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International Cooperation in Conservation: CCI's Role

by Cliff McCawley

The *Directory of World Museums* covers 160 countries and lists approximately 30,000 museums. The number is growing rapidly, since increasing leisure time and disposable income, and the growth of mass education have made museums more and more popular and changed how we perceive them. Over the past twenty or so years, the museum world has slowly realised that if their collections are to survive, conservation is of paramount importance. This is especially true with ethnographic collections since in the post 19th century period, traditions around the world are rapidly being lost and with irreversible environmental damage occurring, collections are deteriorating at accelerating rates and are increasingly irreplaceable. This has resulted in an increase in the number of

Minister of Communications Visits CCI

by Charles Gruchy

The Honourable Marcel Masse, Minister of Communications, visited CCI on 26 April and was able to stop in all of the treatment and research laboratories and the library. The Minister was particularly interested by CCI's broad range of conservation disciplines and how research and treatment go hand in hand at CCI. For example, the current treatment of the Drapeau de Carillon is, perhaps, one of the most complex problems in textile conservation being undertaken in North America. Similarly, a group of exceptionally fragile 16th century wooden polychrome sculptures has presented us with the challenging problem of removing up to layers of overpaint from the surface, while preserving the deterioated wood underneath. The Minister found the Works of Art in Transit project, a cooperative research project with the Conservation Analytical Laboratory of the Smithsonian Institution, the National Gallery of Art in Washington, the National Gallery of Canada and the Tate Gallery in London, to have great value for Canadian museums.•

The Honourable Marcel Masse and Ela Keyserlingk, textile conservator, discussing the treatment of the Drapeau de Carillon.

conservators, conservation scientists and conservation facilities (although by no means commensurate with the number of artifacts awaiting treatment), and in the same way that museums are geographically diverse, conservation has become a truly international undertaking.

With the growing awareness of the need for conservation and research into conservation methods, and the realisation that the funds available to overcome the formidable problems are insufficient, international cooperation is essential. Internationally, the conservation of movable cultural property has become focused in three major professional bodies: ICOM, ICCROM, and IIC.

ICOM

The International Council of Museums (ICOM) is a non-governmental organization which was established in 1947 to encourage international cooperation within the museum profession. Based in Paris, it consists of national committees and more than twenty international committees, one of which is concerned with conservation. The Committee for Conservation had its roots in a Committee on the Care of Paintings, set up in 1948. Today, the Committee for Conservation has approximately 600 members in 26 Working Groups, holds international Triennial meetings and publishes papers from these meetings. Over the years, CCI staff have played an active role in the activities of the Committee for Conservation. For example, Brian Arthur, an earlier Director General of CCI, was Chairman of the Committee for Conservation, and is now Chairman of the ICOM Advisory Committee. The author is a Directory Board Member and Treasurer of the Committee, as well as being Coordinator of the Metals Working Group. David Grattan was for six years Coordinator of the Working Group on Waterlogged Organic Archaeological Materials. He has recently been selected as one of the first Moderators, who for the next Triennial will play an increasingly important role in the production of Preprints and the organization of the conferences. Other staff members such as Raymond Lafontaine and Tom Stone have been Working Group Assistant Coordinators. CCI staff members have also, over the years, presented many papers at the Triennial meetings. Ottawa hosted the 6th Triennial Meeting of the Committee for Conservation in 1981, and the Canadian National Committee of ICOM will organize the ICOM General Conference in Quebec City in 1992.

ICCROM

In 1959, UNESCO established the International Centre for the Study of the Preservation and Restoration of Cultural Property in Rome, with a mandate to encourage international cooperation through study and dissemination of information concerning the scientific and technical problems of the preservation and restoration of cultural property. The name was changed in 1977 to the short form, International Centre for Conservation : Rome (ICCROM). ICCROM is now largely concerned with training and documentation, promotion of research, and provision of aid and technical assistance for specific conservation problems and emergencies to Member States. Training courses last up to six months and present

Proceedings from Symposium 88

Conservation of Historic and Artistic Works on Paper

Symposium 88

Conservation des oeuvres historiques et artistiques sur papier

October 3-7, 1988, Ottawa, Canada

Work is progressing on the preparation of the proceedings for Symposium 88, The Conservation of Historic and Artistic Works on Paper, held October 3-7, 1988 in Ottawa. We hope to have this publication available for distribution by December, 1989. The proceedings will be distributed free of charge to all invited speakers and to delegates who paid the full registration fee for the week of Symposium 88. Students and one-day registrants will not receive a complimentary copy. Copies will, however, be available for sale. The price will be determined at the time of publication.

Copies of the Abstracts of the papers presented at Symposium 88 are still available at a cost of $10.00. We are exploring the possibility of reproducing, for sale, a set of audio tapes of the complete oral proceedings of Symposium 88. These should be available by December 1989, at the same time as the printed proceedings. Cheques made payable to "Symposium 88" must accompany all orders.

Anyone interested in ordering the above items should write to:

Extension Services
Canadian Conservation Institute
1030 Innes Road
Ottawa, Ontario, Canada
K1A 0C8

and past CCI staff (Robert Barclay, John Dawson and Charles Hett) have taught there.

ICCROM is formed by a General Assembly of Member States which are those Member States of UNESCO that have made formal declaration of accession to ICCROM and that pay to ICCROM an annual contribution of 1% of their contribution to UNESCO. Half of Canada's contribution is paid by the Department of Communications, and half by the Department of the Environment. The Director General of CCI, Charles Gruchy, is a member of the ICCROM Council which is the executive body.

IIC

In 1950, the International Institute for Conservation of Historic and Artistic Works (IIC) was founded. This professional body, based in London, England, is organized at the level of the individual conservator, conservation scientist or restorer. The objective for which the Institute was established was to provide a permanent organization which, in a variety of ways, would promote the protection and preservation of movable cultural heritage. It focuses its efforts on keeping the membership informed of technical advances in conservation and by acting as a contact between members in differ ent countries. The Institute publishes the quarterly journal *Studies in Conservation* and was for many years publisher of *Art and Archaeology Technical Abstracts* (this has now been taken over by the Getty Trust under an agreement with IIC), which appears bi-annually. In addition, IIC organizes international biennial congresses which focus attention on specific aspects of conservation. The Institute has a membership of 3000 drawn from more than 150 countries.

CCI researchers and conservators have contributed many papers to *Studies in Conservation* and presented the results of our work at many of the Congresses. In addition, David Grattan and Helen Burgess are two of the editors of *Art and Archaeology Technical Abstracts*, and various staff members have been abstractors. The author is a member of IIC Council.

CCI

On an individual level, CCI staff have contacts with their counterparts in many countries, and respond to numerous requests for information and advice. Many requests are received by CCI to provide staff to act as consultants, lecturers, etc. Our limited resources allow us to respond to only a few; however, in the past few years, CCI has provided assistance in China, Cuba, Egypt, Australia, the USA, and elsewhere.

At CCI, conservation interns and visiting scientists are accepted on a regular basis for stays of several months to a year. As the "Fellowships and Internships" columns in CCI Newsletters show, we have recently had conservators from West Germany, Greece and Australia working in Ethnology and Archaeology, and a scientist from China carrying out a joint project with CCI scientists on the analysis of samples from the Dunhuang Caves in the People's Republic of China (*CCI Newsletter*, February 1989).

