MARTIN WEAVER:

The Deterioration of Wood in Heritage Structures in Canada

An illustrated lecture

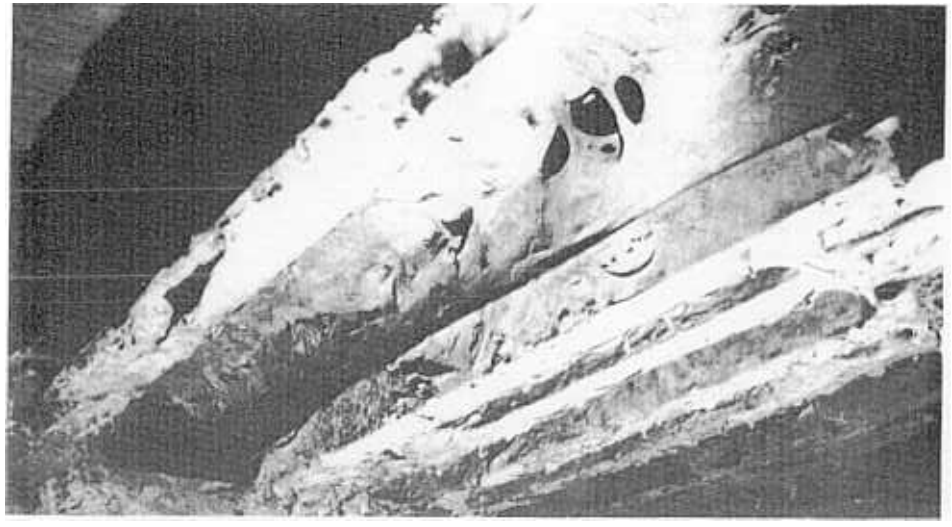
Martin Weaver's communication was built on nearly 50 slides showing examples of deterioration on wood structures.

The reduced choice of illustrations to this publication is made by himself, and we had to cut out comments on pictures which are not published.

The redaction

All countries which include regions with Arctic climates like Canada have remarkable instances of wooden structures being preserved for hundred of years. The cold effectively inhibits or prevents biodeterioration. When admiral Hall's burial from 1868 was exhumed in Greenland, the wooden coffin was in excellent condition.

However, Canada has vast tracts of land which fall in other climatic zones, ranging from rain-forest and mountains in the west via the relatively dry Prairies to the Eastern Woodlands and the cool moist maritime provinces on the Atlantic coast.

