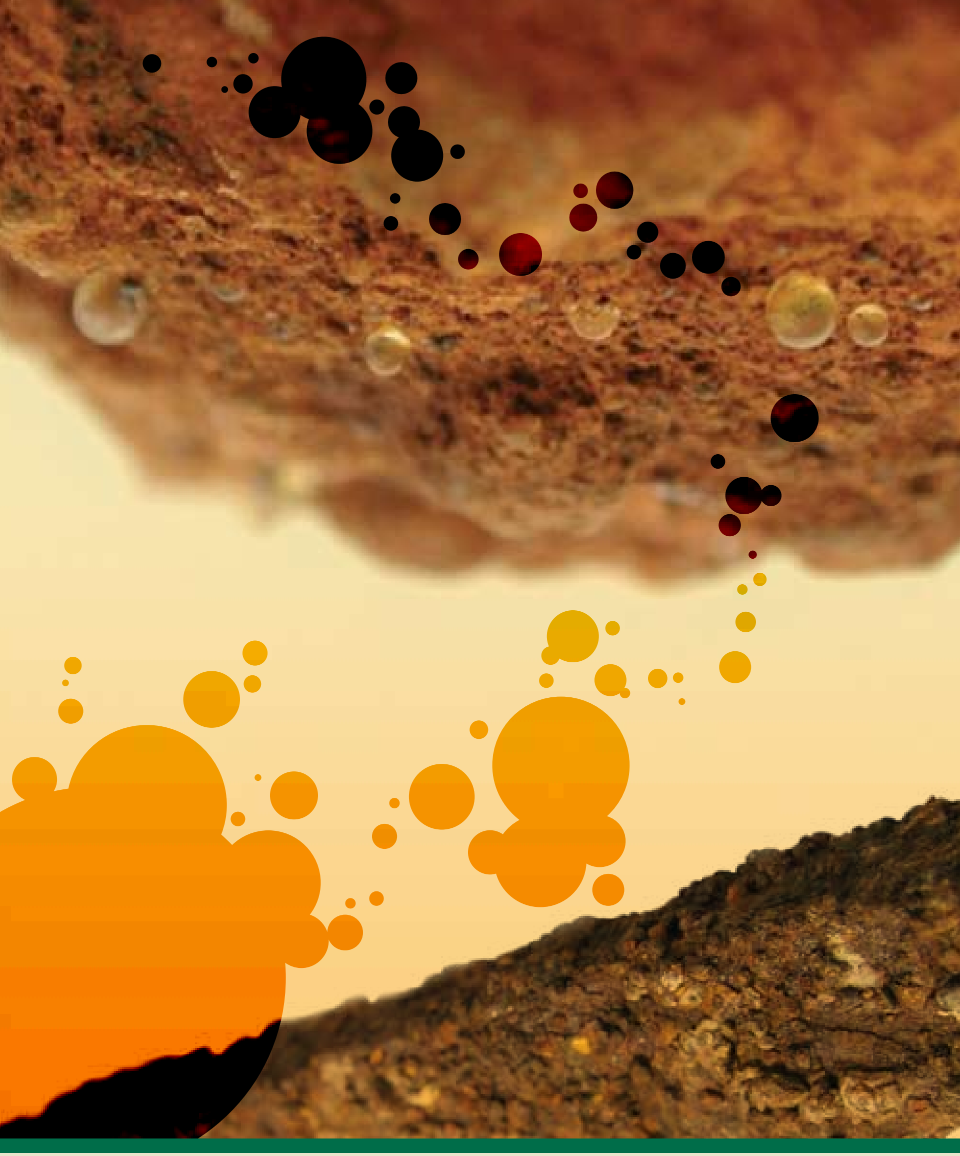
RUST NEVER SLEEPS

RECOGNIZING METALS AND THEIR CORROSION PRODUCTS



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Weeping iron (droplets of water), Nestor Gonzalez, H. L. Hunley Project, Warren Lasch Conservation Center, South Carolina.

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Parks Canada conservators regularly visit national historic sites and parks to perform artifact assessments, and to provide on-site conservation treatments and training for collections management staff and seasonal employees. Producing a corrosion identification booklet for staff was born during a site visit in 2002.

