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Conservation Science—the Next Stage*

"Sciences not yet underpinned by theory are not yet much more than kitchen arts."
(Sir Peter Medawar, Encounter, *August 1965.)*

CONSERVATION RESEARCH HAS NOT YET MADE ANY IMPACT on the world of science. Most conservation scientists would react in blankness or panic to the suggestion that they should be able to make theoretical contributions to physics or chemistry. I mean this in an international context; there is no organization for scientific research in conservation anywhere in the world which scientists would regard as a place interesting enough to "keep an eye on", a place from which new and fertile ideas are to be expected.

The reason is that none of our research is yet at a sufficiently advanced level. I will be more explicit on what subjects could be called "advanced" on p. 269. In a general sense, to talk about an advanced level is to imply an evolution in successful scientific disciplines, and this is surely correct. Most branches of science have grown from a desire either to solve practical problems (e.g. engineering, chemotherapy, meteorology) or to describe in an orderly fashion (e.g. botany, genetics, organic chemistry) or from a combination of the two. Once knowledge is ordered and problems are solved at the simplest practical level, the development of a theoretical framework begins. With the details of plant anatomy before him the botanist can speculate on the mechanism of growth. A difficult bridge is built, and this becomes the starting-point for mathematical theories of general application. At this point a science becomes self-regenerating. Problems solved engender new problems at a deeper and more general level. The development of this theoretical superstructure is in fact a sign that the new science has become viable.

Conservation science has had its successes in saving valuable objects from decay, and analytical results of good quality are steadily accumulating. We have now, for example, a lot of data on the composition of metal objects and on the pigments used in paintings. But why, after thirty years or so, are we still stuck in this first stage? To track this down we might first take a look at the administrators' motives in setting up a museum scientific laboratory, and then at the motives of our scientists in choosing this career.

(A) MOTIVES FOR SETTING UP A LABORATORY IN A MUSEUM

Science and art are said to be at the two extremes of the educational spectrum, and it is usually assumed that there must be a similar gulf between the scientist and the art-historian. To some extent this is undeniable, and I mention it in this context because in the museum it is nearly always the art-historian as director or administrator who will decide whether and in what form a labora-

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tory should be created. His assessment of requirements is consequently unlikely to extend beyond the first stage outlined above—practical problem-solving in restoration, and the use of analysis. Exceptionally, as with my own laboratory, a museum director has had the foresight and trust to leave considerable independence to the laboratory for its development.

Yesterday or today a museum administrator might list the following reasons for setting up a laboratory:

(1) To bring useful scientific techniques into the museum (e.g. X-rays, chemical analysis).

(2) To have an "expert" in this particular branch of knowledge at hand for immediate consultation.

(3) To aid authentication and detection of forgeries.

(4) To perform analyses of the kind considered necessary for conservation and documentation. Thus it is now accepted that laboratory information on methods of construction and extent of deterioration can aid the restorer, and that the information should be stored for future needs.

(5) To perform certain kitchen arts, such as the preparation of varnishes and adhesives from the newer materials. In a more advanced sense, to check on the quality of materials used in conservation, and to advise on new materials.

(6) To carry out particularly technical conservation operations.

(7) To advise on conditions for storage and display.

(8) Research is always mentioned as a desirable objective, but the implications of the word are rarely understood.

All these objectives are perfectly feasible, however phrased, and, except for the last, examples of the usefulness of science in the museum could readily be provided for each of them.

(B) MOTIVES OF THE SCIENTIST WORKING IN A MUSEUM LABORATORY

A scientist, like everyone else, has a desire for a reasonable salary and dignity. He also wishes to be thought useful and to acquire a reputation. These last two motives, though almost universal, acquire a certain bias in the museum laboratory which should be explained.

