obtention ou fabrication, emploi en peinture.


Description, identification et différenciation microchimique des principaux pigments minéraux utilisés en peinture.


Dans l’antiquité le commerce imitait (falsifiait) déjà des couleurs plus chères. Références à Plin, Vitruve et Dioscoride. Liste de ces couleurs et de leurs imitations.


Identification microchimique des anions caractéristiques des pigments minéraux utilisés en peinture.


Identification microchimique, des cations caractéristiques des pigments minéraux utilisés en peinture.


Identification des pigments de fresques de Cimabue, Giotto et Torriti.


A brownish-yellow, amorphous, brittle color found in a Pompei paint store (bright yellow with orange cast when powdered) gave off terpenic camphorlike vapors on ashing, and its ash contained
calcium, carbon dioxide, a little silicon dioxide, aluminum, and magnesium. With soda-lime, it distilled off terpenic (camphor) and balsamic vapors, yielding an orange-red, resinous sublimate. Tests with various acids gave bright yellow solutions while alkali yielded reddish-brown solutions. The organic matter is soluble in alcohol, acetic acid, methyl alcohol, acetone, and aniline, poorly soluble or insoluble in other solvents. It dyes wool from alkaline solution, but not cotton. According to a recipe of Marcus Vitruvius Pollionis (De Architectura, Liber VII, 14) it was shown that a yellow material similar to the Pompei material resulted when dried violets were boiled down in water until the violet color turned first green, then yellow, strained through cloth, the filtrate was mixed with limestone, and taken to dryness.


A long series of tests leads to the conclusion that the end point of the process of complete wetting of the pigment may be determined as the condition in which the paste sticks to the palette knife with very little effort. This point marks the point of saturation, and the indication is sharp within one drop of oil from a buret. This was confirmed by immersing pastes fully or partly saturated with oil according to the above standard in a bath of oil stock used for absorption. Saturated pastes do not absorb any more oil, while unsaturated pastes actually absorb oil almost equal to the calculated deficiency for saturation in 24–48 hours. Results are duplicable with a variation not exceeding 1 percent and oil-absorption values of some pigments have been revised according to this method. The end point should be located at the point of saturation where the whole pigment paste is most easily taken off on the palette knife in course of usual rubbing. Such a paste is coherent, stiff, puttylike and does not “break” or “separate.” Nine references.


The general properties of the different classes of organic pigments are discussed as an aid to their identification and the detection of W and Mo is considered in some detail. Notes are also given on the qualitative analysis of inorganic pigments.


Excellent review of the past 25 years; 121 references. Particle size is not important in pigments until the size approaches the wave length of the incident light. The optimum size for optical efficiency is of great interest but the problem is complicated and practical consequences will not be immediately forthcoming. The distribution of size should
receive greater attention, although effects of particle size do show up in the undertones of blacks, blues and reds. Light absorption and index of refraction are the most important factors in determining optical characteristics. In mixing pigments with vehicles, much evidence has been obtained concerning the importance of surface wetting. Several interesting curves given in the fine discussion of optical properties. Other sections are valuable for references on surface phenomena and developments of inorganic materials.


A thin film of the ink or paint containing the pigment is spread on a microscope slide. In case the pigment is in dry form it is first dispersed in thin-bodied linseed oil. The film on the slide is then ashed in situ in a Bunsen flame. The slide is then examined. In the case of pigments containing no other heat-resistant blue pigments, ultramarine blue can be detected at 200 magnification when the pigment mixture contains as low as 3 percent ultramarine blue. At 1940 magnification 0.25 percent ultramarine blue can be detected. Co blues and violets are also heat-resistant and must be detected to differentiate with ultramarine blue. Co blues and violets can be detected by microscopical examination of an ashed slide before and after treatment with 4 N HCl. HCl decolorizes ultramarine blue but not Co blues or violets. Detection of ultramarine blue in the presence of Co blues is more difficult and requires substantiating tests. In the absence of sulphide a blue ash persisting after treatment with 4 N HCl means absence of ultramarine blue and presence of Co blue. A micromethod for detection of sulphide using a slide coated with acidified gel is described. In the presence of sulphide 2 methods can show ultramarine blue in the presence of Co blues: microscopical examination of the ashed film on a slide before and after treatment with acidified gel to detect destruction of blue pigment, and microscopical examination of an ashed film after treatment with 4 N HCl to detect the presence of cubic NaCl crystals, which are formed by the action of HCl on ultramarine blue.


A historical survey of the contributions made by Dutch scientists (Drebel, Fahrenheit, Boerhaave, etc.) and Dutch industry and commerce over the past three centuries to our knowledge and technology of Hg, Hg oxides and sulphides, cinnabar, and vermilion.


The derivation of the name chrysocolle, the use of that term in ancient literature, and previous occurrence of the natural mineral
hydrous copper silicate as a pigment is reviewed. A new occurrence of chrysocolla is reported by the author. This is on a wall painting dating from about 1300 in the nunnery of St. Trond, which was discovered under a layer of whitewash about 1860. The green is found on the nimbus behind the head of Christ and is painted over a black layer. The green layer crushes easily; the grains show little color by transmitted light and are amorphous in appearance. They seem to be agglomerates of little blisters without distinct contours and without flat faces. In reflected light the color is not so intense as malachite. The green is decomposed by acids, without effervescence; copper goes into solution and silica, which separates, gives characteristic silica skeleton when fused in a sodium phosphate bead. The pigment blackens on heating. It is not attacked by caustic soda in the cold. The author believes the pigment was applied in secco technique. He does not believe chrysocolla was used here for any particular reason but was used unknowingly in place of malachite.


Several facts in the history of the culture of the madder in Zeeland are given, and also notes about the detection of zinc oxide in 1741 and the purification of barytes in 1825.


Many properties of pigments depend on size, distribution of size, and shape of the particles. The limit set on the resolving power of light microscopes is about 0.11μ for an ultraviolet microscope using light of 2500 Å wavelength and 0.16μ for a glass-lens microscope using 3650 Å wavelength. The transmission-type electron microscope has a best resolving power in routine practice of 0.004–0.007μ. The depth of field of a high-power light microscope used photographically is only 0.1μ or less. As a result, particles more than about 0.05μ from the object plane appear out of focus. Because of the low numerical apertures, the depth of field of electron microscopes is of the order of several μ. Comparative photomicrographs of ZnO pigment samples were made and clearly show the superiority of the electron microscope for these studies.


Identifications and analyses were made on pigment specimens scraped from objects and found in bulk during excavations of the Agora in Athens. These were: red ochre, yellow ochre, cinnabar, malachite, blue frit, white lead, and chalk. Quantitative analysis of red ochre scraped from a sherd showed it contains 13 percent Fe₂O₃. The possible origin of these pigments is related to information contained in De Lapidibus by Theophrastus of Eresos (late fourth century B.C.).

Similar to article by same author (see "Ancient Greek pigments," *J. Chem. Educ.*, 23 (1946), pp. 314–316), but not identical with it.

**RJG**


Pictorial art of the past 40,000 years is reviewed. Pictorial art material from the chalk and charcoal used in monochromatic art through crushed brick and colored earths, fig juice, honey, eggs, wax, siccative oil, zinc oxide, Prussian blue, iron cyanide, ultramarine blue, cadmium reds and yellows, cobalt blue, chromium yellows, and up to synthetic resins. Thirty-five references.


Green earths of different geological ages exist, principally in Cretaceous formations, where they are combined with Ca phosphate. It is suggested that in some localities, especially the Rhone Valley, they exist in sufficient quantity for industrial development. Glauconites, when of good quality, could be separated for use in paints; the remainder could be used in fertilizers.


The factors to be considered in selecting coloring materials for vinyl chloride-acetate copolymers are: specific behavior of the color in the presence of the stabilized copolymer vinyl resin, bleeding and blooming tendency, inherent light stability, heat stability, and covering power and dispersibility. The data reported refer to calendered, extruded, and molded compounds, but it is believed that they may be extended to vinyl lacquers. Tests for bleeding, light stability, and heat stability are described. A high bleeding rating is required for most compounds containing 10 percent or more plasticizer. Ratings, based on the above tests, are given for 70 coloring materials, listed by trade names, and 52 chemical types.


A review with fourteen references covering the history and occurrence of Co and the composition, crystal structure, properties, and uses of the Co pigments.

A detailed account of the many factors affecting the color of pigment mixtures, usually oversimplified as "subtractive mixture." Knowledge of coefficients of scatter and absorption makes it possible to predict the color range obtainable with a given set of pigments and to formulate mixtures of alternative pigments which will match in color.


American, English, and French attempts to standardize color terminology are discussed, and the significance of the terms used in all three countries, together with some German terms, is defined. Nineteen references.


Among a lot of pigments recovered from a well in Corinth and identified as originating in the first half of the second century B.C. were identified red and yellow ochres, realgar, dolomite, gypsum, litharge, Egyptian blue, cinnabar, and madder. Most interesting were four small lumps of rose madder. An original color sometimes called Hellenistic pink has frequently been observed on terra-cotta figurines and other painted objects from classical times, but here is presented for the first time spectrophotometric evidence that it is madder.


Microscopic examination of ancient pigment indicated madder. Al was confirmed by the spectroscope and by precipitation as Al(OH)$_3$. The reflectance curve was similar to that of modern rose madder.


The effect of surface-active agents on pigment dispersion was studied to aid in formulating general principles for such products as printing inks and paints. The experiments were limited to major types of pigment-vehicle systems as determined by basic wetting characteristics. The pigments used were: toluidine toner, barium lithol toner, iron blue, ultramarine blue, carbon black, and TiO$_2$; the vehicles: linseed oil varnish, glycerol, mineral oil, and modified phenol resin varnish; the surface-active agents: Aerosol OT, Aresket 300, Benzidine, Cu-oleate, Daxad 33, Dupanol ME, Gilsonite, Ink Lengthener EE, Lecithin, Naccanol NR, Santomerse D, Sapamine KW, Tergitol 7, and Zn naphthenate. The effect of these agents on the pigment dispersion was measured by the change of plastic viscosity.

Lapis lazuli was used in Mesopotamia for lapidary purposes over a long period. In the first millennium A.D. ground lapis mineral came to be employed for pigment purposes, and eventually it was carried all over Europe for painting and illuminating purposes. The evidence from many sources including the writings of early travelers, the history of commerce, and archaeological discoveries indicate that all the blue lapis mineral that was spread across Europe and Asia came from a single mine located in the narrow valley of the Kokcha River, a tributary of the river Oxus in the ancient province of Badakshan, which is in the northeastern part of Afghanistan. Recently (1932) a German geologist re-explored the Kokcha Valley, and he has given account of the geology of the area, a description of the ancient lapis lazuli mine (it now appears to be completely worked out), and a theory in respect to the genesis of the precious blue mineral.


Photomicrographs are used to describe various types of suspensions and to associate their physical properties with their structures.


In making water-color copies it was noted whether the colors were “abundant” in “traces,” “faint traces,” or “very faint traces.” Red, blue, black, and white are reported, but no identifications of material are made.


The identification of organic pigments by chemical means is considered. The four main groups are: azo pigmentary colors, lakes and toners of acid dyestuffs, lakes of basic dyestuffs, vat and other prod-
ucts. Only azo colors lend themselves to chemical analysis. Dry distillation with soda lime and sodium dihydrogen phosphate possess certain advantages. Tables I—VIII cover the general chemical behavior of the color groups.

RJG

829. HILER, HILAIRE. Color harmony and pigments. Chicago, New York, Favor, Ruhl & company, 1942. 61 pp., illus., Hiler color chart.

Contents: Introduction; Systematizing color; Terminology; The Hiler color circle; Shades, tints and tones; Color harmony and the chart; Practice based on theory; Conclusion; Appendix; Bibliography.

BMU


New iron blues have been formulated with increased resistance to alkaline environments, resulting from the addition of nickel salts during manufacture. Since iron blues have been formulated as salts of a polynuclear "berlinic acid," investigations were undertaken into the possibility of forming nickel and other metallic berlinates. No general stoichiometry was found for the latter; in fact, the usual formulas for the iron blues did not apply under the experimental conditions. The literature on the constitution of the iron blues is reviewed. Forty-six references.


An accurate, precise color measuring and comparison instrument is described.

SR


BMU


Contents: Introduction; Color and coloring (Materials and technique); Nature of color; Meaning of color; Development of coloring in German painting, 1500–1800; Approach of Germans to color; Final remarks; Index.

PC

Describes the life cycle of the cochineal insect (*Dactylopis tomentosus*) relative of the historic Mexican variety (*Dactylopis coccus*) from which the dyestuff and pigment carmine was made. Cochineal was one of the principal discoveries of the conquistadores, and by about 1523 the Spaniards in Mexico were shipping to Spain as much cochineal as they could obtain. It was not until about 1630 that tin oxide was found to be the most suitable mordant for dyeing wool. Cochineal raising was transplanted to Europe and to the Canary Islands. The industry declined after 1874 because of competition with less expensive aniline reds. Cochineal bugs are still raised commercially in the state of Oaxaca, Mexico. Carmine is used mostly for making artists’ colors and for coloring foods, drinks, and cosmetics.

RJG


Passages from Cennini’s book are quoted with suggestions regarding their interpretation. Fresco painting and the preparation of linseed oil for paints are described. Castor oil was used in a varnish in the twelfth century. The secret of the durability of old painted work might lie in the avoidance of organic binders. It is suggested durability might be enhanced if pigments were less finely ground than is now customary.

AEW


This pigment, much used by the Masters between the fifteenth and seventeenth centuries, is being used in increasing quantities today. The present-day pigment does not possess all the qualities of the old product. The true pigment is produced by calcining antimony oxide and white lead, and is an impure lead antimonate, but pale ochres and mixtures of cadmium sulphide with zinc oxide are also sold under the name of "Naples Yellow."


Les résultats.

FD


PC

The author discusses the style, iconography, and technique of a Japanese hand-colored print, sixteenth–early seventeenth century. R. J. Gettens identified the pigments and medium (see footnote 19, p. 23). Particularly interesting is the identification of one blue as smalt, since its early use in the Orient appears to be little known. Other pigments are indigo, malachite, orpiment, vermilion, an organic red dyestuff, a yellow dyestuff, iron oxide brown, lime white, carbon black. The medium is animal glue.


Various pigments produced on insects by symbiotic bacteria are listed and special reference is made to the lac insect.


A historical study of the colors used in ancient times. Numerous illustrations and references in the text.


Contents: General introduction; Introduction; Foreword; Translator's note; Carotenoids (Polyene pigments); Diaryl methane compounds; Carbocyclic nitrogen atoms; General bibliography; Author index; Subject index.


Contents: *Physical and chemical aspects*: Some properties of light; The electromagnetic wave theory; Some radiation phenomena; Photochemical effects; The photoelectric effect; The absorption of light; Electronic wave forms; Colour and chemical constitution; *Physiological and psychophysical aspects*: The human visual apparatus; The character of the visual response; Colour matching and measurement; Systems of colour description and specification; Colour discrimination and tolerance; An explanation of the visual processes; Defective colour vision; *Light sources and colorimetry*: Light sources; Spectrophotometry; Visual colorimeters; Standard illuminants and artificial daylight; Physical photometers and colorimeters; *Miscellaneous aspects*: The
selective use of colour; Colour in nature; Appendix: A classification of natural and synthetic colouring matters; Tables; Extracts from the report on color terminology.


Nickel carmine (a Ni derivative of dimethylglyoxime containing 20.31 percent Ni), manufactured by introduction of a dilute NaOH solution of dimethylglyoxime into an ice-cooled, ammoniacal solution of NiSO₄, filtration of the precipitate, washing and drying at 50–60°, is practically insoluble in water, very fast to light, of red-carmine color, produces in white paint a vivid pink color, and is especially suitable as water color because of its glazing effect.


A lecture delivered to the Physical Society Colour Group. Beginning with the use of soot and earth colors the development of stable coloring materials is followed up to modern times. Artificial and derived pigments of the Egyptian and Roman periods are discussed. Other subjects are the classical dyestuffs, materials of miniature painting, buon fresco and easel painting, both tempera and oil. Beginning with the discovery of a method for making Prussian blue in 1704 the impact of the chemical age is traced up to recent times. The author regrets that the artist will continue to use cheap impermanent paints in spite of the availability of permanent materials and notwithstanding the great advances of the past century in our technical knowledge in respect to the properties of materials. Bibliography.


Contents: Introduction; History; Color and chemical structure; Color and physical structure; Raw materials; Intermediates; Pigments from natural organic colors; Synthetic organic pigments; Testing of pigments; Identification of organic pigments; Pigment types and properties; Conclusion; Bibliography; Index.


La pierre uqnu, dont l'utilisation dans le Proche-Orient remonte à la plus haute antiquité, serait le minerai d'arsenic: réalgar. Les textes assyriens ayant trait à son emploi sont commentés.

A general account of the pigments used by the Greeks and Romans, and also in the Middle Ages.


An account is given of the preparation and properties of various cobalt pigments; their use as artists’ colors is emphasized.


A historical account of the ochres found in the Paris area, with special reference to Berry. Berry ochre was known to the Romans and was worked up to 1860.


A review of this question, as it appeared in France in the period, 1850–1920.


Metallic powders of various colors were used by medieval artists on illuminated work. Further development was carried out in Germany and during the 19th century by H. Bessemer. The latter realized the necessity of obtaining flaky particles. A table is included of the constituents of various bronzes, some of which contain (besides Cu and Zn) Fe, Sn, and Al.


A historical account of the production of Naples yellow and comments on present-day practice.


An account is given of the red pigments used by the Greeks and Romans. The most commonly used pigments were iron oxide, cuprous oxide and red lead. Other pigments were cinnabar and realgar.


Contents: Introduction; Basic carbonate white lead; Basic lead sulphate; Zinc oxide; Leadex zinc oxide; Lithopone; Zinc sulphide; Titanium oxide; Antimony oxide; Barytes and blanc-fixe; Whiting;
Gypsum or terra-alba; Ultramarine; Ferrocyanide blue; Lead chromes; Zinc chrome; Lead cyanamid; Cadmium pigments; Brunswick green or chrome green; Zinc chrome green; Guignet’s green; Natural iron-oxide colors; Synthetic oxides and ochres; Raw and burnt umber, sienna, and Vandyke brown; Red lead; Cobalt blue and cobalt violet; Black pigments; Organic coloring matters.


Contents: Introduction; Colour theory; Colour mixing in oils; Mixing, superimposing, and blending water-colours; Colour mixing and planning a picture in oil-colour; Body colour on tinted paper; Colour and the various media.


The physical and chemical states of sulfides prepared from mixtures of cadmium and mercury salts are discussed. New data on the black variety of mercuric sulfides given.


Red pigments painted on Jōmon earthen wares preserved in the Anthropological Institute of Tokyo University were chemically studied and found to be iron oxide red and vermilion.


History of the development of rutile titanium dioxide. The physical properties of anatase and rutile forms and their effect on performance. Comparative exposure tests establish the superiority of the fine particle rutile pigment.


Preliminary experiments. Color changes of pigments mixed with lac, oil, and Japanese lacquer were studied. Vermilion and orpiment alone remained unchanged in Japanese lacquer, while the lac and oil vermilion, red lead, iron oxide red, orpiment, yellow ochre, malachite, azurite, litharge, and white lead preserved their original colors.


Directions are given for the preparation on a laboratory scale of ultramarine blue pigment, which is chemically identical with the
natural semiprecious gem stone, lapis lazuli. The charge composition is kaolin 100 parts (by weight), anhydrous sodium carbonate 100, charcoal 12, sulphur 60. It is important that these be finely ground together.


Pigments used in the wall paintings of temples in Japan were chemically studied. Among the existing wall paintings which amount to 68, that of the Hōryūjī is oldest. Pigments used in it are china clay, red ochre, cinnabar, red lead, yellow ochre, litharge, azurite, malachite and carbon. There are no marked differences between the pigments of Hōryūjī (end of seventh century) and wall paintings of eighteenth century, except white pigment. Before Kamakura period china clay was used, while in and after Momoyama period calcium carbonate was used. The time of change is not yet determined with certainty, but it seems to be Muromachi period (fifteenth–sixteenth century).

KY


Pigments used in the wall paintings of various temples, such as Hōryūjī and Hō-ōdō, were studied chemically. In the wall paintings of Hōryūjī, which is of about the end of the seventh century, use was made of cinnabar, red ochre, red lead, yellow ochre, litharge, malachite, azurite, and carbon applied to mud walls coated with china clay. CaCO₃ does not appear to have come into use as a white pigment until a later date.


Colored ornaments of about 40 ancient tombs distributed in northern Kyushu, mainly in Fukuoka and Kumamoto Prefecture, were chemically studied. The ornaments and figures painted in the inner walls of stone chambers are concentric circles, triangles, magical geometrical figures, bird, ship, swords, bow, arrows, quiver, horse and man. The pigments used are red ochre, yellow ochre, china clay, charcoal, a black mineral containing manganese which is probably pyrolusite, and powders of green rocks containing chlorite. Malachite,
azurite, and cinnabar were not found. The most numerous figures are red concentric circles. The date of these ornamented tombs is supposed to be about 500-700 A.D. KY


The paintings, which represent the Paradise of Buddha and figures of Bodhisattva, were painted more than 1,000 years ago with inorganic pigments on mud walls, prepared with a thin coating of white clay. Pigments identified by spectrographic methods were: cinnabar, iron oxide, yellow ochre, red lead (discolored brown), brown hydrated iron oxide, malachite, azurite, and carbon. The paintings were badly damaged by fire in January 1949.

867. YAMASHITA SHINTARŌ 山下新太郎 Abura e no kagaku 油絵ノ科学. Science of oil painting. Tokyo, Kogakusha Co., 1948, 163 pp., illus.

Contents: . . . Litharge; Pigments and their chemical composition; Oil; Supports; Varnish; . . . KY

3. DYES


A review of ancient textile dyes including indigo, wood, logwood, madder, Tyrian purple, kermes, cochineal, colors used by the American Indians, and the more important classes of modern dyestuffs, pigments, and auxiliary-application compounds. Bibliography with 19 references. RJG


Review of hand methods of dyeing and decorating. Nineteen references. RLF


Brief description of the sources, history, and special uses of the principal ancient textile dyes, namely: weld, brazilwood, logwood,
barwood, camwood, orseille, cudbear, annato, cutch, quercitron, and the fustics.


The origin of the vegetable coloring matter found on the Paracas fabrics is discussed.


Silk fragments found in the coffins with Fujiwara mummies of the twelfth century at Chūson-ji temple were chemically examined. Vegetable dyestuffs identified were *Rubia akane* (red), *Phellodendron amurense* (yellow), *Coptis japonica* (?) (yellow), *Miscanthus tinectorius* (?) (yellow), *Polygonum tinctorium* (blue), and *Lithospermum erythrorhizon* (violet).


Fluorescence of ancient silk cloths colored with vegetable dyestuffs was studied under a mercury lamp. Yellow dyes containing berberin showed intense greenish yellow fluorescence and safflower rouge, weak pinkish fluorescence. Other dyes showed no fluorescence.

874. KIERSTEAD, SALLIE PEASE. *Natural dyes*. Boston, Bruce Humphries, inc. c1950. 104 pp., illus.

Contents: Introduction; Dye plants and how to extract the dye; How to dye wool; How to dye wool, using mordant first, followed by dye; Fancy dyeing of several shades in the same skein; What mordants are and what they do; Mordant formulae; How to mordant wool; How to mordant cotton and dye silk; How to test the fastness of dyes; Natural dyes which were used in ancient times and are still used; Natural dyes from the woods, fields, and roadsides, and garden weeds; The birth of natural dyes; Why use natural dyes; Collecting materials for dyes; How to dry and store petals for future use; A dyer's laboratory; Sources of dyes arranged alphabetically; Partial list of dye plants arranged by colors; Compound colors; Tie-dyeing; Dyeing thoughts; Bibliography; Index.

Contents: Introduction; Materials and methods (handling wool, mordanting, preparing the dye-bath); Dye-plants; List of dye-plants arranged by colours; List of dye-plants arranged alphabetically; Recipes.


Contents: By way of introduction; Materials and methods—Handling wool—Mordanting—Preparing the dye-bath; Sources and qualities; Dye-plant colors; Dye-plants; An alphabetical list; Dye-plants considered individually, with recipes; Index.


Contents: Introduction; The vegetable dyes—madder, indigo, woad saffron, safflower, weld, brazilwood, logwood, barwood, camwood, the fistics, orseille, cudbear, annatto, turmeric, cutch, gambir, quercitrin; The animal dyes—Tyrian purple, kermes, cochineal, lac; The mineral dyes; Bibliography.

878. Mairet, Mrs. Ethel M. *Vegetable dyes; being a book of recipes and other information useful to the dyer*. Brooklyn, N. Y., Chemical publishing co., 1942. 68 pp. First issued 1931.

Contents: Wool, silk, cotton, and linen; Mordants; British dye plants; The lichen dyes; Blue; Red; Yellow; Brown and black; Green; The dyeing of cotton; The dyeing of silk; Glossary; Bibliography; Index.


Historical discussion of the production and use of Tyrian purple. It is shown that the "doubly colored" purple consists of two components, a red dye which is not very fast and a violet dye which is more fast. The violet component corresponds to 6,6-dibromoindigo which Friedländer obtained by synthesis and from *Murex brandaris*. The identification of the red component is not certain. S. believes it is probably a 2,3-bisindolindigo (Indigo Red), which corresponds to the red component in tint and fastness. The so-called "Cardinal's purple" has been produced since 1464. It is pure kermes dyestuff and is unrelated to Tyrian purple.


These are comments on a display which demonstrates the destructive effects of light on dyed materials, particularly textiles. It was arranged in the Nordiska Museet simultaneously with the ICOM Committee on Museums Display that was held in Stockholm, May, 1950.
The main purpose of the display was to present the most impressive specimens available of damage caused by daylight and artificial light. Mostly the exhibits dated before 1850 when modern synthetic dye-stuffs were discovered. In addition to affecting the dyes, sunlight reduces the tear-strength of fabrics. The time necessary to reduce the tear-strength of cotton fibers by 50 percent when exposed to full sunlight without any protection is 940 hours; flax 990; jute 400; wool 1,200; chrome-dyed wool 1,900 and cultivated silk 200 hours. The thickness of the material diminishes the effect to some extent. Most of the old-time "natural colors" showed less than satisfactory light-fastness by modern standards. Dark yellow cellophane, contrary to popular opinion, does not afford protection to fading. Fading does not proceed to a certain point and then stop. It continues until all the color has disappeared. Fading is caused by artificial light as well as by sunlight although it is usually slower because the intensity is less. Diffused daylight will cause fading in poor colors. Unless the dangerous part of the light spectrum can be eliminated by filters the only way to protect light-sensitive dyes is to keep them in absolute darkness as much as possible.

881. Young, Stella, compiler. Navajo native dyes; their preparation and use. Recipes formulated by Nonobah G. Bryan. . . . Illustrated with drawings by Charles Keetsie Shirley. Chilocco, Oklahoma, Chilocco agricultural school, 1940. 75 pp., illus. (U. S. Office of Indian affairs, Education Division. Indian handcrafts, 2.)

Contents: Introduction; Mrs. Bryan dyes the yarn for a rug; Additional observations regarding native dyes; Preparing wool; Selecting and mixing natural colors of wool; Whitening wool; Mordants; The dyeing of yarns—recipes [using native plants]; Red dye for moccasins.

4. INKS


Iron-gall inks were used almost exclusively. As the quill pen was a common writing instrument in America and England a fluid writing ink was necessary. Old recipes and books on ink are discussed. Black iron-gall inks are more acid, hence more destructive to paper than brown inks. The inks which remain black contained sufficient tannic and gallic acids to balance its quantity of iron in the copperas. Results of National Bureau of Standards tests on inks and papers are reviewed. Nearly all the early manuscripts tested were much higher
in acidity, than is now permitted in paper selected for permanent records. Bibliography.