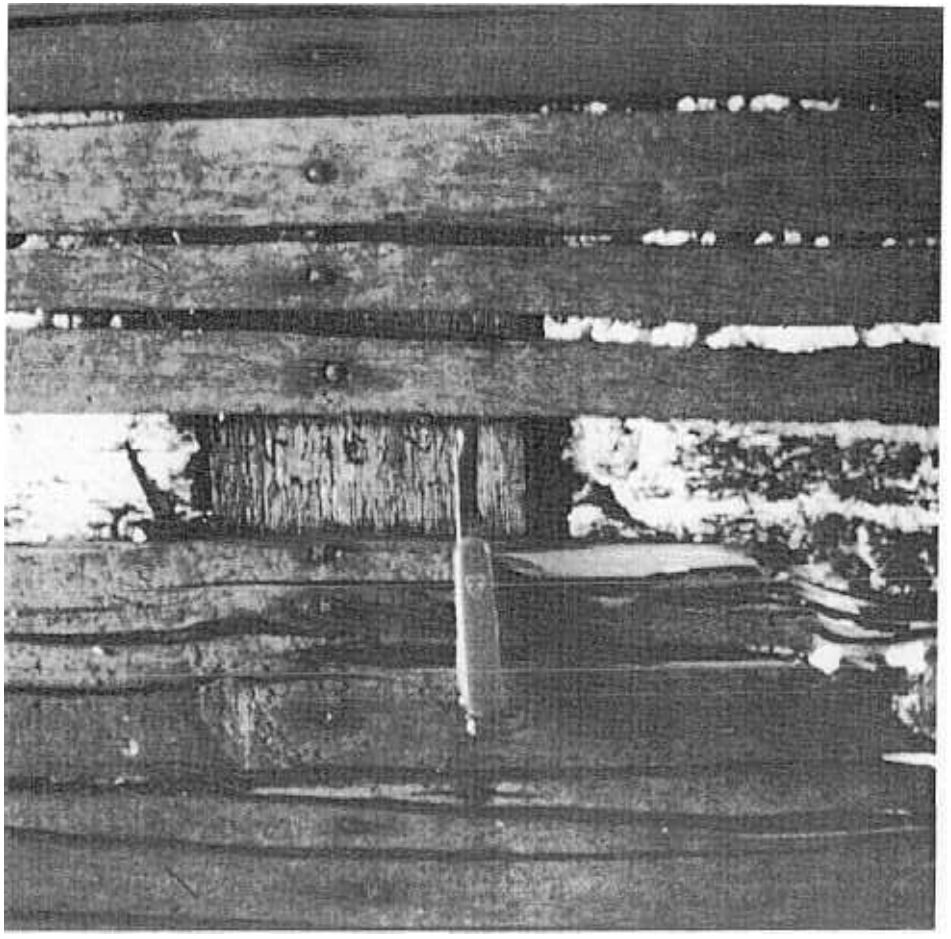


1. Rot outbreak caused by poor maintenance and ventilation, in Charlottetown, Prince Edward Island. Photo: Martin Weaver.

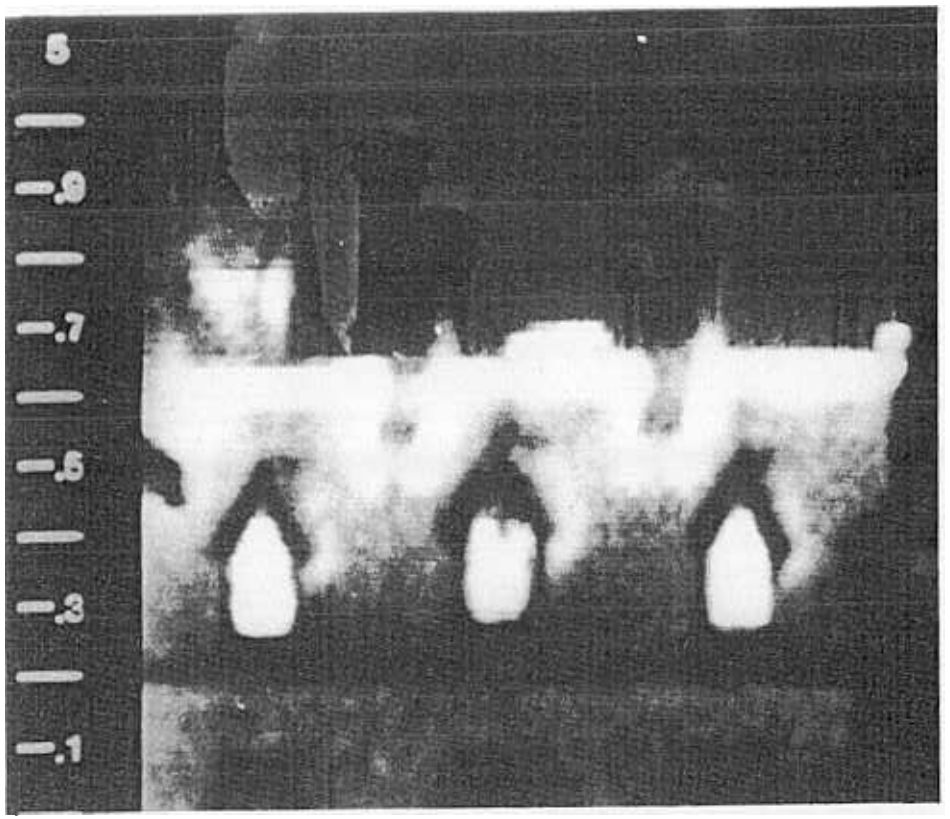
Historic settlements were concentrated in the east in the maritime and woodland regions. Structures were frequently built of soft woods with little regard for permanence and they have understandably deteriorated.