CCI is involved in several international cooperative ventures. For example, the Conservation Information Network (CIN) is a collaboration between CCI, the Getty Conservation Institute, ICCROM, the Conservation Analytical Laboratory of the Smithsonian Institution, and other contributors. The system is now being used in nineteen countries, including the Soviet Union, Israel and Japan. The Materials Data Base of CIN (MCIN) is an elaboration of a similar data base in CCI's ICARUS system.

Together with the Tate Gallery, England, the National Gallery of Art in Washington, and others, CCI is collaborating in a project to study the effects of vibration and packaging on works of art in transit.

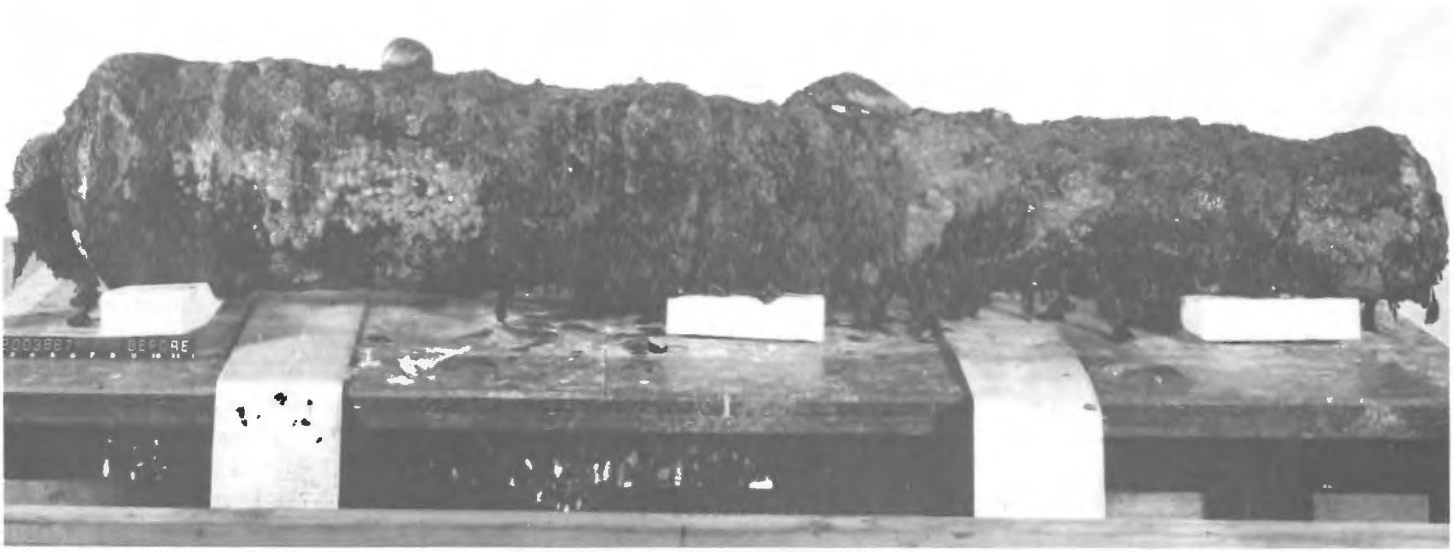
Since its creation, CCI has organized several international conferences that have focused attention on topics of international as well as Canadian concern. Planning is presently underway for the next of these conferences which will take place in 1991 and deal with modern materials and conservation.

Finally, but perhaps most importantly, CCI makes a very significant contribution to the advancement of conservation through its research programme. The results of our research are useful not only in Canada, but also to conservators around the world. To use just one example: the Relative Humidity module designed by Stefan Michalski to create a precisely controlled relative humidity in a display case or small gallery, has universal application and is being used by several museums.

The Department of Communications Mission is "Nation Building through Communication and Culture" which could not be more appropriate for CCI. We are very much involved with Canada's cultural heritage and subscribers to better communication, since one of the essentials of scientific endeavour is cooperation through communication. So, whether it be through technical abstracts, publications, exchanges or conference attendance, CCI is committed to playing an international role. Not only does it help to avoid costly duplication and to ensure that new ideas and techniques are quickly disseminated or assimilated, it also provides a substantial benefit to Canada and its unique heritage.•

The Longest Treatment in the History of CCI

by Judith A. Logan

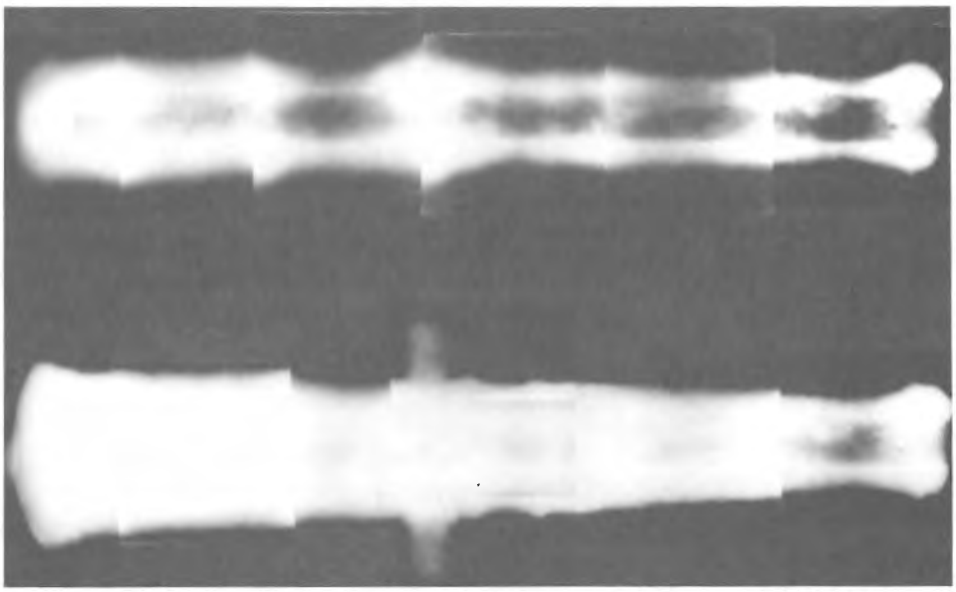


Cannon as received at CCI, side view. Surface detail is obscured by a layer of concretion approximately 10 cm. thick.

On January 19, 1989, 52,560 hours of continuous treatment, or six years of slow electrolysis, were over for CCI artifact number 2003667. Adding approximately 450 hours of manual work needed to monitor the progress of the treatment, clean the object, and apply a protective finish, gives the Archaeology laboratory title to the most hours spent on the treatment of a single artifact.

This particular artifact, a cast iron cannon from an unidentified wreck located off Baie de Gaspé, was raised with careful planning by André Lépine, a marine archaeologist on the staff of the Montreal Military and Maritime Museum. In 1981, after surveying the site, M. Lepine asked CCI to assist him in the raising and conservation of a selection of artifacts in order that he might be able to identify, if not the wreck itself, at least its provenance and date[1]. In August of 1982, CCI staff went to the site and retrieved a total of 168 bits of ceramic, fragments of bone, lead weights and cannon balls, as well as the 2.27 metre long cannon.