Thanks to Lana Chan and Liz Croome of Cultural Resource Services in the Western and Northern Service Centre, the booklet took on a life of its own. From 2003 until publication we have had the generous assistance and guidance of Lyndsie Selwyn, corrosion scientist at the Canadian Conservation Institute (CCI). We also collaborated with Martina Griesser-Stermscheg, University of Applied Arts Vienna and Bart Ankersmit, conservation scientist, The Netherlands Institute for Culture Heritage. We sincerely appreciate their contributions to this project.

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Thank you to the following for allowing Parks Canada to use their images: Canadian Conservation Institute, Ottawa; Warren Lasch Conservation Centre, South Carolina; The Netherlands Institute for Culture Heritage, Amsterdam; University of Applied Arts, Vienna; Parks Canada's Atlantic and Manitoba Service Centres; Stedelijik Museum, Amsterdam; Museum Valkhof, Nijmegen; the Groninger Museum, Groningen; Royal Alberta Museum, Edmonton; the Bavarian National Museum, Munich; the Glenbow Museum, Calgary; the National Museum of Antiquities, Leiden; and the Maritime Museum, Amsterdam.

Final thanks is reserved for the Western and Northern Service Centre's talented graphic designer, Shouresh Jalili, whose creative spirit has transformed corrosion identification into a very user friendly, sexy and colourful booklet.

The Authors

RUST NEVER SLEEPS

Recognizing Metals and Their Corrosion Products

by Bart Ankersmit, Martina Griesser-Stermscheg, Lyndsie Selwyn and Susanne Sutherland

I hear and I forget,
I see and I remember,
I do and I understand.

The wisdom of this Chinese proverb guided us in writing and illustrating this booklet. By providing clear descriptions and helpful tips, accompanied by useful photographs, we hope it will assist you in identifying corrosion products on artifacts at your historic site. We would appreciate your comments and feedback.

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Objectives of the Brochure

- help staff responsible for the historic houses, museums, churches
- act as a visual guide to problems and damage occasionally observed in metal collections
- offer tips for the proper care of metal objects
- provide reference material for further reading

COPPER AND COPPER ALLOYS

(BRASS AND BRONZE)

RECOGNIZING COPPER

- colour of bare metal: various shades of yellow (pure copper is reddish)
- not magnetic (but brass-plated iron will be magnetic)
- brass is an alloy of copper plus zinc
- bronze is an alloy of copper plus tin

COPPER CORROSION

Copper and Copper Alloys (Brass and Bronze)

- tarnish (or patina) is black
- more serious corrosion is green or blue-green (may be red underneath)
- fingerprints easily stain polished metal
- organic acids react with copper to form green corrosion products

RECOGNIZING METALS

COPPER AND COPPER ALLOYS
(BRASS AND BRONZE)

COPPER OBJECTS *(Figure 1)*

Freshly polished copper objects have a reddish-orange colour. Examples of objects made from copper include coins, roofing, cookware, and pipes. Shown here is a copper vase.

Photograph courtesy of the Canadian Conservation Institute.

BRASS OBJECTS *(Figure 2)*

Freshly polished brass is usually yellow. Shown here is brass that has been partly patinated. Other examples of brass objects are candlesticks, military accessories, and musical and scientific instruments.

Photograph courtesy of Martina Griesser-Stermscheg.

BRONZE OBJECTS *(Figure 3)*

Although polished bronze is normally yellow, objects made with bronze are brown in colour because they have tarnished. Intentionally patinated bronzes can be many colours. Examples of bronze objects are statues, bells, and Chinese mirrors. This photograph shows a cast bronze figure with a natural tarnish layer.

Photograph courtesy Colleen Day, Parks Canada, Atlantic Region.

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CORROSION

COPPER AND COPPER ALLOYS

TARNISHED COPPER *(Figure 4)*

Polished copper gradually tarnishes. This darkening is caused by sulphur-containing gases (e.g. pollution, rubber, wool) in the air. This photograph shows a copper pot with the left side tarnished and the right side just polished.

Photograph courtesy of the Canadian Conservation Institute.

TARNISHED BRASS *(Figure 5)*

Polished brass can also tarnish. This photograph shows a polished brass candlestick on the left and on the right, a tarnished brass candlestick.