The ink, which has been perfected by the Organic Section of the U. S. National Bureau of Standards, is composed of iron, ammonia and gallic acid (*di-ammonium hydroxyferrigallate*). Because it is non-acid it does not injure paper and it does not clog fountain pens. The characters written with it become insoluble in a few hours.


An address dealing largely with the legal aspect, but listing cases involving evidence on ink and references to scientific methods.


The method of Boldrini (*Arch. antropol. criminale, psichiat. e med. legale*, 59 (1939), p. 156) was found satisfactory for making a comparative analysis of the ink of a manuscript. Many observations are noted on the behavior of the various inks with Boldrini’s reagents.


In Upper Egypt Coptic manuscripts with an antique appearance are still made by a few romantic individuals. The colored inks are simply modern commercial pigments dissolved in water which is thickened with gum. A translation is given for directions dictated by an Arab on how he makes iron-gall ink.

M. Mediums, Drying Oils, Tempera, and Other Film Materials


Alkali-refined linseed oil was heat-bodied at 305° under the following conditions: under vacuum, under an atmosphere of N, and under an atmosphere of N with 1 percent PbO added to the oil. Samples were withdrawn at intervals and the following properties determined: Wijs I value, density, specific refractivity, n, acetone insolubles,
molecular weight, hydrogen absorption and in some cases heat of combustion. Study of the data obtained indicates the formation of an intermediate compound which may be an intrapolymer resulting from formation of a six-membered ring between unsaturated acid chains in the same glyceride molecule. Ester interchange is a logical explanation for the disappearance of the intrapolymer and the appearance of an interpolymer of higher molecular weight as bodying progresses.

888. ANDRÉ, E. *L’altération spontanée des corps gras; moyens de l’éviter et d’y remédier*. Paris, 1942. 15 pp. (Cours-Conférences du Centre de perfectionnement technique, Paris. no. 735.)


The rates of thermal polymerization at 275° of the various conjugated trienoic esters investigated have the same order of magnitude, although methyl pseudo eleostearate polymerizes slightly faster than its positional isomers, methyl α- and methyl β-eleostearate. These rates are much more rapid than those of the two unconjugated trienoic fatty acid esters examined. The fact that the geometrically isomeric forms of the trienoic acid esters have approximately the same rates of thermal polymerization, but at the same time have widely different oxidation rates, may account for the anomalous behavior of certain oils in which no previously predictable correlation has been found between speed of gelation and rate of drying. Additional evidence in conformity with Scheiber’s theory of isomerization (*C.A.*, 24, 978) and the Kappelmeier theory (*C.A.*, 27, 4425) of diene mechanism of polymerization of unsaturated fat acids or their esters has been presented. By a simplified interpretation of 1,4-diene addition of conjugated trienoic acids, structures for a bicyclic trimer and a tricyclic dimer have been suggested to account for the physical properties of the polymerized products.


Contents: Preface; Introduction—Part I. General: Emulsifying agents; Types of emulsions and foams; Methods, formulation and equipment; Stability; General technical emulsions; Dispersing agents; wetting agents; Emulsifying agents list; Demulsifying and defoaming agents list; Part II. Formulas: Agricultural spray emulsions; Cutting oils, soluble oils, miscible oils; Emulsifying agents; Bituminous emulsions; Cleaners and soaps; Cosmetic and drug emulsions; Defoaming
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agent; Food emulsions; Gasoline emulsions; Lacquer emulsions; Leather treatment emulsions; Lubricant emulsions; Medicinal emulsions; Paint emulsions; Paper processing emulsions; Polish emulsions; Textile emulsions; Waterproofing emulsions; Wax emulsions; Miscellaneous; Dispersions; Index.


The physiochemical basis of paint binders in the painting of the Middle Ages.


The effect of aluminum stearate as an ingredient of artists’ oil colors and its bearing on the aging characteristics of the film over periods up to 8 years are reported. Aluminum stearate 2 percent seems to be optimum quantity, and evidence indicates it has very effective plasticizing action. Films reached max. hardness in 6–12 months and returned to original hardness after 8 years. A device for measuring hardness is illustrated.


A linseed oil decolorized with fuller’s earth which yellowed strongly in diffused light, and another bleached with 0.5 percent Bz₂O₂ (C.A., 44, 9695) which yellowed only slightly, were subjected to chromatographic analysis by means of Al₂O₃ from solutions in petroleum ether. The former gave a green band (5 mm.), a colorless zone (100 mm.), and a yellow band (10 mm.) while the latter gave only a yellow band (10 mm.) preceding a colorless zone (105 mm.). The green band of the former oil carried the characteristic linseed oil odor. The extracted colorless materials yellowed much less than the starting oils. Mucilaginous matter, antioxidants (e.g., 2-naphthol), and Co-Pb, Co-Mn, or Co-Pb-Mn driers favored yellowing. Co naphthenate alone, as well as combination driers after settling precipitated Pb soaps, did not favor yellowing.


A survey with 17 references. Evidence is noted that ether-linkages may be subjected to peroxide formation and subsequent decomposition. Aldehyde and ketone groups are suspected to arise on oxidative decomposition. Yellowing increases with unsaturation but opinions
are divided as to the effect of conjugation. The latest approach may

test the suggestion that hydroperoxides form at the methylene group
adjacent to double bonds, leading to the formation of alpha-beta
unsaturated ketones. Compounds related to the phoron structure
might arise; Phoron is yellow. RLF

895. Frilette, Vincent J. Drying oil and oleoresinous varnish films;
496; C.A., 40 (1946), 4230.

Lack of suitable method for determining acid nos. of oil and varnish
films has retarded the investigation of the fundamental chemical
changes that occur during the life of such films. An accurate semi-

micro titration method was developed, and changes in acidity of the
films were studied by this method. Air-dried oil and oleoresinous
films rapidly develop acidity, about half of which can be extd. with
MeOH. Alkali resistance is determined mainly by the acid values of
the films. Resins appear to act as diluents, the acidity arising mainly
from oxidation of the oil. Phenolic resins inhibit acidity formation
more than other resins. Tung oil develops much less acidity than
linseed; this accounts for its use in alkali-resistant formulations.
Wrinkling and disintegration by NaOH solution are both evidences
of swelling and are equivalent in evaluating alkali resistance. Oleoresin-
ous coatings dried by baking do not develop acidity on drying. This
last conclusion substantiates previous statements that chemical re-
actions involved in baking and air-drying differ.


The sulphate or chloride of Nile blue (I) produces a red color
with neutral fats and a blue color with soaps. At pH 12, I turns red,
but in the presence of soaps, such as the oleates, a complex is formed
which raises the point of color change to pH 13. This reaction de-
tects as little as 0.2 mg. Na-oleate in a vol. of 10 cc. It does not take
place in the presence of alcohol or acetone. The color is proportional
to the amount of oleic acid present and can be used for colorimetric
determination. It does not work for free fatty acids having one or
more double bonds.


The effects exerted by differences in reaction temperature on induc-
tion period and on bulk oxypolymerization of raw linseed oil under
otherwise constant conditions of air flow and agitation are discussed.
At 84–200° the initial viscosity increase rate is identical for tempera-
tures. At a definite point in the oxidation a change occurs in the
viscosity increase rate, making it possible to show at least three dis-
tinct temperature regions (about 130°, 84–130°, and below 84°) each
characterized by different types of oxidative changes. In the inter-
mediate temperature range the length of the induction period decreases exponentially with unit increase in temperature; the induction period is of very short duration at 130° and above. During the initial stages of oxypolymerization the peroxide value increase is independent of the temperature in the 84–200° range; the maximum value, however, is a definite function of temperature, higher values corresponding to lower reaction temperatures. Ultraviolet absorption analyses indicate that the formation of diconjugated systems reaches a maximum and that at 84–200° the diene configuration as determined by the characteristic inflection at 232µ is never appreciably greater than 5 percent; higher values are obtained at lower reaction temperatures. The results obtained in this study agree with the free radical propagation theory of oil oxidation and appear to indicate the formation of an intermediate prior to oxidative molecular weight increases may take place partially by association of intermediates to double molecules by H bonding.


Before the period of oil paints and varnishes there were 2 groups: (1) embodied the principle of closing the color substance in an inorganic medium, such as the paint enclosure in glass, the painting of stained glass windows, or the painting of china, (2) embodied the principle of mixing the pigments with media such as glue, gelatin, or egg white. Around 1750 A.D. the basic foundation had been laid from which the industrialized varnish and paint production could get its start as an industry.

III. Ibid., 32, no. 36 (1948), pp. 30, 32, 34, 36.

A review of the beginnings of the oil paints and varnishes.


Articles include “The Solexal process” of oil extraction, “Synthetic drying oils,” “Isomerization of drying oils,” “Mechanism of the oxidation of drying oils,” * “Thermal polymerization of esters of drying oil acids,” “Deterioration of dried oil films.” * Immediately preceding are related articles: “Twenty-five years of paint testing” and “Physics and chemistry of pigments,” * the latter includes 121 references. (Articles with asterisk have been abstracted).


A survey with 41 references. Process of oxidation is envisioned as:
1. Induction period due to inhibition by antioxidants.
2. Peroxide formation of unknown mechanism and structure.
3. Peroxide decomposition through dehydration, rearrangement, rupture, etc.
4. Poly-
merization. 5, Degradation. There is growing evidence that oxygen bridges are not the principal cross-linking components. RLF

901. REMINGTON, JOHN STEWART. Drying oils, thinners and varnishes. London, Leonard Hill, 1946. 144 pp., illus. (incl. plans), diags.

Contents: Preface; Introduction; Drying oils; Thinners; Varnishes; Bibliography; Appendix—Rapid varnish arithmetic. BMU


The various theories which have been advanced to describe the mechanism of polymerization are discussed.


Students have long been interested in a recipe in the late medieval manuscript of Jehan Le Begue in which a paint medium is made from fish glue, white wax, and gum mastic incorporated in a lye solution prepared from wood ashes and lime. Earlier translations had certain bad errors which made the recipe unworkable. Some have had trouble in preparing a painting medium from the recipe because of the curdling of mastic resin—but this can be prevented by reducing the alkalinity with dilute sulphuric acid until it barely turns litmus paper blue. The medium can be prepared to paint thinly or with heavy impasto. It sets quickly. Unlike egg tempera it does not remain tender for some time but in a few hours becomes resistant to scratching and can be burnished. RJG

N. Adhesives

904. Aero research, ltd., Duxford, Eng. Structural adhesives; the theory and practice of gluing with synthetic resins. London, Lange, Maxwell & Springer ltd., 1952. 203 pp., illus., tables, charts.

Lectures given in Cambridge at the summer school "The Technology of synthetic resin adhesives" held by Aero Research limited, Duxford, Cambridge, from September 23 to 29, 1951.


Contents: Theory and application; Tests for adhesives; Raw materials; Flour pastes and starch adhesives; Dextrin adhesives; Casein
adhesives; Vegetable glues; Animal glues; Sodium silicate adhesives; Rubber dispersions and solutions as adhesives; Miscellaneous adhesives; Equipment for the manufacture of adhesives; Water insoluble adhesives; Rubber adhesives; Rosin and its derivatives; Gums and resins (natural and synthetic materials); Wax adhesives; Putties; Index.

BMU


Contents: Preface; Part I. Theoretical aspects, General conditions for wetting and for adhesion, by R. Houwink; Molecular forces, by A. J. Staverman; Rheology of adhesives, by J. Hoekstra and C. P. Fritzius; Static problems, by C. Mylonas and N. A. De Bruyne; Part II. Technological aspects: Organic adhesives (Animal glues . . . by Earl D. Cornwell) (Vegetable adhesives, by William M. Lee) (Synthetic resin adhesives, by F. Chapman) (Asphaltic bitumen, by R. N. J. Saal); Inorganic adhesives and cements, by John H. Wills; Rubbery adhesives, by G. Salomon and W. J. K. Schönlaub; Adhesion in soldered joints, by W. R. Lewis; The physical testing of adhesion and adhesives, by N. A. De Bruyne; References at end of each subdivision; Indexes.


BMU


Superiority of polyvinyl acetate adhesive over casein, rubber, and gum arabic shown. Resorcinol-formaldehyde adhesive better for long-term loading.

RLF


Strength of gels made with cornstarch, wheat starch, wheat flour, arrowroot, rice, and others discussed in detail.

RLF


The humidity or incubative chamber may be a large stone crock or wash boiler with loose-fitting cover. An inch or two of water is placed in the bottom of the container and a platform to hold specimens is built of wood or bricks. To serve as sources of infection, sheets of fresh veneerwood are cut smaller than the container and are dipped in a thin casein or soybean glue solution which has been infected with mold spores from an old molded sheet. The veneers are soaked
in the inoculated glue one hour. The infected sheets are stacked horizontally with spacers within the chamber and left to incubate four days at temperature 72–95°F. Standard plywood shear specimens, glued to manufacturer’s directions (or prepared in any desired way, with or without preservatives) are dipped in water and laid on the molded veneers. Container, loosely covered, is kept at room temperature or slightly above. Joint strength tests are made on the shear specimens weekly or at greater intervals. A table shows the result of mold test on yellow birch shear specimens glued with several commercial casein and soybean glues. Results are shown for these glues with and without addition of preservatives which include ortho-phenylphenol, pentachlorophenol, sodium orthophenylphenate, and sodium pentachlorophenolate. Effect of these preservatives on maintenance of shear strength during continued mold exposure is marked.


The physical and chemical fundamental theory relative to the use of adhesives is reviewed. Stronger bonded assemblies can often be secured by designing bonded joints in accordance with these theories. Sixty-nine references.


Added evidence that all amorphous polymers have equal viscosities at their tack temperature. This gives the tack temperature a characterizing role, just as the brittle point, softening point, etc.


Includes data on glue penetration and relationship between glue thickness and shear strength.


Description of apparatus and sample calculations are given.

Adhesion tested by ultrasonic method described in article on p. 2334. Author suggests that solvent or plasticizer molecules are necessary in a resin film for high adhesion. Thus, after different drying times, a given film gave different values of adhesion. Loss of plasticizing molecules is faster once the film has parted from surface and evaporation can take place from under side of film as well as upper. RLF


Results of a series of tests of 11 glues of this type from eight different manufacturers, and of animal and casein glues. Tests included original strength tests, tests at elevated temperatures, static load tests and studies of the effect of wood moisture content, assembly conditions, and rate of strength development. RLF


Ten years of practical experience show that these adhesives are adequate under a wide variety of conditions and that they are superior to casein in moisture resistance. RLF


Materials and methods are comprehensively covered with data and illustrations. RLF


A review presenting a history of the development and uses of starch adhesives, together with a discussion of adhesion theories, adhesive requirements for specific purposes and methods of determining the comparative properties of different types. One hundred forty-seven references. RLF


Description of an accelerated aging procedure which shows excellent correlation with results of weathering. RLF

In order to obtain a strong adhesive bond, it is suggested that the coefficient of expansion of the component parts be matched, thus reducing stresses. The coefficients of expansion on a number of plywood woods and adhesives are presented. A formula for calculating the coefficient of expansion of mixtures is given.


One hundred fifty-one current synthetic resin glues are classified as to type, form, and general operating characteristics. A list of the names and addresses of the manufacturers of these adhesives is also indicated.


Includes discussion of the classes and characteristics of synthetic resin glues, and the advantages, disadvantages, and limitations of each type. Consideration is given briefly to adhesives for bonding metal to wood.


Lindsay Verrier claims for this recipe that gives a paste of uniform consistency which is not messy to make and is nonpoisonous.

O. Natural Resins, Natural Resin Varnishes, and Oriental Lacquer


Shellac does not form a molecularly dispersed or a colloidal solution, but appears to form loose aggregates of molecules similar to cybotactic groups in liquids.


Examen de textes anciens se rapportant aux vernis et glacis de peintures.


Films were prepared on paper supports and their water permeability measured by a technique involving P₂O₅ and a microbalance. The permeability increased exponentially with temperature.

An outline of the history of lacquer and lac in China, Japan, Siam, and India with brief discussion of the chemistry, steps in the fabrication of wares, and a list of colorants used in lacquer. Bibliography with 22 references.

**RLF**


Chemical natures of the various materials used for repair of antiques, such as Japanese lacquer, and synthetic resin are discussed.

**KY**


The scratch- and rocker-hardness of spirit varnishes was established in the order: mastic, damar, isobutyl polymethacrylate, polyvinyl acetate, normal butyl polymethacrylate. Damar was found to be less brittle than mastic, during the first few months, but in time the two varnishes tend to become almost identical in hardness and tendency to crack. The synthetic resins are considered an entirely different class of materials from damar and mastic and they offer wide possibilities in new picture varnishes.

**RLF**


Difficulties in the preparation of stable, clear solutions of dammar are discussed. An acidic amorphous residue remaining when dammar is dissolved in benzene, chloroform, carbon disulphide, or turpentine is identified as the mucoid material which causes trouble in filtering. The name damatic acid is proposed for the material; its properties and empirical formula C₅H₈O are given.

**AEW**


Crude dammar resin is purified by dissolving it in a mixture of aromatic and chlorinated hydrocarbons, separating the insoluble impurities and then drying the clear solution. In an example 100 g. crude dammar resin is dissolved in 75 g. benzene, while the solution is diluted with 200 g. CHCl₃. After clarifying by settling, the clear solution is concentrated and finally dried by spraying *in vacuo*. A light-colored resin is obtained.


A general discussion of the sources and uses of mastic, sandarac, dragon's blood, frankincense, laudanum, asafoetida, galbanum, ammocum, and liquid and solid storax.

**AEW**

In a room in one of the houses of Iron II level at this site, the excavators found a large quantity of a bitumen in the bottom of a broken pithos. This was identified as glance pitch on the basis of its appearance, solubility in carbon disulfide and in chloroform, moisture content, volatile matter present, fixed carbon content, and the amount of ash. Suggestions are made as to probable source of this material and its possible uses.


The Egyptians produced a black varnish coating which was not a bituminous material. The material is alcohol-soluble, but since the Egyptians did not use alcohol as a solvent, it seems probable that it was applied in a semisolid condition. Some authorities have assumed that it was a black Indian dammar, but these are not now shipped in a semi-solid condition, and are not soluble in alcohol. It is suggested that the resin of the sweetgum (Liguidambar), or an Oriental species of this genus, may have been used. This is a honey-colored liquid, containing a large amount of cinnamic acid and its derivatives, and darkens on exposure to light. Small amounts of styrene may be recovered from it. This may be the earliest use of styrene in surface coatings.


Description of Utah resin found in conjunction with coal mining there. Soluble in low-solvency hydrocarbons.


Meinel (Akust. Z. 1937, 27) has found by oscillographic studies that the varnish does not essentially change the character of sound of violins, except that a pliable varnish can cut down the durations of the oscillations; Cremona violin varnishes (1550–1750) still exhibit thermoplastic properties, but are somewhat brittle towards shock. Their outstanding property is their fiery brown, yellow, or red color which can be brought out by polishing. The varnishes are very sensitive to alcohol, perhaps because of their porosity. Early attempts to match varnishes and the findings and recipes of Michelman (Violin Varnish, 1946 (C.A., 40, 6269 ?)) are discussed. L's tests on varnish samples from a number of old Italian violins gave the following results: (1) A Josef Guarnerius, fil Andreae had a transparent, fiery golden-yellow, fairly brittle, and nonthermoplastic varnish which charred without melting; it was very slightly soluble in EtOH and only little more soluble in C₆H₆, saponified with a waxy
odor, and left an ash containing much Fe. (2) A Ferdinand Gagliano
had a yellowish brown, pliable, nonthermoplastic varnish; it was
soluble in EtOH with a yellow color and a resinous color, and the
solution turned reddish brown with NH₄OH, indicating gum guttis;
itself contained Fe. (3) A Camillo Camilli had a brownish, soft,
nonthermoplastic varnish; it dissolved partially in EtOH to a yellow
solution with a resin odor; Fe was present. C₆H₆ also extracted some
saponifiable oil. (4) A Carlo Antonio Testore had a pale brown,
elastic, nonthermoplastic varnish; it was soluble in EtOH with a resin
odor; Fe was present. (5) A Venetian master (?) had a reddish
brown, fairly hard, nonthermoplastic varnish which was soluble in
EtOH; Fe was present. The woods were brown or brownish. The
varnishes gave a dark-red fluorescence (as that of metal resinates)
under a quartz lamp, but this is also found with dragon's blood or
propolis. The varnishes are thought to contain Fe as a resinate because
of their clearness (cf. Becker, Instrumentebau Z. 1948, 1). The resin-
ous or waxy odors may have come from finishing varnishes. Varnishes
made according to Michelman's recipes have beautiful colors but
show some brittleness after 1–2 years. Additional work led to the
use of polyvinyl acetate (Mowilith N) as a suitable binder the films
of which were thermoplastic, glossy, capable of high reversible swel-
ing in H₂O (Hintz, C.A., 35, 6347 ‡), and imparted good tone quality
to violins even in overheated rooms. To make a varnish, a resinate
was first prepared by saponifying 54 grams pale rosin with 2.7 g.
NaOH and 5.4 g. Na₂CO₃ in 37.9 g. H₂O, diluting to 500 ml., and
precipitating with 300 ml. 5 percent Fe₂(SO₄)₃ solution, the Fe was
collected, washed with H₂O, dried at 80° and powdered. The yield
was 35 grams of a product containing 10.6 Fe₂O₃. Next 7 g. of Fe
resinate, 4 g. turpentine, 4 g. raw linseed oil, and 3 g. EtOC₂H₄OH
were ground up, and the product was mixed with solution of 36 g.
60 percent Mowilith N, and 3 g. Clophen in 9 g. EtOC₂H₄OH, 16 g.
BuOAc, 8 g. toluene, and 10 g. BuOH. The resulting varnish was
somewhat cloudy, settled out a precipitate and was applied in several
coats which each required several days to dry. More BuOH was
added before additional coats. The wood turned yellow, as is de-
sirable, when it was exposed to the sun after a primer coat of
Mowilith.

938. MACLAREN, N., and WERNER, A. E. Some factual observations about

In reply to Brandi (Bur. Mag., 91 (1949), p. 183) a careful analy-
sis is made of his arguments and of additional historical evidence.
Alternative interpretations are given of the observations made on the
three pictures cited by Brandi. The terms varnish, glaze, and patina
are defined.

SRJ

939. MICHELMAN, JOSEPH. Additional confirmatory evidence of the re-
discovery of the old Italian varnish. Science, 112 (1950), pp. 337–
338.
On the basis of previous work by the author (Cf. Science, 107 (1948), p. 679) a varnish was prepared by a method believed to have been used by the old Italian violin makers. Spectrographic analysis of this varnish and of that from a Stradivarius violin showed that the same metals were present in both and that their proportions were very similar.


Microchemical and spectrographic analysis of varnish from a Francesco Ruggieri cello (1691) has shown the presence of madder and resinous or fatty acids together with large amounts of Ca. These results indicate the use of madder and Ca rosinate with pretreated linseed oil. This was confirmed by prep. such a varnish; when applied in thin films and exposed at once to light it gave a red-brown film of the desired depth of color, transparency, and permanency.


Spectrographic and microchemical analyses indicate that metal resinates and linseed oil were used. Si found in the ancient varnishes is probably derived from the alkali prepared from wood ashes used in their preparation and from solutions of the metal salts.

942. Michelman, Joseph. Violin varnish, a plausible re-creation of the varnish used by Italian violin makers between the years 1550 and 1750 A.D. Cincinnati, O., The author, 1946. xi, 185 pp.

Contents: Introduction; Principal previous publications; Miscellaneous previous publications; Publications pertaining to colors; Criteria for the varnish; Materials and methods; Formulation of earliest varnishes; Chemistry of the varnishes; The orange colored varnishes; The yellow varnishes; The red varnishes; Preliminary treatment of the wood; Varnishing, drying and polishing; Other resins and soaps; The old coloring agents; Alizarine as a coloring agent; Previous work from past to present.


A few grams of material found in one of the Albenga amphorae had the following properties: softening point 60°C.; M.P. 68°C.; acid no. 92; saponification value 124; soluble in benzene and EtOH, largely soluble in white spirit; positive Morawski test. The material is almost certainly rosin, which appears unchanged and in excellent condition after 2,000 years.

The composition of violin varnishes, particularly of the Cremona school, is discussed. There is considerable evidence to show that a fairly wide range of compositions give superb results.


A method of preparing strain-free detached varnish films together with an improvised tensiometer of simple design for determining the modulus of elasticity of a film and measuring its change during water immersion is described. The method is applied particularly to insulation varnish. Data are included to show the reproducibility of the method.


Varnish on a wooden coffin dated 1160–1210 A.D. excavated at Shaowu, Fukien, was made of tung oil and pigment. The brownish-yellow pigment used in the thick under layer was natural ochre. The bright red pigment of the thin outer layer was ferric oxide from heating ochre. Analytical data on the vehicle and pigment are given. RJG

**P. Polymers, Plastics, and Synthetic Coatings**


Mechanism postulated for the degradation of this widely used plastic. Styrene is also an integral part in GRS type synthetic rubber. RLF


Mechanism of degradation given. Development of color and loss in weight followed. RLF

Various acrylate and methacrylate lacquers and emulsions are proposed and sources of supply given. A method of electrolytic plating of Ag with an invisible thin film of Be oxide to prevent tarnish is mentioned.


Review of methods dealing with scratch hardness, pendulum hardness, indentation resistance, impact resistance, tensile strength (detached films), other distensibility tests, and resistance to abrasion.


Theory developed to explain yellow color in terms of conjugated double-bonds.


Silicon monoxide replicas of the surfaces of air-dried films are shown which were cast from a Saran latex containing various amounts of plasticizer. It can be observed that the poor films are composed of discrete individual particles while in a continuous transparent film the particles have coalesced into a polymeric mass. Replicas of surfaces of films are shown which were produced from different types of synthetic latices before and after they had been plasticized.

Author's abstract


Aside from the slight susceptibility of cellulose nitrate, polyvinyl acetate, and melamine formaldehyde polymers, synthetic resins are very resistant to fungal growth. Fatty acid derivatives, natural oils and cottonseed-containing glyceryl esters of fat acids are susceptible. Fungal resistance is developed by the incorporation of fungicides. Salicylanilide gave the best protected plastics. Vinyl copolymers are rendered fungistatic with less than 1 percent of phenol mercuric salicylate. Phenolic resins are difficult to protect. No treatment is known that will inhibit fungal growth on all plastics.


This paper deals mainly with a comparison of commercial accelerated aging units of the carbon arc-light type with natural sunlight.
In the brief [p. 2506] it says: "A study of 25 films under 12 outdoor conditions and in two accelerated machines, Fade-Ometer and X1A Weather-Ometer, was made. In New Jersey it required 2.8 winter sun hours and in Florida 1.6 winter sun hours to equal 1.0 sun hour in summer, which showed Florida to be more consistent the year round. With window glass covering, 40% longer time than with direct exposures was required to reach the same degree of degradation. A temperature rise increased rate of decomposition by 40% but the rate of fading of colors by only 10% on the outdoor test. On the average 1.5 hours in the Fade-Ometer were required to equal 1.0 hour in the X1A unit for fading of colors, but there were marked deviations. The X1A Weather-Ometer decomposed compounds at the same rate as it faded colors, while the Fade-Ometer decomposed compounds 1.9 times as fast as it faded. Hence, the X1A unit was concluded to be the more reliable."