Most of the artifacts did not present any particularly complex problems, other than the fact that objects from marine sites contain salts that can be time-consuming to remove. The cannon posed a few questions of its own, the most obvious being whether or not it was loaded. It was covered by a layer of coral and silt concretion, bound together with iron corrosion products. CCI does not have x-ray sources powerful enough to penetrate an object as dense as a cannon, so the Hawker-Siddeley Canada Inc. plant in Montreal was contacted and an



X-radiographs of the cannon, taken by Hawker-Siddeley Canada Inc., using their 7.5 MeV Linatron Varian. The two images have been taken at different exposures. Grey areas indicate loss of metal due to corrosion; black spots are casting flaws.

[1]Lépine, André; "Archéologie sous-marine: Épave d'un vaisseau ancien dans la Baie de Gaspé; *Gaspésie*, vol. 12, n° 1 (n° 85), mars. 1984, p. 12-25.

appointment was made to radiograph the cannon with the equipment that they use to radiograph airplane engines. The results were rewarding: it was not loaded, but it was very corroded and was a poor casting. The tube had numerous flaws, and if it had been used to any great extent, the chance of the metal failing would have been quite high. The voids of the casting flaws coupled with the very porous, corroded metal saturated with salt water would make treatment difficult.

Electrolysis is a reliable conservation treatment for corroded cast iron[2]. During electrolysis, iron corrosion products are converted to magnetite as a small electric current is passed through the object and conducted through an alkaline electrolyte to stainless steel plates. The graphite in cast iron is a good conductor of electricity, so the current is carried throughout the object, into deeply corroded areas. Because of the electric current, the chloride ions, which are negatively charged, migrate from the object to the positively charged steel plates.

Hydrogen gas forms on the object as the corrosion is converted to magnetite. Too much hydrogen building up in the casting flaws of the cannon would embrittle what little metal was left and result in a fragile object, or even fracture the metal. To control hydrogen build-up, the current must be kept low.

As the corrosion is converted to magnetite, the overlying concretion can be removed by mechanical cleaning methods. The exposed surface will be rich in graphite and therefore very soft. From the radiographs, we knew which areas of the cannon would be particularly soft and liable to damage as the surrounding concretions were removed.

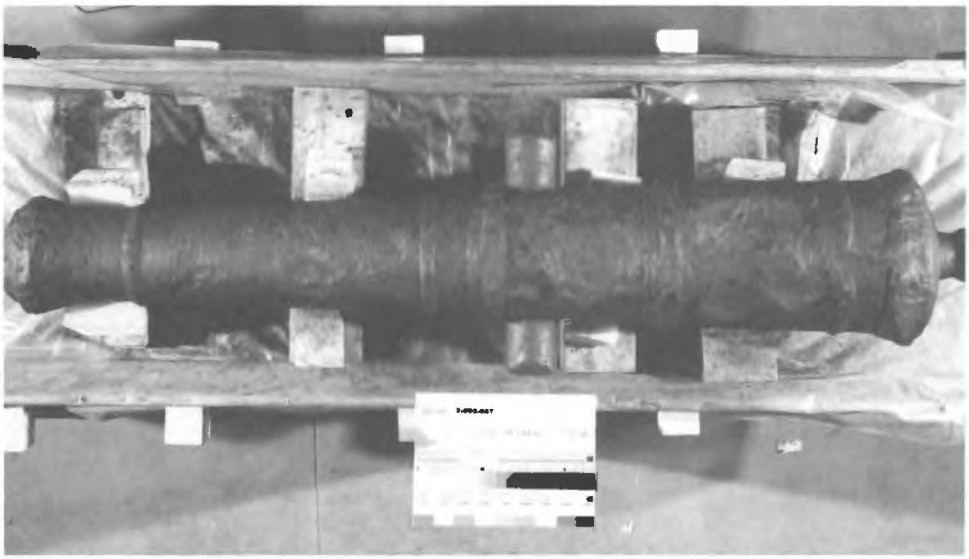
After examination and preliminary cleaning, the cannon was placed in an aqueous solution of 1% weight/volume sodium hydroxide, in a plastic-lined tank. A current of 1.5 amperes was applied to the system via wire that connected directly to the metal of the cannon through a small hole drilled near the back of the tube. Over the next 4 1/4 years, the concretion that encased it was carefully chipped away and details of the surface began to appear. Gradually, the concretion blocking the bore softened and was scraped out, clearing the bore to the back of the tube. Samples of the electrolyte were analyzed for chloride content in order to monitor how much chloride was leaving the object. The electrolyte was changed periodically.

Of course, a few setbacks occurred during this period, including the collapse of the gantry used to lift the cannon, and a leak in the electrolysis tank. After being in electrolysis for over four years, the cannon was placed in deionized water to wash out residual chloride and electrolyte. This involved heating the water daily to about 40 °C, taking samples to check the conductivity and changing the water at regular intervals. After approximately 1 3/4 years, the conductivity of the wash water began to be close to that of the deionized water. CCI's Analytical Research Services laboratory did complete elemental analysis of the wash water and found virtually no chloride or electrolyte.

The cannon was then dried by placing it under fans and infrared lamps. The temperature of the surface and interior was monitored, and when the cannon seemed to be conducting heat evenly, we decided that drying was complete. This took about three days. One of our concerns during drying was that finely divided corrosion products remaining in the object in a reduced state could re-oxidize rapidly on exposure to air, thereby cracking the cannon. Fortunately, this did not happen.

The next stage involved removal of the rust blisters that had formed during the long hot-washing period. Finally, the cannon was treated with tannic acid to stablize the remaining metal and give the surface an even, dark colour.

[2]Hamilton, D. L.; *Conservation of Metal Objects from Underwater Sites: A Study in Methods*, Miscellaneous Paper No. 4, Texas Memorial Museum, Publication No. 1, Texas Antiquities Committee, 1976.



Cannon after treatment. Weighing approximately 600 kgm., the cannon would have fired 4 lb. shot. The touch hole with remnants of a wick is intact. In size and style, the cannon corresponds to ordnance being made in France between 1690 to 1758.

The cannon is now ready to be returned to its owner. We will make the recommendation that it be stored and displayed in a sealed case with dry silica gel to keep the relative humidity low. This will reduce the likelihood of corrosion occurring, just in case after all the treatment time, one or two pockets of chloride-containing salt are still lurking in the casting flaws of the metal.

What did we learn from all this? The disappointment is that the upper side of the cannon, which would normally carry identifying marks, had been badly abraded while it had been resting on the ocean floor. Ice scouring and possibly erosion by sand and tidal currents had effectively removed any trace of such marks. However, from the style of the mouldings and the size of the cannon, plus the association of the other objects which had been retrieved with it, M. Lépine is confident that the wreck is French and dates to the late 17th or the first half of the 18th century. The ship would have been about 25 metres long, and 150 to 200 tons[1]. Unfortunately, between the time that M. Lépine first surveyed the wreck in 1981 and the actual artifact recovery in 1982, a sport diver had done considerable damage to the site. The diver had lifted three cannon, which were subsequently disintegrating on his property, and had disturbed about 40% of the remains of the wreck[1]. Had M. Lépine not carried out his meticulous survey in 1981, even less would be known about the site.

In terms of conservation, we used a tried and proven conservation treatment, and many interns, volunteers and CCI staff benefitted from the experience of carrying out this type of procedure. Having a cannon radiographed is not standard practice but the radiographs proved their worth throughout the treatment. Finally, although the length of time it took to treat the cannon may sound excessive, it is not unreasonable for an artifact of this nature.•

Silver Cleaning Project

by Lyndsie Selwyn

At CCI, we are often asked by conservators and museum staff about cleaning silver. Can we recommend a specific product? Is it better to use an abrasive-type cleaner such as a polish, foam, cloth or wadding, or is it better to use a chemical-type cleaner such as a silver dip? What about the product used last year now being sold as "new and improved"? These are just samples of the many questions asked about cleaning silver.

