Introduction

In the analysis of easel paintings, laboratory methods play a double role. They are useful on one hand in the study of technology, and on the other hand in the field of conservation and restoration.

The history of art is a special branch of history and by virtue of this uses texts, archives and literary source material. It examines the content of a work of art by iconography and iconology. It uses art criticism to date and attribute a work when other methods are unable to do so.

Often, criticism of style seems uncertain after it has produced numerous errors. More and more there is a turning towards the study of the material structure that depends on technology. It is in this area that laboratory methods play an increasing role and complete the pure and simple observation of a work without an instrument.

As soon as it is completed a work of art evolves and deteriorates. This is brought about by internal factors as well as by conditions of conservation and the action of man. Here too a good knowledge of the material structure of a work from its beginning and through its evolution is indispensable in order to define the best conditions for conservation and eventually propose a restoration treatment. In this regard the role of laboratory methods is also essential. It is understandable therefore that a good definition of the material condition of a work and its internal structure is necessary for both the areas of art history and conservation.

***

The history of the use of laboratory methods for painting is still rather sketchy. It is sometimes thought to have begun with the invention of photography and followed by the step-by-step developments of this physico-chemical technique applied one after the other to the present field. The same parallelism exists between the evolution of physics and chemistry and the application of these sciences to a better knowledge of paintings. The laboratory methods for the history of art are therefore a part of contemporary scientific evolution of which they are only one aspect. However, this aspect can involve developments and applications that are characteristic.

It is therefore logical that laboratories have been created that were specific not only by the object of study, that is, the work of art, but also by the particular techniques that they develop.

These laboratories are the converging point of various specialities such as art history, physics, chemistry, photography techniques, restoration and conservation.

The importance of the problems that need to be solved as well as the improvement of techniques have given rise to 'specialization in the specialization' such as the chemistry of oily mediums, dendrochronology, the diagnosis of the condition of a work of art.

*
**

For this work we have benefited from the collaboration of specialists with a great experience in research, each in his own field. While we think that this study may lack some homogeneity, it gains surely in scientific rigor.

The translation of the original texts was carried out under individual supervision of the authors, the final editing of the English version has been achieved by Miss Anne Lovelace Holloway, M.A. (Princeton Univ.).

*
**

First of all, it is important to define the separate structural elements that make up an antique painting : supports and frames (chapter I), ground, paint layer, varnish (chapter II), underdrawing (chapter VI). It has been seen that a work of art undergoes a natural evolution that goes towards a degradation and besides this natural evolution, there exist modifications due to conservation conditions or because of the intervention of man. Modern methods of conservation and restoration strive to remedy these disadvantages by proper and, in principle, reversible treatments (chapter III).

The methods of examining works use radiations situated in the visible spectrum : photography in black-and-white and color, raking light, macrophotography, binocular microscope examination and microphotography (chapter IV). Next come the radiations that are situated outside of the visible spectrum. Ultraviolet rays have been used for a long time especially to determine the state of conservation of the protective layers and/or the paint layer. They presently give other information (chapter V). Infra-red rays allow the underdrawing, placed before the paint layer, to be seen (chapter VI). X-rays give information on the state of conservation and the make-up of the work (chapter VII).

Samples mounted in opaque sections or in the layers illustrate the superposition of the layers and can reveal to a certain extent the materials they are composed of (chapter VIII). Different methods from physical chemistry identify the materials of a painting : supports, ground, pigments (chapter IX), mediums, varnish (chapter X).

Certain methods reveal or try to discover an absolute dating. Some are based on radioactivity : C^{14}, Pb^{210} (chapter XI) ; the others use dendrochronology (chapter XII).

ACKNOWLEDGMENTS

We are greatly indebted to Professor Tony Hackens who assumed the publication of this book, providing us with invaluable help. We also thank Mrs. Thérèse Poilvache-Lambert and Mr. Francis Poels who collaborated in the correction of the proofs, and Miss Tine Stynen who spent many hours in typing. Mrs. Anna Trobec-Henrard was helpful on many occasions, Mrs. Nancy Holloway accepted to read and improve the english when necessary. Their help is gratefully acknowledged.

R.V.S. H.V.M.

BIBLIOGRAPHY

Books and articles

M. DE WILD, *The scientific examination of pictures*, London, 1929.

R. MANCIA, *L'esame scientifico delle opere d'arte ed il loro restauro*, Milan, 1936, 2 vol.

J. CORRADINI, *Cuadros bajo la lupa. Manual de conservación para uso de los coleccionistas, con un metodo de examen ocular y consejos sobre restauración*, Buenos Aires, 1956.

M. HOURS, *A la découverte de la peinture par les méthodes physiques*, Paris, 1957.

P. COREMANS, *Le laboratoire et sa mission*, in *Musées et Monuments*, 9, 1959, p. 101-126.

E.T. HALL, *Application of science in examination of works of art*, Boston, 1959.

S. AUGUSTI, *Les méthodes d'analyse appliquées aux œuvres d'art et aux antiquités*, in *Recent Advances in Conservation*, London, 1963, p. 19-25.

M. HOURS, *Les secrets des chefs-d'œuvre*, Paris, 1964.

R.H. MARIJNISSEN, *Dégradation, conservation et restauration de l'œuvre d'art*, Brussels, 1967, 2 vol.

B. HALLSTRÖM, *Några tekniska undersökningsmetoder för konstföremal*, in *Scritti di Archeologia ed Arte in onore di Carlo Mauro Lerici*, s.l.n.d., p. 103-113.