Results of physical tests on 29 clear plastic materials available for coatings on glass are listed. The lacquers were applied to the lenses by the spinning method. Physical properties of the many plastics are so different that no one test procedure can be considered satisfactory. The information should be of interest to those concerned with the preparation of clear coatings for paintings.


Electron-diffraction experiments are made with a series of synthetic polymers in which the length of the side chain in the repeating unit is progressively increased. The polymers studied are vinyl acetate, methyl acrylate, ethyl acrylate, methyl methacrylate, ethyl methacrylate, butyl methacrylate, cyclohexyl methacrylate, β-ethoxyethyl methacrylate. Dilute solutions of the polymers in acetone, toluene or benzene are placed on water and evaporated, the resulting thin lens being then examined with electron diffraction. Structure is derived from the haloes. The configurations of the polyvinyl acetate, the acrylate and the methacrylate polymers suggest a zig-zag C atom chain for the long main chain. No crystalline features can be detected in the amorphous structure. It is concluded that the polymers are in a liquid state. Relationships between the elastic properties and the proposed structures are discussed. Relationships between chain flexibility and structure are reviewed. Because of the stiffness of the main chain the Kuhn theory of elasticity cannot be applied. It is pointed out that the main chain of methacrylate can coil, and the extension is due chiefly to the rotation of the side chains and is approximately proportional to their length. This does not hold for
very long side chains like octadecyl methacrylate because crystallization takes place at the end of the side chains. A smaller proportion of the extension may be due to the spiral of the main chain. The more flexible acrylate will have a smaller diameter, the main chain contributing more to the elasticity.


Alkoxy acetones, such as ethoxy acetones, are excellent solvents for vinyl resins, and have an evaporation rate about that of butyl acetate. They have excellent tolerance for lacquer diluents.


An apparatus for the determination of water-vapor permeability is described. It is also possible to measure the value of two constants, solubility coefficient, and diffusion velocity, which together determine the vapor permeability of a film. The dependence of permeability on film thickness, vapor pressure and temperature is discussed. The permeability constant is affected by hydrophilic material or polar groups that sorb water. Permeability is an exponential function of temperature. The mechanism of permeation is discussed. Permeability measurements were made on films of koroseal, polythene, saran, pliofilm, vinylite, and cellulose (uncoated cellophane).


A method is described which involves filling a cell with an absorbent for the gas or vapour, applying a film of the material under study over the mouth of the cell and sealing it in position with wax, weighing, placing the covered cell in an atmosphere of the gas or vapour for the desired period of time, and reweighing. Some permeabilities are given, including those for cellophane, polyvinylidene chloride, rubber hydrochloride, polyvinyl chloride, and Et cellulose.


At a conference held by the British Rheologists' Club, Mr. Hall described investigations on methyl methacrylate at the Royal Aircraft Establishment which had confirmed that tensile stress combined with solvent vapor absorption caused crazing. RMO

The swelling of a high polymer can be described in terms of only one diffusion coefficient. The existence of visible boundaries leads to the conclusion that the diffusion coefficient must vary with concentration and exhibit a maximum at intermediate concentrations. Since molecules of different sizes will diffuse at different rates, it is necessary to assume that the diffusion mechanism is supplemented by a movement of the swollen polymer as a whole. This movement of the two components together can be demonstrated by following, under the microscope, the movement of foreign particles inserted in the polymer. To facilitate measurement of this movement the foreign particles can be inserted in the form of a scale. This is conveniently done by engraving a scale on one side of a polymer film, filling the engraved groove with an inert finely divided solid, and placing another unscratched sheet of the polymer on top of the first. Entrapping of air can be prevented by pressing out a drop of a suitable liquid between the sheets. Experiments with commercial cellulose acetate as the polymer, TiO$_2$ as the foreign matter, acetone as the solvent, and tritolyl phosphate as the liquid used to displace air, clearly demonstrate the movement of the swollen polymer as a whole, and are in full agreement with the theoretical predictions. The maximum of the diffusion coefficient and the movement of the swollen polymer as a whole represent two factors which make the swelling process clearly distinguishable from a simple solution-by-diffusion process. The reverse process—the shrinking and drying of a swollen polymer—is mathematically much more complicated than the swelling process.


The penetration of oriented cellulose acetate film in the plane of the film by various solvents and swellers is much more rapid normal to the preferred direction of the macro-molecule axes than parallel thereto. Certain "abnormal" solvents which are peculiar also in that they give rise to a sharply serrated front of attack in penetration of isotropic film are excepted. It is doubtful whether there is any penetration at all parallel to the macromolecule axes in highly oriented film securely clamped against lateral expansion. With less oriented film and oblique penetration there is also a quantitative abnormality in that depth of penetration is initially more nearly proportional to time ($t$) than to $\sqrt{t}$.


Comprehensive study of factors affecting permeability of selected thermoplastic films to water vapor. Nylon, polyvinyl butyral, cellulose acetate, polyethylene, polyvinyl alcohol, vinylidene chloride-acrylonitrile copolymer, regenerated cellulose, and rubber hydrochloride investigated.

An apparatus is described for the determination hardness and associated properties of organic films. (See the complete abstract for detailed information.)


A review, with 94 references, of the uses of carboxymethylcellulose in the textile, paper, and food industries, and in drugs and cosmetics, ceramics, leather, paints and lacquers, adhesives, films and filaments, and miscellaneous materials.


The \( H_2O \) permeability of a paint film depends on the structure and chemical composition. The permeability for liquid \( H_2O \) and \( H_2O \) vapor can be directly determined by simple methods. \( H_2O \) permeability is determined by the weight increase of lacquered beech wood cakes by immersion in \( H_2O \); \( H_2O \)-vapor permeability, by the weight loss of tumblers filled with \( H_2O \), sealed airtight with the film to be tested and placed in a desiccator. Both methods give comparable results. With films of nitrocellulose, permeability increases with decreasing N content (12–10.5%); with acetyl cellulose the permeability is greater, especially with lower acetyl content; benzylcellulose is more impermeable than most nitrocellulose; ethyl cellulose is just as permeable as acetyl cellulose with low acetyl content. Rubber chloride has very low permeability.


A description of the preparation of an accurate reproduction of a cuneiform inscription by means of rubber latex molds is given as part of this news section. SR


Because of the difference in molecular structure, organic high polymers do not show the absolute water impermeability of metals. The polymers consist of long, chain-like molecules or loose networks or clews, so that intermolecular cavities can appear easily, thus offering easy passage for water and other small molecules. Mathematical relations are derived for the diffusion of water through an organic
membrane, in which space the water vapor concentration changes in one direction only, diffusion through membranes without retardation at boundary surfaces, influence of boundary surface, diffusion and passage through the boundary surface, and diffusion through a number of layers of equal thickness. Water permeability was measured by Hoekstra's method with some modifications. Thus metal cells were substituted for porcelain crucibles; a circulating system was employed also in some tests. These water-vapor permeabilities (g./cm. hr. mm.) were found at 25° and 50° respectively: vinylidene chloride and vinyl chloride copolymer (Saran) 3–4 x 10⁻¹⁰,—; polyethylene (Alkathene, Imperial Chemical Industries) 3.5 x 10⁻⁰,—; chlorinated polyvinyl chloride (Vinifol, I. G. F.) 6.0 x 10⁻⁹, 6.8 x 10⁻⁹; polystyrene (Styroflex A, D. Seekabelwerke) 3.7 x 10⁻⁸,—; (Styroflex B) 2.8 x 10⁻⁸, 3.1 x 10⁻⁸; a plasticized polyvinyl chloride (Welvic, Imperial Chemical Industries) 5.8 x 10⁻⁸, 1.1 x 10⁻⁷; cellulose acetate (Triacetat, Schering) 3.7 x 10⁻⁷, 4.0 x 10⁻⁷; and cellulose acetate (Triafol, I. G. F.) 4.4 x 10⁻⁷,—. According to the results Saran and Alkathene are high in water-vapor impermeability. Doty's data for the permeation constants of Saran and Alkathene determined at 25° by McLeod-gage measurements of the permeated water vapor are somewhat lower and were 0.3 x 10⁻¹⁰ and 0.6 x 10⁻⁹, respectively.


A review with recommendations for further work.


Cellulose-nitrate shown to be the least durable of the two. RLF


Polyvinyl chloride plasticized with tritolyl phosphate, dibutyl phthalate or dibenzyl sebacate and molded was heated at 110–55° in vacuum and the volatile material was condensed in liquid N. The sample was suspended by a quartz spiral and the change in weight was estimated by readings with a cathetometer, which also determined the changes in dimensions. A trial determination of the rate of evaporation of the plasticizer from a container suspended like the sample showed the liquid to be at the same temperature as the surrounding bath and to evaporate irreversibly. The loss of plasticizer from the sample followed a relation derived from Fourier's equation until about 30 percent had evaporated, after which the concentration became increasingly less than required by the relation. This
deviation was partly due to decrease of the diffusion with plasticizer concentration. The change in volume of the sample corresponded to the liquid volume of the plasticizer lost. The contraction was isotropic. The fact that all three plasticizers behaved alike indicates that the forces holding them are physical (van der Waals), not chemical (valence).


Coatings are classified as follows: (1) Insoluble pigments are directly applied to a surface by friction (crayons, red pencil, pastel), by projection at elevated temperature (metal spraying), or over fresh plaster (fresco). (2) Insoluble pigments are applied incorporated into liquid binders, such as melted wax (encaustic), drying oil, and thinners (oil paints, enamels, printing inks), emulsified oil (tempera), solns. of cellulose derivs. (lacquers), or of rubber or synthetic resins (Alloprene, Duroprene, Pergut, Tegofan paints), aq. solns. of gums (aquarelle, gouache), caseinate (casein paint), gelatine (whitewash, water color, carbon paper), silicates (stereochromy), as well as in org. silicates, the sap of the lac tree (Japan lac), pitch or asphalt (bituminous paint). (3) Insoluble pigments are formed during or after application, as by FeSO₄ or K₂Cr₂O₇ on plaster or portland cement, by sulphides or chlorides on etched metal (patina), by plating with Ag, Au, Cu, Ni, Cr salts, or by decomposition of salts in light (photography). (4) Soluble pigments (dyes) are applied in a binder, such as resin solns. in alc. (spirit varnish, India ink), in turpentine, in drying oil (oleo-resinous varnish), nitrocellulose solutions (Zapon, lacquers), wax solns. (encaustic solns.), aqueous stains, or in complex still residues ("carbonyl"). (5) Soluble pigments in (wax) emulsions. (6) Soluble pigments in a melted binder, such as wax, or in metals (Sn, Zn).


A critical review and discussion of present knowledge. The highest average degrees of polymerization, i.e., of cellulose, rubber, gutta, and starch to be found in nature, are probably around 3000. Synthetic linear high polymers of degrees of polymerization of the same order of magnitude can be prepared without difficulty; in fact, degrees of polymerization up to 10,000 have been measured. To facilitate processing, these products must be degraded to lower degrees of polymerization and, in the form in which they are used in manufacturing, rubbers, plastics, and fibers have approximately the same degrees of polymerization. Furthermore, the distribution curves of these three materials are similar; the main differences are the forces between the chainlike molecules and the tendency to crystallize under the influence
of these forces. Whether a particular substance seems to behave at room temperature as a rubber, a plastic or a fiber depends chiefly on its tendency to crystallize and to remain crystalline. If the mutual attraction between chains is small, and if (or) the segments of these chains do not fit easily into a crystal lattice, the substance should be classed as a rubber. On the contrary, if the forces are strong and if (or) the chains crystallize readily, the substance should be classed as a fiber. An intermediate behavior signified a thermoplastic material. Tables show the relation between the properties and structure of high polymers, the effects of intermolecular forces on the mechanical properties of some high polymers, and the structures and mechanical behavior of some polyhydrocarbons. Seventy-three references.


Brief description of method for reproducing metal engravings by cast phenolic resins.


Plasticized panels of cellulose acetate butyrate (14 percent Ac; 37 percent Bu) and cellulose acetate (38.5 percent Ac) were subjected to standard weathering tests in Tennessee, Florida, and Arizona for 2 years. Two types of decomposition occurred, chain-length breakdown proportional to the amount of ultraviolet light and plasticizer leaching and volatilization. Phenyl salicylate (1 percent) inhibited decomposition by ultraviolet light and maintained the panel strength over 2 years, although the cellulose acetate compositions warped and crazed in 6–8 months. Nearly all unstabilized compositions were highly degraded in a few months in all locations. Plasticizers showed a small ultraviolet-inhibiting effect. Extensive graphs of data.


Contents: Ch. I. General introduction; Ch. V. Vinyl resins; Ch. VI. Acrylic resins; Ch. XIV. Shellac; Ch. XVIII. Methods of identification and testing of synthetic resins and other raw materials of plastics; Author index; Subject index.


Polyvinyl alcohol and acrylic resin were spread on glass plates and Aspergillus glancus variety tophiilus was inoculated on them. It grew on both resins. Formaldehyde-phenol type resin prevented the growth of the mould on it due to the formaldehyde contained as impurity.

Gelation is basically identical with the formation of two layers in mixtures of partially miscible liquids; no two separate layers are formed only because of the high viscosity of one of the phases. Gelatin gel, e.g., consists of droplets of 0.2–0.5 percent gelatin solution embedded in approx. 50 percent gelatin. Drying of a gelatin gel causes shrinkage of the droplets, but their traces remain, and swelling of dried gelatin consists in expanding the holes left over and in filling them with the dilute gelatin solution. The dependence of swelling on the concentration of gelatin and the magnitude of the swelling pressure are explained from this point of view.


This is an address in which is reviewed the amazing growth in the use of the vinyl coatings during the past 25 years. The vinyl plastics are recognized today as one of the important raw materials of the coatings industry. Technically, any polymeric resin can be classified as a vinyl resin if it is prepared by the polymerization of a vinyl group, CH₂=CHX, where X can be almost anything. Hence, one can classify polystyrene, polyethylene, and the acrylic, methacrylic and allylic resins as “vinyls” but the term is usually limited to vinyl chloride and vinyl acetate-polymers and copolymers. For commercial coatings the copolymer resin of vinyl chloride and vinyl acetate has been most successful, because it does not have the “horniness” and low solubility of the former or the low softening point of the latter. Methyl isobutyl ketone solvent has been especially developed for applying these resins in coatings. The copolymer coating resins can be modified with carboxyl and hydroxyl groups which improve their adhesion to metals and their compatibility with other resins. Vinyl acetate has some unique properties which commend it, especially its clarity, solubility and stability, but it is deficient in water resistance and tends to be soft, so it is used only to a minor extent as a coating material. It is used primarily for adhesives. Its derivative, polyvinyl butyrol, has many uses, especially for “wash primers” for coating ship-bottoms and other water-immersed surfaces and for outdoor structures. Resins with special properties are being developed all the time. Vinyl dispersions or emulsions in water have found many uses, both as coatings and adhesives. There are four types of dispersions: the organosols, the plastisols, the latices and the hydrosols. In organosols the suspending phase consists in part of volatile organic liquids. Plastisols are suspensions of finely divided resin in liquid plasticizers and they contain no volatile materials. Latices are aqueous dispersions of resins made by emulsion polymerization. Hydrosols are prepared by dispersing dry resin powders in water. Vinyl dispersions have the
advantage that the resins can have as high molecular weight as is necessary for desirable film properties, like hardness, toughness, and insolubility, without imposing considerations of solubility and solution viscosity as is often necessary in organic solvent resin solutions. Dispersions tend to give tougher films. They represent a distinct trend away from coating vehicles, which change chemically after application to materials which are manufactured under carefully controlled conditions to the high molecular weights products desired in the final film.

980. PRITCHETT, WILLIAM KENDRICK. Liquid rubber for Greek epigraphy. *Amer. J. Archaeol.*, 56 (1952), pp. 118–120.

Detailed directions are given for making casts of ancient inscriptions on stone with rubber latex. Latex has the following advantages over paper squeezes that were formerly used for this purpose: (1) easier to apply, being nearly foolproof; (2) gives a more accurate copy; (3) requires less equipment; (4) latex squeeze is easier to handle and to carry around; (5) is tougher; (6) impressions may be made of joining fragments in such a way as to illustrate their original positions; (7) when thinly applied is translucent making it easy to read when held to the light. Disadvantages are: drying process is longer so that the paper and the latex cannot be used on a friable surface.


Improved methods are described for making latex impressions (squeezes) of Greek inscriptions on stone. Three thin coats are used instead of a single thick coat; the surface of the finished squeeze is dusted with corn starch before pulling. This reduces the adhesive character of the latex and prolongs the life of the squeeze.


Methyl methacrylate is useful for making transparent plastic mounts. Directions are given for removing the inhibitor from the monomer, for carrying out polymerization, for preliminary treatment of specimens (plant and zoological) and for preparation of moulds. Polymerization with ultraviolet light is preferred because there is less tendency for bubble formation than with heat.


Describes the use of "Marco resins" for embedding and for injecting objects.

984. ROBINSON, COMMAR. Diffusion and swelling of high polymers. II. The orientation of polymer molecules which accompanies unidirec-

If the swelling of a high polymer involves the movement of the swollen system as a whole (cf. *C.A.*, 42 (1948), 8520b) it can be expected that unidirectional swelling will be accompanied by stretching and partial orientation of the polymer. This effect could be demonstrated in experiments in which the swelling of cellulose acetate in either Me Et ketone or acetone was restricted to one direction by glass walls. The stretching was measured by means of inert foreign particles suspended in the polymer in the form of a scale; and the orientation was measured by determining on the stage of a polarizing microscope, the double refraction accompanying the diffusion. Since the observed double refraction was found to be proportional to the thickness of the sheets, it cannot be caused by a shearing effect but must be the direct consequence of the stretching. On account of relaxation of orientation taking place in the more dilute solution, the maximum of double refraction failed to coincide with the maximum of swelling, and the double refraction was found to fall increasingly below the value expected from the degree of swelling. Experiments with mechanical prestretched specimens indicated that the effects of diffusion and initial orientation were not purely additive.


The first two methods described for determining the evaporation rates of solvents employs the "Shell evaporometer" and is suitable for routine evaluation; the second allows full examination of solvent loss from resin films at all stages of the process and can be used to investigate the effect of several variables on the rate of solvent evaporation. Results are presented to show the effects which variations in relative humidity, air flow, sample weight, and characteristics of the surface from which evaporation takes place have on the evaporation rate of some solvents. The evaporation behavior of solvent mixtures is briefly discussed.


Processes of film formation are: A. Varnish: Chemical reaction occurs after application; evaporation of solvent may also be involved. B. Lacquer: Evaporation of solvent only. C. Aqueous dispersions: Evaporation of immiscible phase. D. Fusion processes: scinttering—partial fusion of solid particles; hot spraying of powders—total or partial fusion of particles during spraying; melt coating—medium applied as liquid; solidification occurs on cooling. E. Dispersion coating: particles are dispersed in a liquid which is absorbed at elevated temperatures to form a gel. Discussion of each process. RJJ

Contents: Preface; Styrene polymerization; Styrene copolymerization; Styrene derivative and related polymers; Methacrylic and acrylic ester polymers; Acrylonitrile, Acrylic acid and related polymers; Polymers from vinyl acetate and related monomers; Vinyl chloride polymers; Vinylidene chloride and fluorovinyl polymers; Ethylene high polymers and copolymers; High polymers and copolymers of isobutylene; Vinyl ether polymers; Sulfur-vinyl compounds; Nitrogen-vinyl polymers; Vinyl ketone and miscellaneous polymers; Appendix; Index.


BMU


This circular contains technical information and data furnished by manufacturers on about 1,350 synthetic and modified natural resins used by the paint, varnish and lacquer industries. The resins are classified in groups like alkyd, vinyl, acrylic, etc. For each resin is listed its trade name or designation, its producer and its properties like viscosity, solubility, and acid number.

RJG


Copolymers of methyl methacrylate and methacrylic acid copolymers form harder and more mar-resistant resins than polymethyl methacrylate. Copolymers containing up to 60 percent acrylic and methacrylic acid are insoluble in water. The ester groups in polymethyl methacrylate will react with aqueous potassium hydroxide at room temperature. "Salts" may then be prepared with various metallic ions. Some ions color the resin. Several increase the hardness and otherwise alter the physical properties of the resin.

RLF


The resin is isolated in a pure condition by its separation from solvents, plasticizers, fillers, pigments and dyes, followed by separation of mixtures into individual resins. Identification is done by separation into groups by reaction of halogens, N, S, saponification number, acid number. If halogens are present, consecutive solubilities in ligroin, hot acetone, ethyl acetate and ethylene dichloride are tested; this is followed, if necessary, by consecutive solubilities in
pyridine, tetrachloroethane and morpholine. When N or S is present, consecutive solubilities are tried in ethanol, acetone, ether, ethyl acetate, dioxane, pyridine, acetic acid, CCl₄, CHCl₂CHCl₂, C₆H₆, and hot water. If S and N are both present, 10 percent NaOH is tried before the addition of hot water. All the resins are further separated by odor on ignition, carbonate fusion, reactions of Liebermann-Storch, carboxylic acids, formaldehyde, acetates, acid number, saponification number, n and specific gravity. Shaw also classifies the common resins according to types and general reactions. The scheme will not distinguish between different degrees of polymerization.


The permeabilities of 16 polymeric films to organic vapors are reported in terms of the permeability constant P*. The effects on permeation rates of film and vapor structure and properties are discussed and related to the general theory of permeation advanced previously by other workers. It is shown that the least permeable polymers are those whose molecular structure is such as to permit close packing and strong intermolecular bonding and whose adsorption, or solution, of vapor is low. The presence of bulky side chains and the introduction of plasticizers increase permeability in general. The effects of temperature and film thickness are also discussed in the light of polymer and vapor characteristics. The data presented here strongly suggest the possibility of tailor-making films to yield any degree of permeability to any organic vapor. Author's abstract


The permeabilities of 21 polymeric films to oxygen, hydrogen, carbon dioxide, nitrogen, ammonia, hydrogen sulphide, and sulphur dioxide, both dry and moist, were studied. The data are presented in terms of a permeability constant P* and are interpreted in terms of the structures and physical properties of the films and the gases. In general, it may be said that gas permeation increases with any decrease in the bonding forces between the polymer molecules of the film and with any increase in the attractive forces between film and gas. . . . Author's abstract


Method is proposed using a Model C Mullen Tester. Influence of film thickness, moisture content, hardness and retained solvent on brittleness is discussed. RLF

The preparation, physical properties, and applications of Saran latexes (colloidal dispersions of polyvinylidene chloride polymers in water) are described. They are easily applied as coatings to paper, cloth, leather, plastics, etc., and dry rapidly; the resulting coatings are characterized by high luster, clarity, toughness, unrestricted choice of color, and high resistance to water, oils, acids, alkalies, and organic solvents. As aqueous dispersions, the particle size is uniformly in the range of 0.08–0.15 micron. Uniform size and distribution are still maintained at concentrations as high as 60 percent solids. The sensitivity to various substances, and the additions of various compound ing ingredients are described.

995. Stevens, W. C., and Johnston, D. D. *Tests to investigate the efficacy of various coatings and coverings applied to the backs of painted panels with a view to reducing distortions following changes in atmospheric conditions.* London, 1950. (Gt. Brit. F.P.R.L.)

Typed report. These tests, made at the request of the National Gallery, London, were planned to extend preliminary data from similar investigations in 1951. Though still exploratory in nature the tests confirmed the previous observation that in thin panels, the gesso coating may be a factor inhibiting normal shrinkage. Of the various coatings tested in varying humidities, coatings of hot wax, polyvinylidene chloride, coverings of sheet polyethylene were most efficient in the increasing order given.


An experimental investigation on the moisture permeability and sorption of detached varnish and polystyrene is described. Details for preparation of samples and method of test are given. Results for hydrogen and carbon dioxide permeability are also reported. The experimental results can be interpreted by assuming that the diffusion process is analogous to that of substances in solution. The effect of structure on diffusion and the relationship of the results to electrical insulation problems are considered.


Chief result of irradiation is lowering of molecular weight. Ultraviolet light of shorter wavelengths than 3500 Å necessary for appreciable reaction. (Technical report on durability of modern plastic-sheeting.)


An address.


**Q. Waxes**

1000. **Bennett, Harry.** *Commercial waxes; natural and synthetic, including properties, uses, methods of handling and formulas for making commercial wax compositions—a symposium and compilation.* Brooklyn, N. Y., Chemical publishing co., 1944. 583 pp., illus., tables.

Contents: Preface; Introduction; Abbreviations; Natural waxes; Manufactured and synthetic; Physical properties of waxes and wax compositions; Wax technology; Waxes in industry; Tables and glossary; Wax formulary; Appendix; Index.


Contents: Foreword, by Walter J. Murphy; Introduction; Acknowledgments; Expedition to the Amazon; Wax through the ages; Exploring the Big Bend; On to Mexico; Submarine treasure; The little lady lac bug; *Chin-lu* and the wax caravan; *Ouricuri*, the ant killer tree; The Esparto harvesters of North America; The mysterious bee, famine fighter of mankind; A 60,000,000-year-old plastic; Wax from an ancient forest; White crystals from black gold; Miscellaneous waxes; Technical reference section (properties of waxes—bibliography); Index.


This is a well-illustrated description of the occurrence of the carnauba palm in northwestern Brazil and the harvesting, crude refining, and grading of carnauba wax obtained from it.

The Carbowax compounds (solid polyethylene glycols, mol. wt. 1000-7000) and the liquid polyethylene glycols (mol. wt. 200-1000) fill an industrial need for water-soluble unctuous compounds and are available commercially in various molecular-weight ranges. Melting point, flash point, specific gravity, viscosity and aqueous solubilizing action all increase with increasing molecular weight. Water solubility, vapor pressure, hygroscopicity and solubility in organic solvents generally decrease with increasing molecular weight. Phase diagrams are given for Carbowax compounds and water. Solubilities in various solvents and compatibilities with various organic materials are measured. Some industrial uses are as bases in ointments and cosmetics, as plasticizers, as humectants, as special washable lubricants, as binders for ceramic pigments, as dispersing agents, and as sizing material.


The physical properties that characterize a wax and differentiate it from a fat or a resin are attributed to semicrystalline structure described as a "crystal gel," on the grounds of solubility and compatibility phenomena described.


A discussion of the history, source, processing, and uses of carnauba wax.

AEW

R. Solvents and Detergents


The maximum allowable concentration of toluene (toluol) is 200 parts per 1,000,000 parts of air by volume, corresponding to 0.752 mg. per liter at 25°C. and 760 mm. pressures for exposures not exceeding a total of 8 hours daily. This applies to all places of employment. Sampling procedure and analytical methods are given. RJG

Notes and tables on the toxicity of industrial solvents are given. I covers physiological action, anesthetics and irritants, groups of solvents, alcohols, amides, esters, ethers, and furans. II covers glycols, halogenated compounds, hydrocarbons, ketones, nitriles, nitrohydrocarbons and carbon disulphide.


New equipment has been devised to measure the evaporation rates of thin films from relatively large surface areas. This Shell evaporometer is a modified Jolly balance with quartz-fiber springs and it employs filter paper cones in place of non-porous metal pans. The work shows that at atmospheric humidity, the nature of surfaces from which liquids are permitted to evaporate and the chemical constitution of solvents and solutes are significant factors, which often assume greater importance in thin film evaporation than in the evaporation of bulk liquids. This work (done in the Shell Development & Co., Emeryville, Calif.) aims to standardize evaporation rate measurements and the means of reporting them.


