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I, Charles II, by the Grace of God ...

by Gregory Young, Conservation Scientist, Analytical Research Laboratory

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On May 2nd, 1670, King Charles II granted a charter to the Company of Adventurers of England giving them exclusive trading rights over Rupert's Land, the territory encompassing all rivers that flow into the Hudson Bay. The Company later changed its name to the Hudson's Bay Company, and today is the oldest incorporated merchandising company in the English-speaking world.

Recently, eight CCI employees had the exciting task of studying the historic royal charter before it went into a new, permanent display at the company's Toronto headquarters. The charter was brought to CCI's Analytical Research Laboratory to record its current appearance, composition and state of deterioration. This work was part of a larger project of study, analysis and

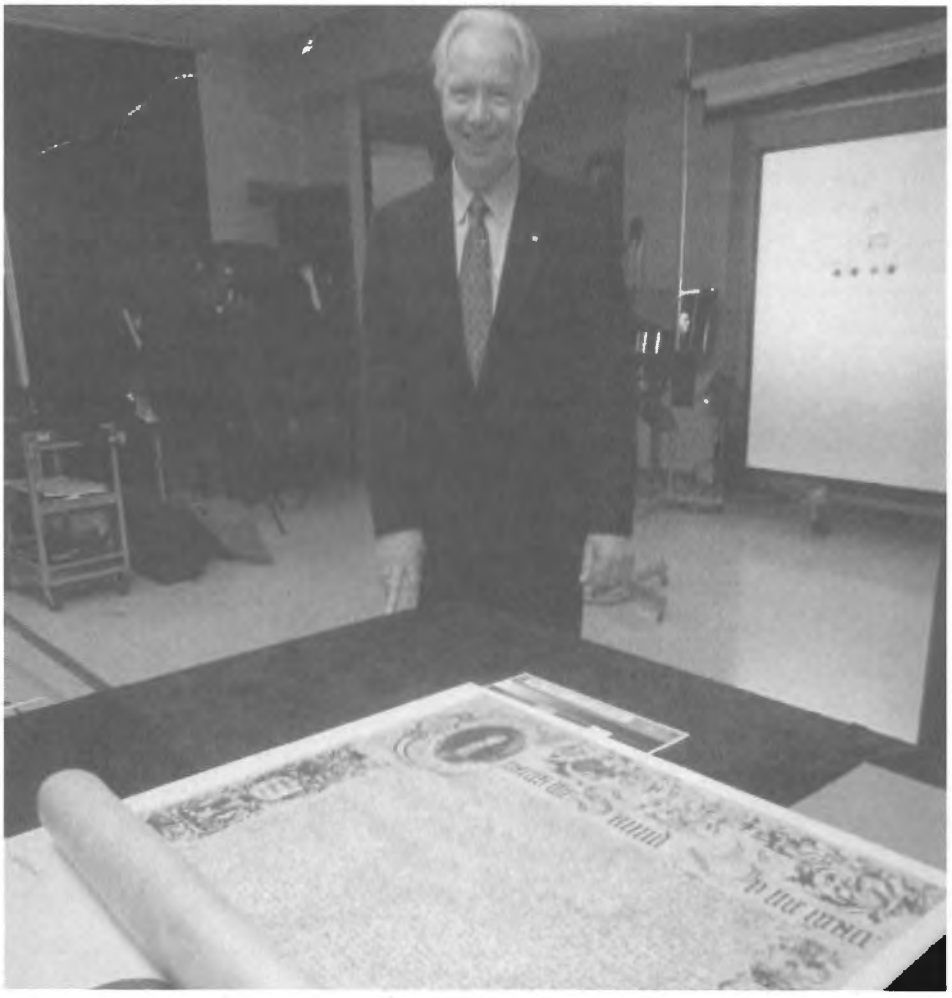

Photo: Patrick McGrath, *The Ottawa Citizen*

Officials from Hudson's Bay Company visited CCI in January to be briefed on the progress of the work. David Mitchell, the company's 32nd governor, was enthusiastic about the work done by CCI and Dorset Conservation, and said his company is proud to contribute to the preservation of such an important piece of Canada's history.

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preservation done in collaboration with the private sector. Professor Thea Burns of the Master of Art Conservation Program at Queen's University researched the charter's history. Kenneth Lockwood, President of Dorset Conservation Inc. in Toronto, developed and oversaw the project on behalf of the Hudson's Bay Company. He also designed and constructed the new glass display case, which includes electronic monitoring of a low-oxygen atmosphere and a pair of wooden doors that cover the top of the case and shield the charter from continuous exposure to light. The charter was installed in April 1997.

Documenting the Charter

The charter consists of five large sheets of parchment made from calfskin or deerskin. Each sheet is about 65 cm by 80 cm. Page one lies flat; the others are rolled up at the bottom. All the pages are inscribed with ornate calligraphy, and the top right corner of page one contains a portrait of Charles II. As well, the top and side margins of page one are adorned with printed illustrations of lions, unicorns, shields and other images. The Great Seal of King Charles is bound to a silk cord, which, in turn, binds the five pages together.

One of the major goals of CCI's part of the project was to establish a baseline for future monitoring of the charter's condition. The charter's appearance was documented through photography. Visible and ultraviolet illumination was used with close-up photography to record nicks, erased words, smudges, stains, scratches and so forth. X-radiography of the Great Seal revealed numerous pins and nails embedded in it as the result of past efforts to repair breaks in the Seal.

In a first for a document this large, world-leading laser scanner technology developed at the National Research Council of Canada (NRC) produced, in partnership with CCI, a digital, three-dimensional, colour record of the Great Seal, and of the text and images of page one. Many of these features were recorded at a resolution of 50 micrometres to create a high-definition, visual record of the charter's current condition. Additional laser images produced during future monitoring can be overlaid with this baseline image to reveal even minute changes in appearance.

The laser data produced magnified visual evidence of the charter's construction, including printing plate marks associated with the side margin illustrations and the portrait of the King. It also recorded the ridge line of what appears to be an extremely thin, skin-like support that holds the top margin illustration as a lamination on page one.

As a spin-off of the digital recording, NRC used rapid prototyping technology to produce an epoxy replica of the Great Seal from the laser data. At the request of the Hudson's Bay Company, the replica was moulded by Michael Harrington and Paul Heinrichs of CCI, and several wax facsimiles were made.

Chemical and elemental analyses identified most of the original materials of the charter. Materials of common use in the 17th century were found, including cinnabar/vermilion, carbon black and iron gallotannate inks. A beeswax/rosin mixture coloured with copper resinate made up the Great Seal.

The analyses also uncovered poly(vinyl acetate) (PVAC) applied in a past treatment of the five pages. The distribution of the polymer on page one was determined by a novel use of reflectance Fourier transform infrared spectroscopy. Ninety-four locations were chemically analysed without sampling or even touching the page. Some of the calligraphy shows losses of ink; the PVAC may have been applied to prevent additional losses.

Colour measurements were taken at 18 locations on page one to create baseline data. Tristimulus chroma meters were used, because they are highly standardized, calibrated to universally accepted specifications and readily available. Use of these or similarly standardized devices in the future should produce data that can be compared with the baseline data to determine changes in colour.