CCI does not have an on-going testing program to evaluate new or "improved" silver cleaning products on a regular basis. However, several years ago, in an attempt to rank several silver-care products, Charlie Costain and other staff members evaluated a wide range of commercially available silver cleaning products. Four categories of silver and metal polishes were tested, including liquid and foam polishes, polishing cloths, wadding-type polishes and silver dips. Controlled polishing experiments were performed on silver plate and the degree of scratching was recorded using a scanning electron microscope. Analytical work was also carried out to identify the major constituents such as abrasives and soaps in the polishes and foams, or the acid in the dips. The results of this series of tests were inconclusive.

Having recently joined CCI, I was asked to participate in further work on this project. It was decided to evaluate the polishes under practical, subjective conditions where a polisher stopped polishing when the silver was clean and shiny, rather than stopping the controlled experiment after a pre-defined time. Fourteen of the least aggressive silver polishing products identified by the controlled experiments were selected and four volunteer polishers have just completed their polishing assignment. They polished a set of fifty six pieces of tarnished sterling silver spoons and forks, borrowed from the New Brunswick Museum in Saint John, N.B. Each polisher compared fourteen products (five polishes and foams, three cloths, four dips and two waddings), used according to manufacturer's instructions. They answered questions about length of time needed to polish, smell, feel, abrasiveness, ease of use, ease of removal, and any problems. Each piece of sterling silver was photographed before and after polishing.

As yet, we are not in a position to make specific recommendations; however, after studying the before and after photographs, as well as evaluating the comments from the polishers, the results will be written up for publication.•

Administrative assistant (and volunteer polisher) Martha Perry polishing the tarnished sterling silver forks and spoons.

Guest Editorial

Directions in Textile Conservation Research: Who is Responsible?

by Dr. Nancy Kerr
Department of Clothing and Textiles
University of Alberta
Edmonton

Nancy Kerr is spending 8 months of her one year sabbatical leave at CCI in the Conservation Processes Research Division where she is working on the characterization of proteins such as wool and silk. At the University of Alberta, Nancy teaches textile science and textile conservation courses and conducts research on the degradation and preservation of textiles.

Dr. Nancy Kerr

The conversation I overheard made me smile. It was the third day of a conference called "Science and Technology in the Service of Conservation" (Washington, DC, 1982) and two conservators were filing out for coffee. One said to the other "If I have to look at one more graph or table, I'm going to . . .". This attitude more or less sums up the feelings of many textile conservators. The research they see being done by scientists, for the most part, is not what they think needs to be done. This often means that it is not immediately useable in the textile conservation laboratory. Before I am accused of "putting down" conservators, let me elaborate. The fact that research in the textile field often does not meet the needs of conservators is two sided: neither the textile scientist nor the conservator is entirely to blame. They are both responsible because, too often, they don't speak to each other or listen to each other when potential problems are being discussed. This failure to communicate needs is not new, nor is it confined to textile conservation research. Let's look at what both the scientist and the conservator can do to ensure that research projects are addressing problems which conservators care about.

Scientists should seek out conservators, talk with them, discuss research plans and be open to their suggestions. Visits to conservation laboratories, as well as storage and exhibition areas, will tell the scientist what storage and display conditions are like and what type of equipment the conservator has available in the laboratory. Imagine a scientist developing a treatment for a silk fabric which requires that a small sample of the fabric be subjected to amino acid analysis or scanning electron microscopy. This equipment is not available to most conservators. Scientists need to take time to explain why their experiments are designed in a particular way; for example, conservators often object to the use of new or artificially aged fabric in experiments rather than naturally aged fabric. A scientist uses new fabric because the supply is not limited, the fabric is uniform and its history is known. If it is aged artificially, the changes in the fibres are known or can be predicted. The number of variables in an experiment can be reduced. If naturally aged fabrics are used in an experiment, it may not be possible to determine cause and effect. An unusual characteristic of a naturally aged fabric may mask results. Conservators will say, of course, that they must treat naturally aged fabrics, and thus, an experiment must eventually be tried on these fabrics, but not until it has proven its worth on new fabrics. The scientist developing treatments for textiles must be aware of the time constraints under which most conservators work, as well as limitations of equipment and facilities.

Conservators have a responsibility to scientists if research relevant to their needs is to be conducted. It is important for the conservator to understand the research process - the difference between precision and accuracy of measurements, the need to control variables, to use statistics to analyze data, to replicate an experiment a number of times. The conservator should read research reports even if the information does not appear to be useful immediately. Good information on fibre deterioration or properties is frequently found in research articles the conservator tends to pass over. It is also important for conservators to read critically. Are the researchers conclusions backed up by the data? What is the significance of the numbers generated in the research; for example, will the presence of one nanomole of hydrochloric acid in a linen fabric after drycleaning with trichloroethane significantly affect the lifetime of the textile relative to other factors which deteriorate it? Finally, the conservator has a responsibility to continue to learn about new materials, especially man-made fibres and plastics. Even though most conservators repair textiles with fabrics and thread of natural fibres, they should know the properties of man-made fibres. As twentieth century textiles begin to appear in textile collections, the conservator must know how to handle these fibres. The research scientist can assist by designing experiments which deal with problems forthcoming from these textiles. Both the textile scientist and the conservator, therefore, are responsible for new directions in textile conservation research.•

An Eighteenth-century Silk Open-Robe

by Chris Paulocik

A blue silk gown and petticoat which were recently treated at CCI will offer costume historians a rare opportunity to study an example of eighteenth century cut and construction. Many eighteenth century dresses were remade once or twice because fabric was so expensive and labour relatively cheap. Fortunately, this dress had not been dramatically altered. The dress originally belonged to the Tucker family, who were among the first English settlers in Bermuda. It remained in the family until being donated to the Dugald Costume Museum in Dugald, Manitoba in 1983.

An open-robe consisted of a bodice and overskirt joined together. The overskirt opened in front to reveal the petticoat, which was a visible part of the full dress and did not serve as an undergarment. This gown exhibits many features typical of the eighteenth century such as heavy black top-stitching, baleen boning, and the careful piecing of the costly brocaded silk fabric. The gown would have been worn for formal events or lavish evening entertainment.

Various experts were consulted for information on the dating of the fabric and the costume. We were fortunate to have Dr. Aileen Ribeiro, Head of Dress at the Courtauld Institute in London, an expert in eighteenth century costume, examine the artifacts. In consultation with Natalie Rothstein, a specialist in eighteenth century fabric from the Victoria and Albert Museum, she concluded that the dress was probably made in England *circa* 1780. Both the open-robe and petticoat were made from the same silk brocade fabric with silver metallic threads probably woven in France *circa* 1720.

A sample of the blue silk fabric was analyzed according to the method of Hofenk-De Graaff[1] as modified by Schweppe[2] to determine the dye. This test was positive, indicating that an indigo-type dyestuff was present.