The resistance to shear, as determined by the punch test, was used as a measure of solvent action. Strips of plastics were immersed in various solvents for different lengths of time and the load necessary to produce failure was determined before and after. An equation expresses the solvent power of an organic solvent on a plastic by 

\[ S = (K/R) e^{-t/2R} \]

where \( K \) is a constant for a given solvent on all types of plastics, \( R \) is resistance to penetration, \( t \) is time and \( x \) is thickness. Data are given for 14 solvents on cellulose acetate, cellulose nitrate, cellulose acetate-butylate, polyvinyl chloride acetate, polystyrene, and polymethyl methacrylate.


In solution of resinous substances there are equilibriums of solvation-desolvation and aggregation-disreggregation. Desolvation rate is fixed at constant temperature, whereas rate of solvation is a function of solvent concentration. As a homologous series of solvents is ascended, the threshold concentration necessary to initiate the solution process diminishes to a constant minimum, which is independent of the diluent and can be used as reference standard for a given resin. The second equilibrium depends upon the first. In fluid solutions the
aggregation extent rises linearly with solvent concentration decrease, but at the threshold value, desolvation allows aggregation at multiple points of contact, resulting in gelation or precipitation. In film formation the high viscosity obstructs the tendency of molecules to unite with one another at the maximum number of points of contact; this results in an extended structure. Plasticization prevents complete desolvation of resin with similar effect. Data are given for nitrocellulose and vinylite resins.


The threshold concentration for solvation was measured at different temps. between −10° and 50° for numerous homologous series of solvents. The temperature coefficient of solvent ability is defined as the negative of the mean fractional change in threshold concn. per degree over the range −10° to 50°. Temperature dependence of solvent ability in homologous series of solvents is influenced by the mol. wt. Members of low mol. wt. generally have a positive temperature coefficient of solvent ability, whereas high-mol.-wt. members exhibit a negative temperature coefficient of solvent ability. The temp. dependence of solvent ability is influenced more by the shape of the solvent mol. than by its wt. The most compact shape has a pos. temp. coeff., whereas a more extended structure exhibits a neg. temp. coeff. This inversion is greater with branching and increases with the extension of the branches. In linear mols. contg. multiple solvating groups, the inversion is greater the farther the active groups are from the ends of the mol. With solvents showing a pos. temp. coeff. of solvent ability, gels of macromol. substances that liquefy on heating can be prepd.; whereas with solvents exhibiting a neg. temp. coeff. of solvent ability similar gels that liquefy on cooling can be prepd. To prepd. a gel that liquefies on cooling the solvent must actively solvate the resinous substance in addn. to having a neg. temp. coeff. of solvent ability over the desired temperature range. In general, linear solvent mols. are more effective in promoting an abrupt sol-gel transformation than branched mos., although the latter may often show a greater negative temperature coefficient of solvent ability.


Suggested as practical working limits: Concentration from 500–2500 p.p.m. (examples: acetone, gasoline, ethyl ether, ethyl chloride, ethyl alcohol); 100–500 p.p.m. (methyl alcohol, toluene, methyl ethyl ketone, trichlorethane); 20–100 p.p.m. (benzene, butanol, carbon tetrachloride; carbon monoxide); 2–20 p.p.m. (hydrogen sulphide, carbon
disulphide, tetrachloroethane, hydrochloric acid, hydrocyanic acid); 0.1–2 p.p.m. (chlorine, phosgene, arsenic, dimethyl sulphate); below 0.1 p.p.m. (radioactive gases).


Contents: Introduction; Part I: Solvent action; Solvent power; Plasticising solvents; Solvent balance; Viscosity; Vapor pressure; Inflammability; Toxicity. Part II: Introduction; Hydrocarbons and sundry solvents, nitroparaffins; Alcohols and their ethers; Ketones; Esters; Glycols and their ethers; Cyclohexane derivatives; Chlorocompounds; Furanes; Plasticising solvents; Appendix: Trade names; Solubility tables; Plasticiser proportions; Index.


Bref aperçu historique.

1015. FORBES, ROBERT JAMES. Short history of the art of distillation from the beginnings up to the death of Cellier Blumenthal. Leiden, E. J. Brill, 1948. 405 pp., illus., maps.

Contents: Introduction; The Alexandrian chemists; The Arabs; The Middle Ages; From Brunswykg to Boyle; From Boyle to Lavoisier; The wedding of spirit and science; New vessels for old; The aftermath; Bibliography (673 references); Indexes.


In tables gives maximum allowable concentration of a number of toxic solvent vapors. II. Convectional dispersion. Ibid., 43 (Jan. 1946), pp. 69–73. Considers the removal of toxic vapors from bench tops. Fundamental engineering data for ventilation design. III. Designing local exhaust for solvents. Ibid., 43 (Mar. 1946), pp. 83–86. It is shown how standard dilution rates are employed in the design of hoods and booths. IV. Industrial applications of the dilution principles. Ibid., 43 (Apr. 1946), pp. 79–81. The fundamental principles described in the preceding articles are applied to various kinds of sheet rubber cementing operations and similar processes where a solvent may evaporate into the working atmosphere.


Six cases of CCl₄ poisoning which occurred from using this substance without adequate safety precautions are described. With the
possible exception of benzene, CCl₄ is the most toxic solvent used in industry and produces acute hemorrhagic nephritis and toxic hepatitis, usually by inhalation. Being an excellent solvent with noninflammatory properties, it tends to be used too often both in industry and in the home without appreciation of its dangers. A reminder is given to physicians assocd. with industries of their responsibility in the education of employers.


Contents: The nature of solution; Solvents, latent solvents, non-solvents; Vapor pressure, evaporation rate, boiling point; Viscosity; The industrial application of solvents; Safe handling of solvents; Hydrocarbon solvents; Halogenated hydrocarbons; Nitroparaffins; Amines; Alcohols; Furfural; Ketones; Acids; Ethers; Esters; Selected bibliography; Indexes.


An oven is described using a stainless-steel, rotating, squirrel cage-type sample holder which always maintains the sampler in a vertical position. A test method consisting of heating for various periods of time is given; this method is capable of distinguishing between various plasticizers on the basis of small differences in volatility.


The nature, composition, potency and other characteristics, as well as methods of analysis, of most commercial detergents are given, and some non-scientific terms, e.g., "active detergent" are discussed. LB

S. Materials and Methods of Early Painting


Reconstitution de la technique picturale pompéienne: composition et structure du "tectorium," de la "préparation" surjacente et de la
couché picturale. Elle peut-être considéré comme une "technique spéciale à la détrêmpe," le liant étant une "chaux saponifiée" (suspension aqueuse de chaux et savon, additionnée de cire).


The optical effects of fixatives in pastel surfaces are explained. Use of fixatives is traced back to the fifteenth century. Up to the middle nineteenth century no resins but only animal glues and vegetable gums were used. Shellac and casein fixatives were introduced in the middle nineteenth century. Now synthetic resins have taken their place. Thirty-one references.


Contents: Foreword, by P. Tudor-Hart; Preface; How to paint in egg tempera; Grounds for egg tempera; The art of gilding; Supplementary workshop notes; Table of reference to Cennini's "Trattato.

1024. BOSCH, LODEWYK. De geheimen van de gebroeders van Eyck. *Phoenix (Amsterdam)*, 1 (1947), pp. 23–26, 6 illus.

Généralités sur le liant des van Eyck. Les travaux de Ziloyt. PC


Renseignements techniques trouvés dans les recettes du moyen-âge (Hermeneia, Théophile, Heraclius, Cennini) sur la préparation (colle et gypse) et le support (bois, toile) des tableaux anciens. PC


Paintings on the roof of a cave in Altamira in North Spain and on the walls of grottoes in the Dordogne in central France are estimated as being 20,000 years old. The materials used in the limestone cave at Altamira include Spanish red oxide, ochers, and charcoal with likely binding media of blood serum, milk, or animal fat. Some of the outlines have a feathered edge. One possible hypothesis is that the dry powder was blown on to the outline by means of tubes, the medium having been previously applied. The use of the paintings in sympathetic magic is discussed.


A brief account is given of the early history of water-color painting in America. A few early colormen are listed, beginning with John
Smibert's advertisement of "all sorts of colours, dry or ground" in 1734. Although imported manuals of water-color painting were advertised as early as 1761, the first American volume appeared in 1815 and was entitled "The Art of Coloring and Painting Landscapes in Water Colours, accompanied with Ten Engravings Selected from the best Masters on these Subjects by an Amateur, Fielding Lewis, Jr." Many of the early painters in oil also used water color.


L'étude des restes d'una peinture à l'encaustique datant du 1er siècle A.C.


Contents: Foreword; Preface; Introduction; Ground and carriers; Pigments and binding media; Crayon and brush; Method of painting; Perspective, shading and landscape; Stances and proportion; Decoration and border; The artist, the pupil, and the workshop; Faked pictures; Historical retrospective; Index.


Détails sur la technique picturale. Trois analyses chimiques de liants et pigments.


This is a report (in French) of the technical examination of Bouts' altarpiece of the Last Supper (St. Peter's Church, Louvain), which is one of a series to be studied for identification of the materials, analysis of stratified structures and determination of the painting technique. The ground is made of chalk and animal glue and is separated from the paint by a thin unpigmented layer which appears to be a drying-oil film. The existence of minute fossil forms of marine algae of the family Coccolithophoridae was observed in the chalk; their presence may be significant in connection with the geographical origin of the chalk. The various paint layers in the design are well defined. Several photomicrographs and diagrams of paint cross sections are shown. The medium in all paint structures appears to be drying oil or at least to have a drying oil base. There is no evidence of tempera even in the under painting. No evidence was found either to support or to disprove the emulsion theory. The materials of the colors are: violet—glaze of madder red over or mixed with azurite and white lead; green—copper resinate and malachite; canary yellow—tin-lead
oxides; red—vermilion (mercuric sulphide), ochre (iron oxide), and madder; brown—mixture of black, red and green pigments; white—white lead; flesh tone—white lead tinted with vermilion; black, probably bone black; gray—white lead mixed with black and other pigments. Microchemical tests used in the identification of pigments and mediums are charted.


A survey of the development of colors, coatings, etc., from ancient times.


A translation is made of Secrets of portrait painting, by Wang I, preserved in T'ao Tsung-i's Cho-kèng lu, which was published in 1566. In the treatise the artist not only gives directions for posing the sitter and executing the portrait but he also tells exactly what colors to use for different parts of the physiognomy and how to mix colors to produce different tones and shades. The list of basic colors at the end of the treatise seems to be arranged in systematic order beginning with the darkest shades. The translator points out the difficulty of giving correct interpretation to the numerous technical terms. Many terms of the Yüan period seem to have become obsolete among later painters.


Contents: History; Construction of octagonal hall; Ornamental paintings. Addenda: Pigments used in the decorations (Kazuo Yamasaki); Reconstruction of the octagonal hall (Kiyoshi Asano); References.


The small religious paintings of New Mexico called "santos" were usually done on wood panels in aqueous medium over gesso grounds. Pigments identified on 13 panels are as follows: Red: vermilion, most common; also red lead, iron oxide, and an organic red probably derived from the cochineal insect. Yellow: a faded organic yellow, not identified, most common, and also ochre. Green: indigo mixed with an apparently faded organic yellow; no copper greens were identified. Blue: indigo most common; also Prussian blue on 2 panels. Brown:
umberlike earth pigment; also carbonaceous brown. Black: carbon, both charcoal and lamp black. White: usually uncovered gesso background; white lead on one panel. It appears that the "santeros" employed chiefly colors imported from Mexico or by way of Mexico.


A quotation from Pliny's *Historia Naturalis* concerning Apelles' painting technique indicates the use of dark varnish "so that its brightness of the colours should not hurt the eyes." Postmedieval artists may have been influenced by this important account.


Reconstitution de la technique picturale ancienne. Exemple choisi: une miniature d'un Évangéliaire de Westphalie, 12e s.


Detailed description of methods of fabrication of wooden caskets which were applied with relief decoration. The *pastiglia* on some caskets is compounded with white lead and an animal binder, which resembles the whole of egg; on others gesso was used. Matrices were made of wood or hardened plastic material and in some instances apparently of metal.


These paintings were executed during 200 B.C.–A.D. 600 on hard impervious rock faced first with a mud plaster prepared from ferruginous clay containing vegetable matter and then with a fine plaster of lime and gypsum. Pigments used included local ochres, siennas, umbers and terre verte, lamp black, and lapis lazuli. It is not clear what medium was used, but no trace of an organic binder could be found.


The author discusses the chronology and subsequent history of Gilbert Stuart's three original portraits of Washington taken from life. The portrait subsequently purchased by the Boston Atheneum in 1831 was the most popular. Stuart himself copied it over 70 times and a large number of forgeries were made even during Stuart's lifetime. X-rays of the Atheneum portrait and of Stuart's last copy, now owned by the Walters Gallery, are compared with that of the "Etting" copy now owned by the Maryland Historical Society. The powerfully constructed form of the first two, strikingly revealed by their shadowgraphs, is not present in the third portrait which is not by Stuart.

The history of painting by the Egyptians, Italians, etc., before the use of drying oils as vehicles is discussed, particularly as concerns tempera painting and wax vehicles.


Contents: Foreword; Painting in Egypt, Greece and Rome; Buon fresco in classical times; Buon fresco; Mediaeval pigments; Pigments described by Cennino Cennini; Painting with yolk of egg; Painting in drying oil; The building-up of a painting in the fourteenth and fifteenth centuries; Light; The Rokeby Venus; Brushwork; Mediaeval varnishes; The Persian illuminated Mss.; Forgeries; Emulsions and the Van Eyck medium; Index.


Historical review with 24 references.


Contents: Section 1: Introduction; On drawing; Encaustic painting; Theophilus, the Monk; The tempera technique; Van Eyck; An incident of the invention of Van Eyck (Printing); The first lead medium (Antonello da Messina); The second lead medium (Leonardo da Vinci); The lead and wax medium of the Venetians (Giorgione, Titian, Tintoretto); The High Renaissance (The results of technical development); Rubens; The Dutch masters (Rembrandt, Hals, and "The Little Masters"); Velasquez; The loss of the medium; Section 2: The formulas and technique of Van Eyck; The formula for the first lead medium (Antonello da Messina); The formula for the lead and wax mediums of the Venetians (Giorgione, Titian, Tintoretto); The lead and wax formula simplified; A summary of the formulas and technique of Rubens; The formulas of the Dutch Masters ("The Little Masters," Rembrandt); The formula of Velasquez; Section 3: The materials; Preparation of grounds; Bibliography; Index of artists quoted.


Contents: Introduction by A. C. Sewter; An inquiry into the nature of the colours used in fresco painting by the Italian and Spanish masters: Preliminary observations—Red colours (Amatto)—Red colours (Sinopia)—Blue colours—Green colours—Black colours—White, yellow, and brown colours; Concluding remarks; The art of fresco painting: Pt. I. Directions and observations from various early writers: I. Vitruvius and Guevara. II. The Monk Theophilus. III. Leon Batista Alberti. IV. Cennino Cennini. V. Giorgio Vasari. VI. Raffaello Borghini. VII. Giovanni Batista Armenino. VIII. Andrea Pozzo. IX. Francisco Pacheco. X. Antonio Palomino. XI. John Martin. Pt. II. Extracts from various authors illustrative of the practice of fresco painting: I. Practice of Early Italian school. II. Of the painting. III. Colouring and colour. IV. Of the use of gold on frescoes. V. Instances of the durability of external frescoes. VI. Causes of the destruction of frescoes. VII. Of retouching, repairing, and cleaning frescoes. VIII. Of the repairs of the Gallery of Carracci in the Palazzo Farnese, and of the Loggia of Raffaello at the Lungara; Index.

BMU


Les différentes techniques de peinture "a fresco" et leur utilisation.

FD


This is the title of a small account book which dates around 1800; it apparently belonged to an apprentice cabinetmaker who recorded information that his master taught him about preparing paints for furniture, especially chairs. These recipes can be useful to modern restorers of old cabinet work and furniture. Although the apprentice’s notes are hardly literate and many of his terms are quaint or obscure in meaning, annotations drawn from various dictionaries make them understandable and usable.

RJG


An analysis of the beginnings of modern painting in the seventeenth century. How the handling of paint changed under the brushes of El Greco and his contemporaries.

RJG

Contents: Differences; Similarities; Borderline cases; Collaborations; Mutual influences.

"Compares and contrasts the great art and the great craftsmanship of the ages. A valuable book ... his illustrations open a rich field of enquiry." — Liverpool Post.


Contents: Introduction; Influences; Personality; The works of art; List of illustrations; Index of artists; Acknowledgements.


A preview of the Artist at Work.

1051. SCHMID, FREDERIC. The practice of painting. London, Faber and Faber Ltd., 1948. 125 pp., illus. of the palettes of many prominent painters.

Contents: The theory and practice of painting; The French academy and its school; The art of Holbein and the tradition in Northern Switzerland; The practice of painting in England; Water-colour books in England from 1750 to 1850; The earliest history of the colour wheel; Bibliography; Index.


An investigation was made of the original interior paint coats; pigments identified were Prussian blue, yellow ochre, Paris green, sienna, and white lead. None of the tints could be reproduced with modern commercial ready-mixed paints. Library research turned up several interesting early works on the decorative painters art. The history of pigments and paints and early practices in varnishing, glazing, and graining are discussed.


This covers materials and structures of masonry and mortar; the analysis and source of constituents of plaster; renewal of plaster coats; identification of paint pigments; and the application of paints.


A few technical data on materials and technique of ancient Egyptian (Thebes) wall paintings.

A historical survey with 19 references.


Contents: Preface; Technical introduction. Part I: The discovery of J. Van Eyck. General: The problems and the mediums; Written records from the XV to XVI cent.; The main hypothesis; The secondary hypothesis based on the use of essential oils. Part II. The evolution of the technique of oil painting since J. Van Eyck. Introduction; The end of the XV and the XVI cent.; The XVII cent.; The XVIII cent.; The XIX and XX cent.; Illustrations; Index. PC

T. ARTISTS' METHODS AND MATERIALS


TiO$_2$ alone is unsuitable for artists' oil color. Poppyseed-oil colors with TiO$_2$-zinc white (1:1) show practically no yellowing in darkness, dry very slowly and have very high covering power with good package stability. Poppy-seed-oil colors with TiO$_2$-Kremnitz white (1:1) yellow little in the dark and dry well.


A review on the production and properties of oil paints, water colors, pastels, and colored chalks.


A discussion of the history of prepared artist colors which began in the early seventeenth century. Traces the development of suitable containers for storing oil paint, starting with animal bladders, proceeding to metal syringes and ending with the collapsible tin tubes of today. Twenty-three references. RJG

The methods and materials for making pastel crayons are traced from their first literary mention in the sixteenth century to the present time. Forty-seven references. RJG


Optical effects depend on the quality of applied binders, the sequence of layers forming the actual picture, and the method of painting. The most durable frescoes are those which contain exclusively inorganic binders (with exception of casein if it is treated abundantly with lime).


Contents: Author's preface; Translator's preface; Preparation of grounds for easel pictures; Pigments; Binding media of oil painting; Painting in oils; Tempera painting; Pastel painting; Painting in water colors; Mural painting; Techniques of the old masters; The restoring of easel pictures; Bibliography; Appendix; Index.


1063. GETTENS, RUTHERFORD JOHN, and STOUT, GEORGE LESLIE. *Painting materials; a short encyclopedia*. New York, D. Van Nostrand company, inc., 1942. 333 pp., illus., diagrs. Published as separate sections in *Technical Studies in the Field of Fine Arts* from 1936 until 1941.—Pref.

Contents: Introduction; Preface; Mediums, adhesives, and film substances; Pigments and inert materials; Solvents, diluents, and detergents; Supports; Tools and equipment; Glossary; Bibliography at end of each chapter. RJG


Contents: Poster paint; Pastel; Charcoal; Oil paint; Finger paint. BMU


Contents: Drawing materials: charcoal, crayons, pencils, paper, etc.; Water colour methods: Distemper, colours, paper, washes,
brushes, gouache, tempera; Oil painting: Colours, the oils, diluents, varnish as a medium, siccatives and driers, glazing, a few rules; Supports; canvas, wood panels, cardboard, metal supports; Grounds: The underpainting, primings, glue grounds, casein grounds, vegetable glues, oil primings; Varnishes: Hard-resin, soft-resin, wax, nitrocellulose, rules for varnishing, preservation of brushes, conclusions on picture varnishing, other varnishes; Wax painting: oil and wax painting, wax-resin vehicles, varnishing wax painting, painting in solid wax; Murals: On canvas, buon fresco, fresco secco, tempera, oil on walls, wax fresco, water-glass fresco; Tools: brushes of the old masters, modern brushes, palette knives; palettes, easels; Pigments: manufacture and properties of pigments, mixing of pigments, grinding, conclusions, pigments at a glance; Conclusions; Appendix: The problem of colour, colour perception, Problems of contrast, colour and 'temperature', concept of colour, summary. Glossary—8 pp. of terms. Index. BMU


Brief descriptions are given of printmaking processes, their history, the traditional techniques and modern experiments. The following subjects are included: relief and intaglio processes, the planographic process, stencil processes, cellocut, allied processes. Photographs of some examples in the exhibition are included. A summary (pp. 16-17) in chart form gives photographic details of subdivisions of these processes with very brief descriptions of their line, surface tone or texture, tools, materials, and variants.


These are a series of brief topics directed to the modern artist. They contain comments on materials and techniques and some practical formulas.


Contents: Introduction; Color; Pigments; Grounds; Oil painting; Tempera painting; Aqueous paints; Pastel; Mural painting; Studio and equipment; Additional reading; Index.


Now that silk-screen painting has become established as an artists' medium of expression, increased attention should be given to development of proper and permanent paints for use in this technique. Printing inks, and commercial paints used in industrial serigraphy are not suitable for artists' purposes. Good grade artists' tube oil colors can be reduced to proper consistency for silk-screen work. The use of pure rag paper is advocated. Simple tests for permanency of materials are outlined. It is expected that special serigraph paints for artists will be developed by colormen.

A water-soluble, pasty paint vehicle for artists' paint contains a soap of triethanolamine and soap-forming fatty acid about 23–52 pounds, soap forming fatty acid 1–11 pounds, starch 20–25 pounds, carbohydrate gum 24–30 pounds, a polyhydric alcohol, such as glycerine and sorbitol, 5–10 pounds, formaldehyde 3–3.5 pounds, and water 100–125 pounds. The paint is especially suited for classrooms, as it dries rapidly, is ready for use, and brushes and palette are easy to clean.


This section begins with the above issue and is at present appearing monthly. Advertising with suppliers' addresses but gives much useful information about modern artists' materials.

RJG


Contents: Walls; Preparation of mortar materials; Mortar mixing; Plastering the fresco ground; Fresco grounds; Intonaco; Preliminary work to painting the fresco; Painting the fresco; Secco painting in limecolor; Modeling of relief in mortar; Retouching; Preliminary work for plastering; The scaffold; Source of supplies; Index.

BMU

1074. Pratt, Frances, and Fizel, Becca. Encaustic materials and methods. New York, Lear, c1949. 64 pp., illus. (part col.).

Contents: Foreword, by Edward W. Forbes; Authors' note; Methods, processes and formulas; Materials and equipment; Sources of supply; Bibliography.

BMU


Description of process and equipment for decorating vinyl film by silk-screen printing.

SR


Contents: Equipment; How to make a serigraph; Development of technique; Approaches and contributions; The film stencil; The photographic stencil; The silk-screen process in schools; Miscellaneous notes; Index.

BMU


An account of a meeting to reactivate the Standing Committee for Commercial Standard CS98–42 on artists oil paints, which was set up under the auspices of the National Bureau of Standards in 1942.

RJG

Contents: Foreword. Part I. Oil-painting materials and practices: 1. Education of the painter; Comparative merits of various techniques; Notes on materials; Painting tools; Preparation of the canvas; Notes on colors; Glossary of colors; Notes on the preservation of paintings; Miscellaneous notes, recipes, etc.; Studio equipment; Part II. Making and finishing picture frames: General observations; Glossary; Index.


Contents: Introduction; Paintings; Scientific photography of oil paintings; Pictures and those who buy them; Imitations; Determination of genuine paintings; Infrared photography; The simple palette; Glazing; Permanent colors; X-ray as applied to paintings; Ultraviolet light; The varnishes; Dammar as a picture varnish; The newer picture varnishes; The synthetic resins; Lacquers; Stand oil; Restoration of paintings—composition of varnishes and their removal; Pigments; Grinding oil colors; Foundations for painting canvas, wood and metal; Bibliography; Index.


Contents: Purpose; Scope; Nomenclature; General requirements; Detail requirements; Methods of test; Labeling; Guarantee; Effective date; Standing committee; History of project; Appendix: Sponsors' notes on the commercial standard for artists' oil paints, by R. J. Gettens and F. W. Sterner; To the acceptor; Acceptors; Amendment (dated Jan. 1, 1952) with table of tinting; Strength of standards.


The physicochemical aspects of oil painting are discussed and many methods of improving the durability of artists' oil paintings, e.g., by careful choice of the correct pigment/oil ratio, by the addition of wetting agents, use of stand oil or alkyd resin media, careful selection of the ground, etc.


The history and the application in modern art of this drawing technique are discussed and experiments with variously prepared papers are described.

This report describes the products of the German artists' color manufacturers such as oil colors, water colors, pastels, mediums, poster colors, crayons, drawing inks, etc. The raw materials, machinery, labor, export, war activities, and war damage sustained, are noted briefly. Appendix A lists the branch factories and the products of the largest manufacturer, Gunther Wagner of Hannover.


A concise summary of composition, available types, and techniques of application of artists’ oil paints is presented.


The technique and materials (substrate, binders, pigments) required for satisfactory results are concisely summarized.


A concise summary of composition, preparation, types, properties, technique of application, effect of varnish top coat, etc., is presented.

U. Paintings (Including Wall Paintings, Drawings, and Prints)

1. General Technical Observations


Black spots of a special type have been observed on oil paintings both in Europe and in Brazil. The cause is a fungus identified as *Cladosporium herbarum* (Pers.) var. *Nigricans* (Roth.). Even during its culture period it forms black deposits. On paintings it is convenient to speak of the phenomenon as "Cladosporium spots" or "blackening fungus." Observations are reported which show the distinctive operation of the fungus and its disfiguring effect. Conditions essential to the growth of the fungus and counter measures are discussed.

RJG

Sei tipi di alterazione; leurs causes: temps, soleil, poussières, gaz, humidité, chaleur, variations de température, vent, salpêtre, micro-organismes et parasites animaux et végétaux, matériaux ou technique défectueux, couleur et liants, homme; leurs effets.

FD


Après une description des altérations, des analyses prouvent que les efflorescences sont constituées de carbonate de calcium et d'un peu de nitrate de calcium et sont dues à l'humidité dont on recherche les causes. Les méfaits des restaurations antérieures sont envisagés et, en conclusion, tout le mécanisme de l'altération est résumé.

FD


Le processus d'altération par les microorganismes, les parasites végétaux et par leur action combinée.

FD

1091. **Augusti, Selim.** *Il contributo della chimica e della fisica all’esame dei dipinti.* Firenze, F. Le Monnier, 1942. 8 pp., 9 illus.

L'examen scientifique des peintures: identification des matériaux, étude de la nature et des causes d'altération, examen de la technique picturale.

JT


Description de l’altération; examen technique des conditions locales de conservation des fresques et prélèvement d’échantillon; examen chimique et microscopique des fragments prélevés; conclusion: action combinée de l’humidité et d’une attaque due à des microorganismes, bactéries et moisissures et à des insectes parasites.

FD


De nombreuses analyses montrent que les sels formant les efflorescences sont de diverses natures. Le mécanisme chimique de leur formation est exposé.

FD


A general discussion covering literary sources, visual methods, experimental methods and scientific methods including X-ray, infrared photographs, and microchemical analyses.