Measuring Deterioration

The charter's five pages have the typical stiff, smooth handle of modern parchment, but cockling and a darkened colour betray their 327 years of age. Neither the appearance nor the identification of the charter's composition could tell us anything about the parchment's state of deterioration; therefore, we used microscopic thermal stability measurements, with the bare minimum of sampling. Parchment is composed almost entirely of fibres of the protein collagen. These fibres have the property of shrinking in length at a temperature that is determined, in part, by their state of deterioration: as the deterioration increases, the shrinkage temperature drops. Our measurements found that the tiny samples of collagen fibres taken from page one had values approximately 16°C below the values for undeteriorated fibres. This finding indicates moderate deterioration, a state that is entirely consistent with the age of the parchment and with past storage conditions, which did not contribute to accelerated rates of deterioration.

The current condition of the charter reflects well on three centuries of storage. The completion of CCI's material and technical studies and of the larger interdisciplinary project marks the beginning of a new period of storage for the charter, in which modern preventive conservation practices are combined with innovative chemical and physical methods of analysis to provide as complete a program of non-interventive care as is possible. Future analysis and comparison with the current data will monitor the rate at which the appearance and condition of the charter change.

The study of the charter is an excellent example of partnerships CCI wishes to pursue with the private sector and with public institutions. ◊

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The Road to Excellence: Exhibit Transportation Services

by Deborah Robichaud, Director, Information and Extension Services Directorate

The long white truck backs up to the loading dock of the Glenbow Museum in Calgary, Alberta. It has just arrived from the McCord Museum in Montréal after three days on the road. The driver efficiently unloads five crates for the Tom Thomson exhibition organized by the Robert McLaughlin Gallery of Oshawa, Ontario, ... and another shipment of art is successfully delivered in good order. This scene is repeated hundreds of times each year as the Exhibit Transportation Services (ETS) ensures the secure transportation of everything from single works to entire exhibitions from Canadian museums and galleries.

The Exhibit Transportation Services warehouse in Gatineau, Quebec.

ETS was created in 1976 to provide transportation services to the National Gallery of Canada, which required a specialized fine art shipping service that met their standards of scheduling and collection preservation. Over the years, the service expanded to serve the other three national museums. As part of the review leading up to the 1990 National Museum Policy, the non-federal museum community successfully lobbied for access to the service.

Recently, it became part of the Canadian Conservation Institute. A strong justification for the merger is the compatibility of ETS with CCI's mandate to ensure the protection and preservation of museum collections in Canada. The service is an excellent complement to CCI's research into the transportation of works of art and the development of tools such as PadCAD, a computer program used in the design of fine art shipping crates. As a result, an integrated approach to the care and handling of collections in transit is now possible.

The merger of ETS with CCI has also opened the door to some additional exciting possibilities. CCI has completed an agreement with the Canadian Museums Association (CMA) and the Canadian Heritage Information Network (CHIN), which is designed to promote and market the sharing of exhibitions across Canada. There are two major aspects to this new alliance. One is the establishment of a shared database that will allow museums to see what exhibitions are being planned and will be available for travelling. The second is the creation of a position for a centralized program coordinator for exhibitions who will be hired by the CMA, and whose job it will be to actively promote the sharing of exhibitions. This program coordinator will work closely with the travelling exhibitions coordinator at ETS to ensure efficient and cost-effective transportation of exhibitions across the country.

This strategic alliance will provide a stimulus to help promote the sharing of exhibitions at a reasonable cost. It will also create a clearinghouse through which museums and galleries could circulate exhibitions, and actively involve the museum community in the service, with the result that more institutions could take advantage of exhibits. Increased utilization of ETS services to move exhibits should reduce the cost of circulating exhibits to small and medium-sized institutions, help promote an awareness of and access to more exhibitions, and improve the economic health of the museum community.

ETS provides reliable, safe and convenient road transportation in state-of-the-art vehicles. Its personnel are experienced art handlers who are accustomed to handling fragile museum objects and display materials. In order to minimize the risks that are always present in the handling of packing cases, ETS significantly decreases the number of transfer points between point of origin and destination; in many situations, when an exhibition is loaded and secured in a truck, it remains in that truck until it reaches its destination. Thus museums and galleries are assured of the ability to move their exhibitions and collections with a timely arrival while minimizing the risks of damage or theft.

The service to non-federal museums is limited to transportation needs that cannot be adequately met by the private sector. For example, the service enables museums in remote and under served areas — areas that are not readily served by private shipping firms — to share collections at a reasonable cost. ETS has flexible shipment schedules, which allow them to accommodate the needs of as many museums as possible, at the lowest possible cost. It operates on a cost-recovery basis. The partnership with CMA is part of a strategy to have ETS operating on a full, cost-recovery

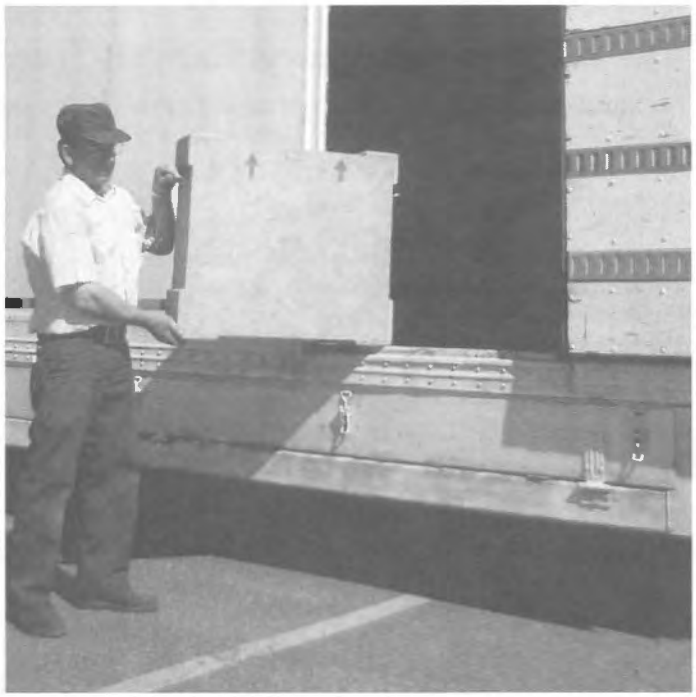
basis within five years. While the rates for shipping with the service have not increased substantially in the last five years, the only way of minimizing costs to any individual museum is for a number of clients to share the expenses of a "run" in order to make the most efficient use of the equipment. It should be noted that in instances where clients have no flexibility in their schedules, or where they specify that the truck be used exclusively for carrying their shipment (it may not be shared by shipments from other museums), the costs to clients will be higher.

Each year, ETS serves approximately 130 institutions and transports an average of 200 exhibits packed in 9,500 crates. Its vehicles log a combined total of over half a million kilometres. The fleet consists of five tractors, seven trailers, one straight truck, a 16-foot cube van and a small van. The trailers all provide a climate-controlled environment and enhanced security.