The fabric itself was dirty, but generally in sound condition, with varying degrees of abrasion, fracturing and loss. Many of the metallic threads of the brocade fabric had come loose. Fading and discolouration of the silk was evident, particularly down the front panel. The front opening of the bodice had been altered resulting in permanent crease lines and fractured silk. Perspiration caused extensive damage in the underarm areas of the sleeves and bodice. Previous repairs not only had been made using fabrics with fugitive dyes, resulting in staining, but were haphazardly sewn, pulling on the weakened material. The back panel of the bodice had been shaped with baleen boning which was broken and delaminated. Evidence indicated that several attempts had been made to repair the original hems, which had been turned under several times and were extremely worn.

Old repairs were removed. Tests determined that wet-cleaning would be safe for the fabric and the artifacts were prepared by reinforcing areas of loss or weakness with cheesecloth. The open-robe and petticoat were washed using a solution of WA Paste, a neutral anionic detergent. As a result of the wet-cleaning, the appearance of the gown was much improved; the silk appeared much cleaner and stronger, with the sheen restored to the fabric and brocaded areas.

A compatible silk fabric was chosen to support deteriorated areas and was dyed to a suitable colour match. Torn areas were flattened, threads realigned and underlaid with this support fabric. The couching of all of these areas was a lengthy procedure, with vast expanses of the skirt requiring support. A different challenge was presented when dealing with the deteriorated underarm portions of the bodice. Not only was the silk badly disintegrating, it was very awkward to repair due to the three-dimensional nature of the bodice.

It is important when displaying an historic costume that it not only be properly supported but also correct in silhouette. In the eighteenth-century, a corset was worn to achieve a conical shaped torso. A mannequin torso was constructed based on this shape. In addition, a linen chemise would have been worn underneath with a bum roll or hip panniers to achieve the correct line of the dress. In order to complete the proper period look, undersleeves and a fichu were made from fine cotton voile.•

[1]Hofenk-De Graaff, J., "A Simple Method for the Identification of Indigo," *Studies in Conservation*, Vol. 19, No. 1, 1974, p. 54.

[2]Schweppe, H., "Identification of Dyes in Historic Textiles," *Historic Textile and Paper Materials: Conservation and Characterization* , Advances in Chemistry Series 212, Needles, H.L. and S.H. Zeronian, Eds., American Chemical Society. Washington, 1986, pp. 153-174.

Phycologists Use CCI's Scanning Electron Microscope To Conduct Algae Research

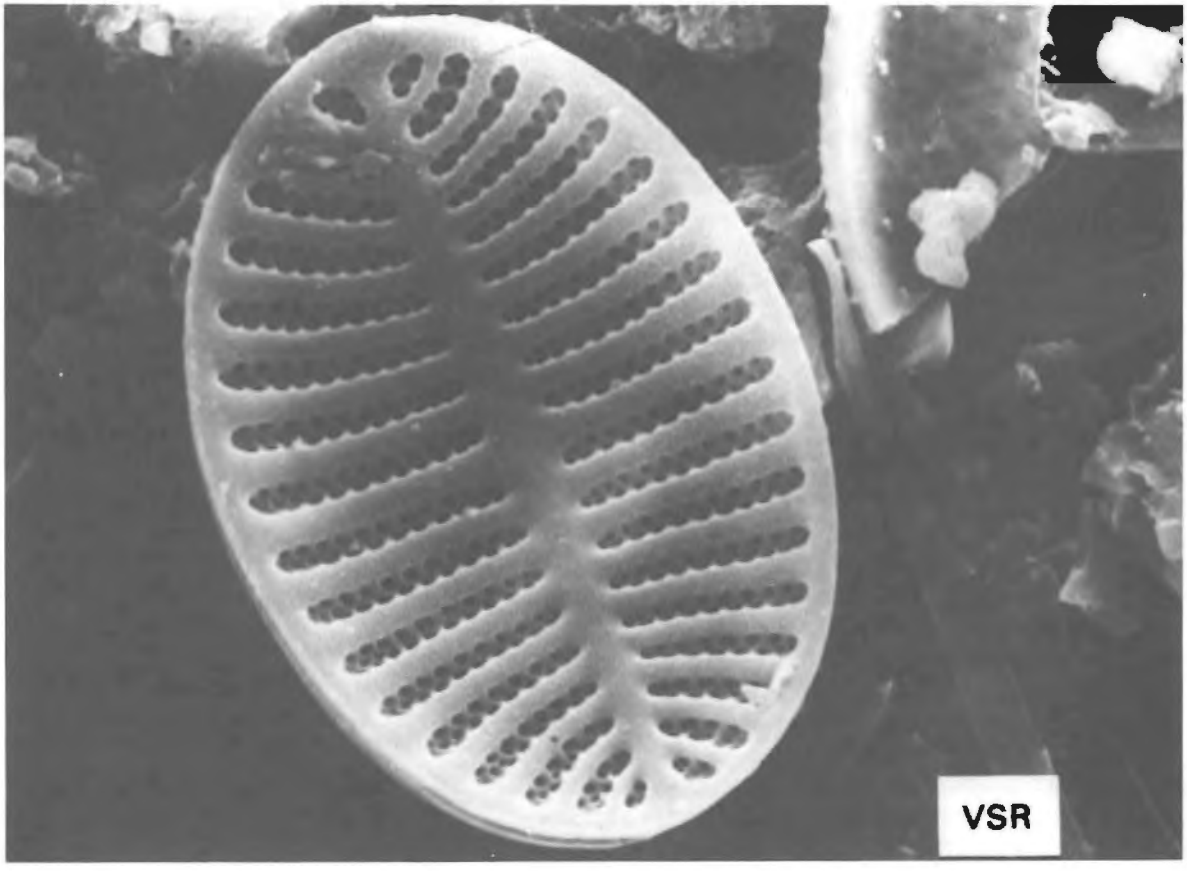
by Michel Poulin and Paul B. Hamilton
National Museum of Natural Sciences

The research activities of the National Museum of Natural Sciences' Phycology Section are highly diversified. Some projects are designed to identify species of algae that are indexes of acidic environments, while others are focussed on the diatom flora found on the lower surface of sea ice in the Canadian Arctic.

One particular class of algae that has attracted our attention is Bacillariophyceae, commonly called diatoms. Diatoms are microscopic unicellular algae; their vegetative cell is covered by two silicified valves that fit together perfectly, like the top and bottom of a petri dish. The surfaces of these valves are highly sculptured and consist of generally orderly rows of pores, central apertures and various silicified outgrowths that are not easily visible. In addition to these elaborately sculptured valves, diatoms also have a very high morphologic plasticity. Thus, their structure and ornamentation are the two main criteria for identification.

Because these microscopic algae cannot be seen with the naked eye, light microscopes were very useful to diatomists since it allowed them to describe several thousand species. Light microscopes are still used by researchers. However, the advent of electron microscopy has revolutionized the fields of taxonomy and systematics, to name just two. Scanning electron microscopy (SEM) provides a three-dimensional image of diatoms and allows us to clearly examine the morphological structures that cannot be seen with light microscopes. It also allows us to examine the internal and external walls of the valves.