RJG

Introduction; Quelques principes de physique; Applications basées sur l'optique; Peinture opaque et translucide; Couleur d'une peinture sèche; Jaunissement de liants huileux; Maladies du vernis et son traitement; Pigments "migrateurs"; Le tableau et son milieu; Examen physique des tableaux; Craquelures dans les tableaux.


Généralités sur l'examen scientifique des tableaux. Rapprochement avec l'affaire des faux Vermeer.


A portrait, traditionally said to be of Mme. de Bourboulon by Hubert Drouais was given to the Museum. Removal of the discolored varnish revealed repainting far more extensive than had at first appeared. Examination with the aid of X-ray, infrared, and ultraviolet light helped to define the areas of repaint but were not very helpful in revealing the true condition underneath the repaint. Further cleaning revealed that extensive small flakings had been smeared over with lead putty, which covered much original paint. The restorer had then repainted most of the picture. The lead putty had blocked the penetration of the X-rays and limited the effectiveness of the infrared. The author points out that this picture presents a valuable lesson in the limitations of such means of investigation.

1098. **Coremans, Paul B.** *L'Agneau Mystique au laboratoire; examen et traitement.* Anvers, De Sikkel, 1953. 132 pp., 71 pls. (168 photos, some in color). (Les Primitifs flamands, III. Contributions à l'étude des primitifs, pt. 2.)

Contents: Physical history; Original materials and Eyckian painting technique; Examination of the picture before treatment; Physical condition before treatment; Eyckian perception and execution; Special problems; Investigation of the flora; Table of dimensions; Glossary; List of proper names; List of plates.


The abrupt transition between the artistic production of the late fourteenth early fifteenth century and the easel paintings of the Flemish Primitives following van Eyck has been the subject of numerous
studies. Some explain this transition on purely aesthetic grounds, but scientists are inclined to think that the differences are caused by the use of different materials. They think the identification of the paint mediums will unlock the secret. It is well known that drying oils were used long before the time of van Eyck. Moreover, physicochemical and microscopic studies on paint specimens from the paintings of the Flemish Primitives show that the medium is oil, not tempera. In certain documents on the archives at Bruges dating 1345–46 are found such terms as “alambic,” “eau-de-vie” and “tiribinthine” which indicate that distillation and diluents for thinning oil paints were known at least a century before van Eyck.

PC


During the recent cleaning of the Ghent altarpiece several observations were made which bear upon a few of the many questions that art historians have raised about this famous work. Among these are:
(1) The brown letters of the inscription at the feet of the Christ are not original. The same is true of the crown which is rendered on top of an area of silver leaf. (2) The dove in the central panel has been overpainted in a heavy manner; the original left ear of the lamb has been revealed. (3) The so-called Tower of Utrecht appears to be a later addition because beneath it occurs a golden ray which seems to be part of the original work. Some authorities have claimed that the Tower is evidence that the work was begun in Holland but in the light of this new technical evidence this view cannot be substantiated. The tentative opinion is expressed that Jean Van Sorel, Canon of Utrecht, and Lancelot Blondeel, who restored the polyptych in 1550 may have made these additions. The reason for this is not clear, however, because there is no evidence that those areas were in poor condition at that time.

RJG


This is a progress report on the cleaning of the Ghent altarpiece which was begun in October 1950 in the Central Laboratory of Belgian Museums in Brussels. It tells of the International Committee of experts who were invited to review the cleaning problem and to recommend a plan of work. In this plan the panels and their painted surfaces were to be impregnated with a material with a wax base. The thickness of the varnish was to be reduced. Repaint which concealed or might cause deterioration of original work was to be removed. A brief account of the history of the polyptych is given.

RJG

1102. Defenbracher, Daniel S. Fact or fancy; the Walker Art Center calls in the experts. Mag. Art, 38 (1945), pp. 58–61, illus.

Describes the results of technical examination and cleaning of several paintings in the well-known Minneapolis collection.

RJG

L'auteur est partisan de l'originalité de l'épitaphe gravée sur la tombe d'Hubert et du quatrain peint sur quatre cadres de l'Agneau Mystique. Il développe cette thèse, basée surtout sur des arguments historiques et matériels (examen scientifique par E. Bontinck).

PC


A radiograph of Correggio's *Agony in the Garden* taken before the cleaning showed the figures of sleeping apostles which had been painted out owing to damage. The painting was restored to the artist's original intention.

SRJ


Contents: Publisher's statement; List of illustrations; Introduction; Preface; The Rape of LaBelle; An old master business in full bloom; The world's greatest art dealer; History is the authenticator; Technique processes; A master develops a technique; Da Vinci, master of color; The Olympian critic; "Expert" examination; Dating pigments; X-ray analysis; Certificate of "Genuineness"; "Happiness consists in being well deceived"; Appendixes 1–3; Bibliography; Index.

BMU

1106. Horyūji temple. (Special edition devoted to the lost murals.) *Buddhist Art*, 3 (1949), pp. 1–144, pls. (part col.). (In Japanese.)

Articles on the temple with a record of the conference held February 5–6, 1949, to discuss emergency measures for the Golden Hall of Horyūji temple and its murals.

HPS


Contents: Introductory notes; First principles; The planographic or lithographic processes; The relief processes (woodcuts—metal cuts); The intaglio processes; Color in prints; Of copies, facsimiles, and other bothersome matters; Note on a few points of interest (On the social importance of the graphic technique—The influence of the illustration—Of reproductive prints—Of reproductive print makers—On the economics of print publishing—Of the maintenance of standards—Of quality of impression—Of states and watermarks—Of the lighting of prints—Of enlargements—A philosophical note); Table of illustrations.


Technical examination consists of study by physical, optical, and chemical means of the materials, methods of construction, and current condition of a specific painting. In general it cannot alone authenticate and attribute a work, but it can help to do so. Chemical analysis of materials may give conclusive evidence of later copies and frauds by showing that they contain materials not of a period, but it does not identify artist, place of origin, or exact time. X-ray photographs may show technical details and changes in drawing and handling, but they do not usually distinguish layers. Contrast and detail depend on X-ray technique; dense pigment in any layer may obliterate significant details in other layers; it often does not show abrasion. X-ray photographs require skillful interpretation. Ultraviolet-ray examination may indicate repaint and falsifications, false and altered signatures, and painted crackle. It may, however, not show repaint that is covered with heavy varnish. It also requires careful interpretation. Infrared rays may reveal lines or tones covered by thin paint or darkened varnish more clearly than the unaided eye. Microscopic study of cross sections of paint shows the separate layers of paint, but it shows construction only at a given point. Low-power microscope often shows repaint clearly. Macrophotographs may be used to isolate characteristics of style and brush work. They however require careful comparison with a large number of related works photographed, developed and printed under standard conditions.


Altération de peintures murales par efflorescences salines, moisissures et dépôts de nature variable.


Contents: V. I. Il nuovo apparecchio R. M. 3665; Laboratorio per l'esame scientifico delle opere d'arte; Dipinti Antichi—Imitazioni—Restauro; Esame fisico e chimico dei pigmenti coloranti e dei solventi; Studio per il restauro delle navi Romane di Nemi; Appendice—Scuola del restauro. V. II. I raggi ultraviolettici ed il filtro di wood applicati all'esame delle opere d'arte; I raggi infrarossi nell'esame delle opere d'art; Filtre e luci monocromatiche; L'Impiego del raggi X nell'esame dei dipinti; Il restauro scientifico dei metalli; Studio storico artistico e scientifico di varie opere.

Compte rendu de la dépose de peinture murales anciennes à Tournai et Nivelles, Belgique.

PC


The structure of a panel painting *The Flight into Egypt*, formerly thought to be Italian sixteenth century, was compared to four panel paintings by Bernhard Strigel dated about 1495. They are all composed of several knotty-pine boards with traces of coarsely woven fabric between the ground and the support. The Strigel panels had been thinned down and glued to a new pine panel and cradled, and two were dangerously cracked and blistered. The "Flight" bore evidence of two battens on the back. It had not been thinned and although warped and separated into three sections, the treatment of flattening, permeating it with wax-resin and reinforcing with metal strips was much more straight-forward than that of the two Strigel panels. The "Flight" panel has the additional advantage of having retained the valuable evidence of its original physical structure.

EHJ


In the catalogue of Leonardo paintings notes are included on the physical state of many of the works, and the technical findings from laboratory examination. Also a final chapter "Documentation photographique;" by Madeleine Hours, is a catalogue of photographs and radiographs shown with the exhibition.

RJG


The report surveys the methods available for the examination of the four strata of a painting: support, ground, paint film, varnish film. The use of methacrylate and other resins in modern painting technique is noted, with some comments on their merits and defects. The work of a gallery laboratory is described. Some details are given of apparatus and methods of obtaining photographs of macro- and micro-structures of paintings under normal, infrared, and ultraviolet illumination. X-ray examination is described, with numerical working data and illustrations of typical results. Spectrographic analysis is advocated for obtaining chemical information. The report concludes with observations on storage conditions and the air-conditioning of galleries, with figures for optimum humidity and temperature ranges. Fifty-eight references.

Scientific examination reveals how the great masters achieved their results and how scientific principles can be applied in matters of conservation. Factors causing deterioration over centuries are discussed. These are dimensional changes in wood fabrics and adhesives with changing humidity and temperature; shrinkage of vehicles, yellowing, etc. Creation of proper environment, use of synthetic moisture barriers like polyethylene, and removal of deteriorated but nonessential wood support and varnish aid in extending the life of a painting.


A Rembrandt Portrait of Saskia as Bellona painted in 1633 was found on examination to be covered with at least two heavy coats of varnish, one toned. Fortunately the paint was sound and had not been affected physically except for traces of crackle in the thin dark passages. Distinction between the yellow and white metals in the armor was scarcely perceptible. (Shown in a color reproduction of the partially cleaned painting on the cover of the Bulletin.) This was no age-induced modification of the paint but a disfiguring curtain applied by a later hand. In some areas every refinement of tone relation had become invisible. The painting had previously been relined with a glue-type adhesive. Pressure applied at the time of relining had crushed some of the impasto. Removal of the old varnish was not difficult. No tinted varnish glazes were present. The paint layer was well preserved and showed only minor losses. After final cleaning the painting was given a synthetic resin coating which would have many times the life expectancy of a natural resin varnish.


The condition of wall paintings in several Egyptian tombs, including that of Queen Néfertari and those at the necropolis of Tounah el-Guibel are described. During the centuries in which the tombs were closed, a humidity and temperature equilibrium was established which favored the preservation of the wall paintings. Since the tombs were opened several decades ago, deterioration has progressed rapidly because of disturbing the equilibrium and exposure to alternate dry and moist conditions. Humidity and temperature measurements taken (by A. Lucas) within the tombs of Amenhotep II and Seti II show that on winter days variations of 8° in temperature and 14 percent in relative humidity are possible. The main causes of deterioration are (1) degradation of the rock wall support and (2) breaking up of the paint and plaster layers. Proposed methods of treatment are (1) injection of liquid cement, and (2) transfer. For various reasons the latter procedure is favored.

RJG

Abstract of a talk given at the annual meeting of the American Association of Museums in Williamsburg, Va., May 1942. RJG


A summary of several lectures given to various local sections of the institute over the past several years. Discussed is the stratified structure of paintings which comprises mainly the support, ground, paint, and varnish surface coating layers; the effects of stresses and strains on the layered structure caused by dimension changes in the support (usually wood); the desirability of air-conditioning in galleries; the materials of conservation, especially the newer synthetic coatings; the use of X-rays and microchemical techniques to determine the condition of paintings and for the detection of fakes. RJG

2. CARE AND TREATMENT


Le traitement 1950-51 de "l'Agnéau Mystique." Quelques résultats esthétiques, scientifiques et techniques. JT


Techniques opératoires des laboratoires du service des monuments historiques de la R.F. de Macédoine: examen scientifique préalable des œuvres, détermination de l'état d'altération, conservation et restauration proprement dites. PC


The Kuaua ruins now known as the Coronado State Monument are situated on the western side of the Rio Grande near Bernalillo, N. Mex. During excavations of the site in 1953 paintings were found on the subterranean walls of the kiva. Adhering to the adobe wall of the kiva was a laminated layer almost 2 inches thick. The laminations consisted of thin adobe washes which averaged about one-thirtieth of an inch in thickness. In one place 17 out of a total of 85 layers were painted. To save the walls from weathering and destruction it was
decided to remove them *in toto* to the University of New Mexico. The mural walls on the northwest and south were jacketed as a unit and then sawed apart at the corners. The jacketing process is explained in detail with the aid of diagrams. In brief (1) the painted surface was sprayed with a thin solution of celluloid dissolved in acetone. (2) Three layers of tissue paper were tamped on with a wet brush. (3) While the tissue was still wet a thin solution of molding plaster was flipped on it until it was completely covered and immediately strips of burlap soaked in plaster were applied on top of the plaster layer and molded on the wall by hand. Three layers of plaster were applied. (4) Laths were laid against the wall at 6-inch intervals and were bound on with plaster-soaked strips. (5) A wooden framework of 1- and 2-inch timbers was made to fit the face of each wall. Each framework was bound to its respective wall by balls of excelsior and burlap strips soaked in plaster. (6) A trench was dug behind the kiva wall and then the wall was cut down until about a foot of the back side of the mural layers was exposed along the full length of a wall. (7) The exposed section was shellacked and when dry was applied with plaster-soaked burlap as in front. When firm the back of the kiva wall was cut down another foot and the jacketing process repeated until even the base was undercut and jacketed. (8) A framework for the back was applied and the front and back frameworks were bolted together.

The three main walls were 14–18 feet long and about 4 feet high. The average weight of the mural layers in the jackets was nearly 5 tons. Held rigid by the jackets the walls were transported to the University by truck. In the laboratory after removal of the jackets the paintings were stripped and remounted on hard wall board. Stripping was done by brushing the surface with Eastman stripping collodion, then by applying unbleached muslin and more collodion. When dry the muslin with the painting adhering was peeled from the wall. The back of the painting was applied with a solution of adobe mixed with casein; when dry the back was set down on the wall board support with Ambroid adhesive. When the Ambroid had set the muslin facing was removed by rolling it back sharply upon itself to expose the painting mounted solidly on the wallboard. RLG


Contents: Introduction—L'Élaboration matérielle d'une peinture; Quelques notions de physique; Applications basées sur l'optique; Couleurs couvrantes et couleurs transparentes; Couleur de la couche picturale; Jaunissement des agglutinants oléagineux; Maladies du vernis et leur traitement; Pigments migrateurs; Milieu dans lequel vit un tableau achevé—Influence de ce milieu sur le tableau; Méthodes physiques appliquées à l'examen des tableaux; Craquelures, crevasses, fentes, etc.; Bibliographie générale. BMU

Les retards apportés à la bonne conservation des tombes leur furent préjudiciables; une transposition des peintures qui les recouvraient s’avéra nécessaire, en opérant de la même façon que pour la tombe de Tarquin (Bollettino 2 (1950), pp. 11–40, 85–93). Des analyses de l’enduit et des couleurs sont données.

FD


Traitement provisoire des peintures murales fortement endommagées par l’humidité, à l’aide de gomme laque.

FD


Toute la technique du transport avec les précautions employées, depuis le lieu d’extraction jusqu’au Musée des Thermes.

FD


BMU


The existence of colored varnishes was observed in cleaning paintings by Coppo di Marcovaldo (1261), Benozzo Gozzoli (1456), and Giovanni Bellini. Various literary references to glazes are discussed and the concept of patina (with reference to paintings) is introduced, the function of which “is to conceal the materials used in a work of art, to arrest the work of art in the threshold of the image, to prevent it from relying for its appeal on irrelevant qualities.”

SRJ


Considérations théoriques sur la restauration. Importance du point de vue esthétique.

PC

L'état de conservation, les altérations, les remèdes à appliquer sont examinés et le problème de l'enlèvement des surpeints du 19e siècle est mis en relief.


Dangers de la transposition sur toile de peintures sur bois et de peintures murales, à la suite de phénomènes de tension. Technique opératoire améliorée. Condamnation de la transposition de fresques sur ciment.


Une étude sur les propriétés auxquelles doivent satisfaire les supports pour transposition. De neuf types rigides essayés, "l'Éternit" donne les moins bons résultats.


This little booklet was prepared as a visitors’ guide for a special technical exhibition in connection with the recent cleaning, by A. Philippot, of the Van Eyck altarpiece of the Mystic Lamb, under the direction of the staff of the Central Laboratory of the Belgian Museums in Brussels. After a brief review of the technical history of the famous work, the various operations of examination and treatment are outlined. For the purpose of long-range conservation, the wood panels and the paint layers were impregnated with beeswax, and blisters were set down with wax-resin mixture. The old varnish was completely removed in certain areas of paint, in others not, depending upon esthetic considerations and upon the condition of the particular panel. Areas originally painted with copper resinate had turned brownish in tone; the blues had retained their original value. Repaint of earlier restorations, wherever it concealed the original paint, was removed. The cleaned painting will not be revarnished until sometime after it is returned to the cathedral of St. Bavon in Ghent. During the cleaning several areas of repaint applied in previous restorations were located. The mantle of the Virgin had been entirely repainted in 1859 with artificial ultramarine. When this was removed it was found that it concealed much of the original modeling in the lower part of the robe. Likewise, there had been much alteration around the head of the Lamb. Study of the medium draws the conclusion that the principal vehicle of the paint is a drying oil. There is also evidence that tempera was used in certain places.


A "Madonna and Child" in the Fogg collection, which is attributed to Rogier van der Weyden, had been questioned as to authenticity. Previous technical examination had overlooked important details of structure. Closer examination showed that the painting had been transferred from its original oak panel and cemented to fabric with white lead in oil. After transfer the new fabric was mounted on a sixteenth century panel that already carried a painting. The latter was recognized as a Flemish manneristic work of the time of Franz Floris, representing Venus, Cupid, Ceres and Bacchus. This complex of layers explained the confused structures shown in old radiographs. Details are given of the composite panel that was made to support the Madonna and Child after separation. It was made of thin red-wood sticks set in a mortar of wax-resin adhesive mixed with chalk and hard-wood sawdust. The attribution of the painting has not been changed.

RJG


A partial report of experiments on test panels treated variously with wax and with aluminum paint to determine the effectiveness of moisture barriers. Although moisture transfer was markedly reduced in some treated panels, all panels eventually changed in dimensions and in weight equal to the untreated controls. By comparing the behavior of the test panels with weight changes in a few small paintings, it can be estimated that moisture barriers give only partial protection against the long seasonal humidity cycles, but that they are extremely effective in insulating wood from short term fluctuations of humidity. With the help of some winter humidification, moisture barriers may bring the response of many paintings within limits that both wood and paint can tolerate without rupture.

RDB


Introduction et exposé des altérations, l'analyse de la couche picturale, et de l'enduit, la transposition de la peinture; les résultats.

FD


La technique est celle qui fut utilisée pour la tombe de Bighe; on décrit les particularités de la peinture, de la préparation, de l'enduit, ainsi que les altérations dont un type est analysé.

FD

Les dommages causés par l’humidité ainsi que par l’utilisation de la cire sont examinés. La technique de la transposition et du nettoyage est décrite.

FD


A detailed and critical review of the Report of the Committee of Confidential Inquiry (Weaver Committee) appointed by the Trustees of the National Gallery to consider the physical condition of the pictures and how it has been affected by cleaning, both recently and in the past.

RMO


The author outlines what a curator can do in the safeguarding of the collections in his care within the limits of his means and the systems already established. The importance of proper diagnosis of deterioration is stressed. Treatment is divided into “First-Aid,” the treatment of symptoms, and the more elaborate treatment of the causes of deterioration. The value of records is pointed out. The author suggests that for the training of curators in the recognition of deterioration and understanding of treatment and for the adequate care of works of art in the smaller museums a center is needed where several museums could pool their resources to maintain an adequate laboratory, staff, and research center.

EHJ


A method for transfer of wall paintings uncovered from beneath plaster is described. The paintings were originally done in tempera and had been considerably damaged. The method consisted in (1) drying out the wall with artificial heat, (2) spraying the surface with celluloid solution made from celluloid bearing 18 percent tricresyl phosphate. For the first two or three spray coats 1 percent celluloid in equal parts acetone and amyl acetate were used. Last coats, to build up to a shiny surface, employed 10 percent celluloid solutions. (3) With paintings of large dimension it was necessary to break the area up into several fragments; these are delimited with small nails. (4) A layer of kaolin, in suspension in a mixture of equal parts of amyl acetate and alcohol, was applied over the surface to give tooth for the facing layer which followed. (5) After drying, the surface was covered with a thick layer of starch paste prepared from water to which a little alcohol was added. One then affixed two thicknesses of fine tissue paper, then a layer of strong paper, next a layer of closely
woven cloth, and finally a layer of the same strong paper. The various pieces of paper and cloth were attached with starch paste, allowing suitable drying period between layers. The succession of layers was completely dry at the time of transfer. The next operation was to delimit, with a crayon, the areas for separate detachment and to cut them into sections with a thin knife. Lifting the faced fragment away from the wall was done with a thin steel blade. (Transfer to a new support in the Museum Laboratory is to be described later.)

RJG


A process for the removal and remounting of fresco, encaustic, and tempera paintings is described. Bibliography.


After the cleaning of this National Gallery painting in the summer of 1946 several correspondents on The London Times claimed that the painting had been severely overcleaned with consequence that color and tonal relationship were altered. After careful examination the author concludes this was not so. This painting, done on oak panel, was enlarged by Rubens himself during the course of painting by the addition of wood strip on the right and one across the bottom. The more intense luminosity of the chalk-ground on the added strips made it necessary for the artist to raise the luminosity, particularly the blue of the sky, of the original panel on the left. Cleaning away of yellow varnish (added in later restorations) has accentuated contrasts, but has not removed original paint. The blue of the sky, which is of white lead and smalt is hard and tough and resistant to solvents. Black paint used in the delicate terminations of the feathers and laid over the blue is intact. Black oil paint is well-known to be easily affected by strong solvents and abrasive action. The green tone seen at left of the face is not caused by overcleaning but was painted that way by Rubens and can be seen in other paintings by that artist.

RJG


About half of the paintings in the Johnson Collection have been scientifically examined by David Rosen, who is also responsible for their conservation. An example is given of the detection by X-rays of extensive repainting (addition of a hat and a gloved hand) in a portrait by Anthonie Palamedes. The radiograph and the picture before and after cleaning are reproduced. Among other paintings the treatment of the Van der Weyden Crucifixion is noted. The problem of
panel treatment is mentioned: cradling is condemned but reducing the thickness and bedding down on aluminium with wax adhesive is found to be satisfactory.


Facteurs d'altération et leur action sur les diverses couches d'un tableau ancien. Examen scientifique préalable. Quelques principes généraux en matière de restauration. Illustration à l'aide d'exemples choisis à l'atelier de restauration du Musée National d'Art Antique, Lisbonne. Le rôle de l'ICOM (Commission internationale pour la restauration des peintures) et de l'UNESCO (périodique Museum (Paris)).


The Alsop House in Middletown, Conn., begun in 1839, has interior and exterior murals painted in oil or oil varnish. The original paint, which was scaling and cracked, was coated with a wax composition driven in with a hot iron. Reconstructions or copies were prepared by the author. There is a discussion of the sources of the design elements and the possible identity of the artist.


Contient des commentaires sur le traitement des tableaux anciens et notamment sur le "Chanoine van der Paele" (van Eyck, Bruges) au sujet duquel un diagnostic médical est établi.


A woodcut, thought to be Flemish fifteenth century, printed in brown ink on two sheets of paper joined in the middle, had been colored by hand and mounted on a rough pine panel. It was stained and had been attacked by silverfish and woodworms. It was first cleaned with alcohol. Photographs and a scale drawing were made so that the individual pieces could be put back into their proper places. An outline drawing was made on specially made paper of the same weight and texture as the original. The adhesive was softened in warm water and the original pieces removed, individually cleaned, and mounted on the new paper. The print was carefully dried, the losses inpainted and the surface sprayed with poly-vinyl-copolymer. Dirt, atmospheric conditions and sulfate stains had changed some of the colors, but treatment with water was possible since old watercolor becomes fixed to the paper.

In welcoming the postwar opening of the National Gallery the editor comments briefly on the appearance of certain paintings some of which have been satisfactorily 'doctored, nursed, restored to health and groomed afresh'.


A brief note in praise of the newly cleaned painting together with a paragraph on its history.


An editorial on the "Cleaned Pictures" exhibition at the National Gallery giving personal reactions to the paintings in their new state and a reflection of the current criticism. Seven reproductions.


A general discussion of the concept of "conservation" as opposed to that of "restoration."


Nettoyage "scientifique" ou "artistique." Exemples dans diverses galeries.


When Rembrandt's Night Watch was unrolled from the cylinders on which it had been stored during the war, lack of adhesion was found in the relining of 1851. The painting, now relined and cleaned by H. H. Mertens, had suffered through much revarnishing, treatment with copaiva-balsam, and overpainting, no less than 63 repaired spots and tears being found. The reappearance of the true colors has completely transformed the painting.


Prints and drawings which bear no fugitive colors may be effectively cleaned and bleached without danger to the paper by (1) 15 minute immersion in 2 percent solution of NaClO₂ in water followed by washing; (2) by immersion in a half or third saturated solution of ClO₂ gas in water followed by a minimum of washing; (3) by exposure of the dampened print in a ClO₂ gas chamber for 15 minutes or more. Methods 2 and 3 are used when the paper can stand little
or no washing or handling. A simple all-glass apparatus for the
generation of ClO2 gas by adding H2SO4 to 10 percent NaClO2 solu-
tion and a gas bleach chamber are described. Experiments are de-
scribed which demonstrate the superiority of ClO2 over Cl2 in respect
to retaining the strength of paper.

1159. GOODeson, J. W. A cleaned Frans Hals in the Fitzwilliam Museum.

An example of a painting, 'improved' in the nineteenth century,
restored to its former state. The ground is red-brown and the only
pigments used are black, white, yellow ochre, and Venetian red. SRJ

1160. Goulinat, Jean Gabriel, and Aubert, Lucien. Technique de la
peinture; détérioration et restauration. Texte rédigé sous la direc-
tion de Monsieur J. G. Goulinat, Chef de l'Atelier de restauration du
Musée du Louvre et Monsieur Lucien Aubert, Secrétaire de l'Atelier
de restauration. 1950. 13 pp., dactyl.

1161. Hall, Henry C. Restoration of water-colour drawings. Apollo (Lon-
don), 51 (1950), pp. 52–53.

Results are illustrated but no working methods are described. RJG

1162. Han, Verena. The problem of cleaning pictures—Subject of inter-
pp. 51–58.

Généralités centrées sur le rapport Weaver. PC

1163. Hendricks, P. A. Restoration work done at Johannesburg Art Gal-
ley to oil paintings, by Thomas Baines (1822–1875). SAMAB,

Descriptive.

pp. 43–45, illus.

One of a series of articles on the postwar outlook for museums.
Discusses, inter alia, the policy with regard to the technical prob-
lems of conservation. Illustrated with photographs of two National
Gallery paintings: the Piero della Francesca Nativity, and the Giovanni
Bellini Madonna of the Meadow. The former is taken with raking
light and the latter with reflected light. SRJ

1165. Hours, Magdeleine. Le contrôle photographique de la restauration
au laboratoire du Musée du Louvre. Museum (Paris), 3 (1950),
pp. 328–331, illus.

Three illustrations taken during the transfer of Francia's The Crucif-
exion, and two photographs, one of them in the infrared, of Rem-
brandt's The Carpenter's Household. IG

List of delegates, and resolutions passed at the first meeting of the Commission, which was held at the National Gallery in London, December 13–15, 1948.


Resolutions of the fourth meeting of the ICOM Commission for the care of paintings held in Brussels October 27–31, 1951, under the chairmanship of Paul Fierens.