A purpose-built warehouse facility in Gatineau, Quebec, is the home base for ETS. Constructed in 1990, the 1,400-square-metre building meets museum design norms for security, fire protection and environmental control. The internal loading dock can accommodate five tractor trailers — all equipped with air ride suspension.

A 209-square-metre storage vault holds shipments awaiting the next trip, as well as art from museums and galleries that are undergoing renovations and require safe medium-term storage for their collections. ETS can also provide secure, climate-controlled long-term storage. Occasionally, its trailers are moved to museum sites to act as temporary climate-controlled storage units, or as fumigation or freezer units in support of insect eradication.

One notable job in the history of ETS was transporting the Degas exhibit from the National Gallery of Canada to New York. Another significant exhibit transported by the service was *Vatican Splendour: Masterpieces of Baroque Art*, which was trucked from Ottawa to Vancouver. Not all the exhibits are fine art-related. *Klondike Gold* is a travelling museum exhibit created by the Dawson City Museum, Yukon. Museum director Mac Swackhammer says that the mandate of the exhibit is "to share the story of our part of the country with other people in Canada who will never get the chance to visit us here. Sending our exhibition to small museum sites in communities so distant from Dawson is our contribution to Canadian unity, and is possible only with the help of ETS."



Jacques Préseault, driver, loading a crate into an Exhibit Transportation Services truck.

Possible future expansions include links with European customs brokers and freight forwarders to increase movements of international cultural exhibitions to and from Canada, as well as improving transborder services between Canada and the United States.

For now, though, ETS travels the highways and byways of Canada, making high-quality exhibits accessible to more Canadians.

For more information about the services offered by ETS, please contact Emile Mongrain by telephone (819) 243-4990 or fax (819) 243-8267. ◊

CCI's New Logo

CCI is proud to announce its first ever official logo! Meant to symbolize stability, precision and experience, the logo was designed by Michael Webb of Alchemy Design in Ottawa. Michael familiarized himself with CCI and reviewed staff suggestions before incorporating suggested concepts into the final design. The colour chosen is a rich, antique red.

The development of the logo is an important element of CCI's corporate identity, and is the first step in implementing the recently developed marketing plan. As CCI adapts to the changing realities of the coming years, the marketing plan will guide the Institute's revenue generating initiatives. The plan, based on CCI's mission statement, highlights the maintenance of services to eligible clients as a priority.

So stay tuned — the March 1998 newsletter will have a new look!

More information on CCI and its activities can be found on CCI's World Wide Web pages:

http://www.pch.gc.ca/cci-icc

CCI's 25 Years of Dedication and "Divertissement"

by Cliff McCawley, Director, Conservation and Scientific Services Directorate

When I look back over CCI's 25 year history, Timothy Findley's quote from *Inside Memory* comes to mind: "people are the landscape of memory." For me, CCI is not a collection of achievements, treatments completed, or scientific advances. CCI is the people who work here. They are the ones who made the achievements, who together form what has become the very special ethos of CCI: whether working at a laboratory bench, in a fire-gutted archives rescuing artifacts in sub-zero temperatures, or organizing a party for charity, CCI staff bring to their actions dedication, imagination, skill, and the knowledge that what they are doing makes a difference, and that it should be done well.

I think this ethos began at the birth of the Institute in 1972. Then, there were few conservators or conservation scientists in Canada. However, three years later, the Conservators-in-Training program began to fill the gaps. It was a time of great beginnings when the staff was caught up in the excitement of forming something new, something of great value. For conservation was also in its infancy in Canada, and CCI was to be the catalyst for its development.

A great sense of purpose was developing on which the CCI ethos would form. The foundation would be the staff's deep, abiding commitment to conservation and its overwhelming willingness to be of service — both of which continue to this day. This commitment received major support when the Mobile Conservation Laboratories were instituted. These five rolling labs brought hands-on conservation into all parts of Canada, to small as well as large museums. This program represented a profound change from CCI's intended course — the active and interventive treatment of artifacts in the laboratory. Now, CCI hit the road offering advice on care of collections and preventive conservation, and performing treatments where time and facilities permitted.

Three week tours were the norm. During this time the conservators could visit as many as six museums. It was not all one-sided. CCI benefitted as well as the client. CCI staff learned how to practice "the art of the possible." Ingenuity was constantly called upon when staff was forced to head to the nearest hardware store to buy supplies that just might solve a treatment problem. In turn, the staff in small museums across the country were becoming more aware of the need for conservation and the needs of collections.

Over the eight summers that the mobile labs roamed the country (1979-1986), many adventures were had, many lessons learned, many collections saved. Late night phone calls while the labs were on the road were often answered with mild trepidation. One never knew what the message would be: "the air conditioner was knocked off the top of the truck when driving through a car wash"; "the van is in a ditch"; or even, the memorable call — "the museum has burned down!"

It was with profound regret that the program closed. However, the closure did not dim the enthusiasm and commitment of CCI staff to foster the positive attitude to conservation that was growing in the country. Staff began searching for ways to continue to reach out to the museum community. The special nature of our scientists and conservators was becoming more evident. Concerned about outreach, maintaining regular contact with museum staff, and promoting preventive conservation awareness, a program of seminars and workshops was put into place. CCI staff entered into this new program with the same dedication and commitment as before.

In time, the CCI ethos was carried onto the international stage as we began to play a greater role in ICOM, and in a number of other international arenas and conservation treatments. Soon the international conservation community recognized that CCI gave as much as it received. As our influence broadened, many of us have proudly represented Canada many times.

Over the last 25 years, our national and international presence has been further underlined due to the many interns and ex-staff who have gone on to important jobs all over Canada and the world. A large network of, if we can call them such, "old CCI Boys and Girls" has been created.

However, our 25 year history is more than a recitation of achievements and benchmarks, it is also filled with laughter and comradeship. The social occasions we have enjoyed together, the great parties, the hilarious practical jokes — these have also been hallmarks along the length of our history. Who could forget the desserts topped with cod heads, or

the time an unsuspecting person returning from holiday found his office had been turned into a camp site? Or, how could we forget the time one of our managers misheard an incoming new staff member call to say he had to ship his "cow" to Ottawa, when he actually said, "car". And how, when some CCI staffers found out, they played along with helpful suggestions on what to feed this cow until the owner arrived in Ottawa.

While CCI staff take their work very seriously they do not treat themselves the same way. How many organizations have a "Goof of the Year Award" as CCI did for many years? It was awarded for some truly outrageous escapades. One of CCI's most senior people - an excellent scientist - received it one year for allowing his enthusiasm for research get the better of him. In addition to chlorinating his paper samples, he also chlorinated all of CCI staff and the building had to be evacuated. This same person travelled to Hamilton to give a talk and arrived feeling uncharacteristically tired. On looking in his suitcase, he discovered why. Beneath his papers, a caring colleague had inserted a sheet of lead weighing more than ten kilograms.

CCI's parties are always successful and often distinct. Never more so than when the purpose is to raise money for charity. Who will ever forget the Easter breakfast for United Way? Certainly not the Director General of the day, who was summoned from his office to the front door to be greeted by a live menagerie, including a donkey, rabbits and several roosters!