Much wood deterioration is a direct result of high humidities caused by poor maintenance and ventilation.(fig. 1). Poorly ventilated basements, wet earth floors and resulting condensation have severely damaged many churches in the humid maritime provinces.

Winter condensation and subsequent freezing and ice build-ups can cause delayed action problems in the short northern summers. If heritage buildings are temporarily closed, they must carefully ventilated to prevent condensation build-ups and subsequent rot or insect attacks.



2. Urea formaldehyde insulation contracting and admitting water vapour to cold woodwork, St. Andrew's, New Brunswick. Photo: Martin Weaver.



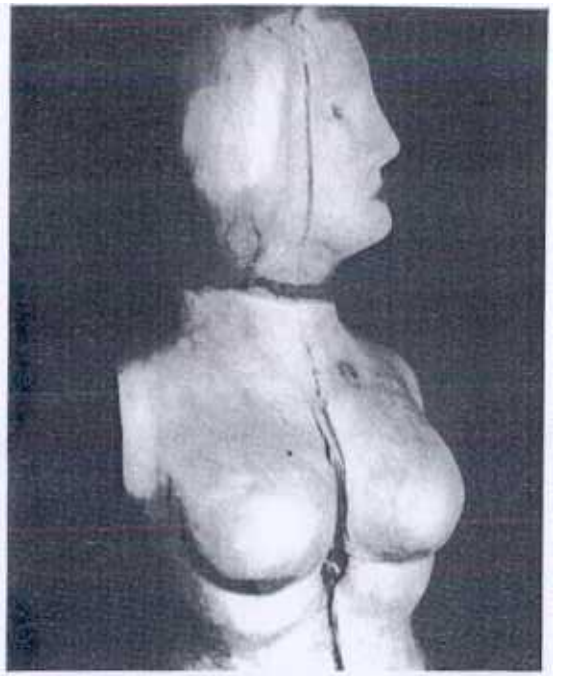
3. Infra-red thermography used to show heat losses through timber framed roof, East Block, Parliament Buildings, Ottawa. Photo: Public Works Canada.

Poor retro-installation of thermal insulation and breakdown of materials has also led to a large number of condensation – related problems in historic woodwork. (fig. 2). All retro-installations of thermal insulation must be conducted with great care (fig. 3).

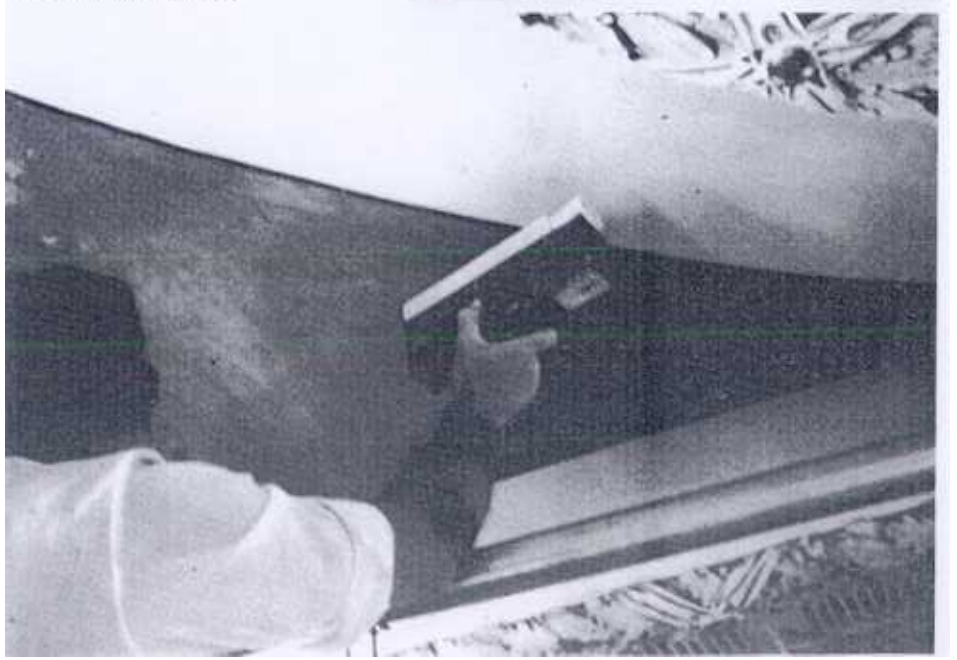
Great care must be taken to carefully observe and copy appropriate historical technology. Wooden shingles on the 18th. century Lutheran church in Halifax, Nova Scotia, have been re-fixed too close together, preventing adequate expansion. Misguided attempts to nail the shingles down have led to disaster Excessive humidity created specially for the interior of the National Gallery in Ottawa has caused severe damage to the structure of this recycled building. This is a common problem where more attention is paid to historic artifacts than to the requirements of the historic building which houses them.