Treatment of the wall paintings of the Golden Hall of Hōryūji after the fire of 1949 are described. Experiments on the heating of pigments and walls in the furnace are reported.


The materials and structures of painting are described. The importance of knowledge of the layered structure or third dimension of paint films in understanding the causes of deterioration is emphasized. Processes involved in treatment of a painting include preservation, revelation and compensation. Advice is given to the curator and private collector concerning cleaning and care.


A portrait, said to represent Lady Georgiana Gordon, by John Hoppner, was extensively repainted in the head and left hand. X-rays showed that the undamaged original painting underneath differed in many details from the surface appearance. The discolored varnish and repaint were removed with a mixture of petroleum benzine 50 percent, acetone 30 percent, diacetone alcohol 15 percent, and methyl alcohol 5 percent. The original head proved to be less "pretty" in feature if more attractive in color. The left hand and arm were less finished than the rest of the painting and had suffered from abrasion, as had other areas. Inpainting was done in tempera paint followed by pigments in a polyvinyl acetate solution. The picture was coated with polyvinyl acetate. The painting still bears no resemblance to other portraits of the supposed sitter.

The materials and structure of early American paintings are discussed briefly. The wide range of condition from excellent to poor is attributed to the difference in their subsequent treatment and not to differences in their construction. Five symptoms for which the conservator looks in analyzing the condition of a painting are listed. A portrait of Deborah Hall by William Williams, dated 1766, is discussed as an example of some of these symptoms and of the measures used to treat them. Advice to owners of such works covers care and treatment, including a list of "Don'ts."


Fresques de Zingaro, cloîtres de Platono, Venise. Enlèvement à chaud de la "crasse" et de la cire par la triéthenolamine et l’émulsion O.


Compte rendu de cette Conférence qui a eu lieu à Lisbonne, en octobre 1952. Contributions intéressantes de João Couto (Aspects actuels du problème de traitement des peintures), A. Alvim de Matos (Etude sur les bois servant de support aux tableaux), J. Pinto Lopes (Altération par les moisissures des œuvres d’art en bois), Maciel Chaves (Quelques insectes qui s’attaquent au bois). Glossaire technique portugais-français-anglais.


Contents: Foreword; Glossary; Catalogue: A. Seven introductory pictures; B. Apparatus; C. The cleaned pictures; D. Photographs and a colour print; Index of paintings in the exhibitions; Bibliography.

Reviewed in: The Times, May 8, 1948, by J. R. H. Weaver. BMU


Histoire de la transposition au 18e s. Rôle de Roxin, Picault, Godefroid, Collins, Hacquin, Riario, Michelini, Simone, Contri, Paccini et autres.


At the end of the war the need for restoration had become urgent for many paintings. Moschini describes work carried out mainly by Manro Pellicioli. Tintoretto’s St. Roch in Glory had previously been attached to a panel; in a subsequent incompetent restoration the crease
which had developed had been treated by slitting and by nailing; the nails had corroded thus rotting the canvas. The canvas was removed from the panel and relined. The treatment of further works, including those of Carpaccio and Tiepolo, is mentioned but no technical details are given beyond the statement that the methods followed a long tradition. Seven reproductions.


Contents: Introduction, by Théodore Rousseau; I. The Weaver report on the cleaning of pictures in the National Gallery; II. The Louvre Museum and the problem of the cleaning of old pictures, by René Huyghe; The restoration of the *Pietà* of Sebastiano del Piombo; by Cesare Brandi; Some comments on the cleaning of *The Night Watch*, by A. van Schendel; Cleaning and restoration of old paintings, by Paul Coremans; The future of museum conservation, by Murray Pease; The cleaning of pictures at the National Gallery, by the National Gallery; III. The ICOM Commission for the care of paintings and the problems of cleaning; Treatment of the Polyptych of the *Adoration of the Lamb*; Index.

The articles listed first appeared in *Museum (Paris)*, 3, nos. 2, 3 (1950); 4, no. 1 (1951).


A note written on the occasion of the London exhibition of art treasures from Vienna.


The extensive practice of applying wood cradles to the back of panel paintings is questioned. Although a cradle may be an attractive piece of the cabinetmaker's craft, it often defeats its own purpose and may, bedded in trenches, supply rigidity in the opposite direction. The cradle opposes, by fixed rigidity, the inherent tendency of the panel to assume a simple all-over warp caused by greater shrinkage on the back than on the front with the result that strains and cleavages are set up in the paint films. An example of another method of treatment is given in which moisture is first applied to the reverse causing the panel temporarily to resume its original flat state. Channels are then cut in the reverse. The reverse surfaces are impregnated under radiant heat with beeswax-dammar resin-gum elemi mixture. The channels are then filled with redwood strips. Hardwood dowels embedded in trenches supply rigidity in the opposite direction. The whole rear surface is covered with Irish linen and sealed with the same thermoplastic adhesive. The panel is kept under light pressure
until the adhesive sets. The basic purpose of the method of treatment is to discourage movement rather than to oppose it by constriction.


A review of the exhibition of cleaned pictures at the National Gallery. Discusses the issues involved and the change in outlook resulting from the application of scientific methods of examining pictures.


Editorial introducing a number largely devoted to restoration on the occasion of the National Gallery Exhibition of Cleaned Pictures. The cleaning of the Baptistry doors, leading to a revised conception of Renaissance sculpture, and of the Night Watch have established that the treatment is justified in certain circumstances, quite apart from the need to preserve. The main objections have been on how certain pictures ought to be treated and not whether they ought to be cleaned. How many critics have watched the cleaning or heard a restorer expound the technical problems? Remarks such as “irretrievably ruined” and “skinned” are hysterical and senseless. The only fruitful argument is: what to clean; how; and how far. “Taste” is ultimately involved. The photographic and other clinical paraphernalia then become useless. Paintings so badly worn and ghost-like as to fall in the category of falsehood should be left alone or half cleaned. The exhibition shows too much store on science, too little on sensibility. Not only scientists but “human beings devoted to the arts” (other than painters) should be consulted when a delicate operation is contemplated.


The author describes restoration work at the Gabinetto dei Restauro of the Uffizi for which he was responsible and which was the subject of a current exhibition. The Masaccio had in the past been drastically cleaned and extensively repainted. Furthermore, a coating of white of egg had been applied, which was by now causing the paint to flake off. The removal of accretions was carried out under the microscope mostly by the dry method. Illustrations show the painting before and during cleaning. The Sassetta and Fra Angelico triptychs were disintegrating as a result of inexpert war time storage. Transfer was indicated for both. The results are illustrated and notes given on the painters technique thus revealed: Angelico’s silverpoint contours, rigidly respected in the painting, and Sassetta’s free brush drawing. In a further example a Madonna and Child, now attributed to the Magdalen Master was discovered beneath two superimposed versions, added in the thirteenth and nineteenth centuries. The final ex-
ample is an account of the recovery of the fragments and restoration of the fresco in Filippino Lippi’s house, which was destroyed by bombs.


The preservation and treatment of paintings are discussed.


Cleaning is practiced continuously in art galleries. It is concerned with backs and edges of pictures as much as with the fronts. Before a picture is cleaned, it is carefully examined, microscopically as well as macroscopically; under ultraviolet, infrared, and X-ray illumination. Some examples taken from the Weaver Committee Report are discussed.


The scientific care of the collection of paintings in the National Gallery is discussed. War experience indicated that conditions of 63° F. and 58 percent relative humidity were good for the preservation of paintings. In the absence of air-conditioning, the use of moisture barriers on the backs of panel paintings seems desirable to minimize the effects of humidity changes. Saran, polythene, and waxes are being studied. Pigments are identified by reaction to form characteristic crys. ppt's., by spot tests, and by optical examination (sometimes with the use of the von Federov stage). Vehicle analyses are crude and unsatisfactory, and it is hoped that chromatographic analysis will prove helpful. Surface coating with polybutylmethacrylate in place of natural resin varnishes is being considered. The uses of ultraviolet and infrared radiations for the detection of spurious areas and the condition of underlying layers are cited. Colorimeters and Glossmeters are used to record the indicated properties. The Ultrapak microscope is used to reveal repainted areas and spurious cracks. Conjecture is made concerning artists materials of the future, polymethylmethacrylate supports and pigment binders and polybutylmethacrylate surface coatings being envisioned.


An outline of the reasons for the methods of removing old varnish films from pictures is given. Nondestructive testing methods include the use of electromagnetic radiations (including infrared, ultraviolet, and X-rays) and the microscope.

A short editorial on the progress of postwar restoration in Italy. Illustrated by reproductions of the reverse side of the paint films of the Fra Angelico Cortona polyptych taken during a transfer operation.

SRJ


PC


The traditional procedures used in attempts to prevent the warping and cracking of paintings on wooden panels are reviewed. These include: (1) transposing the gesso ground and paint film to canvas, (2) reducing the panel to a thin section and mounting this on another panel, and (3) cradling. Objections to these methods are discussed. The author recommends that badly warped panels that are otherwise sound be left as they are. If the paint surface is in danger or the panel has been planed down or damaged by a cradle, treatment with a wax and resin mixture is recommended. Metal strips may be attached to give mechanical strength if necessary. Panels weakened by being planed down may have an aluminum backing for reinforcement.

EHJ


A water color, *Abraham Preparing to Sacrifice Isaac*, was largely obscured by a heavy coating of varnish, no doubt applied by Blake himself. It was adhered to a paper, then a cardboard backing. The threat of the paper disintegrating made treatment necessary. Francis W. Dolloff removed the cardboard backing first. The paper backing, adhered with paste and saturated with varnish, was more difficult to remove. The surface coating was removed with alcohol. The drawing was dipped in an alcohol bath for 5 minutes, dried, reimmersed for the same time, then while still wet dipped in a hot water bath for 5 minutes longer. A few stubborn residual spots yielded to a final washing in alcohol. The water color washes were well set so that the water did no harm. The subdued color of the drawing was apparent for the first time in perhaps a century and a half.

EHJ


Recommendations are made on the care and handling of fine prints. The injury caused by the cutting of margins, the abrasive action of dirt and dust, careless handling, damp air, water drip, and poor mounts are described. Amateurs are advised not to attempt home treatment of prints but to leave that to professional print restorers.

Cf. also Lawrence Sickman. An early Chinese wall painting newly discovered. *Ibid.,* pp. 137-144. It describes how a painting on a mud-wall painted over an older painting on similar mud-wall were separated. The upper painting was scored with a sharp knife in 10-inch squares to a depth of one-eighth inch. After facing each square with Tosa paper attached with polyvinyl acetate, the mud support of the upper painting was sliced through parallel to the surface with a thin wire probe. The mud from the surface of the under painting was removed mechanically. Assembly of the upper painting and fixing and mounting of both paintings on Masonite support are described in some detail.

RJG


Mainly the author's views on the controversy which was set off by "An exhibition of cleaned pictures, 1946-47" in London National Gallery. The practices of "progressive restorers" and of "conservative restorers" are described. Comments are made on restoration activities in London, Paris, Amsterdam, Florence, Madrid, and Lisbon.

RJG


Application of synthetic resins for the prevention of flaking of pigments of wall paintings and the preservation of burnt wood and wall bodies of Hōryūji temple was studied. Polymethyl-methacrylate for the first and urea resin for the second and third purposes were used. Polyvinyl alcohol was suitable for the preservation of old silks.

KY


The 12 walls on which the Paradise of Buddha and portraits of Bodhisattva were painted were seriously damaged by the fire of 1949. Preservation of pigments remaining on the walls was done with acrylic resin immediately after the fire. All the walls were enclosed in frames and removed from the pillars. The removed wall was laid on a working stand with surface side up, and the wall body was planed away from reverse side with rotary cutter to within 8.5 cm. of the surface. Then urea resin varnish was injected from reverse side to reinforce the body and to join together the surface clay layer and the inner mud layer. Stainless steel bolts were put in the wall from the reverse side and fixed rigidly with urea resin. The restored panels were put back in place with steel fittings.

KY

The treatments consisted of: (1) Scorched timbers were impregnated with compound urea resin; (2) fragments of the wall paintings were restored to proper position with urea resin; (3) to prevent separation the layers of the wall were reinforced with urea resin; (4) pigments of the wall paintings were fixed with acryl [acrylic] resin; (5) walls were mounted and removed to facilitate treatment; (6) the backside of the walls were scraped and the mud layer was treated with urea resin; (7) the walls were reinforced with a welded stainless steel lattice; (8) reinforced walls were enclosed in stainless steel frames; (9) Eight scorched wooden doors were planed and stuck together to form four complete doors with urea adhesive.


The results of application of acrylic resin to the wall paintings of Ryōzenji temple, Nara and those of Nijō castle, Kyoto in 1942 were examined in 1951. No color change and flaking of pigments were observed.


Résumé du travail accompli par la Commission de l’ICOM pour le traitement des peintures.


The authors, respectively curator and restorer of the Rijksmuseum, Amsterdam, made a research into the previous treatment of Rembrandt’s *Night Watch* and give a full account of the recent cleaning and restoration of the picture. New and important information could be collected from historical documents, as well as from visual observation and photography by infrared and X-rays.


Contents: Preface; General information; Demounting and surface cleaning; Stripping; Spots and stains; Repairing; Inlays or invisible patches; Bleaching; Straightening; “Mizubari” fulling or shrinking; Backing; Mounting; Cataloguing; Solander boxes, portfolios and cabinets; Print sizes.

Contents: Allerlei von Restauratoren, ihren Werkräumen und ihren Arbeiten; Probierstube und Inventar; Geschichte des Papiers; Papierbereitung; Wie verschafft man sich alte Papiere? Das Proben von feuchten Papieren; Aufhellung und Ablösung; Ablösung aufgezogener Drucke; Wann darf man mit Chlor arbeiten? Gegenmittel gegen Chlor; Behandlung von einfarbigen Drucken mit Chlorwasser; Chemische Reinigung kolorierter Drucke; Die chemische Behandlung von Farbendrucken; Die Reinigung von Handzeichnungen; Reinigung von Büchern; Wasserstoffsuperoxyd; Die Behandlung von verschiedenartigen Flecken; Entfernung des Spirituslackes; Stärkekleister; Einfärbung, Farbbereitung; Prüfung und Präparierung des Papiers; Allgemeines über Papier; Die eigentliche Flickerei oder Restaurierung; Das Ansetzen eines Randes; Der künstliche Plattenrand; Das Spannen von Stichen; Das Spannen von Zeichnungen auf Kell- oder Blendrahmen; Die Retusche; Behandlung von Chinadrucken, die auf Kupferdruckpapieren aufgezogen sind; Die Behandlung von Autografen; Die Behandlung von Drucken auf Pergament; Chemische Behandlung bemalter Reispapiere; Wiederherstellungsarbeiten an groben Papierformaten; Kleine Winke; Plandeien über alte und neue Restaurierungen; Die Aufbewahrung und Konservierung von Kupferstichen; Die Aufbewahrung und Konservierung von Büchern; Techniken, auf die es ankommt; Zusätzliche Hinweise für den Briefmarken-Restaurateur.

BMU


Altération. Technique opératoire.

PC


A well-illustrated account of the results of cleaning a Dürer *Madonna* formerly in the Cook Collection and now in the National Gallery. The effect of removing darkened varnish and unnecessarily extensive retouchings is clearly shown in the detail photographs.

SRJ


Contents: Construction of pictures; Surface blemishes; Defects in paint or drawing; Ground; Weakness and damage; Flaws in the support; Housing, handling and moving; Appendices: A, Record abstracts of repair treatment. B, Special means of examination; Bibliography; Index.


Treats illuminated manuscripts and etchings as well as oils and water colors.

"... what [the author] does so effectively is to describe the structure and mechanism of painting and give advice to artists, students, curators and collectors [on] how to keep in as good health as possible the pictures entrusted to their charge. ... Readers will find [the author's] diagnoses of picture ailments most useful, the chemical causes of darkening, discoloration and decay, how they may be discovered in time, and arrested before disintegration. All these are helped by the ingenious and lucid explanatory diagrams." —The Connoisseur.

BMU


Opinions divergentes suivant que l'on adopte le point de vue "scientifique" ou "artistique."

PC


Bills dated 1742 and 1748 relate to restoration work carried out by one Isaac Collivoe. Items include cleaning, new stretchers, lining, mending, and "taking off the painted spots."

SRJ


Paper read at the annual meeting of the American Association of Museums, Chicago, 1949.

1209. Ullah, Mohammad Sana. Conservation of mural paintings in Central Asia which have been damaged by salt efflorescence. Mouseion, 49/50 (1940), pp. 131–136; C.A., 37 (1943), 6056; Abstract Review, no. 88 (1944), p. 5.

Mural paintings in the museum of New Delhi, which have been made by mixing ocher, blacking, malachite, green earth and lazuli with hardened mud plaster applied over a layer of gypsum, are subject to damage as a result of the humidity at certain seasons of the year, which causes an efflorescence of salts out of the plaster. The composition of the base makes leaching out by immersion in H₂O impossible. Impregnation with solutions of cellulose- or vinyl acetate do not prevent the penetration of the moisture. To remove the salts from the plaster layer, a moistening chamber is used which produces a counteracting moisture. In this chamber humidity is maintained above 85 percent. The backs of the tablets were provided with a paper pulp layer 12 mm. thick. To prevent mold formation 15-30 g. of thymene was evaporated in the chamber from time to time and a little phenol was added to the paper paste. The application of the
paper paste was repeated until traces of salts were no longer evident. The tablets were finally impregnated with 5 percent vinyl acetate solution in toluene.


Restaurations de tableaux de l'école de Caravaggio, exécutées pour la Sicile: A. Rodriguez, Maître inconnu et Caravaggio. PC


Les dégâts sont causés par les conditions locales et aggravés par des traitements antérieurs comportant notamment l'application de cire. A la suite d'essais pour l'enlever, on constate que la "triéline" en est le meilleur solvant. FD


Généralités sur la restauration récente de la "Ronde de Nuit" de Rembrandt. Résultats obtenus. PC


Considérations d'ordre technique sur le nettoyage des tableaux à la National Gallery de Londres. PC


An account of emergency protection of works of art in France during World War II and the activities of the Louvre group of restorers in cleaning paintings during that period. RJG


A shortened version of the Weaver Report on the safety and effectiveness of cleaning methods and materials used in the National Gallery covering three of the ten paintings which were the subject of the original confidential inquiry. The paintings considered in detail are Rembrandt's A Woman Bathing; Rubens' Le Chapeau de Paille, and Velasquez' Philip IV When Elderly. In each case criticisms which had been made in the correspondence columns of The (London) Times are summarized. A full account is given of the technical examination made and of the records of treatment. Forty-two diagrams and technical photographs are reproduced. SRJ

Importance de la restauration des tableaux. Généralités et problèmes particuliers, notamment les retouches, les vernis originaux, la régénération. Les travaux de la National Gallery. Nécessité d'une collaboration internationale et de la création d'écoles de restauration.  

A description of the surface characteristics of old fresco paintings and the procedure for their restoration.  

1218. WILLEMSEN, ERNST. *Museale Gemälde restaurierung.* Düsseldorf, Kunstsammlungen der Stadt, 1950. 16 pp., 5 illus.

Construction et aménagement d’un Institut de restauration à l’Académie yougoslave des Sciences et des Arts.  

Détails historiques et techniques sur la restauration d’une peinture à tempera de Nikola Božidarević (15e s.) et de deux tableaux à l’huile de David Teniers (17e s.) et de Josip Račić (20e s.).  

This is a catalogue of 14 paintings of the Jarves Collection at Yale which have recently undergone cleaning. Included with technical notes on each painting are illustrations of details showing the before and after condition.  

Approves the removal of the spurious date and signature on Rembrandt’s *The Woman Taken in Adultery* in the National Gallery, and of cleaning policies there in general.

A study of the technique of *sokugiho* used in the making of dry lacquer sculpture in the Nara period with particular reference to the images which were once in the Kondō of the Hokkeji temple. In the *sokugiho* technique the image is constructed of layers of hemp cloth and lacquer. The author infers that the various techniques can be identified by measurement of the thicknesses and includes tables of his measurements with diagrams of structures. A comparison is also made with other lacquers known as *tsuchi-urushi*, *sumi-urushi*, and *samoku-tsuchi-urushi*.


*L'examen scientifique des sculptures polychromées est indispensable avant leur traitement. Exemple: Vierge et Ste Anne* (début 16e s.).


There are at Tun-huang and other ancient Buddhist sites of eastern Turkestan many clay statues made by the use of molds for mass production. Some are made by single molds, others by joining the parts separately modeled. Interesting variations were produced by differences in coloring, in accessories, and in methods of joining the parts. The murals of the Main Hall of the Horyū-ji temple at Nara, Japan appear also to have some sort of moldwork.


Falling off of Japanese lacquer and pigments of wooden sculptures of 11–14th century was prevented by the injection of synthetic resins. 15–35 percent solutions of co-polymers of methacrylic and vinyl resins were used. Solution of pentachlorophenol was used as the insecticide. To make copy of the sculpture with gypsum, tin foil was put on the original sculpture with paste made of sodium alginate and ethylene glycol.

Contents includes: Introduction . . . Ceramic sculpture, by Carl Walters; Stone and marble carving, by Robert A. Baillal; Wood carving, by Glea Derijinsky; Bronze casting, by Anton Basky; Conclusions; Suggested reading; Index.


Contents: Preface; The anatomy of sculpture; The plastic earths; Plastic wax; Plaster of Paris; Casting; Metal; Surface treatment of metals; Stone; Sculpture in stone; Wood; Other sculpture materials; Appendix; Bibliography; Glossary; Index.


The striations on the sides and backs of archaic Greek stelae were not caused by a saw but by the use of a broad chisel known as the drove.


The steps used in painting and in applying gold and silver leaf to church statuary are given.


The author has been using wax immersion since 1935 to correct powdery or insect-damaged wood and chalky gesso as they occur in painted wood panels. The method has been adapted to the more complex problems of polychrome wood sculpture. Objects are immersed in a large tank of molten wax until the wax has penetrated all porosities. Beeswax plus 25 percent gum elemi to improve adhesiveness has generally been used. Without the use of complex surgical techniques, the treatment consolidates the components of objects so that they may be handled safely. Among 30 pieces of polychrome sculpture so treated were two very large altarpieces that were treated disassembled. The author feels that the method is no longer experimental, but safe, practical, and effective.


Contents: Introduction to sculpture; Approach to sculpture; Form in art; Proportions: Anatomy; Rhythm; Design; Working with clay; Modelling a head; The study of planes; Heads in art; Building a figure in clay; Plaster casting—Waste mould; Piece mould and gelatine
mould; Stone casting; Lost wax casting; Sand casting; Patines for plaster casts; Bronzes in art; Wood carving; Wood sculpture; Stone carving; Handling stone; Sculpture in stone; Sculpture competitions; Sculpture today; Appendix (Supply houses of materials); Index (Artists, countries, and periods).


W. Furniture


Only wrought-iron nails were available until about 1800, when cut nails began to be made. The latter had irregularly shaped, hammered heads until about 1825, when cut nails were made in one operation by water-powered machinery that cut the nail, clamped it, and stamped the head. The earliest of these nails had thin lopsided heads, but by 1830 the heads were thick and regular.

Wood screws were made earlier than is generally realized. In English furniture the use of tapering brass screws with slotted heads dates from the 1600’s. They were first imported and used in America about 1725. They were produced mechanically in the early 1800’s, but the pointed end was not introduced until the midcentury.


Contents: Preface; Interrelation of furniture designs; The spread of French and English design influences: Germany, Liège, and Aix la Chapelle, Austria, Denmark, Danish West Indies, Bermuda, Sweden, Norway, Russia, Holland, Dutch Colonies China and the Philippines, Ireland; Structural methods and materials; Illustrations.


Contents: The purpose and practice of restoration; The old-time cabinet maker; The workshop, tools and materials; Patching and jointing; Restoring chairs; Restoring tables; Chests, bureaus and desks; Restoring and modernizing beds; Handles, hinges and fastenings; Fix-
ing old clocks; The art of refinishing; Fakes, fakers and reproductions; Suggested equipment for the small shop; Glossary; Suggested reading; Index; Appendix.

  Gives details inter alia of the history of joints, nails, timber conversion, and selection.

X. BUILDINGS AND MONUMENTS


  Review of the condition of Cleopatra's Needle (London) and the process of cleaning and treatment of the surface. Technical, thorough, up-to-date report.

  This great mausoleum in India, which covers an area of 181,110 square feet, is without intermediate support, and it has the largest dome roof in the world. It was built 1627–1656. Now after three centuries it is showing signs of decay; iron hooks and clamps used in the dome are rusting and disrupting the brickwork; mortar is deteriorating and cracking. After grouting the cracks it has been stabilized with a thin shell of "gunite" 2 1/2 inches thick, and the dome has been hooped with steel rings below the plane of rupture. The interior of the base (intrados) was strengthened with steel reenforced panels 4 1/2 inches thick.

  Compte rendu de l'activité en matière de restauration, de l'Institut de Conservation pour la Dalmatie.


La description du monument; des recherches et analyses chimiques et physiques montrant l’action corrosive de l’humidité; les observations sur la restauration et la consolidation.

FD


Detailed descriptions with diagrams of the construction of a sixth-century church.

IG


L’enlèvement d’un mortier du XVIIIe siècle, recouvrant les murs extérieurs et intérieurs, a permis de dégager de nombreuses fresques et des façades polychromes avec éléments plastiques en céramique.

FD


A brief description of the functions and responsibilities of the Ancient Monuments branch of the Ministry of Works of Great Britain. Most important is the preservation of buildings. At present about 100 skilled craftsmen, chiefly masons, with attendant laborers are working on the preservation of existing remains in England and Wales.

RJG


Chief cause of deterioration of weather-exposed marble is a layer of dust containing clay, SiO₂, soot, and vegetable matter in areas protected from driving rain. This colloidal layer absorbs SO₂ and oxides of N to form acids which attack the marble. Deterioration is not caused by oxidation of ferrous Fe or from CO₂ in water, as is commonly supposed because action is always local. Best means of conservation is periodic washing. Ancient Greek lime mortars in which colloidal material was incorporated have shown outstanding permanence.

RJG


After reviewing the history of repairs to the building the recommendations of the Advisory Committee to Archaeological Survey of India are listed. “The report indicates that whilst much minor repair
work of a somewhat costly kind is necessary and should not longer be delayed the Taj is not in imminent danger of collapse and may not be essentially in very much worse structural condition than when Prince Aurangzeb submitted his adverse report nearly three centuries ago.”

RJG


Catalogue: Restauration de monuments, de peintures, d'antiquités dans les régions de Venise, Vérone, Trente, Trieste, Padoue, Vincenza, Treviso, Bolzano, Udine, Pola.

RL


Consolidation au moyen de béton armé de deux anciens monuments; restauration des vestiges d’un monument religieux, récemment mis à jour et remontant à la Basse Antiquité. Découverte de fresques importantes (fin XIIe siècle) au cours des travaux.

FD

TECHNICAL EXAMINATION OF OBJECTS AND ANALYSIS OF MATERIALS

A. CHEMICAL ANALYSIS (INCLUDING MICRO-, SPECTRO-, AND CHROMATOGRAPHIC ANALYSIS)


A series of articles in this journal on the microchemical identification of mineral pigments in paintings. The latter concerns principally the detection of chromium in chrome pigments. Title varies.

RJG


Proposition d’application de la réaction microchimique au sulfure de sodium non uniquement à la détermination du plomb mais également de l’antimoine caractéristiques de certains pigments minéraux.