As CCI progressed over the last 25 years, it has developed into a special place where conservators and scientists work together under one roof. This has created a unique atmosphere that has made possible our accomplishments. I see this collaboration continuing to bring CCI even greater successes in the future.

An indication of how the future will be handled was staff's response to the long process of reorganization, which began nearly two years ago. With typical spirit, staff pitched in with an unbelievable level of extra commitment to make the reorganization work. Large number of hours were spent in committees and staff meetings. However, at all times during the reorganization, meeting the needs of our clients was always top of mind.

I am continually amazed by the talents and amazing gifts of our staff. Now that we are charging for some services, an entrepreneurial spirit is very evident. But we should not be surprised. CCI is composed of a very eclectic group of people who are interested in so many fields other than their area of specialty, and who bring so many viewpoints to the issues at hand.

As I look back, my fondest memory and my hope for the future of CCI are the multi-faceted men and women who bring CCI to life. There have been, and probably will continue to be, significant changes. However, the spirit and commitment of its people will, I'm certain, ensure that CCI will continue to thrive. ◊

A Canada–France Exchange of Technical Expertise

by Dr. Vasilike Argyropoulos, on fellowship at CCI

Dr. Christian Degrigny (standing) working with Dr. Vasilike Argyropoulos at the Arc'Antique.

During my Conservation Fellowship at CCI I researched the ethylenediamine treatment for iron artifacts, which involves using an amine corrosion inhibitor to stabilize iron. After my fellowship, many questions still remained about the use of electrochemical techniques for studying corrosion inhibitors on archaeological metals. Therefore, with the support of the Canada–France Agreement for Co-operation and Exchanges in the Field of Museology, I spent four months (beginning in October 1996) experimenting with electrochemical techniques on metals at Arc'Antique in Nantes, France.

Arc'Antique is a conservation laboratory that focuses on the treatment of metal and ceramic artifacts. Under the direction of Claude Forrières and with the expertise of Dr. Christian Degrigny, an electrochemist, it has the facilities to conduct research into metal treatments using electrochemical methods. Dr. Degrigny previously worked for the Valectra Group at Électricité de France, which developed electrochemical treatments for metal artifacts. By the time I arrived at Arc'Antique, Dr. Degrigny had become involved in a collaborative project with Arc-Nucléart in Grenoble to study a treatment for iron–wood composite artifacts. Because this treatment uses another amine corrosion inhibitor to stabilize iron, we decided to work together, using electrochemical techniques to study the effect of the inhibitor on archaeological iron with and without corrosion products.

Our collaboration focused on assessing the polyethylene glycol (PEG)-Hostacor treatment for composite artifacts of iron and waterlogged wood, a treatment that was originally developed by CCI and has been adopted by conservators. During my stay in France, I completed part 1 of the study, which used potentiodynamic measurements to compare the effect of Hostacor KS1 to its new replacement product, Hostacor IT, on archaeological

iron in PEG solutions. I also helped set up part 2 of the study, which will focus on systematic long-term monitoring of the PEG-Hostacor IT treatment of iron–wood artifacts. This treatment is based on the approach I used for the ethylenediamine research project.

It was interesting and useful to learn that electrochemical methods can be applied to study chemical treatments of archaeological metal with and without corrosion products, although more research is required to develop an approach for metal with corrosion products intact. These methods can provide information about the corrosion of metal in treatment solutions and are less time-consuming than standard weight-loss measurements on polished metal pieces.

My experience also taught me the benefits of exchanging technical expertise between Canada and France for such conservation projects. The French take an interventionist approach in preserving their cultural heritage and have a wealth of knowledge and experience in treating archaeological objects, while CCI provides and supports development in treatments of archaeological material. Exchanges between Canadian and French institutions promote the continued study and dissemination of knowledge in preserving our cultural heritage. ◊

Scientific and Technical Photography at the Canadian Conservation Institute

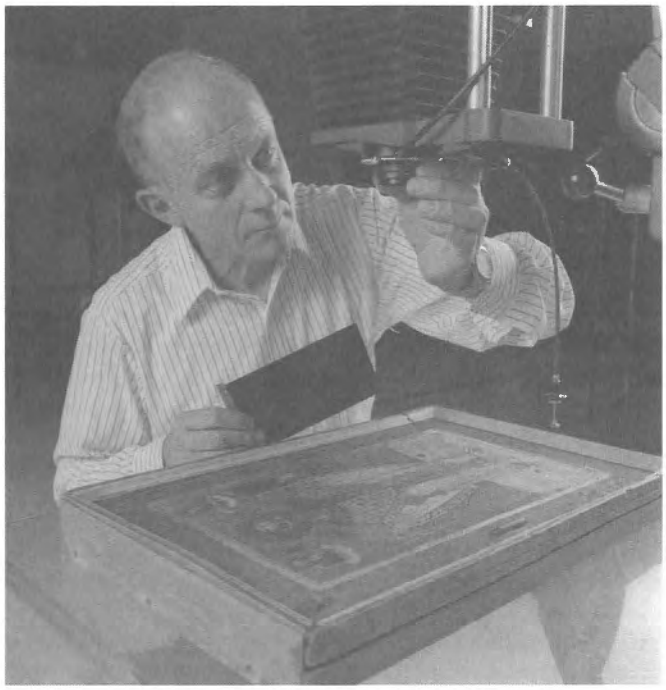
by Jeremy J. Powell, Senior Scientific Documentation Technologist, Analytical Research Laboratory

CCI's scientific and technical photographic unit has performed a vital function at CCI from the Institute's earliest days. Not only has it done the essential recording of the condition of artifacts during treatment in a conservation laboratory, the unit has also provided an important service for conservation scientists who use the information from photographs and X-radiographs to initiate or support their analysis and research. The before-, during- and after-treatment photography of artifacts represents about 70% of the work. Digital imaging and slide making, as well as an increasing proportion of requests from non-eligible clients, account for the remainder.

Many other parts of the Institute depend on this expertise. Photographic components for in-house publications, advertisements and brochures; lectures and presentations by staff, display booths, and display panels are also part of the work.

CCI's scientific documentation technologists also use their skills outside 1030 Innes Road. One of their strengths is their capacity to accurately record rock art sites anywhere in Canada and internationally, often under very difficult conditions. The photographing of six pictograph sites at Reindeer Lake in northern Saskatchewan with SaskPower is a case in point. The snow was deep, the equipment cumbersome and the daily travel from base camp to each site arduous. The technically exquisite images crafted during this adventure are now being digitized, enhanced and analyzed at CCI.

Since its inception, the photo studio has been blessed with a full complement of camera and lighting equipment, as well as dedicated film and processing facilities: Nikon F-3s and Contax RTS cameras for small or 35-mm format; Hasselblad, Linhof Kardan, Sinar p and Polaroid MP4 for medium format; and the Sinar p 8 x 10 for large format. Electronic flash is used extensively for all photo documentation for reasons of safety (of camera operator and artifact, alike), uniformity and the predictability of the quality of the resulting image. However, tungsten-halogen illumination is used for infrared reflectography, as a continuous source of infrared radiation is crucial to the success of this technique.