(1) To be thought useful: in every large museum day-to-day problems crop up which need scientific or technical information. Analytical laboratories exist to solve problems as they come along. The scientific staff in museums can and do quite easily pass from one such problem to the next. Most of them would protest that, however much they want to tackle the big problems, the pressure of enquiry prevents them from doing so. But the temptation of immediate reward in terms of the approbation of ones colleagues also plays its part. It is warmly satisfying to be able to come back in a couple of days with the answer to a problem. Advanced research, on the other hand, may entail a three-year project, which when completed poses more questions than it has answered. I am suggesting, nevertheless, that the stage is now overdue when there ought to be just one group in each major country doing advanced research, of the kind which engenders its own problems. Though serving the conservation of antiquities, such a group would necessarily be run on established scientific lines.

(2) To make a reputation: museum scientists hover between two worlds, science and art technology. The situation up to the present has forced almost

all of them to opt out of the scientific world, where competition is in any case keen, for the smaller and less scientifically critical world of museums. Most museum scientists are therefore satisfied to become known on the international museum scene. Quick routes to recognition are the application of new scientific gadgetry, a new conservation process, or influence on the course of museum affairs. None of these place enough emphasis on good research, which is perhaps why new museum laboratories find it easier to get their expensive equipment than to recruit high-grade scientific personnel.

(3) A science graduate may use the art world as a form of escape from a life of undiluted science. In the sense that this is symptomatic of a lack of abiding interest in science it is a bad thing. In the shelter of a museum a "scientist" can quite easily give up all attempts to keep up with scientific literature. This kind of free-wheeling, or getting along on one's university science, merely results in premature scientific senility.

(4) The able scientist asks precise questions in order to get precise answers. As has often been remarked, he should be able to formulate questions in a way that leads him, firstly, to define the boundary between the known and the unknown, and secondly to lay a path further into the unknown. There is no denying that this leads him away from superficial solutions towards a more theoretical approach. I am suggesting to you that we need a group of such people in conservation. They in turn must be persuaded that they will find in museums a fertile field for discovery.

THE FUTURE PROGRESS OF SCIENTIFIC RESEARCH IN CONSERVATION

Today it could be said that museums in this country have, compared with others, more than their quota of scientifically well-qualified people. The British Museum Laboratory is fulfilling its stated three principal functions as an information centre, an analytical laboratory, and a restoration workshop for problem pieces; the National Gallery Laboratory specializes in pigment analysis and the history of techniques, and continues a tradition of more basic research on a limited scale on paint media and the museum environment; the Victoria and Albert Conservation Department directs scientific enquiry particularly to the deterioration of textiles; the Courtauld Institute Technology Department pioneered teaching and research in the technology of paintings; the Oxford Research Laboratory for Archaeology exemplifies a modern electronic approach to exploratory and analytical methods.

The prominence of British conservation scientists at international conferences indicates that these are relatively sound lines of endeavour. Present trends require that analytical facilities should indeed be increased.

In 1961 the International Institute for Conservation held a conference on Recent Advances in Conservation. Though there were criticisms that, instead of much-needed practical instruction in modern techniques, delegates got a lot of instrumentation, technicality, and generalization, these can be set aside in the present enquiry. The conference fairly represented the present state of scientific research in conservation.

A glance at the conference proceedings, published as *Recent Advances in Conservation* (Butterworths 1963), will show that there is in it quite an accumulation of special knowledge which could be called "applied" conservation science. Without some background of this experience no scientist can any longer be a useful expert in a museum. A properly structured scientific discipline, however, requires progress on the complete spectrum from "applied" to "pure", from "practical" to "theoretical" science. In our case the pure or theoretical end of the spectrum is absent.

The current argument that too much emphasis has been placed in this country on pure research, that is to say research with no stated goal of practical usefulness, simply does not apply to museum science, where no pure research at all is performed. Whatever names are used to describe it, what we need to do is to counterbalance a lot of superficial laboratory work with some research in depth, giving results of good explanatory power.