Photograph courtesy of the Canadian Conservation Institute.

FINGERPRINTS ON COPPER *(Figure 6)*

Fingerprints on a polished surface are caused by touching it with bare hands. This photograph shows fingerprints on a copper surface.

Photograph courtesy of Martina Griesser-Stermscheg.

POLISH RESIDUE ON COPPER ALLOYS *(Figure 7)*

Polish residue after polishing with liquid polishes can leak through holes and be left beneath an object. This photograph shows polish on the underside of a brass object.

Photograph courtesy of Susanne Sutherland, Parks Canada, Winnipeg.

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CORROSION

COPPER ALLOYS

RESIDUE IN CREVICES OF COPPER ALLOYS *(Figure 8)*

Residue in crevices results after polishing if the abrasive materials remain in crevices or engraved areas because of inadequate rinsing. The green colour is copper corrosion staining the white abrasive. This photograph shows a close up of green copper corrosion, on a copper pot, located in the join where the brass handle joins the copper pot.

Photograph courtesy of the Canadian Conservation Institute.

LOCAL SPOTS OF GREEN CORROSION ON COPPER ALLOYS *(Figure 9)*

Local green spots on copper alloy objects may be caused by exposure to organic acids from coatings on leather. This photograph shows waxy green corrosion that has formed on a brass surface adjacent to leather.

Photograph courtesy of Bart Ankersmit and the Army Museum, Delft.

GREEN CORROSION ON OUTDOOR COPPER ALLOYS *(Figure 10)*

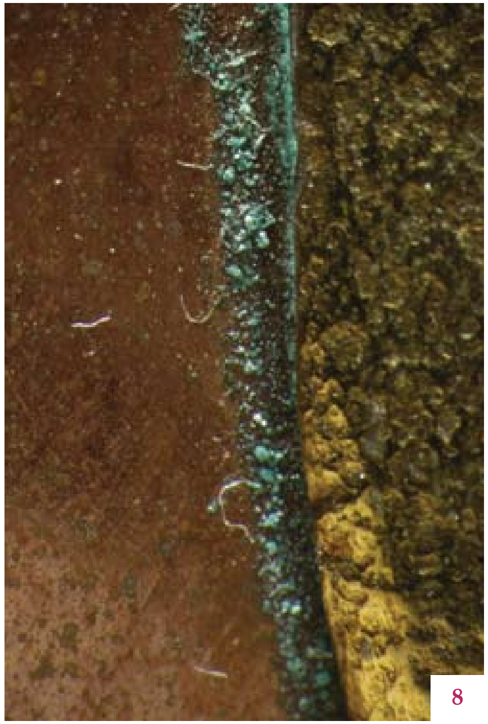
Green copper corrosion products form on copper alloys when they are exposed outdoors. This photograph shows this green patina on an outdoor bronze sculpture.

Photograph courtesy of Colleen Day, Parks Canada, Atlantic Region.

BRONZE DISEASE ON ARCHAEOLOGICAL COPPER ALLOYS *(Figure 11)*

Bronze disease appears as light-green spots of corrosion and is caused by the accumulation of salt (sodium chloride) during burial. This photograph shows an example of bronze disease on an archaeological copper alloy blade.

Photograph courtesy of the Canadian Conservation Institute.