Jeremy Powell taking a close-up photograph of an icon from the Basilian Fathers Museum, Mundare, Alberta.

All artifacts that are treated in CCI's conservation laboratories are subjected to at least one form of photographic technique. Normal or standard reproduction (in colour and in black-and-white) is the starting point, whether the object is a painting, a paper artifact, furniture, or an ethnographic or archaeological artifact. Any of these may be further photographed by using raking light (to record surface anomalies such as cupping, craquelure, etc.), specular reflectance (to record texture and topography), infrared reflected or transmitted radiation (to establish areas of damage, underdrawing, pentimenti, loss, etc.) or ultraviolet-induced visible-colour-fluorescence (to detect areas of overpainting and previous repair).

Precision photography with minimal movement and disruption of artifacts can be done in the conservation treatment laboratories. It can also be done at a camera site largely unnoticed by most people. During the early 1980s, staff recognized

the need for a camera-system location from which large or fragile artifacts could be safely and conveniently photographed under strictly controllable conditions. A 60 cm by 90 cm hole was made in the centre of the studio ceiling and a camera monorail and plate-assembly that accommodates all camera format sizes was bolted in place. The most notable recent examples of oversized artifacts photographed from this four-metre-high viewpoint have been the Gondar Hanging from the Royal Ontario Museum, a map of the counties of Stormont, Dundas, Glengarry, Prescott and Russell from the Chesterville and District Historical Society and the Carillon flag owned by the Musée de l'Amérique française.

X-radiography

For nearly 25 years, radiography at CCI has been an important component of conservation treatment and scientific examination. The remains of a 26,000-year-old horse hide and bones (Canadian Museum of Nature), the panelled back of a walnut throne, the eight hands of the Peace Tower clock, an oil-on-canvas painting (*Heroine of the Old Testament* by Rembrandt, National Gallery of Canada) and the polychromed-wood sculpture *Marie Madeleine* (Musée de Sainte-Anne-de-Beaupré) are but a few of the many memorable and notable items documented by X-radiography.

X-radiography is a photographic process whereby extremely short wavelength radiation is differentially absorbed according to the combination of the density, thickness and chemical constituents of visibly opaque materials to produce an image after processing. The aim of scientific and technical examination by radiography is to collect as much useful, objective information about an object as possible. X-radiography will record the differential densities of an object and the internal features and condition not seen by other photographic techniques. In the case of paintings, the wood support, nails, stretcher and canvas construction, pentimenti, the presence of an underlying composition and worm holes can be detected. Similarly, nails, types of joinage and any woodworm damage in furniture can be recorded. Even the features of original lettering and design on coinage, the degree of corrosion of iron artifacts and the casting technique in bronzes can be shown through this technique.

A close relative of X-radiography is electron emission radiography. This method reveals information about the surface of a painting or other planar object. The emulsion side of a sheet of X-ray film is placed in intimate contact (in a light-tight envelope under a low vacuum) with the paint surface. Extremely hard (250 to 300 kV), heavily filtered X-ray primary photoelectrons are directed toward the paint surface, from which secondary photoelectrons are emitted to expose the film. Chemical elements that make up different pigments will emit different intensities, which, in turn, will produce varying densities in a processed film. The higher the atomic number of an element, the greater the secondary photoelectron emission. This technique was recently used on *Heroine of the Old Testament*.

Carl Bigras enhancing a pair of digitized images.

Transmission electron radiography is another related method. In this technique, the object for examination is always one of low density, such as a paper artifact. Very hard (a minimum of 275 kV), filtered primary X-ray photoelectrons produce secondary photoelectrons from a lead foil screen that is in close contact with the object. The image on film depends on the specimen's material density and the degree to which the direct X-rays produce secondary photoelectrons from the screen to penetrate the specimen. The detection of watermarks in paper artifacts, such as stamps, maps and prints, is a typical use of the technique. This technique was recently used on a collection of five prints and a map entitled *Voyage dans le Nord de la Russie asiatique*, in the collection of the Arctic Institute of North America, University of Calgary.

Digital Imaging

The emerging trend in the scientific and technical recording field is digital imaging. For many years, the Institute relied entirely on conventional photography to achieve the end image. Now, the role of digital imaging is becoming increasingly important.

For digital work, images are scanned from transparencies, negatives or prints. The manipulated images are then incorporated into publications, the CCI web site and staff slide presentations. Enhancement of imported scanning electron microscope files, video inputs from the infrared vidicon and mosaicking of radiographic images are examples of tasks done for the analytical side. Rock art is a good example where the digitization of a raw, perfectly exposed, pin-sharp 6 by 6 cm Ektachrome transparency demonstrates the equipment's capabilities. The scanned transparency is separated into the red, green and blue components. A mask is created and combined with the original scanned image to make an enhanced colour version in a file or on a 35-mm colour transparency. These and other tasks account for a minimum of 500 images scanned and a total output of more than 1000 slides yearly.

Just as technology continues to evolve and improve, so too will CCI's scientific documentation and photographic capacity. ◊

New Directions

by Bill Peters, Director General, CCI

CCI continues its round of discussions with the heritage and conservation communities about the Institute's new strategic directions. In May and June, the annual conferences of the Canadian Association for the Preservation of Cultural Property and the Canadian Museums Association provided opportunities for group and individual discussions about the issues raised in the CCI paper "New Directions for the Canadian Conservation Institute".

In general, clients have expressed concern about the impact of fees on smaller institutions, and about the degree to which CCI will be in competition with private conservators. In both cases, CCI has stated that it will monitor these situations very carefully and make adjustments as necessary. At the same time, there appears to be real enthusiasm about the prospect of more cooperative, partnered projects, and the possibility of bringing new sponsors into the conservation field.

These avenues are being developed in a marketing strategy within the Institute. A number of recent activities indicate the range of future possibilities:

- CCI has partnered with Ken Lockwood, a Toronto-based conservator, and Thea Burns, a Queen's University professor, in contracts with the Hudson's Bay Company. Ken was asked by the company to advise them on the conservation needs of their 327-year old royal charter, a magnificent, illustrated parchment and the oldest extant document of its type. He came to CCI, where a thorough scientific analysis and condition documentation was completed, while Ms. Burns researched the history of the charter. The outcome: the company received a complete condition report, Mr. Lockwood developed a hermetically sealed display chamber for the charter, and Ms. Burns is completing its history. The Charter should survive another 327 years, and, as well, the project generated positive media coverage about the importance of conservation in Ottawa newspapers, *Macleans* magazine and a TV documentary on the Discovery Channel.

- The Institute has provided a conservation assessment as part of the massive restoration program being undertaken by Public Works and Government Services on the Parliamentary Precinct, beginning with the Centre Block. Over the next 10 to 15 years, all of the historic spaces in Canada's Parliament Buildings will undergo restoration. CCI's assessment report will ensure that appropriate conservation standards are built into the project; one result should be a considerable volume of work for private conservators. And, of course, a major national symbol will be protected and preserved for future generations.