Therefore, scanning electron microscopy is an essential research tool that allows us to better define the criteria for identifying diatom species, which in turn helps us to better classify the taxa studied. For example, sea ice diatoms, the composition of which was described more than a century ago, are currently being studied in order to brush up on their taxonomy. Scanning electron microscopy allows us to study the structure of these diatoms in detail, to determine the plasticity of certain identifying characteristics and to observe the structure of the internal and external walls of the valves of diatoms, which is very useful in systematics.•



Cocconeis costata. *Internal view of a rapheless valve showing a straight axial area and double areolate striae.*

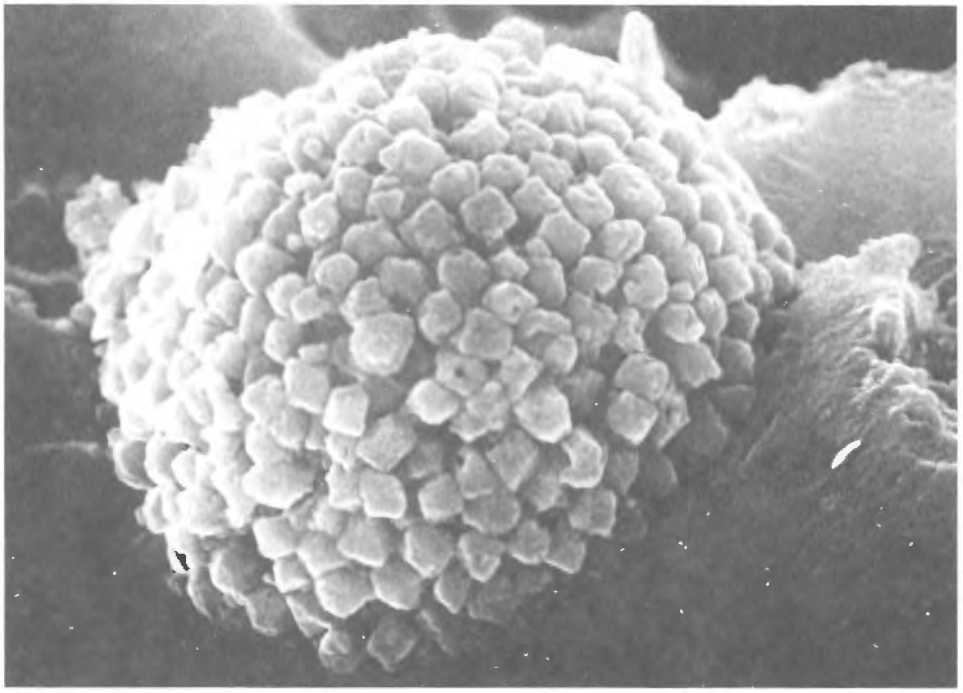
Pyrite Oxidation Studies

Robert Waller
Mineral Sciences Division,
National Museum of Natural Sciences

The Mineral Sciences Division of the National Museum of Natural Sciences maintains two major collections: the display series of the National Mineral Collection and the Mineral Occurrences Collection. Together these collections comprise more than thirty thousand specimens. They are international in scope and include examples of approximately two thirds of all known mineral species.

Although geological specimens can deteriorate in many different ways, oxidation of pyrite is one of the most serious and widespread forms of deterioration. This is largely due to the broad distribution of reactive pyrite in collections. Pyrite exists in accumulations of finely divided grains or crystals in many types of specimens. When such specimens are exposed to air the pyrite (ferrous disulphide) is oxidized to ferrous and ferric sulphates. This results in a large volume increase and consequent rupture and crumbling of specimens.

Much information on possible mechanisms and kinetic dependencies is available in the scientific literature. Unfortunately almost all of this information pertains to oxidation in either water-saturated or water-free conditions. Very little information is available on pyrite oxidation at intermediate relative humidities. Consequently, a study of pyrite oxidation at intermediate relative humidities is being undertaken to provide data on the effect of relative humidity on the rate at which oxygen is consumed and oxidation products are formed. These data may provide a basis for recommending relative humidity (RH) levels appropriate for the safe storage of pyritic material. In addition, improved understanding of the oxidation process will help determine which findings from other studies of pyrite oxidation are applicable to pyritic specimens in collections. It is also hoped that experience in oxidation rate measurement may prove to be helpful for other conservation applications. Finally, this project has provided an opportunity for myself, a natural sciences conservator, to work closely with conservators and conservation scientists at CCI on a full time basis for most of 1988 and intermittently since then.



A pyrite "framboid". It is fine grained pyrite such as this that oxidizes rapidly, breaking specimens apart. Picture width 12 μm.

Oxidation rate measurements were performed using modified manometric techniques employing Warburg manometers and flasks. This method takes advantage of the fact that a change in gas pressure above a sample held in a container of fixed volume and at fixed temperature can easily be related to a change in the quantity of gas present – in this case, the quantity of oxygen consumed. These studies were supplemented with scanning electron microscopic, gas chromatographic, X-ray diffraction, and infrared spectroscopic studies of samples and oxidation products performed by or with the help of CCI staff and by X-ray photoelectron spectroscopic analyses performed by Surface Science Western, a commercial laboratory attached to The University of Western Ontario.

Results are still being accumulated and assessed but some statements can now be made. The initial oxidation rates, expressed as micrograms oxygen consumed per gram pyrite per hour, of freshly ground crystalline pyrite increase exponentially as RH increases from 10% to about 60%. Above about 60% RH the increase in oxidation rate with increasing RH is less drastic and appears to approach a limiting value.

Also significant is the finding that oxidation rates decline more rapidly at low RH than they do at high RH. It appears that at lower than 30% RH oxidation rates may approach zero as time goes on. In contrast, above 50% RH it appears that oxidation rates would not decline to zero until all the pyrite has been consumed. These facts suggest the possibility that specimens, after treatment to remove oxidation products, might be safely stored in air at low RH.

Further experimentation, guided by the findings of this study, will be undertaken. In particular, oxidation rate measurements on specimens before and after conservation treatments are planned.•

Who's Who at CCI

by Cliff McCawley

Lyndsie Selwyn

Conservation Scientist

In January, 1987 scientists at the University of Houston, Texas, mixed three ordinary substances and created what many describe as magic: a material that was a perfect conductor of electricity at a far higher temperature than had been achieved before. This event signalled the start of a furious scientific race to determine the precise structure of the material. Research groups from the United States, China, Japan and Canada, spent hectic weeks trying to unravel the puzzle that might open the door on a multi-billion dollar industry. One of the several Canadian researchers, at the National Research Council of Canada, was L.S. Selwyn.

For more than a year now, Lyndsie Selwyn has been working as a conservation scientist in the Conservation Processes Research Division at CCI. How, you might ask, could someone make what might appear to be such a dramatic change? One reason is that Lyndsie loves science, and since there is no such thing as "easy" science, the field of conservation offers a considerable challenge to her talents. Each field of science, be it cosmology or conservation, has its own peculiar restraints and complexities, and demands the same professional approach. Lyndsie lists as one of her research interests, the physics and chemistry of materials. Conservation science offers her the opportunity to pursue this, since when studying the degradation and stabilization of museum artifacts, one is faced with a wealth of problems in material science. The conservation scientist must first understand the material under study in its undegraded state, then, in what is very often a highly degraded state (iron artifacts from marine sites often consist only of corrosion products). Once the problem is fully understood, the conservation scientist must then devise a solution and apply it to the artifact.

After obtaining B.Sc. (Carleton University) and M.Sc. (McGill) degrees in chemistry, Lyndsie Selwyn carried out research for a Ph.D. from the University of California, at the beautiful San Diego campus. This was followed by three years as a Research Associate (Solid State Chemistry) at the National Research Council of Canada carrying out studies of the solid state using rechargeable lithium intercalation batteries. She joined CCI in December, 1987. This was a kind of homecoming, since Lyndsie spent a summer at the CCI in 1975, studying shipping crates for artifacts.