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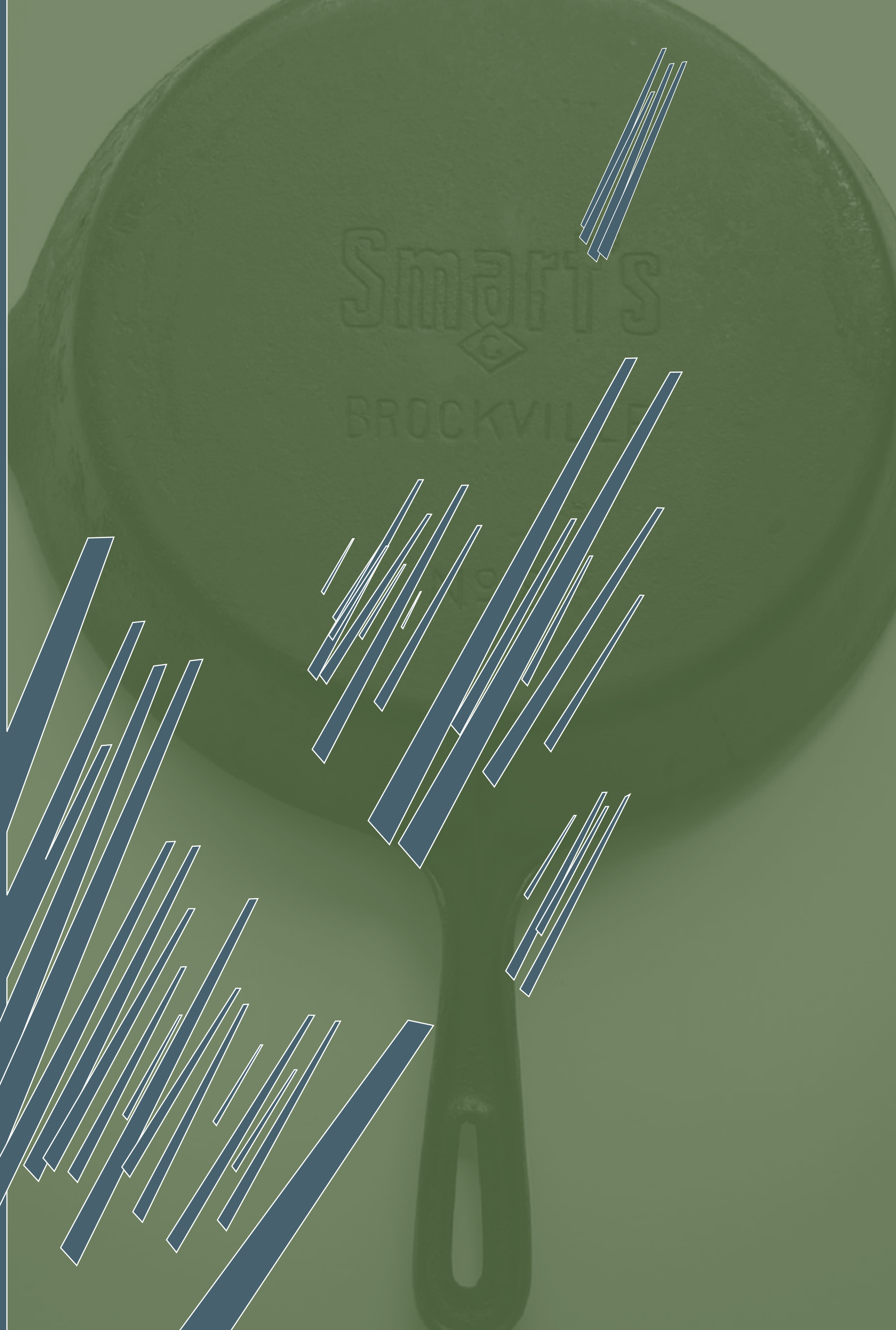
IRON



RECOGNIZING IRON

- colour of bare metal: silvery-grey
- almost always magnetic (certain stainless steels are not magnetic)
- historic wrought iron is almost pure iron (<0.1% carbon) with glass inclusions
- steel is iron plus 0.2 to 2% carbon
- cast iron is iron plus 2 to 4% carbon
- stainless steel is iron plus chromium and nickel

IRON CORROSION

Iron and Iron Alloys (Wrought and Cast)

- corrosion is rust-coloured (red, yellow, red-brown)
- rapid rusting (flash rusting) is caused by a sudden increase in relative humidity
- drops of liquid on iron or dry, hollow shells are evidence of contamination by salt (chlorides)

RECOGNIZING METALS

IRON

WROUGHT IRON OBJECTS *(Figure 12)*

Corroded wrought iron objects have a wood-like structure. This photograph shows a corroded wrought iron chain. Other examples of wrought iron objects are nails, rails, and anchors

Photograph courtesy of Henry Unglick, Parks Canada, Ottawa.

STEEL OBJECTS *(Figure 13)*

Uncorroded steel objects have a silvery-gray colour. Many tools and machinery (lathes, milling machines) are made from steel. This photograph shows a putty knife that has a steel blade.