- Bob Barclay and Carole Dignard provided a public workshop on the care of antiques in conjunction with the Fraser Fort George Regional Museum in Prince George, British Columbia. We hope to give more public presentations of this type when staff are travelling on seminars or other business. These initiatives will hopefully raise the public profile of the importance of conservation.

- Two minister-level foreign delegations visited CCI for discussions and a tour of the facility in recent months. Both the Chinese and Russian Ministers of Culture spent a considerable amount of time at the Institute, exploring the possibility of a Canadian role in their efforts to preserve their nation's cultural heritage. CCI's approach is to open the door to these markets for Canadian conservation expertise — both institutional and private sector.

One of CCI's highest priorities, set out in the New Directions document, is to maintain close contacts with the heritage and conservation communities. The Institute is committed to providing full and regular reports about its activities and the results of its new directions. There have also been discussions about the creation of some form of advisory body for CCI; most of those who have commented on this possibility have suggested that such a body could be useful in providing advice on questions of strategic direction, as opposed to day-to-day decision making. For example, what is an appropriate balance between revenue-generating activity and service to eligible clients; what role should CCI play in international conservation activities; should the Institute devote more of its resources to its training and educational role; etc. I invite your thoughts and comments about these questions — and about any other aspect of our New Directions.

Write to Bill Peters by E-mail at: bill_peters@pch.gc.ca, or call collect: (613) 998-3721. ◊

Intern News

The following individuals have recently finished or are currently participating in an internship at CCI:

Anna Bülow, a conservation student at the Schule für Konservierung und Restaurierung in Bern, Switzerland. April - September 1997. (Curriculum Internship - Conservation Processes and Materials Research Division).

Molly McNamara, a conservation student at Queen's University, Kingston, Ontario. May - July 1997. (Curriculum Internship - Treatment and Development Division, Furniture and Decorative Arts Lab).

Kim Muir, a conservation student at Queen's University, Kingston, Ontario. May - August 1997. (Curriculum Internship - Treatment and Development Division, Fine Arts Lab).

Elizabeth Page, an objects conservator and specialist in preventive conservation at the National Gallery of Australia in Canberra. April - September 1997. (Professional Development Internship - Preventive Conservation Services).

The Care of Antiques and Collectibles: Evening Courses at CCI

by George Prytulak, Conservator, Industrial Collections

Last winter, CCI offered a series of evening courses for the first time. Aimed at the general public, this program was launched with several goals in mind. First and foremost, CCI wanted to raise its public profile: after 25 years of serving Canada's museum community, CCI is still one of the nation's best-kept secrets. CCI believes that promoting its resources and raising public awareness of conservation will translate into much-needed support for the profession. This is crucial at a time when cultural institutions are continually under scrutiny and expected to justify their levels of funding.

In addition to a higher profile, the program provided other important benefits: an opportunity for staff to sharpen their teaching skills and update existing museum workshop sessions and materials, and a broader market for CCI's ever-growing list of publications and products.

Working on the premise that people who collect antiques would be interested in caring for their investments, staff members created four courses that they felt would have great popular appeal:

- *An Enduring Legacy: Caring for Your Antique Furniture*
- *Brass Lamps, Steel Tools, Silver Spoons: The Care of Metal Antiques and Collectibles*
- *Costumes, Embroideries and Wall Hangings: Saving Your Cherished Textiles*
- *Making it Last: Taking Care of Your Treasured Works of Art*

Enrollment was limited to 16 participants per course. The fee was set at $125, and each course ran two hours a night for eight consecutive weeks.

The program was developed in October-November 1996 and was ready for launching in early December. This remarkably short turnaround time was due mainly to the enthusiasm and cooperation of the staff who had volunteered to be instructors. Advertising was at first limited to brochures, posters, and several small ads placed in local community newspapers. Publicity for the program culminated with a half-page article in *The Ottawa Citizen* and an interview on local CBC radio shortly before the courses started in early February 1997.

Bob Barclay demonstrates a technique to the participants of the "Care of Metal Antiques and Collectibles" evening course.

Success by any measure

The success of the program far exceeded expectations. Three of the four courses were filled to capacity — the overflow was put on waiting lists. This is remarkable when one considers that the program was a pilot project with a very modest advertising budget. The program also managed to compete in an environment that is saturated with hundreds of educational evening courses and multimedia diversions. CCI's success clearly indicates that the general public has a keen interest in courses dealing with artifacts.

The program was also successful in terms of client satisfaction. Participant evaluations showed that they were delighted with the program: the instructors' enthusiasm and knowledge, the usefulness of the material, and the friendly, professional atmosphere of CCI were particularly mentioned. Asked what they liked least about the courses, many answered: "Having to stop at 9:00 p.m.," "Not applicable," and "Coffee break."

As far as the instructors were concerned, the courses were demanding but well worth the effort. The program yielded tremendous benefits in terms of establishing useful contacts with the public and contributing to staff enthusiasm for conservation training and presentations. Working with the public was both refreshing and stimulating because it allowed the instructors to interact with exceptionally interested and motivated participants over a period of eight weeks. Closer relations with the public will yield much valuable feedback and goodwill in the future.

Much of the program's success was due to the instructors' willingness to develop and test new teaching techniques and to give more popular appeal to their existing workshop sessions. Hands-on activities, interactive exercises and demonstrations figured prominently in most classes. The time spent preparing for these courses will benefit every educational endeavour conducted by CCI in the future.

Without a doubt, CCI's public profile has been enhanced by the program and progress made towards educating the public about conservation. From the instructors' point of view, the program was a resounding success and well worth repeating. The length of the waiting list for the next series of evening courses augurs well for a repetition of this first successful experience. ◊

Creating a Paper Permanency Standard

by David Grattan, Acting Manager, Conservation Processes and Material Research Division

Among the community of Canadian conservators and library specialists, it has long been known that deteriorating paper is a major problem. The deterioration of the paper base seriously threatens the survival of most of the published materials and written records constituting the collections in Canada's libraries and archives. The problem has gradually been recognized outside conservator circles, so that now there is a considerable degree of public concern. While a variety of efforts have attempted to protect current collections from further deterioration, there has also been a greater focus on prevention, including a move to increase the use of stable, alkaline-based papers.

In January 1992, the government of Canada decided that all of its own publications that could be expected to be retained would be printed on stable, alkaline-based paper. This landmark decision was based on several factors, including safeguarding the federal government's printed heritage, ensuring that Canada's significant national records would survive, helping provide accurate records of Canada's federal government, helping protect the rights of citizens, and responding to the public's right to information while allowing for future research. As a result of the decision, most Canadian manufacturers of fine paper today can produce alkaline paper to meet the increased demand for paper of much improved permanence.

The government's decision included a directive for the Canadian General Standards Board (CGSB) to develop a national standard for paper stability consistent with international standards.