JT

Contents: Foreword; Introduction; Theory; General methods; Quantitative methods; Amino acids; Amines and proteins; Carbohydrates; Aliphatic acids and steroids; Purines, Pyrimidines, and related substances; Phenols, aromatic acids, and porphyrins; Miscellaneous organic substances; Antibiotics and vitamins; Inorganic separations; Bibliography; Author index; Subject index.


In the late eighteenth century chemical analytical methods were first employed in the study of early painting materials. One, de Morrona, wrote on the index of his book (1787) "Per l'utilità di chimici experimenti sulle pitture antiche." Early chemical investigations into the materials and methods of ancient painting are reviewed. Modern methods are discussed in some detail covering: laboratory, equipment, taking of specimens from paintings, making of cross sections, separation of mediums from pigments, and the identification of mediums. There is a scheme for the systematic identification of mediums of wall paintings. The last section is given to the microchemical identification of 18 chemical elements that make up most of the pigments. Sixty-five references.


Microchemical reactions are given for the analysis of adhesives and dyes, determination of N, S, and P in adhesives containing N (egg white, egg yellow, and casein), gum arabic, resins, linoxyn (black spots on treatment with 1 percent aqueous OsO₄ solution; detection of glycerol), wax, starch flour in N-free adhesives, and of Ca, Pb, Zn, Fe, Mn, Cu, Hg, and S in dyes. A table shows the scheme of analysis for the examination of adhesives. The necessary apparatus, solvents and reagents are listed.


CaCO₃ + Ca(OH)₂ in admixture with casein, lapis lazuli, yellow and red ochre, burnt sienna, glauconite, and powdered wood charcoal were identified, but the following pigments were not detected: white lead, cinnabar, and blue and green Cu pigments. The method previously given for the determination of lapis lazuli is not applicable in
the presence of casein. Ca(OH)$_2$ and casein, and also glue, were used as the principal binding agents for black pigments. The presence of casein is indicated also by its resistance to dilute HCl, by which method the presence of organically bound P, N, and S was determined, particularly of P, for which the silicates were removed with HF and H$_2$SO$_4$. The presence of casein was confirmed by testing in ultraviolet light, wherein I causes the fluorescence of casein to disappear.


Chemical analysis was the first of the scientific methods applied to the examination of works of art. There are two analyses dating from the eighteenth century. In 1863 the first microscopic examination of a fragment of painting was made in Munich. In the early twentieth century Wi. Ostwald reported on the first microchemical analyses of binding mediums. Since then notable progress has been made in microchemical methods. Extended bibliography covering the writings of 20 investigators.


It is possible, with accurate quantities of citric acid, to separate chemically the carbonate of bone from the phosphate without destroying the latter. Hence, bone salts are a physical complex of the two. The effect of ignition is discussed. The refractive index of bone salts is equal to that of a mixture of 90 percent pure alpha tricalcium phosphate with 10 percent calcium carbonate, namely 1.590; after ignition the value of the refractive index becomes equal to that of the natural namely, 1.649. The mineral fraction of ivory and cement from tooth is the same as that of bone, enamel having a more complex composition.


A review of the applications of partition chromatography since its inception by the author *et al.* in 1944. The bibliography contains 51 titles.


A miscellany of analytical methods which the author has found applicable to paint constituents.

Nouvelle microméthode spectrochimique. Sont décrits: l’aspect du problème, la forme d’émission, les régions circonscrites, les conditions de travail, les courbes de références. Quelques tableaux d’analyse de haches anciennes montrent des résultats comparatifs avec les analyses chimiques de Jacobsen (1905).


To 1 mg. of sample in a small test tube add 2 ml. of 0.2 percent anthrone (Meyer, *C.A.*, 22, 1586) in concentrated H$_2$SO$_4$. If carbohydrate is present, a clear green color will be seen, quickly becoming a dark blue-green. Other organic material usually gives a brown color. The test is useful for the detection of carbohydrate and for the preliminary classification of resins. When used to detect starch, the test is 10–40 times as sensitive as the I test.


A method is described for the identification of stabilizing and thickening agents used in food products including gum tragacanth, starch, gum arabic, gelatin, and others. The proposed identification scheme is based on precipitation reactions with calcium chloride, sodium hydroxide, barium hydroxide, and lead acetate. (Some of these reactions might be useful in the microchemical identification of the mediums of paintings.)

Technique published earlier (C.A., 45 (1951), 2367a) is described in detail. Analysis of the residue insoluble in aqua regia shows Sn and Si. Solutions containing precipitants or colloids give erroneous results.


Extraction of dyestuffs by organic solvents and the application of paper chromatography to the identification were studied. Chemical properties of following pigments contained in plants were given: berberin, luteolin, curcumin, croc, rutin, fustin, pseudopurpurin, alizarin, carthamin, brasilein shikonin, and indigo. Preliminary report.


Acid dyes such as "Solway Purple" are useful in the demarkation of proteins on the developed paper chromatographs and cellulose columns since they do not stain cellulose.


A microreaction for the specific identification of Sn is described in which Sn is precipitated as SnJ₄ (yellow crystals of the regular system). The test may be confirmed in the same drop, viz., by the formation of black octahedra of CsSnJ₆. Limit of identification of both reactions: 0.02γ Sn. Possibilities of interference and a procedure for the isolation of Sn are discussed. (Test probably useful for the microchemical detection of Sn in alloys and pigments.)

—Author's English summary.


The essential result of this study is the separation scheme given in Table 2, which permits the detection, in a single analytical procedure, of the 20 most important and most frequent elements used by artists. When not indicated by literature references, other detection reactions were mentioned; the "Feigf" spot reactions were drawn on to the fullest extent. Thus a further proof was given that it is entirely possible to accomplish entire separation procedures on a microscale more rapidly and more simply than by macroanalytical methods. The "acro-reactions" given by G. Skalos were employed to lower the sensitivity limits.
still more. When a filtration was necessary, the “Gorbach” procedure was used. A tabular review of the possible chemical composition of the pigments together with chronological data is also given to facilitate the detection of the characteristic ions. Twenty-two references.


A report is given of the microchemical examination of an important cultural historical fresco painting from the years 1740/42 and also of the restoration made on it in 1929 and 1949. These studies served to clear up definitely some damage that recently appeared on the painting.

—Author’s English summary.


Dammar, mastic, sandarac, rosin, elemi, and copal each give a characteristic chromatogram. Working details are given.


The possible scope of spectrochemical analysis in its application to the unsolved problems of archaeology and of ancient foundry techniques is outlined.


An extensive qualitative and quantitative examination of a sample of a dark earthy material found among the bones in an ancient sarcophagus, and a comparison of the results with those similarly obtained on a sample of the exterior soil, indicated that the earthy material had been produced by the infiltration of exterior soil and the admixture of this with decomposition products from the human remains and with material dissolved by ground water from the interior of the sarcophagus itself.


Artificial resin is dissolved by heating in 1 cc. $\text{Ac}_2\text{O}$, cooled (with water, if necessary), and treated with three drops of 89 percent $\text{H}_2\text{SO}_4$. The following characteristic colors were obtained: polyvinyl ether, blue and green; polyvinyl acetate, blue; ketonic resins and coumaron resins, wine red. Igevin M (0.005 percent) and Igevin A (0.01 percent) gave a blue color. Polyvinyl acetate did not produce a color on cooling. The color reactions of numerous synthetic resins are tabulated.


Method for analysis of statuary bronze ($3\text{Sn}, 3\text{Zn}, 2\text{Pb}, 2\text{Ni}, 90 \text{Cu}$) given.


For a sensitive and specific test for Sb, extract tetraiodoantimonate (III) ion with benzene and treat with Rhodamine B.


Contents: The principles of chromatography; Chromatographic methods—adsorbents, solvents, and eluents; The chromatography of colorless substances; The chromatography of inorganic substances; Partition chromatography; Examples of the use of chromatography; Theoretical considerations; Bibliography; Index.


B. MICROSCOPY AND PHOTOMICROGRAPHY


A method similar to the mineralogical immersion technique is described. The test specimen need have only one reasonably plane face, and need not be transparent. Mixtures suitable for making measure-
Abstracts, Art and Archaeology, 1943–1952

Mentions on plastics are benzyl alc., CCl₄, and EtOH in various proportions. Refractive indexes obtained on a few specimens were: polythene 1.515 and 1.519 (2 different lots), "Teflon" 1.378 (d.2.18) and 1.376 (d.2.12), and nylon 1.532.


A single layer of sized grains is mounted in a film of plastic on a flat surface of the same plastic. The layer is ground to the center of the grains, and the ground surface is remounted on more of the same plastic. The original piece of plastic is then cut off, and the other side of the layer of grains is ground until they are of the desired thickness. The surface is then polished, and the specimen can now be examined by either reflected or transmitted polarized light.


By the combination of a synthetic resin of a moderately low n with a compatible plasticizer of a much higher index, a colorless permanent mount for textile fibers can be made which has the desired refractive index. Isobutyl methacrylate polymer of refractive index 1.48 and Aroclor 1242 of refractive index 1.62 were used as resin and plasticizer, respectively. Formula for mounting medium: xylene (filtered) 21 ml., Aroclor 1242 9 ml., and isobutyl methacrylate polymer 18 g. The procedure is outlined and data tabulated for photomicrographs of various fibers mounted in various mounting media.


A tungsten carbide pencil is used to make a series of short parallel scratches so that sufficient glaze is removed in the form of a powder and minute chips to provide samples for analysis. Working under a magnifying glass the depth of the scratches can be controlled, so as to avoid cutting through the glaze. It provides directly a finely divided sample ready for weighing.


A technique for embedding paint films in wax and sectioning them for microscopic examination is described.


Research item in Nature (London), 154 (1944), p. 241, where some details are given of a technique for treatment to facilitate the study particularly of the cuticular scales, which seem to be distinctive for each species.

No. 2 Abstracts, Art and Archaeology, 1943–1952 311

To supplement a National Bureau of Standards recommendation (C.A., 33, 4429) of dye systems for identifying rayons, a solution containing acid fuchsin (Color Index no. 692), 6 g.; picric acid, 10 g.; tannic acid, 10 g.; and National Soluble Blue 2B extra (Color Index no. 707), 5 g., *all* in one liter of solution, is prepared. Momentary immersion in the hot solution, or 2-minute treatment in the cold solution, and rinsing, yield colors as shown: cotton or linen, light blue; acetate or nylon, pale greenish yellow; cuprammonium, dark blue; viscose, lavendar; vinyon, very pale blue; wool, yellow; silk (raw), black; silk (degummed), brown. Films of cellulose acetate or viscose (cellophane) respond to the same tests as above.


Apparatus is described, and a method is employed for determining the adhesive qualities of coated surfaces which involves coating a common plane surface of two adjoining detachably connected inspection blocks, allowing the coating to dry, separating the blocks to fracture the coating along the line of jointure of the blocks and placing a cross-sectional area of the divided coating in the field of a microscope for inspection of the internal structure of the coating along the ruptured edge.


Rock or other powders, embedded in a thin film of cellulose acetate while it is drying, may be microscopically examined or transported easily and safely, and particles of special interest can be marked or cut out without destroying the whole mount.


The concept of particle shape and its microscopic identification is discussed. The microscope can be used to detect soap formation, the painting system used, and the effects of water. A staining technique on paint film sections has been developed. Three references.


Contents: Applications; Magnification; The microscope; Resolution; The microscope and the camera; Equipment; Photographic materials for photomicrography; Illumination of the subject; Filters;
Procedure; Determination of the correct exposure; Special techniques; Text references; Data sheets; Bibliography; List of manufacturers.

BMU


Details are given for making photomicrographs, rapidly and inexpensively, with a Leitz Ultropak microscope and a Land Polaroid camera. These are useful in recording and in demonstrating forgeries and forgeries in printed works. Three cases of employment are cited.

RJG


Contents: Introduction; Le micromanipulateur pneumatique; La microforge; Travaux a la microforge; Les microinjections; Agencement des préparations—La Chambre a huile; Pratique des micromanipulations; Bibliographie; Index.

BMU


A technique is described for obtaining a thin supporting membrane and well-dispersed pigment particles, such as ZnO, TiO₂, ZnS, and lithopone. Approximately 0.01 g. of pigment is mulled into three drops of 1 percent (vol.) poppyseed oil in AmOAc (I). To this nearly dry paste are added 3 drops of 2 percent (wt.) nitrocellulose in I. This is mulled until the solvent has evaporated. About 8 drops of 2 percent (wt.) nitrocellulose in iso-PrOAc (II) is added and mulled till the pigment is in suspension. One drop of this is allowed to spread on the surface of a saturated aqueous solution of NaCl. A portion of the film is removed on a glass slide and refloated in water to wash away the salt, and then attached to the standard 200-mesh screen disk. II is superior to I in preparing the suspension, because flocculation occurs when the latter is used.


Construction details of a hot stage (temps. < 500°) and of a microfurnace (temps. > 500°) which can be used with a microscope to study inorganic substances in the same way as organic compounds have been studied previously.

Contains 1,370 references mostly with abstracts of books, pamphlets, and periodical literature. Author index. Subject index.


Refractive indices $\Delta/20^\circ$ C. are given for 24 resinous media, 6 solvents, and 9 water-soluble media. Commercial sources, lot number, and percent of substance by weight are also listed. RJG


Details are given for the preparation of low molecular weight copolymers of isobutyl methacrylate and styrene for use in mounting microscopical sections between the slide and cover glass. Any refractive index in the range from 1.477 to 1.590 is available, depending upon the proportions of monomers used. A refractive index of 1.550 is recommended for general purposes, though other indices might be desirable in special cases including phase microscopy. The resin gives solutions in toluene of suitable fluidity at usable concentrations, adheres satisfactorily to glass, and has excellent light-transmission. The features which make it especially valuable are its optimum refractive index and its permanent water whiteness.

Copolymers of isobutyl methacrylate and styrene may also be used to prepare plastic mounts of thick sections or gross specimens, which are optically cleared by the plastic mountant. Author's abstract.


A brief report on the properties of improved "Polaroid" discs, which rival those of the best nicol prisms, particularly in their use with the petrological microscope. Extinction curves and chromatic characteristics are given. LB


A new technique is described for the microscopic examination of lyogels, by use of ultraillumination by incident light as obtained with an "Ultropak" ultramicroscope. Results obtained by this technique with natural and synthetic rubber, soap, and other lyogels are dis-
cussed. These results substantiate the assumption that the morphology of lyogels of quite different chemical composition is very similar, thus offering an explanation of the analogy of some of their properties. Several photomicrographs are reproduced as examples of the applicability and versatility of this simple technique.


Simple equipment is described for mounting the camera over a microscope. Finished-print photomicrographs can be produced one minute after exposure. If one wants to have the camera already in position for exposure and still be able to check the focus, a Leitz Micro-Ibso attachment with its standard focusing lens removed can be attached to the eyepiece.


Methyl methacrylate monomer is treated with a 5 percent solution of NaOH to remove the stabilizer (quinol) and then dried over anhydrous Na₂SO₄. Benzoyl peroxide (0.1 percent) is dissolved in the dry monomer to act as a polymerization catalyst, and the solution set aside for 15 hours and filtered; 10 percent of the powdered polymer is then dissolved in the liquid by heating at 80° until the solution acquires the viscosity of concentrated H₂SO₄ by polymerization. After cooling in an ice-bath, the partly polymerized resin may be cast, or preserved for about 30 days by storing at low temperature in a stoppered bottle. The mounting procedure is similar to that employed with acid-hardening resins, but allowance must be made for shrinkage during hardening. Polymerization is accelerated by warming the mount to 50°, the full hardness being developed in 2–3 hours.


Difficulties in preparing polished thin sections are overcome by the use of thermoplastics glycol phthalate or Gelva V 7. Details of procedure are given.


Photomicrographs and descriptive information are given for the identification of the common paper fillers, such as diatomaceous earth, talc, clay, CaSO₄, and Zn, Ba, and Ti compounds.

1307. **Kozlowski, Rudolf.** Les microorganismes de l'époque crétacée aident à établir la différence entre les techniques de la peinture sur

A method is given for distinguishing among different forms of calcium carbonate in paintings done on plaster, especially the chalk used as a white pigment from the lime binder which is used in "fresco secco" technique. In the chalk, which is of marine origin, one can observe microscopically tiny fossil forms called coccoliths, rhabdoliths and asteroliths. (These forms are shown at 600× magnification in eight photomicrographs.) On the other hand, lime which is prepared from limestone by heating and slaking shows no fossil forms.  


An improved method is described for the preparation of cross-sections of old paintings. Monomeric methyl methacrylate with 3 percent benzoyl peroxide is placed to a depth of 1 cm. in an ordinary test tube and is polymerized for 24 hours at 50° C. The tiny paint specimen is laid on the surface of the clear polymer near the side of the tube. The specimen is covered with a paste of methyl methacrylate monomer and granules of polymer. The purpose of the paste is to keep the tiny specimen in proper position and orientation. Impregnation of the specimen is effected by alternately applying vacuum and pressure at the mouth of the test tube. After the paste is hardened by polymerization of the monomer the test tube is broken away to release the mounted specimen. Because of the transparency of the mount it is possible to determine the orientation of the specimen and then to file or grind away the polymer in a plane at right angles to the paint layers. Surfacing is completed by hand grinding on emery papers and polishing on a metallographic lap. Specimens 0.5 mm. in greatest dimension may be polished this way. The layers of cross-sections can be photomicrographed up to magnifications of 300×. Specimens may be examined at higher magnifications by using a cover glass and glycerine as a mounting medium.


The Fisher "Permout" naphthalene polymer, the Hartman Leddon "H.S.R." terpene polymer resin, a Monsanto polystyrene P–1, the Will Corporation "Diaphane" and "Green Diaphane," and the du Pont "Lucite" methyl methacrylate polymer were examined, and the possibility of use of some other plastics was also explored. The first five mentioned were tested for color preservation of a variety of stains in comparison with Canada balsam and Clarite X. From this point of view polystyrene, the Hartman Leddon "H.S.R." and the Fisher "Permout" resins were the most satisfactory, then the "Diaphanes." Both "Permout" and "H.S.R." show some yellowing. The H.S.R. with
a melting point of 115°C, the Permount with 150°C. melting point, and the Polystyrene with a thermal denaturation point above 220°C. all excel Canada balsam in heat resistance. Trimethylbenzene, cymene and monoamylbenzene appear to be the best solvents for polystyrene. Mounts made in a solution of 20 g. polystyrene in 100 ml. trimethylbenzene can be packed flat slide to slide in 24 hours after mounting without sticking together.

Authors' abstract.


The percentages of quartz, mullite-rich glass, and pure glass were determined on polished sections of different German, Chinese, Japanese, and American porcelains by measurements in reflected light. Also the pores were determined. One American hotel china was different, showing 10 percent leucite as a crystal phase in the body. The glass content varied between 15 and 50, the quartz between 10 and 45, and the mullite-rich portions between 15 and 65 percent (the latter in Rosenthal porcelain). From the known firing temperatures of the German and American porcelains, those of Chinese and Japanese (ancient and modern) could be estimated approximately as 1250-1400°C. The microscopic method used is that of Tavasci (*C.A.*, 30, 7800; 43, 5561); the etching was usually done with dil. HF (1:20). Only the American hotel china containing leucite was etched with hot concd. HCl. Mullite aggregates with a characteristic laminar structure indicate their origin from the sheet structure of coarse kaolinite or, even more often, of mica in raw batches. Residual quartz often shows cracks which separate the crystal phase from the surrounding siliceous glass, by contraction effects. In Chinese porcelains, a characteristic formation of glass "nuclei" inside the quartz indicates the porphyric or micropegmatitic origin. The leucite in the American porcelain is derived from feldspar by its incongruent fusion at 1170°C. The inversion of quartz to tridymite or cristobalite above 1400°C is observed only in the high-fired German porcelains, but absent in the evidently lower-fired Oriental products.

1311. MEHLENBACHER, VIRGIL C. Fat and oil microscopy. *Inst. Spokesman*, 5 (1941), pp. 1-4, 6-7; *C.A.*, 37 (1943), 4587.

Fats and fatty oils can be identified under the microscope by the examination of the crystal habit of the respective fat acid mixtures derived therefrom. Photomicrographs are given for the fat acids from lard, beef tallow, cottonseed oil, kapok oil, rice bran oil, palm oil, babassu oil, olive oil, sardine oil, whale oil and coconut oil. Teased oil can be identified by the crystals formed on a slide from the fat acids and KOH in BuOH; corn oil and perilla oil can be identified in a similar fashion. In some cases the microscopic technique can be applied to mixtures of fatty oils while in other cases the oils lose their identity when mixed.

A new series of high-index immersion liquids \((n = 1.66 - 1.81)\) has been made which employs \(\alpha\) bromonaphthalene and a 10 percent solution of precipitated sulphur dissolved in arsenic tribromide. These have the advantages over methylene-containing solutions in that they are more stable; they remain light yellow in color over a period of months. After a period of nine months the maximum change of index was \(\pm 0.001\). Detailed directions are given for preparation.

RJG


A new series of high-index immersion liquids \((n = 1.74\) to 2.00) has been made. The 1.74 to 1.81 liquids contain methylene iodide, precipitated sulphur and arsenic tribromide. The mixing curve is not a straight line. Those from 1.82 to 2.00 contain arsenic tribromide, precipitated sulphur and arsenic disulphide. This mixing curve is a straight line. The temperature coefficient of the liquids is of the same order of magnitude as that of methylene iodide but the dispersion is higher. The liquids are light in color and have satisfactory keeping qualities. Detailed directions are given for preparation.

RJG


In the microscopic examination of paper pigments, fillers, etc., difficulty is frequently encountered in effecting a uniform and satisfactory dispersion of the powders so that particle size and shape and their variations may be readily determined under the microscope. A new and simplified method for the preparation of slides, in which this effect is overcome, is described in detail. It consists essentially in thoroughly drying the powder at 220° F. or higher (if affected by this temperature, the material should be dried as thoroughly as its properties permit), placing 1-2 drops of a solution of 1.94 g. of parlodion (purified pyroxylin in flakes) in 82 g. amyl acetate, 6 g. ether, and 4 g. absolute alcohol., directly on the powder on a microscope slide, rubbing with a small spatula to disperse the powder in the solution, causing a single drop of the dispersion to fall on the surface of a beaker or pan of water, allowing the resultant film to stand for 1-2 minutes, transferring a suitable portion of the film to a microscope slide, removing adherent water with a paper towel or blotter, and drying in an air current at about 130° F. The slide remains satisfactory for at least several hours and probably for several days if stored in a desiccator. The slide may be rendered permanent by treating with a solution of 60 percent of Clarite synthetic resin in toluene and covering with a cover glass. A number of comparative photomicrographs are reproduced to show the merits of the procedure.

1315. Petrym, Andrew Fred. Restoring old masters. Leica Photo. 5, no. 3 (1952), pp. 4-5, 28-29, illus. (part col.)
Interesting illustrations in color showing how the 35-mm. camera with Leitz Micro-Ilso attachment and Ultropak can be used to record details of paint structure and conditions.

RJG


The subject matter of this bulletin was originally published in the Journal of Linnean Society (Botany), v. 52, no. 343 (1941), under the title: The identification of coniferous woods by their microscopic structure. It was amended when published in the bulletin.


With the aid of microscopic and staining techniques, and simple physical and chemical tests, animal or hide glues, blood-albumin, casein, and modern synthetic resin glues may be distinguished. LB


Insertion of a suitable annular stop in the condenser makes possible the examination of, e.g., transparent fibres against a colourless background by converting phase differences into intensity differences. LB


Contents: The preparation of thin sections; The identification of mineral phases; Optical properties of minerals found in ceramic materials, slags, glasses, and sinters; Determinative tables; Appendices (White's test; Bibliography; Reference to photographs); Index.


A lecture in which is described with abundant illustrations some newly developed methods for mounting, cutting, and staining textile fibres, and applications to dyeing, printing, and fabric finishing. Twenty-four photomicrographs in color of cross sections of textile fibres are shown. RJO


Contents: Views of the Calco microscopical laboratory; Introduction; Technique for cross-sectioning textiles; Technique for cross-sec-
tioning leather; Color photomicrographic technique; Photomicrography in polarized light; Photomicrography in fluorescent light; "Optical staining"; Small objects and low-power color photography; Photomicrography in black and white; Bibliography.


Contents: Preface; Principles governing lenses; Getting acquainted with the microscope; Properties of objectives and oculars; Illumination: Equipment and principles; Permanent records: Preparation of sketches and photomicrographs; Quantitative microscopy; Polarized light: Principles, sources, and applications; Chemical procedures on a microscopic scale: General (and) Inorganic reactions; (and) Organic reactions; Laboratory experiments; Bibliography; Index.


Report on staining methods for the examination of glazes and ceramic bodies. Original dyestuff staining, combined with etching, gives evidence not only for the determination of the mineral composition, but also on the adhesion of glazes to bodies, etc.


Contents: The microscope—nomenclature and definitions, Laboratory work. Questions; Lamp houses, lamps, methods of lighting, and photometric units. Laboratory work. Questions; Light, lenses, images and objectives. Laboratory work. Questions; Oculars, illuminating apparatus, slides, cover glasses, and the effect of dirt on the optical system. Laboratory work. Questions; Optical light filters and the control of glare. Laboratory work. Questions; Cameras, photosensitive material, formulae and photographic technique. Laboratory work. Questions; Mounting media, stains, reagents, and solvents—their use and application in photomicrography; Analysis of practical photomicrographical problems; Glossary; Addendum; Index.


A phase-retarding plate in the microscope objective produces a phase diff. of ¼ wave length of green light. A mineral immersed in a liquid of lower n has dark edges adjacent to the brighter index oil. Relief effects are enhanced. The phase contrast objective plus a single polarizer produces upon rotation of the microscope stage a considerable change in the clearness of boundaries, especially with adjacent birefringent minerals with similar mean ns.

Photomicrographs of paint coatings and of cross-sections made with the microtome are shown in numerous illustrations. The value of microscopic evidence in complaint cases is discussed.


A procedure for examining transverse and longitudinal sections of animal hair for the purpose of identification in legal cases is described and illustrated, as is a procedure for examining the superficial scale structure. The paper will be of interest to all analysts who are called upon to identify the species of hair in criminal cases.


Data are presented showing a comparison between the particle size and shape of several pigments and extenders as given by the electron microscope with similar values for the optical microscope and, in certain cases, adsorption methods. The following materials were studied: Zn oxides (direct process, acicular, French or indirect process, "colloidal"), Pb chromates (primrose, lemon, middle, orange), white leads (chamber, stack, electrolytic), lithopone, ZnS, TiO₂ (anatase, rutile), Fe oxides (yellow synthetic, Turkey red), ultramarine, Monastral blue, Prussian blue, China clay, and bentonite. The adsorption method gives results which are in good agreement with those obtained with the optical microscope, but sometimes the values are larger than those estimated by the electron microscope. The latter instrument gives the following additional information: knowledge of the shape of those small particles not completely resolved by the optical microscope, evidence of the existence in certain pigments of smaller particles than previously known, some detail of the surface of the larger particles, and evidence of the existence and shape of extremely thin platelike particles, transparent to visual examination, and possibly only a few mols. thick. The appearance of the above materials under the electron microscope at 14,000 diameters is illustrated by 17 micrographs.


Exposed bone in limestone matrix is cleaned in 20 percent AcOH, then placed face up in a mold which is filled with cold polymerizable plastic (Marco Resin S.B. 26C). After 24 hours excess resin adhering to the back of the matrix is cut or ground away. The excess rock
matrix behind is removed by immersion with 20 percent AcOH. The specimen is then worked and when dry, painted with a diluted solution of celluloid in Me₂CO and Am acetate. The fossil then is freely exposed with its base securely anchored in the clear plastic.