Photograph courtesy of the Canadian Conservation Institute.

CAST IRON OBJECTS *(Figure 14 and 15)*

Uncorroded cast iron objects have a silvery-gray colour. Examples of cast iron objects include pots, pans, fire grates, stoves, cannon, and cannon balls. Figure 14 is a cast iron frying pan and figure 15 is a cast iron hand grenade.

Photographs courtesy of Canadian Conservation Institute.

STAINLESS STEEL OBJECTS *(Figure 16)*

Stainless steel objects have a silvery-gray colour and do not easily rust. Stainless steel is used to make cooking utensils, cutlery, decorative architectural hardware, and for many other industrial purposes. Stainless steel cutlery is shown in this photograph.

Photograph courtesy of the Canadian Conservation Institute.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CORROSION

IRON

STABLE CORROSION (STABLE RUST) *(Figure 17)*

Stable rust is red-brown in colour, usually well adhered, and is caused by exposure to moisture sometime during an object's lifetime. Shown in this photograph is an historic vehicle with many of its iron components covered with rust. This rust will remain unchanged as long as the relative humidity remains low.

Photograph courtesy of Canadian Conservation Institute.

DAMAGE BY ONGOING RUSTING *(Figure 18)*

Ongoing rusting is caused by high humidity. The continued formation of rust causes flaking (or flaking of paint if the surface was painted), surface deformations, and spalling. This photograph shows rust pushing off a dark coating.

Photograph courtesy of Martina Griesser-Stermscheg.

LOCAL RUSTING *(Figure 19)*

Local rusting appears as small areas of rust on bare (uncorroded) iron. It is caused by water remaining in one spot. It might also be caused by the local accumulation of dust or dirt. This photograph shows local rusting on an iron blade.

Photograph courtesy of John Watt, Parks Canada, Winnipeg.

FINGERPRINTS ON BARE IRON *(Figure 20)*

Touching unrusted iron can result in fingerprints or, as shown in this photograph, handprints.

Photograph courtesy of Joosje van Bennekom, Stedelijk Museum, Amsterdam.

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IRON

FLASH RUSTING ON IRON *(Figure 21)*

Flash rusting is rapid rusting on iron just after exposure to high humidity (e.g. a flood). The rust that forms is bright orange. This photograph shows this rapid rusting on a dinner knife.

Photograph courtesy of Susanne Sutherland, Parks Canada, Winnipeg.

DELAMINATION OF IRON *(Figure 22)*

Prolonged corrosion of iron, especially if contaminated with salts, can result in delamination, as shown in this photograph of an archaeological spade from the 1st century.

Photograph courtesy of Ronny Meijers, Museum Valkhof, Nijmegen.

WEEPING IRON (DROPLETS OF WATER) *(Figure 23)*

Weeping iron. This is the formation of small round droplets of water at high relative humidity. These droplets become covered with a thin film of rust. It is caused by salt contamination in objects (these are usually archaeological).

Photograph courtesy of Nestor Gonzalez, H.L. Hunley Project, Warren Lasch Conservation Center, South Carolina.

WEEPING IRON (DRY, HOLLOW SHELLS) *(Figure 24)*

Weeping iron. After weeping has occurred and the relative humidity has dropped, an iron object is often covered with hollow shells of rust. This photograph shows an example of these hollow shells.

Photograph courtesy of the Canadian Conservation Institute.

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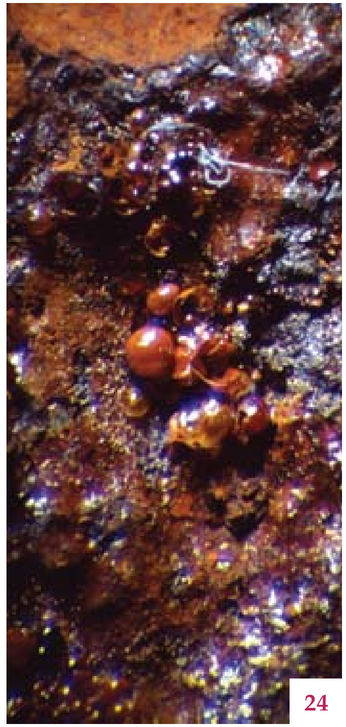