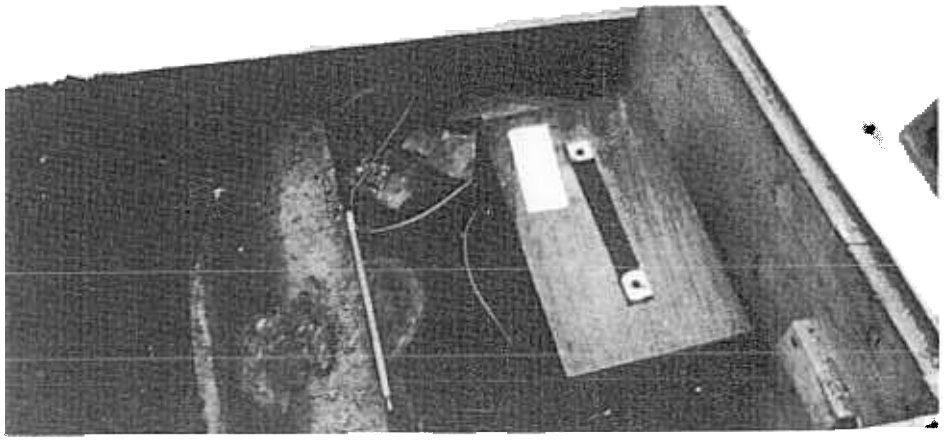
Excessive dessication of wood is also a major problem in Canadian interiors, where forced hot-air heating may loer R.H. to around 20% or less. (fig. 4). Not only does wood dry out, cracking and twisting, but the glue joints also fail. (fig.5).

4. Low interior relative humidities in Canadian winters cracked this primitive wood sculpture. Photo: Martin Weaver.



5. Taking relative humidity readings at ceiling level in Quebec's National Assembly building during research on effects of dessication. Photo: Martin Weaver.





6 – 7. Installing a monitoring thermohydrograph under the floor covering protecting frozen artifacts in an 1853 explorer's supply cache, Dealey Island, High Arctic.
Photo: Martin Weaver.

Excessive cold leads to excessive demands on heating systems with attendant fire-risks and thermal degradation.

Very high rainfalls and high U.V. radiation lead to spectacular wood degradation on Canada's west coast.

8. Heavy attack by carpenter ants (Camponotous Pennsylvanicus) in Eastern White Cedar logs in a nineteenth century log farm building, Ottawa, Ontario. Photo: Martin Weaver.

Many wooden structures rely heavily on vulnerable non-wooden elements for protection against water penetration.