Since being at CCI, Lyndsie has taken responsibility for all research pertaining to metals. This includes a study of rust convertors for large, outdoor iron objects (*CCI Newsletter*, December 1987); silver polishes; treatments for waterlogged wood/metal composite artifacts; ethylene diamine for treating archaeological iron; and an evaluation of protective coatings for bronze statues in extreme conditions. In addition, Lyndsie consults with conservators on treatments, represents Conservation Research Services on CCI's safety committee, and plays an active part in the smooth running of the laboratory. Whether peeling hard-boiled eggs to tarnish silver, or sitting atop a bronze statue on Parliament Hill, Lyndsie is enthusiastic about what she is doing. It has taken her only a short time to learn to work effectively as a scientist in the fields of conservation and museology, and to play an active role in the research programmes of CCI.•

Comings and Goings

At the end of May, **Chris Paulocik** left her position as Conservator in the Textiles section at CCI, to begin work as Costume Conservator at the Costume Institute of the Metropolitan Museum of Art in New York.

Chris first trained in textile design at the School of Design, Sheridan College, Toronto, where she studied various aspects of fibre arts. After graduation she worked as a free lance textile designer in Toronto and New York. Her works were shown in galleries and sold through shops in Toronto, Montreal and New York. During this time, Chris also became involved in historic costuming for museums and in teaching students in fibre arts.

Chris began working in conservation in 1980 when she joined CCI as an intern. At the end of that year she went to the Textile Conservation Centre at Hampton Court Palace to follow their programme of textile conservation. Following this she carried out internships at the Abegg-Stiftung in Switzerland, as well as at museums in Munich, Bamberg and Nurnberg in Germany, before returning to CCI in 1981 as an Assistant Conservator.

Since then she has worked on the Mobile Laboratory Programme, presented seminars, trained interns, and worked on a variety of conservation projects and treatments. Chris' specialty is in the area of costume and accessories. She has worked on major projects, such as the treatment of a collection of Peruvian archaeological textiles and the treatment of textiles which have been damaged in fires or floods. She also set up a fibre identification centre and a reference collection of natural and synthetic dyes for the Textiles section. A recent project has been the conservation of an eighteenth century dress belonging to the Dugald Costume Museum in Dugald, Manitoba (an article on this dress appears elsewhere in this *Newsletter*). One of Chris' special interests has been researching and devising treatments for water sensitive clothing embellishments, such as gelatin sequins.

Chris Paulocik working on an 18th century costume from the Dugald Costume Museum, Manitoba.

In 1986 Chris participated in a cultur al exchange to Italy. She spent six months in Rome at the Instituto Centrale del Restauro and two months at the Palazzo Pitti, Galleria del Costume in Florence. Her work in Florence centred on special treatments for costumes which have been altered, in order to return them to their original state.

Chris is looking forward to working with one of the finest costume collections in the world, and for the opportunity to work alongside curators, exhibit designers and dressers at the Costume Institute. The first major project that she will be involved with is an exhibition of clothing and textiles from the Napoleonic period, including items belonging to Napoleon and Josephine. The exhibition is being mounted in honour of the two hundredth anniversary of the French Revolution and will be travelling to France.

Janet Mason returned to the Ethnology section November 21, 1988 after spending two years as a Mellon Fellow at the Bishop Museum in Hawaii. While in Hawaii Janet had the opportunity to work on a great variety of ethnographic materials; especially feathers, tapa cloth and exotic woods. The experience gained was invaluable and will be of great use to Janet, her colleagues and CCI.

Abigail Quandt, paper conservator from Wilmington, Delaware worked on contract at CCI during the week of January 30, to carry out conservation treatment work on "Descente de Croix", a 14th century Italian illuminated manuscript leaf on parchment, from the collection of the Montreal Museum of Fine Arts.

Mark Boyle, Assistant Conservation Scientist, Environment and Deterioration Research Division, left CCI January 15, 1989 to accept a position with Health and Welfare Canada.

Audrey Yardley-Jones, a graduate from the University of Alberta, Clothing and Textile Program in Edmonton, Alberta completed a two month contract at CCI. She produced dyed samples and didactic material on dyeing for future use by textile conservators. Over 300 fabric samples were created by mixing the 3 primary dyes of yellow, red and blue. These samples will be used as references for conservators when colour matching backing fabrics and stitching threads.

Marsha Selick, of the Furniture and Wooden Objects Section, accepted a newly established conservation position with the Ontario Heritage Foundation in Toronto. While at CCI, Marsha worked on gilded, lacquered

and inlaid furniture and was involved in the presentation of several lectures and training sessions on furniture and general collections care. In her new position, Marsha will be responsible for the diverse collections of the Foundation across the province.

Laura Nagora, who recently completed her second year of the Fellowship Programme in the Furniture and Wooden Objects Section, will be returning in May to this laboratory to continue further treatment of the Boulle bracket clock from the Royal Ontario Museum.

Wanda McWilliams, formerly of the Fellowship Programme, Works of Art on Paper, will also be returning in May. While working in the Paper Section, she will continue treating the book "Dutch Language Concordance" printed in 1615, from the Mennonite Village Museum, Steinbach, Manitoba.

Amanda Gray, who also completed her second and final year of the Fellowship Programme in the Fine Arts Section, accepted a contract to complete treatment of a 19th century ship painting.

Ginette Bertrand, Publications Production Assistant, Extension Services, is on a year's leave of absence.

Monique Alby, on secondment from Museums Assistance Programme, Department of Communications, is replacing Ginette Bertrand, as Publications Production Assistant with Extension Services.

Susan Maltby, Assistant Conservator, Ethnology, left CCI in October 1988 to work as a private conservator. Sue came to CCI in January 1985 as an intern with the Mobile Laboratory Programme. In December 1986, she joined the Ethnology Section and worked on several challenging and rewarding projects including treatment of a pair of rubber bathing shoes and treatment of the cartonnage of an Egyptian mummy.•

An Electronic Switching Module for Portable Environmental Control Equipment

by Paul Marcon

An electronic switching module for portable environmental equipment is now available. The module permits museum and art gallery staff to safely configure environmental control systems for small spaces without requiring the services of an electrician. Basic setups for humidification, dehumidification and humidistatically controlled heating are possible.

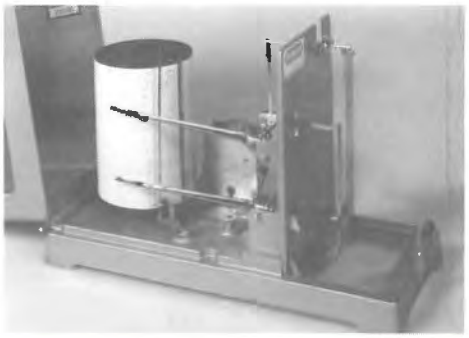
The module consists of a 120 VAC power outlet which is controlled by shorting two terminals on the front panel. When the terminals are shorted, any device plugged into the outlet will be activated. Any appliance which operates on 120 VAC current (up to 1100 Watts) can be controlled by the module.