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SILVER

RECOGNIZING SILVER

- colour of bare metal: silvery-grey (highly reflective when polished)
- not magnetic
- possibly stamped to indicate sterling silver or silver plate
- sterling silver is an alloy of 92.5% silver and 7.5% copper
- silver-plate stamped EPBM is silver plated onto Britannia metal (an alloy of mainly tin with some antimony and copper)
- silver-plate stamped EPNS is silver plated onto nickel silver (an alloy of mainly copper with some nickel and zinc)

SILVER CORROSION

Silver-plate and Silver Alloys (Sterling Silver)

- tarnish is black if thick
- tarnish can be the colours of a rainbow if thin
- fingerprints easily stain polished silver

SILVER

STERLING SILVER OBJECTS *(Figure 25)*

Sterling silver is used to make dishes, jewellery, and liturgical objects. This photograph shows an example of two pieces of sterling silver flatware.

Photograph courtesy of the Canadian Conservation Institute.

SILVER-PLATED OBJECTS *(Figure 26)*

Objects plated with silver are less expensive than those made with sterling silver. Examples of silver-plated objects include flatware, serving dishes, jewellery, liturgical objects, candlesticks, and trophies. This photograph shows the back of a silver-plated fork stamped with the letters E.P.N.S. indicating "electroplated nickel silver," which means that the silver has been electroplated onto a nickel-silver alloy (a copper-rich alloy containing nickel and zinc, but no silver).

Photograph courtesy of the Canadian Conservation Institute.

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CORROSION

SILVER

TARNISH ON SILVER ALLOYS *(Figure 27)*

Tarnish on silver is the gradual discoloration of silver. A thin layer of tarnish looks yellow. Tarnish is caused by sulphur-containing gases (e.g., pollution, rubber, wool). The spoon on the left has been cleaned (no tarnish) and the spoon on the right has not been cleaned and is covered with tarnish.

Photograph courtesy of Bart Ankersmit and the Groninger Museum.

INTERFERENCE COLOURS ON SILVER *(Figure 28)*

Thin tarnish layers on silver can vary from yellow to red to blue before the layer becomes black, its final colour. This photograph shows red and blue interference colours on the outer edges of a silver object.

Photograph courtesy of Margo Brunn, Royal Alberta Museum.

FINGERPRINTS *(Figure 29)*

Fingerprints are caused by touching silver with bare hands. This photograph shows tarnished silver with fingerprints.

Photograph courtesy of Sandra Santesso, Parks Canada, Winnipeg.

LOSS OF PLATING *(Figure 30)*

Damage to the plating layer or to surface detail can be caused by cleaning with an abrasive polish or by excessive handling. This photograph shows detail of the loss of the silver layer from a silver-plated copper tray caused by repeated cleaning with an abrasive polish.

Photograph courtesy of the Canadian Conservation Institute.

RESIDUE IN CREVICES AFTER POLISHING SILVER *(Figure 31)*

Polish residue on a silver object. Polish residue can be left on silver objects after abrasive polishing if the object was not rinsed well enough. The residual material is often trapped in crevices and can be white or stained green if copper is present under the plating or in the silver alloy. The white areas in this photograph show polish residue.

Photograph courtesy of Martina Griesser-Stermscheg.

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TIN

RECOGNIZING TIN

- colour of bare metal: silvery-grey
- not magnetic (but tin-plated iron will be magnetic)
- modern pewter is mainly tin plus some antimony and copper
- old pewter may also contain lead

TIN CORROSION

Tin-plate and Tin Alloys (Pewter)

- tarnish (patina) is darkening of bare metal
- tarnish on leaded pewter is dark gray
- tin corrosion products are either white or black
- rust on tin-plate is corrosion of underlying iron

TIN-PLATED OBJECTS *(Figure 32)*

Tin-plated iron is used to make tin cans, kitchen utensils and dishes. Shown in this photograph is a funnel made with tin-plated iron.

Photograph courtesy of the Canadian Conservation Institute.