The Lignin Debate

The first issue for the CGSB to resolve was the scientific debate about whether lignin should be permitted or excluded in the paper manufacturing process. Most existing permanent paper standards (ANSI, ISO, DIN in Germany) specify that permanent paper should be alkaline and contain at least 2% calcium carbonate to act as a buffer (or as an alkaline reserve) against acid hydrolysis of the paper. Some of these standards (such as the ISO) recognize that paper with lignin may have good strength retention, but the standards nonetheless allow no more than 1% lignin because of the uncertainty about the impact of air pollutants on lignin-containing papers. The restriction on lignin derived from the observation that many papers made from mechanical pulps have poor permanence. It was argued that this instability was caused by the presence of lignin, which constitutes about 25% of the substance of most species of wood. Not surprisingly, manufacturers of high-yield (lignin-containing) pulps objected to the lignin-content restriction, while library and archival communities advised caution about making changes to existing standards.

When the CGSB began looking at developing a new paper permanency standard, it found evidence in recently published scientific work suggesting that assumptions about the impact of lignin might be incorrect. Because this scientific data was insufficient to draw firm conclusions, it was decided that Canada should conduct research to determine whether lignin has a detrimental effect on paper permanence. Hence, a number of Canadian users and manufacturers joined forces in 1994 to launch a collaborative two-and-a-half year research project.

Research Project

Under the auspices of the CGSB, the research plan was established and financial support obtained from both government and industry. Project sponsors included Industry Canada, Canadian Heritage, the National Archives, the National Library of Canada, the Alberta government (Department of Economic Development and Tourism), DuPont Canada, Fibreco Pulp, Louisiana Pacific, Millar Western Pulp, Quesnel River Pulp, Tembec Inc., and Slave Lake Pulp.

The research was conducted in the laboratories of the Pulp and Paper Research Institute of Canada (PAPRICAN, whose headquarters are in Pointe-Claire, Quebec) and the Canadian Conservation Institute. The first report on the work, prepared jointly by the two research teams, was presented by CCI at the ARSAG (Association pour la Recherche Scientifique sur les Arts Graphiques) conference in Paris in April 1997.

The project was divided into two components. First, 21 sets of handsheets made from 6 types of pulp and 10 commercial papers were subjected to accelerated aging. Papers of high and low stability were included for comparison. The aging behaviour of this comprehensive set of papers was determined using a wide variety of mechanical, chemical and optical tests. The results clearly showed that it is acidity—not the presence or absence of lignin—that is a dominant factor in the mechanical stability of paper. Second, the researchers studied the impact of the gaseous pollutants sulphur dioxide and nitrogen oxides on papers. This research showed that the presence of lignin does not have a negative impact on permanency if the paper is buffered with a sufficient amount of calcium carbonate.

Perhaps the key component of the CCI work was developing and using chemical analysis techniques. Credit should go to Elzbieta Kaminska, contractor to CCI, for her work in refining the method of measuring the degree of polymerization (DP) of cellulose. The DP method has consistently been shown to be the most sensitive analytical technique for detecting the early stages of paper degradation. Thanks to Elzbieta, a major breakthrough was achieved in modifying the technique for studying lignin-containing papers.

Future Plans

Since the research was completed, two major events have taken place. First, the CGSB has revived a sub-committee of its committee on Printing and Writing Papers (Permanence of Paper) to write the first Canadian permanency standard for paper. Cliff McCawley, Director of Conservation and Scientific Services, has been appointed chairman of this group. Second, CCI has initiated another paper permanency project. Over a year ago, CCI was successful in its bid to conduct work for the Institute for Standards Research of the American Society for the Testing of Materials (ASTM) in Philadelphia on the effects of aging on printing and writing papers. The project began on May 15, 1997, with the award of the first part of a two-year grant of US $130,000.

The aim of this latter project differs from the Canadian study. It is being conducted

to develop better test methods for paper and thus to enable future standards to be based on the performance rather than the composition of papers. CCI joins a team composed of groups from the Library of Congress (Washington, D.C.), the Image Permanence Institute (Rochester, New York), and the Forest Products Research Laboratory (Madison, Wisconsin). A technical meeting of the group was held at CCI on May 7th and 8th. The meeting helped the CCI team to refine its research and to better integrate it with the other three. The CCI research will study the accelerated aging test for paper at different temperatures and relative humidities. CCI will also examine whether aging the paper in stacks of 50 sheets or more (rather than testing individual sheets) influences the test results. Again, the DP method developed by Elzbieta Kaminska will be a key feature of the research. It is hoped that this work will help to establish an aging test that can be incorporated into the ASTM standard.

Through such efforts as the CGSB research and the ASTM project, CCI researchers are taking part in the long-term goal of preserving our written history.

CCI Services: Seminars, Lectures, Workshops and Visits

April

Jan Vuori took a leave of absence to teach in the Master of Art Conservation Program, Queen's University from February to April, 1997.

Jean Tétreault gave two seminars on preventive conservation in Miramichi for the Association Museums New Brunswick. One seminar was given in French, the other in English.

Peter Vogel and **Bob Arnold** and Wojciech Jakobiec, a private conservator, visited the National Arts Centre to carry out conservation treatment work on a large mural, *Homage to RFK*, completed by the artist William Ronald in 1969.

Carl Bigras and **Tom Strang** travelled to Reindeer Lake in northern Saskatchewan to record rock painting sites affected by hydroelectric development. The project was undertaken for SaskPower. Six red ochre pictograph sites were successfully photographed.

Debra Daly Hartin and **Helen McKay** presented the seminar "The Care of Paintings" at the Art Gallery of Hamilton in association with the Ontario Association of Art Galleries. Following the seminar, they visited several institutions in the area to tour facilities and discuss conservation-related questions and CCI services. The additional visits were made to McMaster Museum of Art in Hamilton, Battlefield House Museum in Stoney Creek, Joseph Brant Museum in Burlington, Oakville Galleries (Gairloch and Centennial) in Oakville, and the Art Gallery of Ontario in Toronto.

Bob Barclay gave a consultation at the Bate Collection, Faculty of Music, Oxford University.

Paul Marcon presented a paper entitled "Decision Support Models for Preventive Conservation" at the Interface Between Science and Conservation Conference organized by the British Museum. Later in the month, he gave a workshop on the "Packing and Transport of Paintings" in collaboration with the National Gallery of Art at the Museum Ludwig in Cologne, Germany, and at the Rijksmuseum in Amsterdam.

Ian Wainwright presented a paper (co-authored with **Kate Helwig**) on the "Analysis of Pigments from Rock Paintings at Cueva de las Manos and Cerro de los Indios, Argentina" to a symposium, *New Studies of Rock Art in South America*, a symposium held during the International Rock Art Congress held in Cochabamba, Bolivia. The paper described the analytical results of a collaborative project — *Conservation and Recording of Rock Art in Argentina* — initiated in 1994.

May

Jean Tétreault presided over the general meeting of the Canadian Association for Conservation of Cultural Property held in Ottawa. The meeting marked the end of Jean's two-year term as president.

Brian Laurie-Beaumont attended the International Association of Museum Facility Administrators Annual Conference, Santa Monica, California. The theme was "Building for Excellence."

Judy Logan presented a paper, "Dust-to-Dust: Conservation for a Site in Jordan," at the Canadian Archaeological Association conference in Saskatoon. She also gave guest lectures on archaeological conservation for classes at Carleton University and Gloucester High School.