It will be pointed out that our museum laboratories can at least be centres through which useful elements of science and technology are passed into the museum. We do indeed make plentiful use of many branches of science. But do scientists outside the museum profit from our scientific thought, or is the traffic one way only?

Conservation in the museum means the care of antiquities. But if the word conservation denotes any kind of effort to increase the permanence of material objects it has a wider scope than this, and the conservation of antiquities could be said to be only one of two large fields. In the other field of conservation (although it is never so called) are the products of industry—metal articles, textiles, polymers, etc. We could profitably examine how industry is dealing with its conservation problems. Without going into any detail it is perfectly clear that the effective research on corrosion of metals, stabilization of polymers, weather-proofing of textiles, storage of foodstuffs, etc., dwarfs anything in the museum field. But there is nothing very awful about this. After all, food, clothing, steel, and plastics play a much more immediate part in peoples' lives than the material achievements of past civilizations. Also we can use much of this research ourselves, though it never seems quite to suit what we want most to know. The lesson to be drawn from industrial research is not the size of its commitment but its recognition that practical problem-solving must be counterbalanced and sustained by a proportion of theoretical research.

SOME PROJECTS FOR ADVANCED RESEARCH

If I were asked to give my own views on what conservation topics require advanced scientific research I would give some such list as the following. But next year my list would probably be different in many particulars, and, more important, I would not expect anyone with scientific initiative to stick to such a list.

Although none of the headings below mention analysis, almost all of them depend on the availability of analytical data. Since such data are still far too scarce (especially in organic chemistry), a laboratory for advanced research would inevitably need to perform a good deal of analytical work.

The main field of research is the "Chemistry and Physics of Very Slow Changes" in (*a*) solid polymers, (*b*) organic colours, (*c*) metals, (*d*) inorganic material such as pigments, ceramics, glass. Biological attack is probably adequately covered by existing organizations.

Some projects in the main field:

Photochemistry of the surface, and variation of change with depth.

Erosion of organic surfaces in museum conditions.

Physical chemistry of slow evaporation and diffusion in organic solids and metals.
Acquisition of quantitative data on museum deterioration.
Effects of climatic variation in the museum.
Effects of moisture movement.
Influence of heat on very slow processes.
Corrosion of buried metal objects and the formation of zoned corrosion crusts.
Chemistry of underwater deterioration.
Bond-strength requirements in polymers suitable for conservation.
Fundamentals of consolidation strengthening and stabilizing processes.
Late stages in the oxidation of paint media.
Methods for monitoring very slow changes in museum material.

CONCLUSION

There are two distinct needs in conservation today. The first is for a wider dissemination of routine but up-to-date conservation and restoration techniques—for more restorers, better trained. Important though this is, it has not been my concern in the present article.

The second need—for advanced research on the lines described above—links up with the first, or, one might say, lies behind it. Conservation techniques cannot be put on a sound basis without a thorough knowledge of deterioration processes.

I am in no sense proposing, however, that the existing museum laboratories are wrongly directed. Their trend will, in fact, be towards expansion as their facilities become increasingly in demand. Indeed it may one day appear incongruous that a museum, meaning here an organization storing and handling a variety of materials, should be without, at the very least, analytical facilities.

In this article I have put the case for a pattern in the planning of science that is widely accepted in the larger industries of Europe and America. Our several museum laboratories should be backed by a central institute for advanced research, independent from, but formally connected with the museums and restoration centres of the country.

The most important point of organization, however, is to bring conservation science into the main stream of scientific activity, and this, it seems to me, can only be done by setting up the new institute within a university, though preferably near an important museum. This will mean a loss of daily contact with museum staff and reduced facilities for examining important antiquities. But, whereas such losses would be most undesirable for the orthodox museum laboratory, the gains for the new laboratory would be decisive. Two of the most cogent reasons for the lack of original scientific work in the conservation world are isolation from daily contact with scientific colleagues and separation from the challenges of a scientific career. The resulting loss of scientific rigour would be corrected in a university setting.