MODERN PEWTER *(Figure 33)*

Modern pewter is an alloy of mainly tin, with some copper and antimony, but no lead. Pewter is easily cast and is used to make jewellery, dishes, vases, candlesticks, and trophies. This photograph shows a dish made from modern pewter.

Photograph courtesy of the Canadian Conservation Institute.

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LEAD

RECOGNIZING LEAD

- colour of bare metal: dull silvery-grey (cannot be polished)
- not magnetic
- objects are relatively heavy
- soft solder (mixtures of lead and tin)

LEAD CORROSION

Lead and Lead Alloys (Solder)

- tarnish (or patina) is dark gray
- corrosion products are usually white
- lead is susceptible to corrosion by acetic acid (often from wood products)

LEAD OBJECTS *(Figure 34)*

Lead has a low melting point and is easily cast. It has been used to make weights, communion tokens, inexpensive jewellery, components in ship models, type metal for printing, solder, ammunition, and toys. Shown in this photograph is an ingot of pure lead.

Photograph courtesy of the Canadian Conservation Institute.

CORROSION

TIN, TIN-PLATE, PEWTER, AND LEAD

STABLE PATINA ON LEADED PEWTER *(Figure 35)*

Old pewter usually contains lead and gradually darkens with time to form a dark gray patina. This photograph shows an example of a pewter tankard with its dark gray patina.

Photograph courtesy of the Canadian Conservation Institute.

WHITE CORROSION VERSUS STABLE PATINA ON LEAD *(Figure 36)*

Lead gradually darkens with time to form a stable dark gray patina (see the arrow on the right hand side). Lead suffering from active corrosion turns white (see the arrow on the left hand side).

Photograph courtesy of Bart Ankersmit and the Maritime Museum, Amsterdam.

WHITE CORROSION ON LEAD *(Figure 37)*

White corrosion on lead is usually caused by exposure to volatile organic acids such as acetic acid (vinegar). This photograph shows lead communion tokens after storage in wood drawers. The lead tokens covered with white corrosion and surrounded by white particles are suffering from active corrosion; the other tokens are not.

Photograph courtesy of the Canadian Conservation Institute.

GRAY CRYSTALS ON LEAD ALLOYS *(Figure 38)*

Corrosion on lead can be caused by formic acid. This photograph shows gray crystals of lead formate on a wheel on a toy T.63.46.18 after nine years in a large sealed display case.

Photograph courtesy of the Glenbow Museum.

RUSTING OF TINPLATE *(Figure 39)*

Tin-plated iron often suffers from the rusting of iron. This photograph shows red iron rust showing through the shiny layer of tin plating.

Photograph courtesy of Susanne Sutherland, Parks Canada, Winnipeg.

WHITE CORROSION ON TIN *(Figure 40)*

Tin corrodes when exposed to moisture. This photograph shows archaeological tin on which white corrosion is causing the dark paint to delaminate.

Photograph courtesy of Bart Ankersmit and the National Museum of Antiquities, Leiden.

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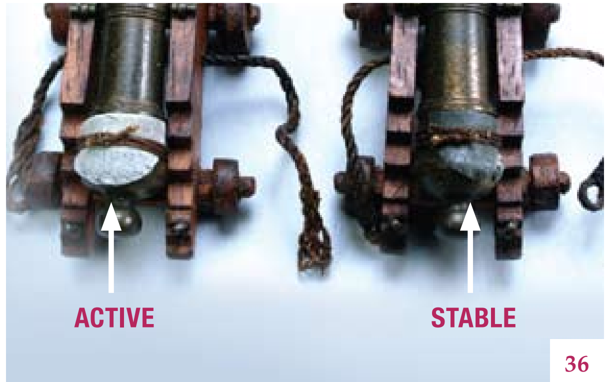

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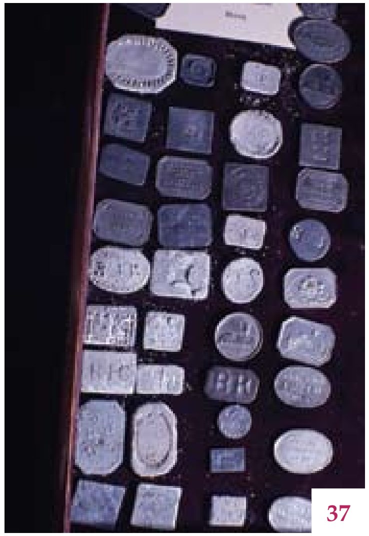

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Problems and Solutions

Further information can be found in the reference section listed below. When in doubt, consult a conservator.