Janet Wagner gave a lecture on the conservation of quilts at the Canadian Quilters' Association seminar in Montreal.

Bob Barclay lectured at the Conservation Colloquia, Victoria & Albert Museum, London. He later supervised a laboratory visit and viva voce examination of Andrew Lamb for the degree of Master of Arts, Victoria & Albert/Royal College of Art combined programme. When he returned to Canada, he gave the Per Guldbeck Lecture at the CAC Annual Conference in Ottawa.

Lyndsie Selwyn presented a lecture entitled "Corrosion Products and Surface Contamination on Outdoor Bronze Statues" at the annual CAC conference in Ottawa and **Carole Dignard** presented a paper and a poster, co-authored with **David Grattan**, **Paul Heinrichs**, **Tom Stone** and **Greg Young** of CCI and Heather Garrod of Parks Canada, entitled "An Overview of Laser Cleaning in Conservation."

June

David Tremain presented a paper about Emergency Preparedness for Museums in Canada to the Canadian Museums Association annual conference in Ottawa. He also conducted a session entitled "Responding to Emergencies" at the Curriculum Development Pilot Workshop on Emergency Response for Cultural Institutions as part of the AIC's Task Force on Disaster Mitigation, Response and Recovery, National Working Group on Training for Cultural Institutions, Washington DC.

Della Dupuis and **Ela Keyserlingk** were presented with People Management Awards by the Deputy Minister of the Department of Canadian Heritage.

Tom Stone presented a paper entitled "Artifacts Revisited: The Evaluation of Old Treatments" in the Objects Speciality Group sessions at the American Institute of Conservation annual meeting in San Diego, California.

Nancy Binnie participated in a field trip to Deadman Bay, Kingston, along with Lorne Murdock and John Stewart from Parks Canada's Historic Resource Conservation Branch and Peter Engelbert from Ontario's Marine Heritage Conservation Program, Ontario Ministry of Citizenship, Culture, and Recreation. The in-situ work being carried out on a War of 1812 shipwreck is part of an ongoing project to study the effect of zebra and quagga mussels on the materials composing historic shipwrecks and other underwater archaeological sites.

Paul Marcon gave presentations and demonstrations on artifact fragility, packaging materials and protective package design at the Canadian Museums Association's workshop on Travelling Exhibits at Exhibit Transportation Services, Gatineau, Quebec.

Marie-Claude Corbeil was a member of the teaching staff for a course on science and heritage conservation entitled "Les apports de la science à la conservation du patrimoine". The course, organized jointly by ICCROM and ENP, was given in Paris.

July

Nancy Binnie spent two weeks as a volunteer at the underwater excavation of a vessel of Phips' fleet (the expedition which attempted to take Quebec City in 1690) at Anse-aux-Bouleaux, Quebec, at the invitation of the Marine Archaeology Section of Parks Canada.

August

Deborah Stewart and **David Tremain** conducted a workshop on the salvage of library and archival material for library staff of the Canada Institute for Scientific and Technical Information (CISTI) in Ottawa.

Nancy Binnie worked on the Shipwreck Monitoring Program at Fathom Five National Marine Park (FFNMP), Tobermory, Ontario, along with Lorne Murdock and John Stewart of Parks Canada's Historic Resource Conservation Branch, staff from the Federal Archaeology Office's Marine Archaeology Section, and Stan McClellan of FFNMP.

Upcoming Training Presentations

Please contact the provincial museums association listed to confirm details or to register for any of these CCI training presentations. Times and places are subject to change.

November 1997

Alberta
(Alberta Museums Association)
"Plastic Objects in Museum Collections"
Date: November 26-28
Place: University of Alberta, Edmonton

Nova Scotia
(Federation of Nova Scotian Heritage)
"Construction of Mannequins for Historic Costumes"
Date: November 6-7
Place: Old King's Court House Museum, Kentville

March 1998

Ontario
(Ontario Museum Association)
"Care of Textiles"
Date: March 9-10
Place: The Museum for Textiles, Toronto

Dr. Norman Tennent Visits CCI

On January 23 and 24, 1997, Dr. Norman Tennent visited CCI. Dr. Tennent is currently affiliated with the Central Laboratory in Amsterdam and was formerly affiliated with Glasgow Museums and the Universities of Glasgow and Strathclyde. He has played a key role in investigating epoxy resin adhesives, glass and ceramics, and indoor pollution. Dr. Tennent visited CCI primarily to discuss possible collaboration with CCI Senior Conservation Scientist Jane Down in writing a review monograph on epoxy resin adhesives. He also spoke with various scientists about projects of mutual interest, such as efflorescence on metals and ceramics and the degradation of plastics, and gave a brief lecture, "Indoor Pollution—Quantification, Effects and Mitigation".

In his lecture, Dr. Tennent spoke about the important pollutants in the indoor environment, concentrating on organic acids and aldehydes derived from cabinet fabrication materials. He also outlined the process for identifying efflorescence products and the development of a new passive sampler for acetic and formic acids. His talk highlighted such issues as the effectiveness of barrier foils applied as a remedial measure, and he described the results of pilot experiments with new absorbents to prevent silver tarnishing. It was a pleasure having Dr. Tennent with us to discuss projects of mutual interest and his work.

Dr. Norman Tennent met with CCI scientists when he visited in January. (Left to right: Dr. David Grattan, Jane Down, Dr. Lyndsie Selwyn, Dr. Norman Tennent, Jane Sirois and, Scott Williams.)

Visit of the Minister of Culture of the People's Republic of China, Liu Zhongde (far left), to the Canadian Conservation Institute, on April 11. David Hanington (far right), paper conservator, is showing treated prints from Birds of America *by John James Audubon, from the collection of the Library of Parliament in Ottawa.*

Visit of the Russian Minister of Culture, Evgeny Sidorov, to the Canadian Conservation Institute, on June 6. Robert Arnold, fine arts conservator, is showing the painting The Gamekeepers *by Horatio Couldery, from the collection of the Hastings County Museum.*
From left to right : Evgeny Sidorov, Nikita Kiriloff, Interpreter, Dr. Vladimir P. Salov, First Secretary, Embassy of the Russian Federation, Cliff McCawley, Director of Conservation and Scientific Services, CCI and Robert Arnold.

The Conservation of Gilded Artifacts

CCI will be hosting several seminars/workshops in Ottawa in 1998. These advanced level offerings will be aimed at conservation and museum professionals, as well as those involved in heritage preservation. The first workshop is "The Conservation of Gilded Artifacts", February 12-14, presented in cooperation with Deborah Bigelow of Beacon, New York. Other seminars are planned to run during a one-to-two week period in November 1998. For further information or to register, contact CCI's Extension Services Division at (613) 998-3721, ext. 250 or by E-mail at cci-icc_publications@pch.gc.ca

"Preventive Conservation in Museums" Video Handbook

This manual complements the 19-video series on preventive conservation produced by the Centre de conservation du Québec, CCI and the Université du Québec à Montréal. Chapters include: an introduction to preventive conservation, storage, the condition report, relative humidity and temperature. Spiral-bound, 20 x 11 cm, 152 pp. ($15.00 each)

To order use form on previous page.

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