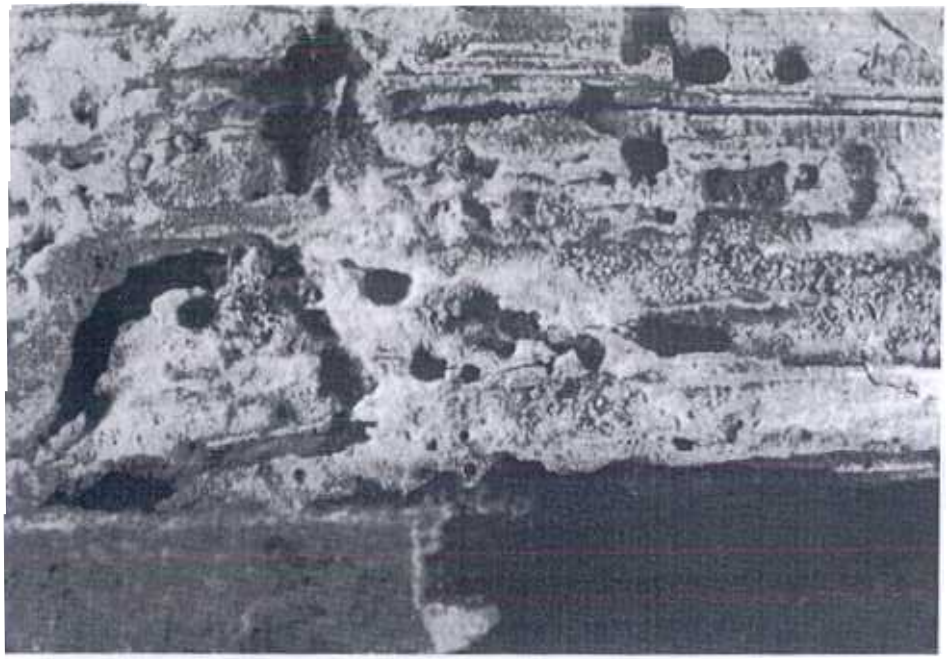
Current vogues for clear «natural wood» finishes have led to a large number of failures of lacquers due to U.V. radiation related degradation of wood surface under lacquer.

An increasing number of conservation projects involve continuing programmes of monitoring of temperature and R.H. (fig. 6&7).

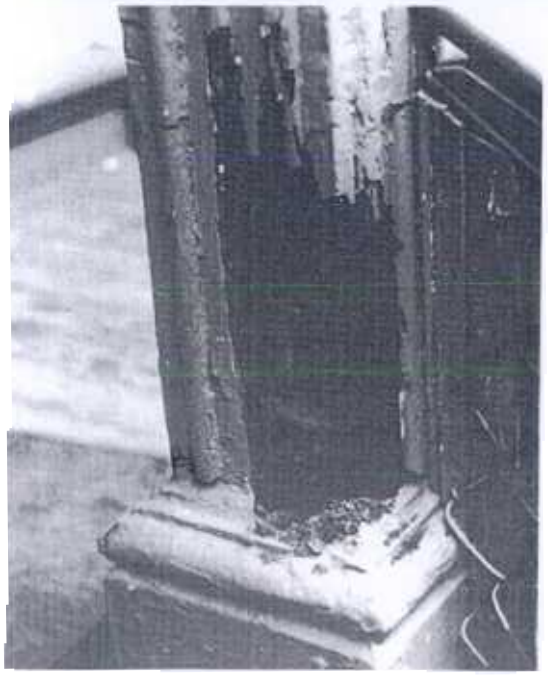
Fungal attacks often occur only because of poor detailing, lack of maintenance or failure to use preservatives in hazardous locations.

Insect attacks and related problems such as woodpecker damage are clearly related to environmental criteria i.e. wood species, sufficient warmth, optimum humidity and wood moisture contents. (fig. 8) Monochamus- pine sawyer beetle damage mainly in forest or recently felled timber. Anobiid.damage larger boreholes than European counterpart (fig.9). Death watch beetle attack together with rot, not uncommon in Maritimes. Subterranean termite attacks are common in Southern Ontario and southern British Columbia (fig.10). Dry wood termites are not to found in Canada but in attacked wood imported in furniture and wooden siding (fig. 11). Nacerdes melanura – the Wharf Borer commonly attacks wood in wharves, docks and wet basements in Ontario, the Maritimes and British Columbia (fig. 12). Marine borers attack wood in salt water on both east and west coasts. They include both teredo borers and lomoria (fig. 13).