PROBLEMS	SOLUTIONS
• Damage caused by handling	minimize handling, wear cotton gloves
• Damage caused by abrasive cleaning	clean only when necessary; use softest abrasive for the job (e.g. paste of precipitated calcium carbonate and water)
• New corrosion of metal under plating	isolate object in a dry environment
• Loss of plating layer	leave alone to save information about history of use
• Condensation inside sealed plastic bag	(a) break seal by cutting small holes in bag to promote ventilation or (b) add a drying agent (e.g. dry silica gel) to the bag and then reseal
• Blue-green corrosion on copper alloys inside wood case	add ventilation to case; consider painting case
• Tarnish on silver	store inside a sealed plastic bag; better yet seal inside a plastic bag containing dry silica gel and activated charcoal
• White or gray corrosion on lead	provide better ventilation to dilute source of problem (volatile organic acids) and consult a conservator about safe corrosion removal and disposal
• Difficulty finding conservation resources	See reference section below. See CCI Notes (9 series) available on the CCI Web site. See also the Preserving my Heritage web site.
• Difficulty finding conservation advice	When in doubt, consult a conservator. For more information, see the Canadian Association of Professional Conservators (CAPC) Web site.

Appendix: Factors of Deterioration

The following factors can affect the deterioration of objects in collections. They are often used as a basis for assessing the risks to a collection:

Contaminants and Pollutants

- accelerate metal corrosion
- contaminants may be from
  - — sulphur-containing gases (e.g. food, polluted air)
  - — cleaning chemicals (especially aerosols)
  - — soot, dust and dirt
  - — degrading plastics

Fire

- loss of collection

Handling (and other physical forces)

- corrodes metals (from salts and acids on bare hands)
- damages objects (e.g. scratching, dents, breakage)

Incorrect relative humidity

- corrodes metals above about 65% relative humidity

Incorrect temperature

- damages sensitive material (e.g. wood) associated with metals

Light

- fades light-sensitive material (e.g. ribbons) associated with metals

Pests

- attack organic material associated with metals

Security

- loss of portable, valuable, or rare objects

Water

- corrodes metals
- water may come from:
  - — burst pipes
  - — melting ice
  - — leaks because of heavy rain and wind
  - — floods
  - — condensation

REFERENCES

Barclay, B. and C. Hett. The Cleaning, Polishing and Protective Waxing of Brass and Copper. CCI Notes 9/3. Ottawa: Canadian Conservation Institute, 1988.

Canadian Conservation Institute. Recognizing Active Corrosion. CCI Notes 9/1. Ottawa: Canadian Conservation Institute, 1997.

Canadian Conservation Institute. Storage of Metals. CCI Notes 9/2. Ottawa: Canadian Conservation Institute, 1995.

Canadian Conservation Institute. Basic Care of Coins, Medals and Medallic Art. CCI Notes 9/4. Ottawa: Canadian Conservation Institute, 1997.

Canadian Conservation Institute. Care and Cleaning of Iron. CCI Notes 9/6. Ottawa: Canadian Conservation Institute, 1995.

Drayman-Weisser, T. "Metal objects." pp. 108-121 in Caring for Your Collections (ed. H. Whelchel). New York: Harry N. Abrams, 1992.

Prytulak, G. Mechanical Removal of Rust from Machined Ferrous Surfaces. CCI Notes 9/8. Ottawa: Canadian Conservation Institute, 1996.

Selwyn, L. Silver - Care and Tarnish Removal. CCI Notes 9/7. Ottawa: Canadian Conservation Institute, 1997.

Selwyn, L. Metals and Corrosion: A Handbook for the Conservation Professional. Ottawa: Canadian Conservation Institute, 2004.

Tétreault, J. "Display Materials: The Good, The Bad and The Ugly." pp. 79-87 in Exhibitions and Conservation. Edinburgh: Scottish Society for Conservation and Restoration, 1994.

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