This bulletin gives much information on microscopic identification of miscellaneous products as animal hairs, insects and insect pests, molds, and all types of dirt and filth. It describes many methods for isolating and examining these materials.  

RJG


The optical properties, specific gravity, and other properties inherent in a mounting medium are described for balsams made from the crude resins of Yugoslav pines and are compared with those of Canada balsam and other commonly used media.  

RJG


For isotropic samples the usual Becke line or half-shadow methods are satisfactory but with anisotropic crystals, the customary order of procedure is reversed. First locate a particle which shows an interference figure under conoscopic observation and from this determine its optical class and optic sign. Next, determine ns on crystals showing the maximum flash of color during rotation between crossed nichols. Rotate such a crystal to extinction, remove the analyzing prism and note either the high or the low index. Rotate 90° and determine the other index. If the crystals are uniaxial positive, the lower index will approximate the value for ω; if the crystal is negative, the ω index will be very near the higher value. With biaxial positive crystals, the β will be nearer α than γ but in negative crystals it will be nearer the latter. The value of β can usually be estimated from these relationships. The β value can be checked on a crystal with an interference figure in the optic north-south position. The ω index of uniaxial crystals can be made on crystals that show centered interference figures.


An address. Photomicrographs of horse hair, cow hair, wool, cashmere, and llama fibers are given.

The stain is prepared as follows: I crystals 0.8 g., CdI₂ 35.0 g.; distilled water 50.0 cc.; when solution is complete at 110° F. add the following in order: distilled water 90 cc., formaldehyde 7 cc., Ca(NO₃)₂·4H₂O 70 g., CdCl₂·2½H₂O 20 g. Colors produced on the chief papermaking fibers are: soda, purple; linen rag, pink; kraft, brown (some gray); groundwood, yellow; unbleached sulfite, colorless; bleached sulfate, blue; bleached sulfate, lavender; cotton, red; straw, green predominates. A sample for examination is conveniently prepared by cutting out with a small hand punch disk samples about %6 in. in diameter from the sheet to be examined, disintegrating by shaking in a miniature ball mill consisting of a stoppered test tube containing a few glass beads and the proper amount of distilled water as determined from the weight of the sample.


Directions are given for using Polaroid films to convert a student or medical microscope. A working drawing is shown for a rotating stage that can be easily turned out of ¼-inch brass stock and fixed to a square stage by using the holes provided for stage clips.

C. Radiation Analysis (X-Ray, Infrared, Ultraviolet, and Visible Range)


A review of X-ray, infrared, and ultraviolet methods applied to Western as well as Eastern art. Research along these lines has been carried out in Japan since about 1952. Since the war interest in use of optical methods has been greatly stimulated.


Contents: Introduction; Nature, characteristics and properties of X-rays; The generation of X-ray and X-ray equipment; Procedures and radiograph interpretation; Exposure factors and technique; Sensitivity and radiograph quality; Films and film processing, screens and filters; Gamma-ray radiography; Radiography of welds; Radiography of castings; Fluoroscopy; High-voltage radiography; Other techniques and applications of radiography; Protection and safety; General index.

A note on the evidence obtained by infrared photography of Vittorio Carpaccio: *The Mediation on the Passion* (Metropolitan Museum of Art). The Carpaccio signature appeared beneath a later Mantegna signature, confirming the stylistic attribution previously made. 


Contents: Preface; The physical principles of industrial radiology; Requirements in design of industrial X-ray equipment; Quantitative measurements in industrial radiology; The response of photographic materials to X-rays; The radiography of heavy metals; The radiography of light metals; Gamma radiography; Some uncommon applications of industrial radiography; X-ray protection; Appendix—Linear absorption coefficients; Index.


Tables are given, showing the color of fluorescence of many pigments in ultraviolet light. The colors may be used for the identification of pigments, particularly in dried paint films, but it is pointed out that some pigments show a considerable variation in fluorescent color according to their mode of preparation (temperature of calcination, etc.) while impurities also have a pronounced effect.


Vues générales sur l’IR; Production de l’IR; Filtration et separation des diverses radiations; Réflexion de l’IR; Transmission et absorption; La photographie IR; Le séchage par rayonnement IR; Cellules photovoltaïques; Relations entre l’IR et la luminescence: Applications biologiques, physiologiques et thérapeutiques.


Vues générales sur l’UV; Mesure et détection du rayonnement UV; Production des rayons UV; Filtration de l’UV; Réflexion de l’UV; La photographie UV; Transmission et absorption; Application des spectres d’absorption; Effets germicides et abiotiques des rayons UV; Photochimie; Photolyse, Photosynthèse; Biologie, physiologie, phyto-biologie.


A method is described for reproducing images of engravings, intaglios, hollow objects, etc. by covering them with a fluorescent product and photographing in ultraviolet light.

Contents: Infrared radiation and the spectrum; Infrared-sensitive films and plates; Filters; Practice of infrared photography; Special uses; Handling and processing infrared materials; Recommended formulas; Specifications—Kodak infrared sheet film (and) Kodak infrared (IR135) film; Ultraviolet photography; Selected references.

BMU


Contents: Radiography's function in industry; The radiographic process; X-ray generating apparatus; Geometric principles; Factors governing exposure; Radiographic screens; Scattered radiation; Arithmetic of exposure; Sensitivity and detail visibility; Special technics; Kodak industrial x-ray films; Processing; The processing room; Appendix I—Sensitometric characteristics; Appendix II—Protection; Appendix III—Unsatisfactory radiographs; Bibliography; Index. BMU


The technique of taking roentgenograms of paintings at the Worcester Art Museum are described. Several examples of interesting revelations by this and other means of scientific examination are shown. The author (a physician) calls attention to observations that bear on medical diagnoses of the ills of the sitters for some of the portraits used to illustrate the article.

RJG


Services que peut rendre la radiographie, notamment pour la technique picturale, le style et l’identification. Exemple: Greco. PC


An elementary account of the mechanism of the production of color by substances showing selective absorption is followed by a brief description of the Hardy recording photoelectric spectrophotometer. Reflectance-\(\lambda\) curves are shown for linseed-oil paints based on 21 common pigments diluted with ZnO to raise the reflectance at the \(\lambda\) of maximum absorption to 0.15. Such curves can be used for identifying pigments, comparing tinting strength, etc.

1348. HARRISON, VERNON GEORGE W. *Gloss; its definition and measurement*. Brooklyn, N. Y., Chemical Publishing Co., Inc., 1949. 145 pp., illus.
Contents: Abstract; Introduction; Pt. I. Physical factors influencing our sensations of gloss or lustre—Reflexion and refraction from plane surfaces—Reflection of light from curved and irregular surfaces—Diffuse reflexion—Reflection from varnished and semi-glossy surfaces—Summary; Pt. II. Physiological and psychological factors influencing our sensations of gloss or lustre—Types of gloss—Binocular lustre—Some psychological experiments—Metallic lustre—Adamantine lustre—Summary. Pt. III. Attempts at practical gloss measurements—The Ostwald-Klughardt method, comments on the method—Polarization methods, comments on the method—The “objective” glossmeter, comments on the method—The Goerz and Askania glossmeters, comments on the method, correlation of polarization and “other type” instruments—Goniophotometers, comments on the method—Distinctness of image measurements, comments on the method—Miscellaneous—Summary. Pt. IV. Discussion: Our present state of knowledge—How does one know that a surface is glossy?—Physical measurements and gestalt properties—Appearances of “Physical realities”?—Future research—Summary; Coda; References.

BMU


Résultats de l’examen radiographique de tableaux de L. de Vinci du Louvre, à l’occasion de l’exposition “Hommage à Léonard de Vinci.”

PC

1350. [Institute of art research, Tokyo.] Studies on art objects through optical methods. Bijutsu kenkyū, no. 159 (1950), pp. 174–190, pls., illus.

Contents: Foreword, by Akiyama Terukazu. Tells of a grant in aid to the Institute, beginning 1949 for studies under direction of the author on art subjects by optical methods including radiography, ultraviolet, infrared, and photographic enlargement. Professors from Tokyo and Nagoya universities collaborated in the project; Studies on Buddhist statues by radiography, by Nakayama Hidedaro. X-ray exposure charts are shown for different thickness of Japanese cypress, the wood most widely used in Japanese wood sculpture. With aid of diagrams he discusses the difficulties in interpreting the distorted shadowgraphs obtained in the radiography of solid wood objects. Opaque pigments and gilding on the surface are other variables which add to the difficulties; X-ray experiment on sculpture, by Kuno Takeshi. Dry lacquer statues radiograph easily and disclose the shapes and constructions of the wooden cores. Clay figures require long exposures but show wooden frames and inner details. It is most effective on wooden sculpture, especially on statues of the yosegi technique where wood blocks are assembled by mortise and tenon devices. It is possible to attribute the holy relics in the uchiguri (hollow interiors) of the statues; Studies on the pigments of ancient Japanese paintings by ultraviolet, by Yamasaki Kazuo. Fluorescent characteristics of various pigments are classified and charted. None of the ordinary pig-
ments used in old Japanese paintings fluoresce except China clay and calcium carbonate. Care must be used in interpreting fluorescence effects because binding materials like glue show strong bluish white fluorescence.

HPS


Report of work carried out in 1951 in the radiography of various masterpieces of Japanese sculpture in different materials. HPS


Examples of the use of panchromatic and infra-red photographs and of radiographs in studying the painting methods of Daumier, Corot, and Jerome Bosch. RJG


Special equipment is described for the support of paintings for X-ray and also for the purpose of taking stereo X-rays. There is a summary in French under title “Nouvelle méthode de l'applications des rayons X pour l'examen des peintures,” pp. 69–70. RJG

1354. MOURA, ABEL. Os raios infra-vermelhos e ultra-violetas aplicados no exame das pinturas. Portugaliae physica, 4 (1946), 9 pp., 18 illus.

Généralités sur l’application des rayons ultra-violets et infra-rouges aux tableaux. PC


Recherches radiographiques et stéréoradiographiques appliquées à l'examen des restes de St. Dominique contenu dans un cercueil fermé. Etude surtout anthropologique. PC


The value of infrared photography was demonstrated in the examination of the Meditation on the Passion, which bore a Mantegna signature but which had been attributed on stylistic grounds to Carpaccio. The Mantegna signature was related structurally to a dark, uneven varnish coating which covered certain voids and scars in the paint film. An infrared photograph revealed traces of an earlier Mantegna signature and another signature “victorjs carpattjj venettj opus.” Further microscopic examination revealed that this inscription was imbedded between two layers of the paint forming the label. There was no indication of stratification or of difference in paint structure be-
tween these two layers. The inscription, almost hidden in ordinary light, even after cleaning, was reached by the greater penetration of infrared rays. The Mantegna signature was removed.


The author points out the fallacy of hoping to obtain final answers about the age and authenticity of paintings by "scientific gadgetry." The difficulties in obtaining a clear X-ray pattern of the densities of a paint film when there are obstructions on the back of the panel have been partially overcome by a new technique, traversed focus radiography. The film is mounted in the closest possible contact with the paint film and the panel and film are rotated in the cone of the rays of the stationary X-ray source. The density pattern of the paint layer, in contact with the X-ray film, is recorded sharply while the shadow of an obstruction not in contact with the film moves during the exposure and is either blurred or lost altogether. This technique is estimated to be useful in perhaps 5 percent of the X-rays of paintings. Similar techniques are used in medical X-ray.

1358. Queen Isabella de Bourbon; a lost portrait by Velazquez located. Connoisseur, 128 (1951), p. 3. (Editorial).

Radiographs (reproduced) proved the existence of an earlier version of the portrait beneath this companion to the National Gallery 'Silver Philip'. The first version corresponds closely to a contemporary copy in the Copenhagen Museum.


Contents: The role of the photographer in crime detection—Theoretical introduction; Cases involving mechanical vehicles; Identification of persons; Criminal cases; The examination of documents of all types; The use of ultraviolet light in police work; Auxiliary apparatus for photography using the ultraviolet region; Photography using ultraviolet radiation; Photomicrography; Photography in infrared; Applications of photography in infrared; X-ray photography; Author index; Subject index.


The construction of paintings as revealed by X-ray, infrared, and ultraviolet radiations.


Nouvel appareil de rayons X permettant l'obtention de radiographies tridimensionnelles et stratifiées de tableaux.

Contents: Radiation in the visible spectrum—its emission, absorption and reflection; Radiation in the visible spectrum—its reception in the eye; The Trichromatic system of color measurement; Colorimeters—their design and use; Spectrophotometry applied to the measurement of color; The color atlas as a sub-standard of color measurement; Practical applications of colorimetry; Appendix I. Illuminants; Appendix II. The C. I. E. system of color specification; Appendix III. Condensed tables; Name index; Subject index.

**D. X-ray Diffraction Analysis**

1362. American society for testing materials. *Alphabetical and grouped numerical index of X-ray diffraction data*. Compiled under the Joint Committee on Chemical Analysis by X-ray Diffraction Methods, of the American Society for Testing Materials, the American Crystallographic Association, and the (British) Institute of Physics. Philadelphia, 1950. iv, 296; iv, 441 pp. (Special technical publication no. 48-B.)

Contents: I. The alphabetical index (white paper): Preface; General inorganic and organic index; Organic index; Minerals. II. The numerical index (blue paper): Preface; Numerical index.


"Samples of synthetic iron oxide (goethite) taken at regular intervals from a twelve-day continuous process showed progressive change of color, ranging from pale yellow to dark brown. X-ray diffraction, electron microscope, and optical microscope studies lead to the conclusion that the color change in these samples is mostly caused by particle growth."

Authors' abstract


Contents: Experimental methods, by G. W. Brindley; Kaolin minerals, by G. W. Brindley; Phase changes which occur on heating kaolin clays, by H. M. Richardson; The montmorillonite minerals (montmorillonoids), by D. M. C. MacEwan; The mica minerals,
by R. E. Grim, W. F. Bradley, and G. Brown; The chlorite minerals, by G. W. Brindley and K. Robinson; Vermiculites and some related mixed-layer minerals, by G. F. Walker; Sepiolite, by Mlle. S. Caillère; Palygorskite-attapulgite, by Mlle. S. Caillère and S. Hénin; Oxides and hydroxides of aluminium and iron, by H. P. Rooksby; X-ray diffraction by structures with random inter-stratification; by G. Brown and D. M. C. MacEwan; X-ray diffraction by randomly displaced layer lattice minerals, by G. W. Brindley; Non-clay minerals in clays, by D. M. C. MacEwan; The interpretation of the composite X-ray powder diagram, by G. W. Brinkley and D. M. C. MacEwan; Mineral and substance index; Subject index; Name index.  

BMU


The glaze used for the production of the silk-crepelike surface (Chirimen-hada) of the earthenware from Arita (Arita-yaki) has been subjected to X-ray analysis, and the results are summarized.


The method of chemical identification by means of X-ray diffraction is reviewed from the point of view of apparatus and techniques recently made commonly available, with particular emphasis on the use of long wave-length X-radiation. Experience in using the A.S.T.M. card index file of X-ray diffraction data is reported. The discussion is designed especially for the person who wishes to make use of this important analysis tool but who is not an expert in X-ray diffraction.

—Authors’ abstract.


Analyse aux rayons X et par mesure de densité d’un alliage d’électrum constituant un bijou antique égyptien conservé au Musée du Louvre: Introduction; Généralités sur l’analyse aux rayons X des solutions solides; l’Électrum; le Système or-argent-cuivre; Analyse d’un bijou égyptien; Interprétation des expériences; Discussion des résultats; Conclusion.

DG


Un bijou égyptien en électrum datant du Nouvel-Empire est examiné par diffraction de rayons X et par mesure de densité. Les caractéristiques observées sont comparables à celles décrites par Massins et
Kloiber pour des échantillons d’alliages de composition voisine, analysés aux rayons X. Interprétation des hétérogénéités et conclusion concernant la non-évolution de l’alliage durant plus de quarante siècles.

DG

E. Analysis for Dating Purposes (Radiocarbon, Fluorine, and Pollen Analysis)


The chemical purification and measurement of C^{14} at natural levels (10^{-12} curie/g. or less) are described. The chemical cycle involves: (1) conversion of the starting material to CO_2, (2) precipitation as CaCO_3, followed by evolution of the purified CO_2, (3) reduction to elementary C with Mg turnings, and (4) extraction with HCl and H_2O to remove Mg and MgO. The counting is done in a screen-wall counter with an A-C_2H_4 filling.


Samples for pollen analysis and radiocarbon dating obtained from soil profiles are expected to contribute towards a chronology of post-glacial events in the Aleutians. Because of the climate, pollen and spores are preserved in terrestrial deposits in good condition and in sufficient quantity for statistical analysis, of which examples are given. By correlation of the results on samples from archaeological sites and by radiocarbon dating a picture should be obtained of the climatic and living conditions at the time of the ancient Aleut settlements.

ERC


The results of tests on samples of wood dated by other methods are given. Two of the samples were from trees and had been dated by the tree-ring method. The other four were from ancient objects and had been dated from archaeological information. The agreement between the radiocarbon dates and the other dates is regarded as satisfactory.

ERC

This first extensive report on the estimated dates by the radiocarbon method of materials of mostly unknown or uncertain age shows in tabular form the results of measurements on 160 samples. Most of these samples are from the Americas and over half are from archaeological sites.


Used in connection with C\textsuperscript{14} work, the method employs pure barium metal heated with the carbon dioxide in a stainless steel vacuum furnace.


Evidence of date by C\textsuperscript{14} method.


Showing the application of pollen analysis to the investigation of four trackways through the raised bogs which lie between the Polden Hills and Wedmore Ridge.


Attention should be paid to the strong possibility that a variety of materials containing carbon that occur in the soil may be grossly contaminated with inactive carbon from interaction with ground water containing calcium carbonate in solution, and even to the possibility that some materials may become enriched in radiocarbon content. Neither marl nor caliche can be dated reliably, and the datability of peat is doubtful. Even charcoal should be washed with acid to remove possible carbonate, and appropriate procedures should be used for other archaeological materials. The object of this article is to warn enthusiasts for radiocarbon dating against assuming that no sources of error exist outside of those inherent in the actual laboratory measurement.

1375. BUSHNELL, G. H. S. Prehistoric America; comments on some C\textsuperscript{14} dates. Antiquity, 25 (1951), pp. 102-103.


A review article on the application of C\textsuperscript{14} to archaeological problems. The half life of C\textsuperscript{14} is about 5500 years. The samples are burned and reduced to pure carbon; the radioactivity of the carbon is measured in a specially constructed sensitive radiation counter. The measurement is expressed in the terms of the number of C\textsuperscript{14} disintegrations per minute per g. of C. This value is 15.3 for contemporary
living samples 5,568 years old and 3.83 for samples 11,136 years old. There is so little C14 in very old specimens that the error in counting is large so that effective range of the method at present is something less than 20,000 years. The year error in dating samples ranges from 5–10 per cent. The minimum amount of pure C necessary for a single counting run (the amount of C placed in the Geiger counter) is \( \frac{1}{2} \) oz. (8g.). It is necessary to have about 2 ounces of plant material or wood, 1–3 ounces of charcoal, 4 ounces of shell, 5–10 ounces of dung or peat and 1 to several pounds of antler or burned bone. For greater accuracy obtained by making 2 independent counting runs \( 2 \times \) these quantities are necessary. History of the development of the process is outlined and examples of its application to archaeological problems are given.


The theory of radiocarbon dating is reviewed. The apparatus and technique employed for radiocarbon dating at the University of Michigan is described in considerable detail with pictures and diagrams. The activity of the relic is compared with that of two other C14 samples of known age.


The construction and method of operation of a completely automatic counter are described. Drawings of mechanical details and circuits are included. The characteristics of this counter are described with illustrative graphs. Important precautions for the use of C14 counters in general are discussed.


Ecological terms and concepts, effects of climatic change on mire vegetation and stratigraphy, correlations of stratigraphy with pollen-analyses and archaeology.


Fluorine contents of 10 samples of human bones, of which nine are from various old shell mounds and the last one is of the present time, were determined. Maximum value found was 0.27 percent F. Older bones contain more F than the present one and the ratio \( F/P_2O_5 \) appears to increase with the length of time elapsed.


Twenty-four references.

Methods and usefulness.


Contents: Introduction, by Frederick Johnson; Radiocarbon dates and early man, by Frank H. H. Roberts, Jr.; An assessment of certain Nevada, California, and Oregon radiocarbon dates, by Robert F. Heizer; Some Adena and Hopewell radiocarbon dates, by James B. Griffin; Radiocarbon dating on samples from the Southwest, by William S. Webb; Radiocarbon dates on samples from New York State, by William A. Ritchie; Comments on radiocarbon dates from Mexico, by Helmut de Terra; South American radiocarbon dates, by Junius Bird; The Lascaux cave, by Hallam L. Movius, Jr.; Radiocarbon dates and their influences in the Near and Middle Eastern areas, by Robert J. Braidwood, Thorakild Jacobsen, Richard A. Parker, and Saul Weinberg; Discussion of the geologic material dated by radiocarbon, by Richard Foster Flint; Discussion of the relation of some radiocarbon dates to pollen chronology, by Edward S. Deevey, Jr.; Radiocarbon dating: a summary, by Frederick Johnson, Froelich Rainey, Donald Collier, and Richard F. Flint; Bibliography.


By addition of a Hg shield around the Geiger counter used in C\textsuperscript{14} age determinations the background count can be reduced from 5 to 2 counts per minute. Thus the limit for determination of the absolute age of natural C is extended from 25,000 to 30,000.


This is the first report from the Lamont Geological Observatory of Columbia University of measurements of C\textsuperscript{14} activity of carbon from modern materials and from samples of archaeological and geological interest. Age determinations of eight archaeological samples are reported; The second report (*Ibid.*, 116 (1952), pp. 409-414) includes age determinations of 18 samples of archaeological and paleontological interest as well as age determinations of a larger number of samples of geological interest. It is shown that the count rate in C\textsuperscript{14} determinations is a function of the size of the sample and that carbon samples weighing as little as 0.5 gram may be used, though measurements on such small samples are more difficult and less precise.

Results are given of measurements of the C\textsuperscript{14} activity of carbon from different kinds of recent organic materials, mostly woods, originating in various parts of the world. On the basis of the agreement of the results it is suggested that the C\textsuperscript{14} activity of carbon from ancient materials may be an index of their age. Test measurements of the C\textsuperscript{14} activity of carbon from Egyptian wood samples of known age show good agreement with the calculated activity. Tests on younger materials of known age are in progress and the measurement of ancient materials of unknown age is projected for the near future. ERC


This list covers measurements made in the period from September 1, 1951, to September 1, 1952. Of the 50 samples examined, over half are from archaeological sites.


Dates established during the period from September 1, 1950, to September 1, 1951, are listed in tabular form. Sixty-two samples, from all parts of the world were measured. Most of these were materials from archaeological sites.


Contents: Preface; Principles; World-wide distribution of radiocarbon; Half-life of radiocarbon; Preparation of the sample for measurement; Measurement of the sample; Radiocarbon dates; The significance of the dates for archaeology and geology (by Frederick Johnson); Appendix—A. Special equipment and chemicals for the C\textsuperscript{14} sample preparation apparatus.—B. Special materials for screen-wall counter; Index of subjects; Index of names; Index of samples.


A review of the C\textsuperscript{14} dating method applied chiefly to the archaeological remains of prehistoric man. The results thus far indicate that: the method is valid and, bearing in mind the expectable error, that a majority of the dates obtained are presumably accurate. Improved methods for collecting samples and greater care in avoiding subsequent contamination probably will sharply reduce the number of unacceptable determinations. Good bibliography.

RJG

The date determined by the C\textsuperscript{14} process for the linen wrappings of the Dead Sea Scrolls is A.D. 33 plus or minus 200 years. This is in agreement with the dating (Hellenistic) of the pottery found in the cave.


The suggestion is made that the distribution of certain elements and their amounts should be different in middens than in the surrounding undisturbed soil. Test middens at two localities were systematically sampled at different levels, and the samples were analyzed for chloride, copper, and zinc. The two metals were determined in different types of extracts in order to distinguish between the metals combined in minerals and combined in organic matter. It was found that the copper and zinc content was distinctly different in the midden samples than in corresponding samples from the surrounding soil. Apparently a period of 1,000 to 2,000 years is not long enough to bring the distribution of these trace elements back to that in a comparable undisturbed site. It may be possible to approximate the age of archaeological sites from differences of this kind.


In view of the present interest in the fluorine content of American animal and human bones as an index of their antiquity, it may be of interest to recall that Wilson in 1895 used the fluorine test to show the antiquity of a human bone found at Natchez. This early work appears to have been overlooked.


The inconclusiveness of the fluorine test for the bones in this cave is probably due to their deposition under conditions where they could not come in contact with ground water. Attention should be given to this kind of limitation of the fluorine method of dating.


Vertical and horizontal distributions of P content of soils of prehistoric site in Kitami, Setagaya, Tokyo were determined. P content is high near the prehistoric site.

1396. Zeuner, Frederic Eberhard. Dating the past; an introduction to geochronology. 2d. ed. rev. and enl. London, Methuen & co., 1950. 444 pp., illus., maps, diagrs., pls., tables.
Contents: Preface; Introduction; Early history and late prehistory, especially in North America; Dating the metal ages, new and middle stone ages, and the climatic phases which followed the ice-age; Dating the old stone age, the phases of the ice age and the pluvial phases of the warmer countries; Dating the history of the earth and of life before the arrival of man; App. I. Tree-ring analysis; App. II. Correlation of pollen-analytical phases; App. III. Varve dating; App. IV. Radio-active carbon dating; Bibliography; Index.


The use of radioactive carbon for the estimation of the age of archaeological objects has attracted widespread attention. Briefly the method relies on the fact that neutrons from cosmic rays are captured by atmospheric nitrogen. The nucleus formed disintegrates immediately, casting out a proton, and a carbon atom of the atomic weight 14 is left. These atoms are radioactive and disintegrate by expelling an electron, the half-life being 5,568–30 years. With the expulsion of the electron the atom reverts to ordinary nitrogen of atomic weight 14. During their period of existence, the atoms of carbon-14 enter into the carbon dioxide of the atmosphere in much the same way as the atoms of normal carbon (carbon-12). The concentration of carbon-14 in the atmosphere is about 10 gm. per gram of carbon-12. Since carbon dioxide provides virtually all the carbon used by plants in building up their tissues, the isotopic composition of carbon in living vegetable matter must be the same as that of atmospheric carbon, and the same applies to living animals, all of which ultimately derive their body material from the plant kingdom. But once an organism is dead, it will no longer receive carbon of atmospheric composition, and its content of carbon-14 will disintegrate according to its half-life period. The proportion of carbon-14 to carbon-12 in dead organic matter, therefore is a direct function of the time elapsed since the death of the organism, and this provides the means of dating the organism by isotopic analysis of its carbon.

The various assumptions on which the carbon-14 method rests are discussed critically. Nevertheless the method is providing answers to some important archaeological problems. Examples are given.


A detailed comparison of the screen wall counter with a gas sample counter with respect to the problems of radio-carbon dating is given. Curves are presented showing the accuracy and range method as functions of the background rate and the counting time. The errors due to intrusion of extraneous carbon are presented and discussed and certain improvements in the method are described. Twenty-four references.—Authors' summary.

Knowledge of the world-wide distribution of radiocarbon in the biosphere is necessary as a basis for radiocarbon methods of geological dating. Mean specific activity was measured on wood samples from widely varying latitudes. The observed mean assay of carbon in equilibrium with the atmosphere is $16.1 \pm 0.5$ disintegrations per minute per gram of carbon and the fluctuations over the earth’s surface are less than 2 percent which is within the experimental error of radioactive measurements. It appears that there has been no considerable variation in cosmic ray intensity over the past several thousand years.

RJG
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