The modules are manufactured in Ottawa by Richard Branker Research Ltd. and are Ontario Hydro approved. A CCI publication illustrating various applications of the modules will be available shortly.•

Can you find the alarm switch on this hygrothermograph?

by Paul Marcon

The hygrothermograph in this picture might look ordinary, but it is equipped with a switch that is capable of triggering most alarm systems. The alarm switch is simple, reliable, requires no power and you can put it together yourself for less than $20. Assembly instructions for the "Hygrothermograph Alarm Switch" are now available from CCI.•



CCI Services: Seminars, lectures, workshops and visits

To respond to specific needs within the museum community, CCI offers, in cooperation with provincial museum and art gallery associations, workshops, seminars and lectures related to the conservation and care of museum and art gallery collections. CCI staff also participate in, and present lectures to, meetings of professional groups and associations.

November 1988

The Textiles Section held a Professional Development Day on November 15, for textile conservators and curators. Sheila Landi, Chief Conservation Officer of Textiles at the Victoria and Albert Museum in London, England was guest lecturer.

Eva Burnham and Chris Paulocik attended the annual meeting of the Harpers Ferry Regional Textiles Group, held at the Smithsonian Institution, Washington, D.C., November 3-4, 1988. Eva presented a paper on "Problematic Materials Encountered in the Treatment of Lucy Maud Montgomery's Wedding Dress". Chris presented a paper on "Buttons, Beads and Sequins – Beware of Water-Sensitive Embellishments".

Peter Vogel visited the Centre de Conservation du Québec, November 28-30, 1988 to carry out research into materials and techniques of the artist Antoine Plamondon.

Gordon Fairbairn presented a lecture on "Veneered and Inlaid Wood Structures," with emphasis on manufacturing techniques and conservation ethics, to the National Association of Watch and Clock Collectors.

David Grattan and Helen Burgess participated in the bi-annual editors meetings of Art and Archaeological Technical Abstracts in New York City, November 30 to December 1.

Gordon Fairbairn and Marsha Selick presented a three-day workshop at the Queen's University MAC programme on the basic care and conservation of furniture. Marsha Selick also gave two lectures to students in the Museum Technology Programme, Algonquin College. The lectures dealt with preventive conservation aspects of furniture and furniture collections.

Ian Wainwright joined Martin Magne and Michael Klassen of the Archaeological Survey of Alberta at Writing-On-Stone Provincial Park, to study the state of conservation of rock paintings and petroglyphs and to take microscopical samples for analysis.

SEMINARS
"Construction of Mannequins for Historic Costumes"
Chris Paulocik and Debbie Juchem
Twillingate, Newfoundland

"Artifacts" OMA Course
Tom Stone, CCI and Sandra Lougheed, Ministry of Citizenship and Culture, Government of Ontario-Waterloo, Ontario

December 1988

David Tremain spent a day at the Musée des arts décoratifs in Montréal to carry out *in situ* treatment work on several historic posters.

SEMINARS
"Construction of Mannequins for Historic Costumes"
Ela Keyserlingk and Debbie Juchem
Whitehorse, Yukon Territory

January 1989

Paul Marcon spent two weeks in Washington at the Conservation Analytical Laboratory of the Smithsonian Institution, working on the modelling of vibration in paintings with Marion Mecklenburg and Len Discenza.

A tour of the Conservation Services and Conservation Research Services laboratories was provided for the Directors-General and Directors of Corporate Policy, Department of Communications, January 10, 1989.

Bob Barclay was seconded from the Ethnology Section to the Conservation Processes Research Division for a period of five months to assist David Grattan in the Parylene Project. A Parylene Coating System was lent for 18 months to CCI by Nova Tran Corporation, a subsidiary of Union Carbide, so that a variety of artifact materials could be assessed. Bob's duties were to run the coater and to coordinate the treatment of samples provided both by CCI staff and outside institutions. A wide range of materials were treated during this secondment, including paper documents, fossils, natural history specimens, forensic material, natural organic materials and even a whole smoked salmon. A brief report on the Project was published in the last *Newsletter*.

Tom Stone gave two lectures on the technology and basic conservation of skin and leather to the Museum Technology students at Algonquin College and the Conservation Research Services staff at CCI.

SEMINARS
"Basic Care of Books and Archival Material"
David Hanington and Wanda McWilliams
Yellowknife, Northwest Territories.

February 1989

Colette Naud conducted a tour of the Conservation Services laboratories for members of l'Association des Archivistes du Québec – section de l'Outaouais, February 2, 1989.

Helen McKay and Amanda Gray presented lectures on the Conservation of Paintings, February 21 and 22, to students in the Museum Technology Programme at Algonquin College.

Charles Gruchy, Director General, gave tours of CCI on February 16 to the Assistant Deputy-Minister and four Directors, Corporate Management, Department of Communications.

Gordon Fairbairn gave a one-day workshop to the MAC students at Queen's University on "Furniture Construction Problems", involving disassembly of wooden artifacts, repairs and reassembly.

Approximately 95 Department of Communication employees attended CCI's Heritage Day – Open House on February 20th. Demonstrations were given on the Conservation Information Network, as well as on a variety of other interesting subject areas throughout the various laboratories in Conservation Services and Conservation Research Services.

Chris Paulocik presented a hands-on workshop on the Care of Historic Textiles, February 23 and 24 to students enrolled in the Art Conservation Techniques programme, Sir Sandford Fleming College, Peterborough, Ontario.

March 1989

Helen McKay and Amanda Gray visited the Library at the University College of Cape Breton to examine a collection of archival material and provide advice on its care and storage.

Wanda McWilliams and David Tremain spent three days at the National Battlefields Commission in Quebec City, to carry out a survey of 137 watercolours and ink drawings.

Eva Burnham presented a lecture on "Problematic Materials Encountered in the Conservation Treatment of Lucy Maud Montgomery's Wedding Dress" to students in the Master of Art Conservation Program at Queen's University, March 8.

Coleen Day, conservator from the New Brunswick Museum, visited the CCI's Ethnology laboratory to discuss equipment needs and other matters related to the establishment of a new conservation laboratory for the museum in Fredericton, New Brunswick.

Mary Peever presented a talk at the spring meeting of the Canadian Region of Living Farms and Agricultural Museums in Milton Ontario. Mary discussed conservation in relation to off-season programming.

SEMINARS

"Le péril des expositions itinérantes" Colette Naud and Paul Marcon Noranda, Québec.•

Fellowships and Internships

In response to the diverse training requirements of the conservation community in Canada and abroad, the Canadian Conservation Institute offers Fellowship and Internship programs. The following individuals have recently participated or are currently involved in one of these programmes at CCI.

Internships

Antonio Paterakis, Head Conservator, Sculpted and Polychromed Wood, Centre of the Conservation of Antiquities, Ministry of Culture and Science, Athens, Greece participated in a Professional Development Internship at CCI, from October 1988 to March 1989. Antonio worked on a number of interesting conservation problems involving wooden objects while working on a part-time basis in the Fine Arts/Polychromes, Archaeology and Furniture Sections.

Fellowships

The Fellowship programme encompasses work in designated laboratories at CCI, as well as participation in CCI services to museums, galleries and related institutions and associations throughout Canada (e.g., workshops, surveys, etc.)

The following individuals started their fellowships at CCI:

Janice Manuel, from the Ukrainian Cultural Heritage Village, Edmonton, Alberta (Furniture Section)

Guy Savard, from the Musée du Québec (Québec) (Fine Arts and Polychromes Section)

Barbara Tose from the Archaeology Section, CCI, (Archaeology Section)

Carolyn Leckie, from the Carnegie Museum of Natural History, Pittsburgh, PA (Ethnology Section)

Continuing into the optional second year of the fellowship programme:

Debbie Juchem (Textile Section)•

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