J. GLENISSON, L. HAY *et al.*, *Les techniques de laboratoire dans l'étude des manuscrits (Colloques internationaux du Centre national de recherche scientifique*, n° 548), Paris, 1974.

H. KÜHN, *Möglichkeiten und Grenzen der Untersuchungen von Gemälden mit Hilfe von naturwissenschaftlichen Methoden*, in *Maltechnik. Restauro*, 80, 1974, p. 149-162.

J. FLEMING STUART, *Authenticity in Art : the Scientific Datation of Forgery*, Bristol-London, 1975.

J.R.J. VAN ASPEREN DE BOER, *An introduction to Scientific Examination of Paintings*, in *Scientific examination of early Netherlandish Painting. Applications in Art History*, in *Nederlandse Kunsthistorisch Jaarboek*, 26, 1975 (1976), p. 1-40.

R. VAN SCHOUTE, *Les méthodes de laboratoire au service de l'étude de l'histoire de la peinture flamande au XV^e siècle*, in *Dirk Bouts en zijn tijd. Tentoonstelling Leuven 1975*, Leuven, 1975, p. 381-387.

M. HOURS, *Analyse scientifique et conservation des peintures (Découvrir, restaurer, conserver)*, Fribourg, 1976.

R. VAN SCHOUTE, *Het laboratoriumonderzoek ten dienste van de studie der schilderkunst*, in *Arca Lovaniensis*, IV, 1976, p. 33-40.

D. HOLLANDERS-FAVART, R. VAN SCHOUTE et H. VEROUGSTRAETE-MARCQ *et al.*, *Het laboratoriumonderzoek ten dienste van de studie der schilderkunst. Aanwending ter kennis van de materiële toestand en van de technologie der kunstwerken. Les méthodes de laboratoire au service de l'histoire de la peinture. Applications pour la connaissance de l'état matériel et de la technologie des œuvres. Laboratory techniques applied to the history of painting. Applications in the diagnosis of art work : condition and technology*, in *Arca Lovaniensis*, IV, 1976, p. 136-205.

F. MAIRINGER, *Untersuchungen von Kunstwerken mit sichtbaren und unsichtbaren Strahlen* (in collaboration with P. HALBGEBAUER and H. HUTTER), Vienne, 1977.

K. NICOLAUS, *Gemälde im Licht der Naturwissenschaft. Herzog Anton Ulrich-Museum Braunschweig. 11 juni bis 20 August 1978*, Brunswick, 1978.

R. VAN SCHOUTE and H. VEROUGSTRAETE-MARCQ, *Toepassing van de laboratoriumtechnieken ten dienste van de geschiedenis van de schilderkunst. Beknopt overzicht*, in *Kunst en Oudheden in Limburg. « Kijk op Kunst ». Schilderijen onderzocht met natuurwetenschappelijke methoden*, 21, 1979, p. 9-16.

K. NICOLAUS, *Gemälde-Untersucht-entdeckt-erforscht*, Brunswick, 1979.

C. PÉRIER D'IETEREN, *L'application des méthodes physiques d'examen à l'étude du modelé dans la peinture flamande du XV^e au XVII^e siècle*, in *Annales d'histoire de l'art et archéologie de l'U.L.B.*, I, 1979, p. 41-56.

M. HOURS *et al.*, *La vie des chefs-d'œuvre. La science au service de l'art*, Paris, 1980.

R. VAN SCHOUTE and H. VEROUGSTRAETE-MARCQ, *Een doordringende kijk op kunst. Laboratoriumtechnieken voor het onderzoek van schilderijen*, in *Natuur en Techniek*, 48, 1980, p. 246-265.

H. VEROUGSTRAETE and R. VAN SCHOUTE, *Kijk op Kunst. Vier schilderijen doorgelicht*, in *Natuur en Techniek*, 48, 1980, p. 709-807.

R. VAN SCHOUTE, *Méthodes de Laboratoire et Histoire de la peinture. Considérations générales* (Fonds national de la recherche scientifique. Groupes de contact. Physique, chimie, géophysique et sciences de la Terre), Brussels, 1981, p. 255-264.

P. PHILIPPOT and C. PÉRIER-D'IETEREN, *Apport des examens technologiques à l'histoire de la peinture*, in *Revue de l'art*, 60, 1983, p. 15-34.

J. LIGOT, L. FAILLANT-DUMAS, J.-P. RIOUX, C. DE COUESSIN, C. LAHANIER, A. DUVAL, J. GAUTIER, L.-P. HURTEL, F. DRILHON, M. MENU, J.-M. MALFOY, S. EFEYAN, *Les méthodes scientifiques dans l'étude et la conservation des œuvres d'art* (École du Louvre), Paris, 1984.

Periodicals

Art and archeology technical abstracts, New York, 1955-

Boletin del Museo del Prado, Madrid, 1980-

Bolletino dell'Istituto Centrale del Restauro, Rome, 1950-

Bulletin de l'Institut royal du patrimoine artistique, Brussels, 1958-

Bulletin du Laboratoire du Musée du Louvre, becomes *Laboratoire de recherche des Musées de France. Annales*, Paris, 1959-

Informes y Trabajos del Instituto de Conservación y Restauración de Obras de Arte, Madrid, 1961-

Maltechnik Restauro. Internationale Zeitschrift für Farb-und Maltechniken, Restaurierung und Museumsfragen, communication of IADA, Munich, 1895-

National Gallery. Technical Bulletin, London, 1977-

Studies in Conservation. The Journal of the International Institute for Conservation of Historic and Artistic Works, London, 1952-

Technical Studies in the Field of the Fine Arts, Harvard University, 1932-1942.