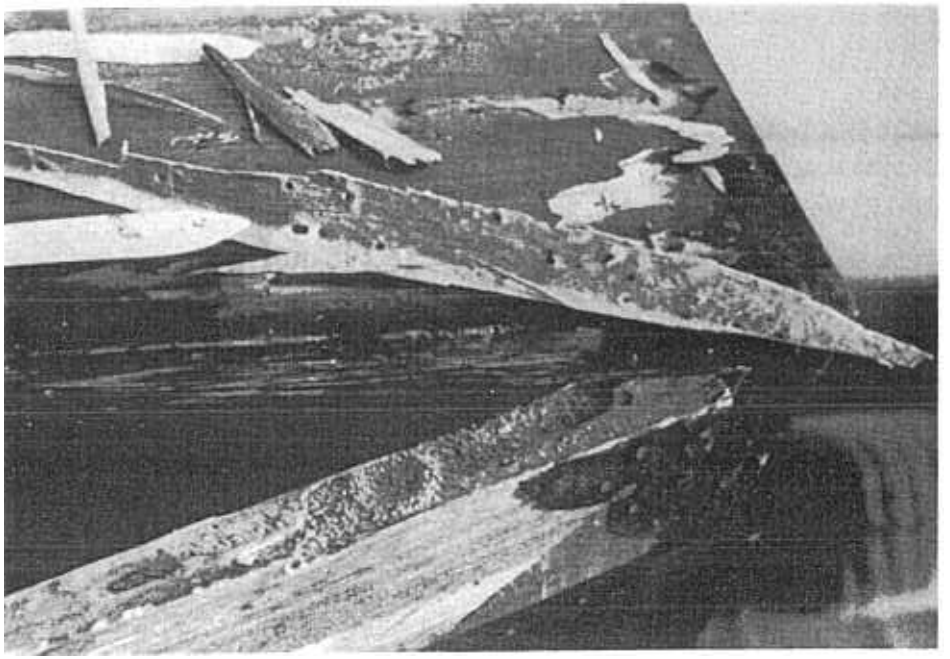
Our major wood detererioration problems are related to the presence or absence of water.



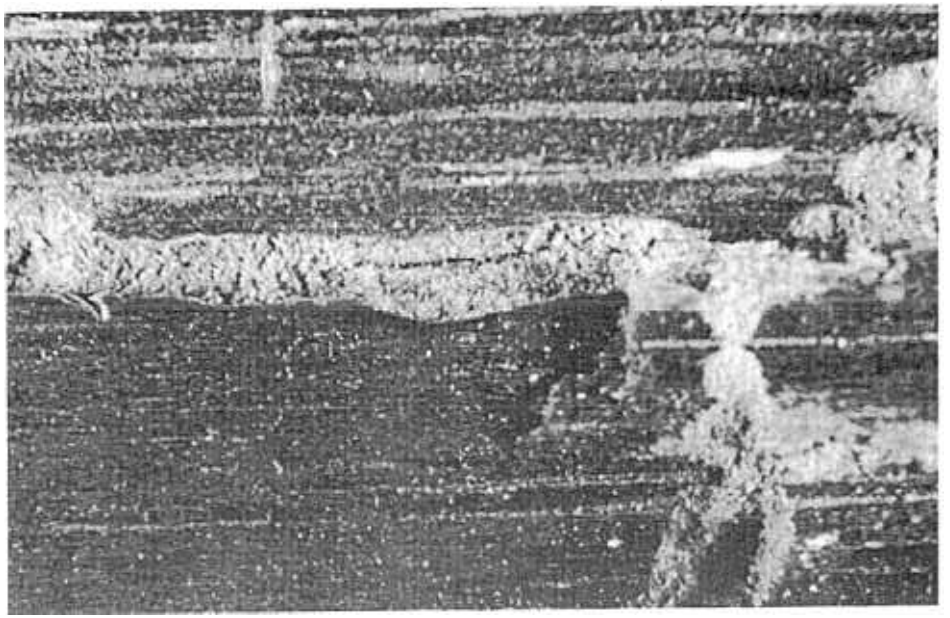
9. Damage to nineteenth century wood flooring caused by the common furniture beetle (annobjum punctatum). The flight holes are larger than European examples ... Photo: Martin Weaver.

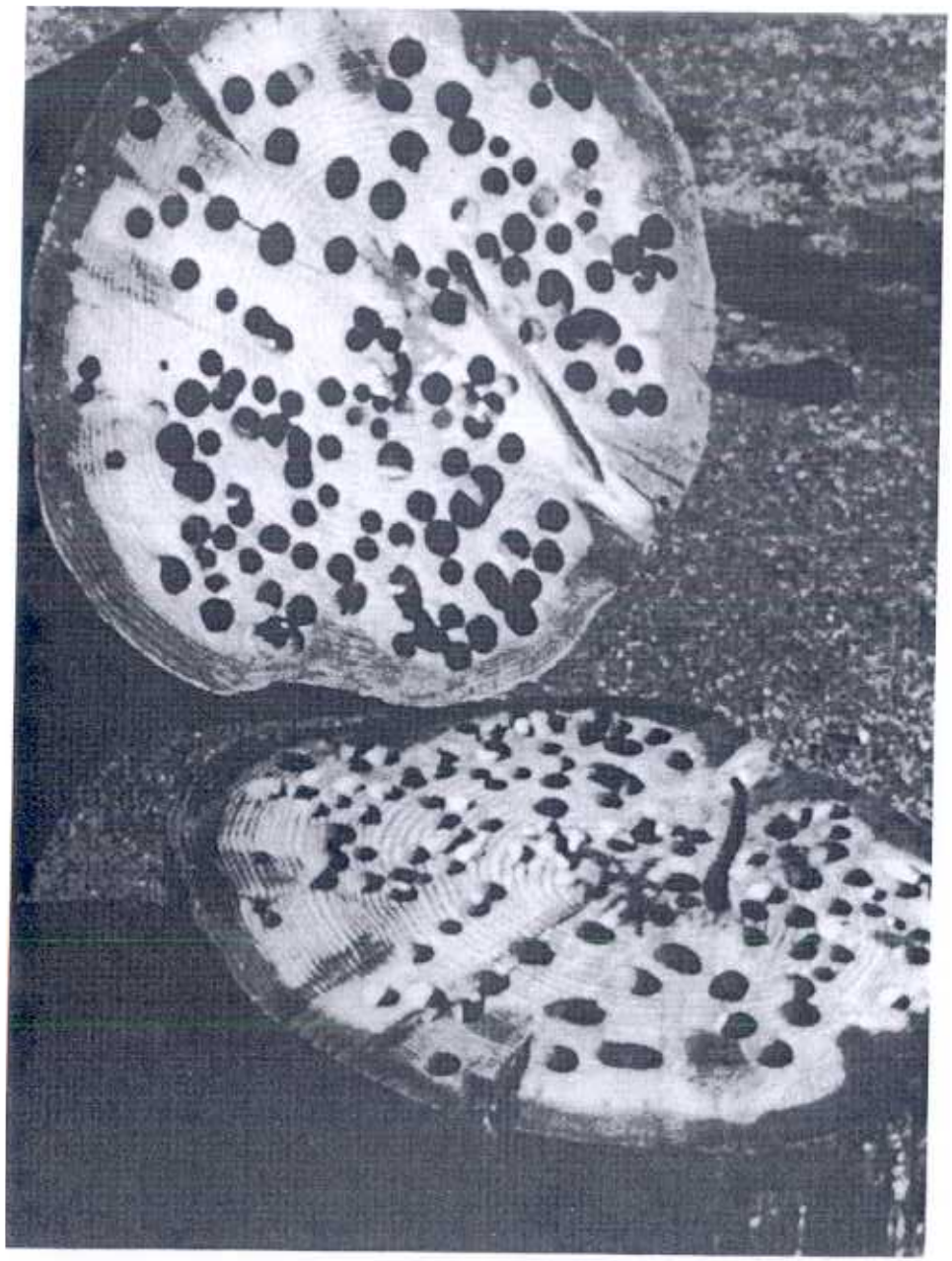


10. Subterranean termites have removed the entire wooden post leaving only the paint in this example from Toronto, Ontario. Photo: Hamish Wilson.



11. Dry wood termite damage in imported antique Chinese chest. Photo: Martin Weaver.
12. Wharf borer insect attack in rotted floor joist, Cornwall, Ontario. Photo: Martin Weaver.





13. Attack by teredo borer in dockside piling, near Vancouver, British Colombia – tunnels approximately 25 mm in diameter. Photo: Martin Weaver.

Résumé

La communication de Martin Weaver était un commentaire d'une cinquantaine de diapos montrant différentes causes de la détérioration du bois. Il a lui même réduit le nombre des illustrations pour cette publication, et nous avons dû faire quelques coupures en supprimant les commentaires de photos non publiées.

La rédaction.

Tous les pays qui ont des régions arctiques, comme le Canada, ont des exemples de structures en bois remarquablement conservées pendant des siècles. Il en était ainsi du cercueil en bois de l'Amiral Hall, datant de 1858 (Groenland) Cependant le Canada est aussi constitué de régions faisant partie d'autres zones climatiques, pluvieuses dans les forêts et montagnes de l'Ouest, relativement sèches dans la Prairie et les forêts de l'Est, ou humides le long des côtes de l'Atlantique.

Les premiers colons s'installèrent dans l'Est, dans les forêts et sur la côte. Leurs bâtiments étaient souvent faits de bois tendre et n'étaient pas conçus pour durer, leur détérioration était donc inévitable.

En général l'humidité, le manque d'entretien et le manque d'aération sont les causes principales de la détérioration des structures en bois.

Illustrations

fig. 1. Exemple de détérioration à Charlottetown, Prince Edward Island.
fig. 2 La condensation dûe à une isolation précaire entraine la détérioration des matériaux.
fig. 3 La thermographie infra-rouge montre la perte de chaleur d'une toiture. Bâtiment est du Parlement, Ottawa.
fig. 4 Mesuration du taux d'humidité au niveau du plafond à l'Assemblée Nationale, Quebec.
fig. 5 La sécheresse de l'air dûe au chauffage intensif pendant l'hiver canadien est la cause de la détérioration de cette statuette primitive qui a craqué.
fig. 6 & 7 Installation d'un thermohydrographe sous le plancher d'une cabane d'explorateurs datant de 1853, Dealey Island, Arctique. La détérioration causée par les insectes (ou les piverts) est également un résultat du climat environnant, du taux d'humidité et de la qualité du bois.
fig. 8 Exemple de rondin de cèdre provenant d'une ferme de l'Ontario, attaquè par les termites (camponotus Pensylvanicus).
fig. 9 Dommages causés par un coléoptère attaquant les meubles anciens (annobivium punctatum). Les trous sont plus grands que dans les exemples européens.
fig. 10 Les termites souterraines ont mangé tout le bois de ce pilier, ne laissant que la peinture. Toronto, Ontario.
fig. 11 Dommages causés par les termites des bois secs dans un meuble ancien importé de Chine.
fig. 12 Un autre genre d'insecte s'attaque aux structures en bois en contact continuel avec l'eau, entre autres les quais et appontements.
fig. 13 Détérioration d'un piliers provenant d'un dock près de Vancouver. Les tunnels creusés par les insectes ont environ 25 mm. de diamtètre.